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ANALYZING THE RELATIONSHIP BETWEEN GRADUATE THESES OF UNIVERSITIES AND THE COMPETITIVE INDUSTRIES IN THEIR REGIONS

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IN

INDUSTRIAL ENGINEERING

BY

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Samet Kürşat BAŞOL

ABSTRACT

ANALYZING THE RELATIONSHIP BETWEEN GRADUATE THESES OF UNIVERSITIES AND THE COMPETITIVE INDUSTRIES IN THEIR REGIONS

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Universities are working to carry out activities such as technology transfer, patent licensing and consultancy along with their traditional teaching and research activities. Universities are also developing strategies to increase the contribution of these activities to their region and national economy, so the importance of universities' regional development-oriented studies is increasing. In this study, the relationship between universities and the most competitive industries in their regions are analyzed with the graduate theses of universities focusing on those industries. Twenty six universities, which are regularly included in seven Entrepreneurial and Innovative University Index (EIUI) rankings, and their regions were selected. The strongest and the most competitive sectors in the manufacturing industry of the selected regions were determined by the Balassa RCA Index and Foreign Trade Balance Index (TBI). The number of graduate theses related to those sectors are divided by the number of academicians and a score is obtained. Universities are ranked according to this score. As a result, the relationship between the graduate theses of universities and the competitive industries of their regions were interpreted according to this ranking. Also this ranking was compared with the GYUE rankings of the universities and the similarities were interpreted.

Key Words: Smart Specialization Strategies, Regional Development, Competitive Industries, Entrepreneurial and Innovative University Index, Graduate Theses

ÖZET

ÜNİVERSİTELERİN LİSANSÜSTÜ TEZLERİNİN BÖLGELERİNDEKİ REKABETÇİ ENDÜSTRİLER İLE İLİŞKİSİNİN ANALİZİ

BAŞOL, Samet Kürşat
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Günümüzde üniversiteler yürüttükleri geleneksel öğretim ve araştırma çalışmaları ile birlikte teknoloji transferi, patent lisanslama ve danışmanlık faaliyetlerini gerçekleştirmek için çalışmaktadır. Üniversiteler, bu faaliyetlerinin kendi bölgesine ve ulusal ekonomiye katkısının artması için de stratejiler geliştirmektedir. Bu kapsamda üniversitelerin bölgesel kalkınma odaklı çalışmalarının önemi giderek artmaktadır. Bu çalışmada, üniversiteler ve bölgelerindeki en rekabetçi endüstrilerin arasındaki ilişki üniversitelerin bu endüstriler odağındaki lisansüstü tezleri ile analiz edilmiştir. Analiz için yedi Girişimci ve Yenilikçi Üniversite Endeksi (GYUE) sıralamasında devamlı yer alan yirmi altı üniversite ve bölgeleri seçilmiştir. Seçilen bölgelerin imalat sanayisindeki en güçlü ve en rekabetçi sektörleri Balassa RCA endeksi ve Dış Ticaret Dengesi Endeksi (TBI) ile belirlenmiştir. Üniversitelerin belirlenmiş sektörlere yönelik gerçekleştirdikleri lisansüstü tez sayıları akademisyen sayılarına bölünmesi ile bir puanlama oluşturulmuştur. Üniversiteler bu puanlama sonucuna göre sıralanmıştır. Sonuç olarak, üniversitelerin lisansüstü tezleri ile bölgelerinin rekabetçi endüstrileri arasında ilişki bu sıralamaya göre yorumlanmıştır. Aynı zamanda bu sıralama üniversitelerin GYUE sıralamaları ile karşılaştırılmış ve benzerlikler yorumlanmıştır.

Anahtar Kelimeler: Akıllı Uzmanlaşma Stratejileri, Bölgesel Kalkınma, Rekabetçi Sektörler, Girişimci ve Yenilikçi Üniversite Endeksi, Lisansüstü Tezleri,

''Dedicated to my family''

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LIST OF ABBREVIATIONS

RIS	Regional Innovation System
NIS	National Innovation System
EIUI	Entrepreneurs and Innovative University Index
SCPA	Scientific Contribution per Academician
RCA	Revealed Comparative Advantage
OECD	The Organization for Economic Co-operation and Development
TÜBİTAK	The Scientific and Technological Research Council of Turkey
YÖK	Council of Higher Education
TURKSTAT	Turkish Statistical Institute
TBI	The Trade Balance Index
ESI	Export Similarity Index (ESI)
CEP	Comparative Export Performance Index
GLI	Intra-Industry Trade (Grubel – Lloyd) Index
GHI	Trade Concentration (Gini- Hirschmann) Index
RC	Revealed Competitiveness
RTA	Relative Trade Advantage Index
RMA	Revealed Import Advantage
UNCTAD	United Nations Conference on Trade and Development
SITC	Glossary Standard international trade classification
EU	European Union
ISIC	International Standard Industry Classification
UN COMTRADE	International Trade Statistics Database

CHAPTER I
INTRODUCTION

Since the 1980s, many academic studies have been conducted on various countries' regional development policies. These studies have changed the focus of regional development. Today's governance mechanisms aim to contribute not only to technology, but also to the level of intellectual knowledge. Therefore, mechanisms are thought to contribute to innovation and economic growth at the regional level. Countries continue to develop policies and infrastructure for the needs of their stakeholders (industrial organizations, public and universities, etc.). As a result of these economic developments, the country adopts regional development strategy that focuses on competitiveness, innovation and technology.

1. 1   Regional Development

Regional economic imbalance is a common problem in both developed and developing countries. After World War II, its current relevant importance in political and economic fields continued to increase. Increased public awareness has encouraged institutional structures for a solution. For this reason, countries are examining global policies in order to manage these solution processes and to include them in their own policy processes.

The concept of a Regional Innovation System (RIS) has emerged with the idea of the National Innovation System (NIS) focusing on a particular region. [1]. Asheim and Coenen said that a region can be defined as the institutional infrastructure supporting innovation for the production structure [2]. There are studies indicating that RIS has been developed as a tool to promote the innovative activities of national and regional policy-makers [3]. The importance of these policies, in terms of supporting the role of regional competitiveness, is increasing daily. With this increasing importance, clustering and incentives as well as regional governance mechanisms that support the formation of the information needed and help put the industry in place geographically [4].

In the last quarter, the focus of regional innovation policies focused on the use of entrepreneurship and innovation in regional development activities, and placed SMEs at the center of the EU's development policy [5 - 7]. Developing a policy to ensure and sustain regional competitiveness through economic growth is called the Smart Specialization Strategy [8]. With the Smart Specialization Strategy, it ensures that stakeholders in the region create solutions for their sustainable development activities and their innovative capacity for their regions.

1. 2   Evaluation of Regional Development Policy and Activities

There is still no conceptual method in the literature for measuring identified regional development activities. The difficulty in determining the evaluation method arises from the fact that economic processes depend upon multiple variables which possess a dynamic structure. Stec and Grzebyk [9] stated that the current literature does not provide precise methods or frameworks for assessing the progress of the implemented strategies in line with Europe's 2020 objectives. Also, Secundo et al. [10] stated that the role of universities in regional development and the centrality of performance measures are guided by EU policies. Despite the shortcomings of the performance measurement methods in the literature, the increase in university activities which produce information in the region gains importance within the a country's framework of national strategies. Universities and research institutes are therefore key actors in the learning process and knowledge-based RIS in regional development policies and activities.

1. 3   Regional Development and the Role of Universities

In a knowledge economy, universities are increasingly expected to make vital contributions to the processes of regional innovation and economic development [11]. The Organization for Economic Co-operation and Development (OECD) proposes a systematic combination of universities to develop strategies towards achieving regional growth. [12]. In addition, the European Union obliges regional development processes with smart specialization strategies to be established, with a focus on universities [13]. Therefore, Etzkowitz et al. proposed the Triple Helix model to evaluate the information infrastructure of RIS together with university industry-government relations. [14-16]. Unlike the traditional educational and research roles of the universities, the Triple Helix model defines a third task for the commercialization

of technology. Within the focus of technology commercialization, universities that produce knowledge begin to build relationships with commercial industry and governments. "Entrepreneurial Universities" that have brought theory to life have become key components of RIS and have played a key role in the development of the knowledge-based economy [17]. These collaborations, which are becoming increasingly important today, benefit all participating parties for the country and the region. Government initiatives and changes in institutional frameworks have therefore been facilitated to enhance other collaborations [18]. In the long term, it is important that the information needed for the development of a region is communicated through universities to be used in innovation and development activities of other organizations.

Lastly, under the influence of these regional development policies, universities are working to carry out activities such as technology transfers, licensing, consulting, spin-off incentives and commercial company formation along with their traditional teaching and research activities.

1.3.1 Competitive Capacity

Nowadays, competition has become a topic that needs to be emphasized as much as globalization. Especially in the last century, changes in technology, economy, society, as well as political, cultural and social spheres have influenced countries and companies to force them into keeping up with this change. It has become impossible to remain indifferent to these changes globally either as individuals, companies or governments. Therefore, it has become the new aim of nations to achieve a competitive advantage. Developments in trade in the production and service industries, efforts to liberalize international capital, the inevitable rapid development of communication technology and globalization efforts under the influence of the world economy require firms and sectors to compete more strongly with their competitors in both domestic and foreign markets, in terms of price and quality. In line with these developments, the concepts of competition and competitiveness are more frequently discussed.

After Porter's Competitive Advantage of Nations [20], the concept of competitiveness was strengthened. The economic roots of the competitiveness study are based on the international economic theories that Adam Smith [21] and subsequent researchers have sought to develop. Especially after 1980, the reason for focusing on competitiveness due to the change in the role of countries at the competitive level,

which is becoming more and more stringent at both national and international levels, and stems from globalization [22].

Competitiveness is a multi-faceted concept as it is based on economy, management, history, politics and culture [23]. The relationship between these concepts is defined as a complex, multidimensional and relative concept that changes according to time and content. Although researchers with different backgrounds have tried to examine competitiveness with different perspectives, the concept of competitiveness remains unclear despite the abundance of literature [24]. Competitiveness has become synonymous with the economic power of countries, industries or individual firms in this period [25]. Competitiveness is an indicator of its ability to survive during economic crises or other turbulent times. As competition becomes harder, competitiveness becomes the power to cope with it [26]. The definition of competitiveness given by Garelli [27] is as follows with four additions, which include efficiency, choice, resources and a goal as a whole: "Competitiveness analyzes how nations and businesses manage the integrity of their competencies for welfare or profit."

Since competitiveness is a complex issue involving many studies at different levels, it has been tried to be conceptualized and measured at country, industry, firm and product levels. Measurement has occurred at the regional level, but not on a regular basis [28]. The concept of competitiveness has two dimensions. The macro dimension focuses on international competition, while the micro dimension focuses on competition between companies in a country [29].

Garelli, S. [27] stated that by trying to clarify the connection between countries and businesses in the conceptualization and measurement of competitiveness, firms are responsible for creating economic value and creating an environment that encourages companies to achieve this economic value. The different definitions, measurement techniques or indicators of an accepted approach for the concept of competitiveness are valid for the other levels of the definition.. This situation can be seen as the result of trying to define the different meanings and the multivariable competitiveness through a single variable. For example, in one view, competitiveness is defined as the ability of enterprises to sell their products and services, as well as the ability to pay

high and increasing costs [30]. The definitions of competitiveness at the country level (macro), sector and firm (micro) are accepted as the main definitions.

1.3.2 Conceptual Definitions of International Competitiveness

1.3.2.1 Competitiveness at National Level

There are various definitions of competitiveness at the national level in the literature. The definition of national competitiveness in the report prepared for management "The Report of the Presidents Commission on Competitiveness" (1985) states it is the degree to which a country under free and fair market conditions increases the welfare of its citizens, in international market extremes through the production of goods and services. According to the widely accepted definition of the OECD [31], competitiveness at national level is "the ability of a country to produce goods and services that address the requirements of international markets under free and fair market conditions, as well as the ability to maintain or increase the real income of its citizens in the long run. According to Porter [20], the only meaningful definition of competitiveness at national level is national productivity. Krugman criticized the concept of national competitiveness. According to Krugman [32], competitiveness has nothing to do with the competition of nations. He emphasized that firms compete for market share, not for nations. In addition, Moon and Peery [33] said that competitiveness should not be confused with productivity, as it is a comparative position with competitors, and that productivity is the internal capability of an organization. Moon et al. [34] defined national competitiveness as the ability of firms engaged in value-added activities in a particular sector of a given country, to maintain their added value despite international competition. Another widely accepted definition of international competitiveness at the country level is expressed as the overall economic performance of an economy, as the ability of an economy to provide employment to those wishing to work, with a high and increasing living standard for a country's population on a sustainable basis. Finally, the World Economic Forum [35] defines it as the institutions, policies and factors that determine the competitiveness of a country's productivity level. As it is understood from the definitions made by various researchers, it can be concluded that national competitiveness is the ability of a nation to provide a favorable environment for companies, and hence industries. As a result,

the aim of competition at the national level is to help increase national welfare while creating value and profit.

1.3.2.2 Competitiveness at Industry Level

According to McFetridge [36], a competitive industry can be defined as involving companies with competitiveness between regions or internationally. If a firm is constantly making profits in an open market, it is a firm that has competitiveness between regions or internationally. According to the EU, competitiveness at industry level is defined as maintaining and improving its position in the global market [37].

1.3.2.3 Competitiveness at Firm Level

Nowadays, companies must continue to increase their competencies in order to find a place in the global competition. According to Porter, competitiveness at the firm level is the firm's market share or firm efficiency [38]. Despite the fact that international competitiveness is understood as competitiveness at the country level, the debate continues that the sector and firms should be understood as competitiveness. Porter [20] stated the importance of the subject with the following sentence; 'countries are not under the pressure of international competition, companies are under the pressure of international competition.' Chikan [22] defines firm-level competitiveness as the ability of a firm to fulfill its customer needs in a sustainable manner. This ability is to provide customers with products and services of a higher value than their competitors. According to another definition, competitiveness at the firm level regards the firm's capacity to benefit from the existing market opportunities and create new markets, with the cost of obtaining the desired results in terms of profit, price or quality of its products, while maintaining its presence in the market [39].

From the above definitions, it can be concluded that the competitiveness of a firm is based on its ability to adapt to market conditions and make long-term profits. A review of the available literature reveals the use of a wide range of concepts for the three levels of competitiveness and demonstrates the existence of an all-inclusive lack of conceptualization.

1.4 Regional Development and Regional Competitiveness

Although there are various theories on how to measure competitiveness at the regional level, policy makers expect innovation-based regional competitiveness strategies to be developed. As a result of smart specialization strategies, regional stakeholders are expected to support their own specialized industries. Specialized industries should be selected from the strongest and the most competitive sectors. Universities are the stakeholders of these smart specialization strategies to produce new knowledge. Therefore, in this study, the relationship between the universities and the most competitive manufacturing industries in their regions is analyzed. As the analysis method, postgraduate theses completed by universities for the most competitive manufacturing industries in their regions were determined. Universities were selected from among those with 7 Entrepreneurial and Innovative University Index (EIUI) rankings between 2012 and 2018. The results of the analysis were compared with the EIUI results of the universities.

CHAPTER 2
PROBLEM STATEMENT

2.1 Problem Statement

Universities are working on traditional teaching and research activities as well as technology transfer, licensing, consulting and spin-off activities. Universities also develop strategies to increase the contribution of these activities in the region and for national development. These activities are seen as a tool to increase the contribution of universities to the region and the national economy.

In this context, Turkey is also developing strategies to increase innovative and entrepreneurial activities of universities. Within the framework of these strategies, the Entrepreneur and Innovative University Index (EIUI) was prepared by TÜBİTAK for the first time in 2012. The most entrepreneurial and innovative 50 universities of Turkey were ranked in this EIUI. [40].

The purpose of this index is to rank universities according to entrepreneurship and innovation activities. EIUI ranking aims to increase the entrepreneurship and innovation performance of the universities. In addition, this ranking is thought to contribute to the academic studies of universities.

Turkey's universities were ranked based on five main dimensions. These dimensions include the scientific and technology research competency, intellectual property pool, cooperation and interaction, entrepreneurship and innovation culture, and economic contribution and commercialization. In addition, these 5 main dimensions consist of 23 sub-indicators.

The calculation of these 23 sub-indicators is as follows:

- Universities with 50 or more professors (Full, associate and assistant) are included in the calculation.

- The min-max method is used in the indices, each indicator is standardized with the maximum value being 100 and the minimum value being 0. During the calculations, considering the distribution of the indicators, techniques such as extreme value analysis and transformation used in the above mentioned indices were utilized.

While normalizing the data, the total value of each dimension was divided by the total number of academicians except the in the Entrepreneurship and Innovation Culture dimension. The weighting according to dimensions is calculated as follows.

- Scientific and Technological Research Competence weighting is 20%.
- Intellectual Property Pool size weighting is 15%.
- Collaboration and Interaction weighting is 25%.
- Entrepreneurship and Innovation culture weighting is 15%,
- Weighting the economic contribution and commercialization dimension weighting is 25%

2.2 Dimensions of Entrepreneurial and Innovative University Index

In the first instance of the Entrepreneurial and Innovative University Index, scientific and technological research competence, economic contribution and commercialization, intellectual property pool, cooperation and interaction with entrepreneurship and innovation culture are shown in Figure 2.1.

5 Dimension and 23 indicators are as follows:

Size 1: Scientific and Technology Research Competency Indicator Headings

- Number of scientific publications
- Number of citations
- Number of projects received by R & D and innovation support programs
- Amount of funds received by R & D and innovation support programs
- Number of national and international science awards
- Number of graduates
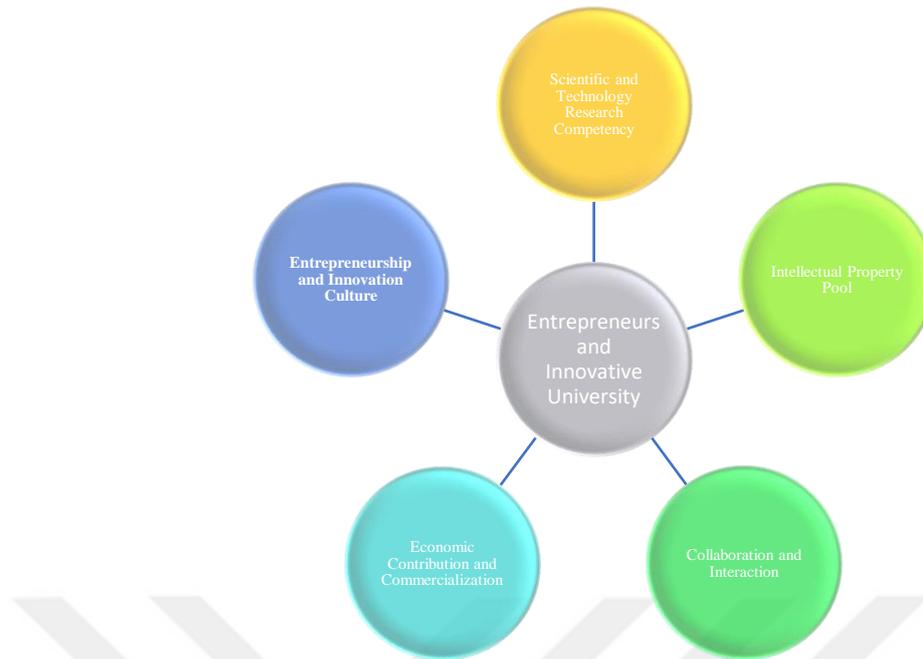
Figure 2.1 Dimensions of Entrepreneurs and Innovative University Index

Size 2: Intellectual Property Pool Indicator Headings

- Number of patent applications
- Number of granted patent
- Number of Utility Model / Industrial Design
- Number of international patent applications

Dimension 3: Collaboration and Interaction Indicator Headings

- Number of R & D and innovation projects in university-industry cooperation
- Amount of funds received from R & D and innovation projects in cooperation with university and industry
- Number of R & D and innovation projects made with international cooperation
- Amount of funds obtained from international R & D and innovation collaborations
- Number of academic staff / students in circulation

Size 4: Entrepreneurship and Innovation Culture Indicator Headings

- Number of courses in entrepreneurship, technology management and innovation management at undergraduate and graduate level
- Number of people working full time under the management of Technology Transfer Office, Technopark, Incubation Centers and TEKMER
- Existence of Technology Transfer Office
- Number of entrepreneurship, technology management and innovation management training / certificate programs organized outside the university

Size 5: Indicators of Economic Contribution and Commercialization

- Number of partners or active firms in academicians in technoparks, incubation centers, TEKMER's
- Number of university students or graduates in the last five years in the technoparks, incubation centers and TEKMERs
- Number of academicians employed in technoparks, incubators, TEKMERs
- Number of patents / utility models / industrial designs licensed

With the Entrepreneurial and Innovative University Index announced in 2019, an update was conducted to ensure that the outcomes of universities' performance can be measured with an impact-oriented approach. In this update, universities have made significant improvements especially in the "Entrepreneurship and Innovation Culture" dimension and stated that a certain level of maturity has been reached in this dimension and has been excluded from the index evaluation dimension. [41]. The 4 dimensions of the updated Entrepreneur and Innovative University Index are as shown in the Figure 2.2.
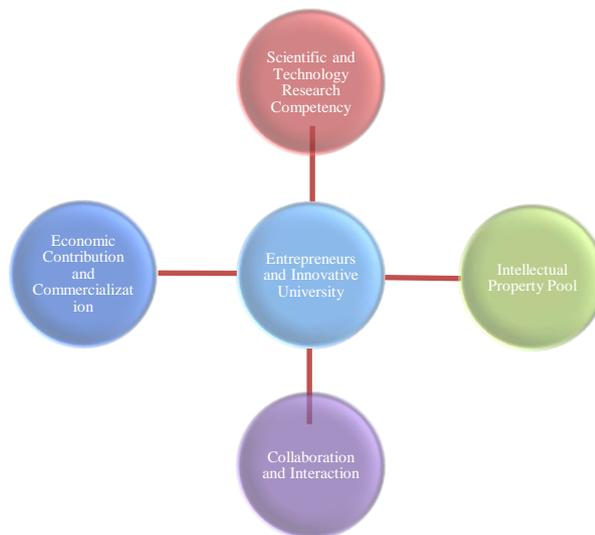
Figure 2.2 New Dimensions of Entrepreneurs and Innovative University Index

The changes in the updated new index methodology are shared in the 2019 information note as follows.

The weight of the Entrepreneurship and Innovation Culture dimension disregarded from the index dimension was distributed equally to the other 4 dimensions. The weights used in indicators aimed at an output and effect-oriented ranking were also updated considering the quality dimension of the indicators. The change is that in the past years, indicators under each dimension were included in the calculation with equal weight, but this calculation was abandoned this year.

Another change is the inclusion of the indicator values in both the pure values (size) and the values of the faculty member (normalized) into the calculation equally.

These changes, and the 4 dimensions and 19 sub-indicators that consist of the Entrepreneurship and Innovation Index, are given below. The weighting and content of the headings that consist of the dimensions of the index in the calculation of the index are as follows:

Size 1: Scientific and Technology Research Competency Indicator Headings

- Weight Ratio: 23,75%
- Number of scientific publications
- Number of citations
- Number of Projects Received from R & D and Innovation Support Programs
- Fund Amount Received from R & D and Innovation Support Programs

- Number of National and International Science Awards
- Number of Graduate Students

Size 2: Intellectual Property Pool Indicator Headings

- Weight Ratio: 18,75%
- Number of Patent Applications
- Number of Patent Documents
- Number of Utility Model / Industrial Design
- Number of International Patent Applications

Dimension 3: Collaboration and Interaction Indicator Headings

- Weight Ratio: 28,75%
- Number of R & D and Innovation Projects in University-Industry Cooperation
- Amount of Funds Received from R & D and Innovation Projects in University-Industry Cooperation
- Number of R & D and Innovation Projects with International Cooperation
- Amount of Funds Obtained from International R & D and Innovation Collaborations
- Number of Students / Students in Circulation

Size 4: Indicators of Economic Contribution and Commercialization

- Weight Ratio: 28,75%
- Number of Active or Partner Companies of Academicians in Technoparks, Incubation Centers, TEKMERs
- Number of Active or Partner Companies of University Students or Graduates in the Last Five Years in Technoparks, Incubation Centers, TEKMERs
- Number of Persons Employed in Technoparks, Incubation Centers and TEKMERs

EIUI results are thought to raise awareness for entrepreneurial and innovative research activities of universities. In addition, as a result of this awareness, it aims to increase the number of commercialized research in universities. Therefore, academic studies in universities are expected to contribute to both the regional economy and the national economy.

In this study, the relationship between universities, and the strongest and the most competitive industries in their regions is analyzed by the graduate theses of universities. For the analysis, 26 universities which are consistently included in the 7 years of Entrepreneurial and Innovative University Index (EIUI) rankings and their regions were selected. Also it has been investigated whether universities in the 7 years of EIUI rankings are similar to the ranking of universities according to number of thesis performed in the strongest and the most competitive industries of their regions.

CHAPTER 3
LITERATURE REVIEW

In this chapter, the models and theories used to measure competitiveness are explained. Among these models and theories, The Comparative Advantages theory was chosen because of its focus on regional development. In the measurement of regional data, Revealed Comparative Advantages Index, which is more commonly used in the literature, was selected.

3. 1 Porter's Diamond Model

Comparative advantages are not permanent, it is subject to change as comparative advantages of countries change over time. Porter wanted to develop an approach to determine competitiveness beyond the traditional theory of comparative advantage. There are two external factors that affect the competitive advantage of a nation. These are luck and the role of government. According to Porter, it is not countries that compete in goods and services markets, but firms [20].

Porter published his research on the exemplary sectors of the ten selected countries (USA, Germany, Denmark, Italy, Sweden, Switzerland, United Kingdom, Japan, South Korea and Singapore) in his article which is The Competitive Advantage of Nations [20].

According to Porter, the diversity of a countries' cultures, economic and institutional structures and history are effective on the competitiveness of countries. Porter disagrees with the fact that the country factor in a globalizing world is no longer trivial, he explained that the unique values of countries have an impact on competitiveness with the help of 'Diamond Model' which he developed. The model illustrates the interaction of country-specific factors, and external factors to make a country a successful home base for a particular industry.

The competitiveness of countries is a result of quality interaction of factors which is the 'diamond'. Government and chance factor are the external determinants and consists of four main determinants as factor conditions, demand conditions, relevant and supporting organizations and company strategy and competition, as shown in Figure 3.1. In addition, although government and chance factors affect the other four main factors, they do not have decisive effects on their own [42].

Porter's diamond model looks like given in Figure 3.1.
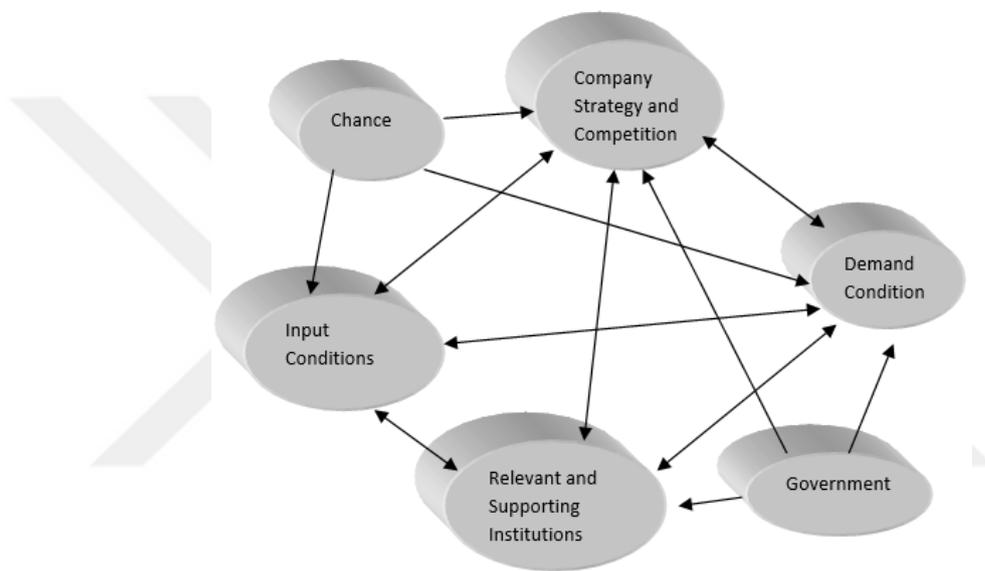
Figure 3.1 Porter's Diamond Model

Factor (Input) Conditions

The factor conditions represent production factors, such as skilled technology, skilled labor or infrastructure to gain competitiveness in the sector or industry. Porter stated [41] that these factors could be improved by policies and technological developments to be implemented by the country.

Demand Conditions

Demand Conditions is the basic structure for goods or services produced in the industry. Qualitative and quantitative demand conditions are crucial to reveal the nature of the demand for a product or service and the potential markets. In other saying,

demand conditions are very important in terms of demonstrating the competitiveness of a product or service.

Related and Supporting Industries

Porter stated [42] that the fact that the producers of intermediate goods in a country that are in high numbers and with intense competition, this increases international competitiveness. Thus enterprises producing goods will provide fast and inexpensive inputs by developing effective methods. A well-prepared clustering network is clear that this will make significant contributions to gaining a competitive advantage in technology, innovation and cost. Universities, R&D institutions and financial institutions etc. can be an example to these supportive industries.

Company Strategy and Competition

The structure of companies and the strategies they follow are related to environmental factors in their own countries. An industry in a country will show different characteristics from the same industry in another country. These differences will provide the opportunity to create competitiveness for companies. Porter discusses the concept of competitiveness and the competition among companies in the same country. Competitiveness will direct companies to compete on quality and innovation development, rather than on cost within this scope. According to Porter productivity achievements will not be enough for firms to gain competitive advantage. Companies that want to gain a competitive advantage will need to develop and implement different strategies than their competitors.

Government

Government plays a role as an external dimension that affects these four factors from the outside. The development of various standards is affects four factors on the competition situation such as preventing monopoly formations.

These factors in the diamond model reveal the structure of a country's overall competitiveness are in constant interaction. Because of this interaction, a change in one factor affects the other factors and the relationship between them. In addition, the chance factor refers to technological developments, sudden political shocks or wars and these factors represents to factors beyond the control of government and firms.

3. 2 Krugman's Approach

Krugman [43] stated that specialization in the existing trade structure will differ from comparative advantages and explains the concentration within the existence of economies of scale in this theory. Krugman considers that the increase in intermediate demand for some products creates economies of scale in the production of products and however, these products have a large domestic market.

3. 3 Double Diamond Model

Porter's Diamond Model has been criticized for being suitable only for developed countries but not for undeveloped countries. Rugman and D'Cruz [44] stated that all of Canada's pre-existing protective policies were invalid after the free trade zone established between Canada and the USA became operational as shown in Figure 3.2.
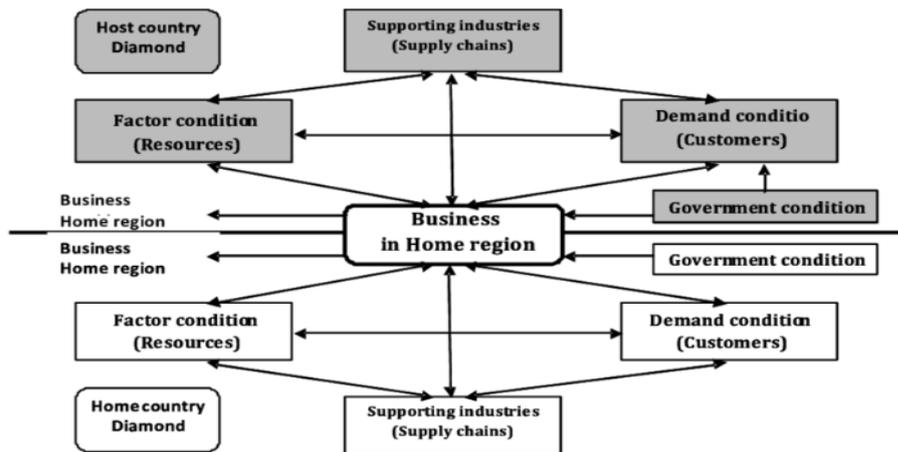
Figure 3.2 Double Diamond Model

The free trade made with the American trade agreement enters a higher market with higher demand conditions, although Canada's demand conditions factor are weak which reveals the fact that in some countries a corner of the diamond is connected to the diamond of another country. In this model, the role of trade agreements and foreign partnerships in competitiveness is considered, unlike Porter.

3. 4 Nine Factor Model

Cho [45] argues that the diamond model of Porter can only be applied by developed countries and that less developed and developing countries do not have four factors in this model. Cho stated that three issues should be considered for the assessment of a

country's competitiveness in the Nine Factor Model. This model is shown in Figure 3.3. The first of these subjects consists of four physical factors. These are natural resources, business environment, relevant and supporting industries and domestic demand. The second issue is a well-educated, highly motivated and committed population who play a key role in the economic growth of developing countries, factor. The human factor is divided into four groups. These groups are workers engaged in basic economic activities, politicians that determine and implement economic plans, entrepreneurs investing at ISIC and professional managers in charge of business management and engineers open to new technologies. The third and last issue is chance, which is an external factor.
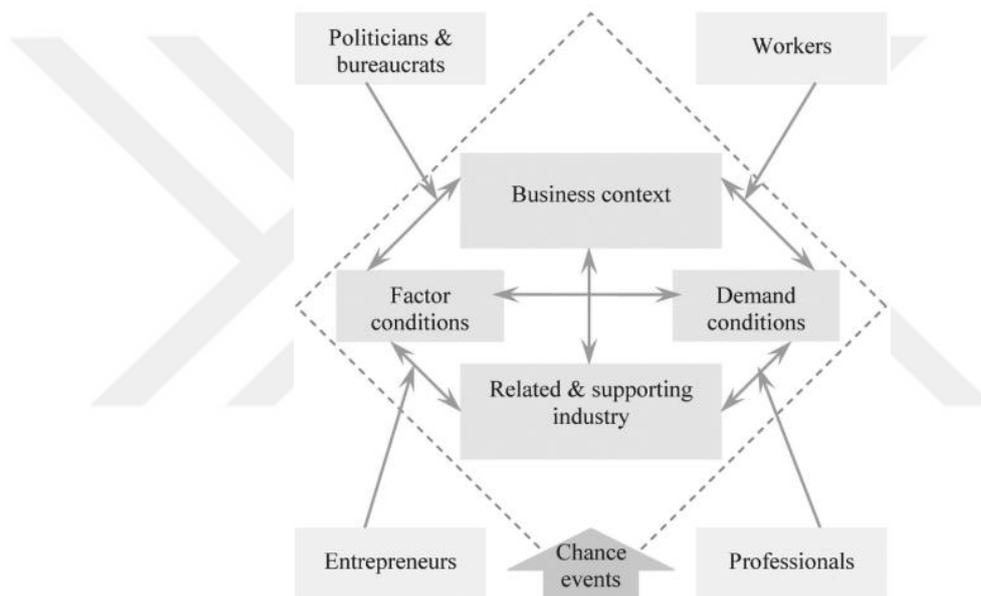
Figure 3.3 Nine Factor Model

Porter's model and four factors in the nine-factor model (equipped resources, relevant and supporting industries, domestic demand and chance) are the same. Cho stated that the grouping of the human factor, such as workers, politicians or bureaucrats, entrepreneurs and professional managers, separated the human factor from Porter's model, and considered it as a separate factor [45].

Cho [45] combined nine factors in his study and tried to explain the SER-M paradigm with four factors as shown in Figure 3.4.

19

The first factor, national policies and business strategies play a role in ensuring competitiveness by rearranging and reassembling existing resources in the environment.

The second factor, the environment, is external. Business executives cannot voluntarily alter natural resources or various economic developments.
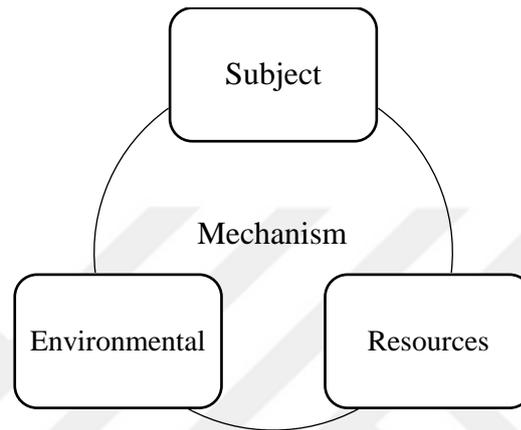
Figure 3.4 The "SER-M" Paradigm

The third factor is the source. Every company in an industry or every industry in a country reacts differently to changes in their environment, because they have different resources.

The fourth factor is mechanism. Mechanism is the process in which these factors use or generate resources. For example, a business strategy is part of the mechanism by which entrepreneurs and managers use their resources. The organization is another part of the mechanism that determines the roles and relationships of entrepreneurs and managers.

Cho attempted to explain the relationship between global competitiveness and national competitiveness in his study [45]. He argued that increasing the competitiveness of firms will increase the competitiveness of countries and he argued that increasing the competitiveness of countries will increase global competitiveness.

3. 5 Theory of Absolute Advantages

The concept of competitiveness is based on book which was published by Smith [21]. This book is titled 'The wealth of nations'. In this study, which emphasizes the specialization of labor, he put forward a two-product theory with two countries. The emphasis on theory is the trade of products in which a country has an absolute cost advantage. Smith explains the benefits of free foreign trade and international specialization on his book with "Theory of absolute advantage". Countries should be able to specialize in the production of whichever product at a lower cost. Smith argued that countries should export these goods to another country. And also Smith stated that countries should import the product produced at a higher cost than other countries. According to Smith, in this way, if each country uses its resources in the most efficient area and specializes in that field, countries will also contribute to an increase of income and the welfare of the world.

The biggest deficiency of this theory is that the Theory of Absolute Advantages does not clarify how to trade if one country produces all its products cheaper than the other.

3. 6 Factor Proportions Theory

Ricardo's Theory of Comparative Advantages failed to explain to explain the difference in labor productivity between countries. Heckscher [46] and Ohlin [47], put forward a model that argues that foreign trade is due to the different production functions, in order to overcome this deficiency in their study. Each country has a comparative advantage in the production of goods that use the wealth factor intensively in model. Thus countries specialize in the production of goods produced cheaper. Thus, the country will export its product by using scarce resources to the specialization factor. Other countries will import this product which is non-specialized factor-based. Both countries will gain through trade. This theory, which argues that the production functions of products are the same in all countries, suggests that if the product is capital intensive in one country, it will be capital intensive in the other. This means that all countries which produce capital intensive products have the same technology [48].

3. 7 Theory of Comparative Advantages

According to Ricardo [49] who first proposed the Comparative Advantages Theory, if a country has a comparative advantage in the production of any product, this product specializes in production. In addition, if there is no comparative advantage in the production of a product, it will import that product instead of producing it. Countries will import this good from other countries to stop the production of a product which has a greater absolute disadvantage. Unlike the Theory of Absolute Advantages, Ricardo evaluated competitiveness on the basis of trade as follows. A country can have an absolute disadvantage in two different products. In addition, another country can have an absolute advantage in the production of these two products. Ricardo can then trade between these countries and both countries could profit from this trade. The comparative advantages is a theory that attempts to address shortcomings because countries consider competitiveness only as labor productivity.

Balassa [50] examined the relationship between export and economic growth of 11 developing countries (Argentina, Brazil, Chile, Colombia, Mexico, Israel, Yugoslavia, India, Korea, Singapore, Taiwan) on the basis of industry between 1966 and 1973. In this study, Balassa used the Revealed Comparative Advantage (RCA) index.

Balassa, and Noland [51], analyzed comparative advantage values (which between 1967 and 1983) of 57 main and 167 finished products of Japan and USA. Also, the United States is becoming increasingly specialized in natural resource intensive products. In addition, it was made clear that the United States of America increasingly specialized in natural resource intensive products. Also, it was stated that comparative advantage in high-tech products increased in both countries.

Vollrath [52], examined the trade density measurements theoretically, as an alternative to the Revealed Comparative Advantage index, which was created by Balassa. In his study, he suggested an alternative 10 comparative advantage method and examined the transformational link.

Startiene and Remeikiene [53], specified the competitiveness of industrial products of Lithuanian origin between 2007 and 2011 by using the RCA and RSCA (Revealed Symmetric Comparative Advantages) indices in this study. In this analysis, they interpreted the results of the Balassa index using the Balassa index classification which

was classified by Hinloopen and Marrewijk [54]. The competitiveness of the Lithuanian industry in global markets looked similar according to RCA and RSCA indices. Both index values showed that between 2007 and 2011, Lithuania had a strong advantage in food, chemical, wood and textile industries in global markets.

Abbas and Waheed [55], researched the international trade competition of Pakistan in 14 main sectors in agriculture and manufacturing between 2013 and 2014 in their study. According to the RCA Index, the results of analysis showed that Pakistan had a comparative advantage in raw cotton, cereals, raw hides and fruits in the agricultural sector.

In another study, Ciffolilli and Muscio [56] attempted to identify the competitive advantage areas of EU countries and regions in Industry 4.0 technologies. In that study, the projects developed and financed under Fp7, were classified by regionalizing. They explained the results of this classification, and identified Industry 4.0 technologies where countries and regions are competitive using the comparative advantage index. As a result of the analysis, they also proposed the establishment of strategies and the implementation of initiatives to effectively channel these technologies to reduce regional gaps between EU Member States and regions.

Dinda [57] attempted to identify the trade advantage of Asian countries in the sub-categories of Climate Friendly Goods and Technologies (CFGT) products in between 2002 and 2017. According to the analysis it was stated that China, Hong Kong and Japan have a comparative advantage in Climate Friendly Goods and Technologies trading and other countries have a comparative disadvantage.

Rossato et al. [58] analyzed the competitive power of wood pulp in the United States, Brazil, Canada, Sweden, Finland and China in their study, which is the focus of the cellulose industry. They explained the RCA index and the RSCA indices to determine the comparative advantage between countries. In addition to these index values, they used the TBI index to evaluate the balance of wood pulp trade in analysis. According to the analysis results, it specified that all countries have comparative advantages according to RCA indices, except China. It was emphasized that Finland, Canada and Sweden have the highest comparative advantages according to the RSCA index value. Brazil, Finland, Canada, Sweden and the USA have a positive trade balance, which was evaluated according to the TBI and it was specified that China has the biggest

comparative disadvantage. That study concluded that the wood pulp industry has a highly positive effect on Brazil, Finland, Canada and Swedish export economies.

Leng et al. [59] measured China's long-term trend of wind power products' comparative advantages by using UN Comtrade data between 2007 and 2016 in their study. According to this study, the competition effect of China has played a dominant role in export growth. Also, the international competitiveness of China's wind power products increase continuously. China's export structure in wind energy products has been limited. The comparative advantage of China's wind power products increased in last decade, but nevertheless, still the general comparative advantages are weak.

Pippinato et al. [60] investigated the competitiveness of Italy in the honey sector with European Union countries. According to the results of the analysis, the researchers stated that Italy is not competitive in honey exports and that it is oriented towards imports at a high rate. As a result, Italy has a significant disadvantage in honey exports compared to Romania, Spain and Germany.

Maqbool et al. [61] examined the comparative advantage of Pakistan in the cotton sector between the years 2003-2017 in their study. It was stated that while Pakistan has a comparative competitive advantage in cotton exports, Pakistan has a comparative disadvantage in cotton imports. In addition, it was noted that Pakistan has a net competitive advantage in the cotton industry.

Sagar et al [62], researched the factors determining intra-industrial trade between India and Australia in a study of the processed food sector. They studied the values of macroeconomic variables and more between 2003 and 2016, and also used the RSCA index for competitiveness indicators.

Serin and Civan [63], investigated the existence of comparative advantage of tomato, olive oil and fruit juice industries in the EU market between 1995 and 2005. The EU market has benefited from RCA the Comparative Export Performance (CEP) index RCA and the Comparative Export Performance (CEP) index to measure the strength of competition in this sector in Turkey. By using regression analysis, they stated that product price can have a statistically important impact to export demand functions, if Turkey is a competitor for these countries. According to the results of index and

regression analysis, Turkey has a dramatically higher comparative advantage in juice and olive oil markets in the EU, but not tomatoes.

Topcu and Kılavuz [64] have investigated the competition performance of Turkey's manufacturing sector between 1996 and 2006, after the Customs Union Agreement with the EU. In addition, they noted a structural change of Turkey's comparative advantage model. Balassa's RCA index and Vollrath's competitiveness indices were used in the analysis. According to analysis, the manufacturing industry data which ISIC coded Rev.2,was classified into four groups as high technology, medium advanced technology, medium low technology and low technology.

Topcu and Sarıgül [65] analyzed Turkey's competitiveness of the five sectors with the highest export share in global markets between 2000- 2014 and used the Comparative Advantages (RCA) index, Vollrath competitiveness indices and the Trade Balance Index (TBI). In addition, they created a sectoral product map which was analyzed. According to analysis, the most powerful sectors of Turkey's economy are the textile and apparel industry. And also, as Turkey is a net exporter in these sectors, Turkey has an export expertise in these products.

Sarıçoban et al. [66] analyzed the global competitiveness of Turkey's exports of manufacturing industry products which formed 157 goods export data in SITC Rev.3, via a 3 digit classification between the years 1996-2015 by using the Revealed Comparative Advantage (RCA) method. According to the analysis of Turkey's competitive advantage in the manufacturing industry, there are 57 out of 157 product groups. In Turkey, it is stated that there is a competitive disadvantage with 100 other products. 19 out of 57 product groups which have competitive advantage have a strong advantage, 18 out of 57 product groups have a moderate advantage and 20 out of 57 product groups have a weak advantage. In addition to these results, significant decreases were observed in the RCA coefficients as of that period.

In the study, Bashimov [67] analyzed mutual advantages in the carpet industry among Turkey, China and India. The Export Market Share index, Revealed Comparative Advantage Index and Lafay index were used in the analysis. As a result of analysis, it has been identified that Turkey's carpet industry has a higher level of competitiveness when compared to China and India. The data of another study [68] which analyzed the comparative advantage of Turkey in the export of agricultural and food products

during the years 2002-2015, were taken from the statistics of the International Trade Center. The Revealed Comparative Advantages (RCA) and Trade Balance Index (TBI) values were used in the analysis of the study. It was stated that according to the RCA index, Turkey has a comparative advantage in 11 product groups, Turkey has also a comparative disadvantage in 13 product groups.

Yıldırım [69] examined the competitiveness of the automotive sector in Turkey using the RCA index. In this study, he explained the RCA values during the economic crisis and determined the current sectoral RCA values as of 2016.

Kuşat [70] examined 28 EU countries' competitiveness of the energy sector in world trade, and he investigated EU candidate countries' competitiveness in the energy sector with the RCA Index. According to the analysis, only Montenegro and Albania has been seen to have a competitive advantage in the energy sector. He also expressed that Turkey exhibits poor performance compared to Montenegro, Bosnia and Herzegovina, Serbia and Albania by losing its competitive advantage over the years. In another study [71] which calculated comparative export performance for the selected manufacturing, agriculture, food, textile, iron and steel and chemicals sectors between 2006-2016 by EU candidates like Turkey, including Serbia, Montenegro, Albania, Macedonia, Bosnia and Herzegovina and Kosovo.

Çeştepe and Tunçel [72] examined the competitiveness of the iron and steel industry in the global market with three-digit sub-product data. In this analysis, Balassa and Vollrath indices are calculated separately, and index results were compared with each other. According to analysis, Turkey has high competitiveness in long product groups which has low added value and Turkey has low competitiveness in flat products groups used in the production of high value-added products.

Akyüz [73], explained the competitiveness of Turkey's paper and paper products industry and attempted to measure using the comparative advantage approach. The data of 23 sub-groups of paper and paper products industry in 2001-2017, were calculated with six different index values and the competition levels in the sub-product group were determined. According to study, it has been determined that there is a competitive advantage in 7 different product groups from the paper and paper products industry and recommendations were made for the desired competitiveness levels in the sector.

Kara [74] analyzed the international competitiveness of Turkey in regards to the industrial wood and wood products industry using the comparative advantage indices in his study. He examined wood and forest products between the years 2008-2017 on the basis of 14 products. The Balassa Index (BI), Vollrath Index, Relative Export Advantage Index (RXA), Relative Import Advantage Index (RMA), Relative Trade Advantage Index (RTA), Export Specialization Index and Relative Competitive Advantage Index (RC) were used as the analysis method. These values were used to determine competitiveness for evaluation and comparison in different sizes. He analyzed the competitive power of Turkey's industrial sector by explaining the comparative advantage method in his study. He used 2-digit Harmonic System industry classification data between the years 2001-2017. The Revealed Comparative Advantages (RCA), Revealed Symmetrical Comparative Advantages (RSCA) and Trade Balance Index (TBI) values were used to create a product map of the industrial sector. According to the results of the analysis, the comparative advantage of the Turkey's industry sector which consists of 73 chapters, has been identified in foreign trade in 34 chapters by the RCA index. In addition, according to Trade Balance Index, Turkey is a net exporter in only 19 chapters. Furthermore, Turkey's industrial sector was emphasized to have a 46% comparative advantage, a 42% competitiveness and a 26% net export power by number of chapters.

Kanat [75] analyzed the Turkish Textiles and the international competitiveness of the garment industry, comparing the index values of Balassa, Vollrath and Lafay from the explained comparative advantage indices. At the end of that study, he stated that he had a high and moderate competitive advantage from 10 out of the 14 export-based sub-product groups of the textile and apparel industry. In addition, he has shown that it has expertise and a competitive advantage in 9 of the 14 sub-product groups when both export and import values are examined.

Ünlü [76] examined Turkey's change of competitiveness and BRICS countries according to technology density in manufacturing industries, with the mutual advantage index explained. Country data included in the study was taken from the UNCTAD database and the Balassa Index which was developed by Balassa (Revealed Comparative Advantage Index) which were used in the analysis and, the technology classification SITC Rev. 3 is taken as reference. It was concluded that while Turkey is a country with the highest competitiveness in the export of low and medium

technology goods, China is the country with the highest competitiveness in the export of high technology goods.

CHAPTER 4
MATERIAL METHOD

Today, countries want to continue to increase their production advantages with innovative policies. Thus, they contribute to the welfare level by increasing their national income. These advantages include transportation, labor, natural resources, capital, technology and intellectual infrastructure. The use of these advantages in production activities is the most important factor in ensuring a product's superiority in trade. For this reason, the concept of specialization has great importance in managing advantages that will provide the advantages in production.

Modern foreign trade is accepted that it started with David Ricardo's book published in 1821. This theory, first expressed by Torrens, is based on how the free trade of products that contribute to the benefit of the country should be. On the other hand, David Ricardo expressed this idea in numerical calculations [77].

Ricardo said that the evaluation of international trade on the basis of absolute advantages would prevent trade in his study, and he stated that the difference of product degree is more important than the advantage of production costs [78].

4.1 H. Leisner RCA Index

To date, more than one method has been developed to determine the competitive advantage which were used by researchers. The most commonly used method which measures competitive advantage nowadays is the Reveal Comparative Advantages Method.

Hinloopen and Marrewijk [79] stated that the conceptual measurement of RCA values was first made by Liesner in 1958. Liesner aimed to measure the competitive advantage of UK's European Common Market. After that, he developed the formula which was called the Liesner Index to measure competitive advantage [80].

According to Liesner, [81] increased competitive advantage of a product is described with an increase in product exports.

The formula as describe in Equation (1),

$$RCA = X_{ij} / X_{nj} \qquad (4.1)$$

X_{ij} is j goods exports of i country,

X_{nj} is j goods exports of n country or country groups

Liesner has addressed i country as England, country groups as ABD Common Market.

This method found by Liesner is important to be the basis for other methods developed, in terms of the literature. This method is no longer preferred due to the short comings of the measurement method in explaining the competitive advantage.

4.2 Balassa's RCA Index

The most famous index which is used to measure competitive advantage belongs to Balassa, and it used as the Revealed Comparative Advantage (RCA) [82]. Balassa [83] thought that a comparison of costs was not enough and he founded the Revealed Comparative Advantage (RCA) by improving upon Liesner's work.

Balassa said that all factors affecting comparative advantages do not need to be considered. Due to this, he suggested that it should be determined whether it has a 'revealed' comparative advantage rather than identifying the main sources of a country's comparative advantage. As a result, he compared specialties in domestic production through explaining export values of a particular sector or product group with world specialization [84].

The RCA index is measured by the proportion of share in total exports of a country of any product, compared to its share of total trade in the world.

The formula as describe in Equation (2),

$$RCA = (X_{ij} / X_{it}) / (X_{jw} / X_w) \qquad (4.2)$$

X_{ij} shows j goods exports of i country,

X_{it} shows total exports of country i,

X_{jw} shows word export of product j,

X_w shows total world exports.

RCA< 1 $\Rightarrow$ means that the competitiveness of the country has a comparative disadvantage in the product j.

RCA> 1 $\Rightarrow$ means that the competitiveness of the country has a comparative advantage in the product j.

RCA = 0 $\Rightarrow$ means that the country does not export j goods

Hinloopen and Marrewijk classified Balassa index values in this study [54]. They stated that this classification was helpful in interpreting the Balassa Index values. These classifications are shown in Table 4.1;

Table 4.1 The Classification of RCA Index Values

$0 <$ Balassa RCA Index ≤ 1	Revealed Comparative Disadvantage
$1 <$ Balassa RCA Index ≤ 2	Weak Comparative Advantage
$2 <$ Balassa RCA Index ≤ 4	Medium Comparative Advantage
$4 <$ Balassa RCA Index	Strong Comparative Advantage

The use of reveal comparative advantage coefficients together with the presence of Balassa Index, enables the evaluation of which sectors have been competitive or not competitive. From Balassa to the present, even though RCA has new indexes which formulate differently from the original form, fundamental differences are in use.

According to Wang and Vollrath [85], the revealed comparative advantage index value is important for the country to realistically demonstrate its advantages or disadvantages over the rest of the world in these sectors, if the country's degree of specialization in certain sectors and export competitiveness have not been altered by administrative policies.

As a result, the RCA coefficient can be used alone, which shows goods tend to specialize in the export of a country or region. However, the RCA index does not show the predictable comparative advantages of the future because it is calculated based on current trade data. [86]. It does not explain the reasons for the emergence of comparative advantage [87].

4.3 Vollrath's Approach

Vollrath [52] made his empirical measurements on comparative advantage theory in his study which criticized the Balassa Index only for taking into account exports. He argued that imports values should be included to index to be calculated because of he argued that import is as important as export. Vollrath's arrangements for RCA which calculated with Balassa Index was briefly summarized as;

- twice calculation of data will be prevented leaving the calculated sector out of calculation
- The proposed RCA value is based on the measurement of net exports that will allow it to reflect intra-industry trade.
- The Balassa index is between 0 and ∞ and is asymmetrical. Balassa specified that if the RCA values are between 0 and 1, countries have comparative disadvantage and if RCA value is between 1 and ∞, countries have comparative advantage. Symmetrical RCA which is important for economic forecasts will be calculated because of that positive values shown that countries have comparative advantage, negative values shown that countries have comparative disadvantage.

Vollrath [52] proposed three different measurements for explained comparative advantages in published article. The first of these methods is RTA which is the difference between the Relative Export Advantage Index (RXA) and the Relative Import Advantage Index (RMA). The second of these method is formulation as simple logarithmic of Relative Export Advantage Index (ln RXA). The third of these methods is RTA which is Relative Trade Advantage Index covering exports and imports. Relative Trade Advantage Index consists of difference between Relative Export Advantage Index and Relative Import Advantage.

4.3.1 Relative Export Advantage Index (RXA)

Unlike the Balassa index, RXA prevents the double account of the country and the sector. Export values of the examined countries and sectors are not included in the total world export account. It is ensured that the country and the goods in question are not included in the calculation twice.

The formula as describe in Equation (3);

$$RXA_{ij} = (X_{ij} / X_{it}) / (X_{jw} / X_w) \qquad (4.3)$$

X_{ij} showed the j goods export of i country at t time,

X_{it} showed the total exports excluding j product of i country at t time,

X_{jw} showed the World export of j product at t time,

X_w showed the total World export excluding j product at t time.

If RCA < 1, competitiveness of country has comparative disadvantage for j product.

If RCA> 1, competitiveness of country has comparative advantage for j product.

RCA = 1, no country exports for j product.

4.3.2 Revealed Import Advantage (RMA)

RMA is a method used to measure the advantage of a country's imports over other countries. RMA index is very similar to RXA. Reason of this difference is that use of imports (M) instead of exports (X). And RMA is interpreted as the opposite of RCA [89]

$$RMA_{ij} = (M_{ij} / M_{it}) / (M_{jw} / M_w) \qquad (4.4)$$

M_{ij} showed the j goods import of i country at t time,

M_{it} showed the total imports excluding j product of i country at t time,

M_{jw} showed the World import of j product at t time,

M_w showed the total World import excluding j product at t time.

If RMA > 1, competitiveness of country has comparative advantage for j product.

If RMA<1, competitiveness of country has comparative advantage for j product.

If RMA = 1 no country imports for j product.

4.3.3 Relative Trade Advantage Index (RTA)

Relative Trade Advantage Index (RTA) is equal to difference between Relative Export Advantage Index (RXA) and Relative Import Advantage Index (RMA). [52]

$$RTA_{ij} = RXA_{ij} - RMA_{ij} \qquad (4.5)$$

RXA_{ij} showed the Relative Export Advantage Index,

RMA_{ij} showed the Relative Import Advantage Index.

If RTA < 0, competitiveness of country has comparative disadvantage for j product.

If RTA > 0, competitiveness of country has comparative advantage for j product.

4.3.4 Revealed Competitiveness (RC)

Vollrath [52] emphasized that RC index is a more preferable measure than ln RXA and RTA indices since it will explain the supply and demand balance more accurately. He also stated that using RCA and ln RXA indices instead of RC and RTA indexes would be a suitable measure due to the deterioration in import policy as a result of administrative preferences.

$$RC = \ln(RXA) - \ln(RMA) \qquad (4.6)$$

$RC = \ln((X_{ij} / X_{it}) / (X_{jw} / X_w)) - \ln((M_{ij} / M_{it}) / (M_{jw} / M_w))$

If RC < 0 competitiveness of country has comparative disadvantage for j product,

If RC > 0, competitiveness of country has comparative advantage for j product.

Alternative RCA indices by Vollrath allow a country to be compared only to the World and it is not suitable for regional level analysis. This is due to the fact that the country to be analyzed with these RCA indices should be part of the group of countries with which it is compared. Otherwise, the respective RCA indices may take 0 or negative values, as the country's trade in a particular sector may be equal to or greater than that

of the group in which it is compared. But this makes it impossible to calculate Equation 1 and Equation 3.

4.4 The Trade Balance Index

Balassa and Noland [51] defined the Net Export Index as the division of net exports by total exports and imports for a specified sector. Also, Lafay [88] stated that a country's specialization as a net exporter or a net importer for a particular product group would be used in the analysis.

$$TBI_{ij} = (X_{ij} - M_{ij}) / (X_{ij} + M_{ij}) \qquad (4.7)$$

X_{ij} showed the j goods export of i country at t time,

M_{ij} showed the j goods import of i country at t time.

The index takes values between -1 and +1 [51]. Negative values indicate that imports are higher than exports in the analyzed sector and shows that country has a competitive disadvantage in the sector. Positive values indicate that exports are higher than imports in the analyzed sector and show that the country is more competitive in that sector.

A country is referred to as a "Net Importer" in a specific group of products where the value of the TBI < 0, as a "Net Exporter" where the value of the TBI > 0.

4.5 Trade Concentration (Gini- Hirschmann) Index (GHI)

The index found by Hirschman is one of the most common methods used to measure the concentration of exported and imported products. The index shows the ratio of one country's exports / imports to another country's total exports / imports. Index takes a value between 0 and 100. The higher the product diversification in exports or imports, the closer the index value to 0. The maximum value of the index is 100. This means that lack of product diversification in export and import. [89].

The formula is:

$$\mu ji = 100 \sqrt{\sum_{i=1}^{n} (\frac{Xi}{X})^2} \qquad (4.8)$$

μ_{ji} express the concentration coefficient of j country in i sector.

n refers to the number of sectors analyzed.

Xi express the exports of i sector of j country.

X refers to total exports of country j

4.6 Intra-Industry Trade (Grubel – Lloyd) Index (GLI)

Grubel and Lloyd [90] developed an index based on the shortcomings of the Balassa index, in order to measure intra-industry trade.

The formulation is as follows:

$$GLI^{G-L} = 1 - \frac{|Xi - Mi|}{(Xi + Mi)} \cdot 100 \tag{4.9}$$

If **GLI**[G-L]=0, there is no intra-industry trade in that commodity group in country trade, so there are only importing and exporting.

If **GLI**[G-L] = 1, the export and import values of the commodity group in the country trade are close to each other.

If **GLI**[G-L] > 0, 50 intra-industry trade is high.

If **GLI**[G-L] < 0, 50 intra-industry trade is low.

j refers to the country, X refers to exports, M refers to imports, i refers to product i index. X_{ij} show the exports of country to the other country for i product, M_{ij} show the imports of a country from other country for i product. GLI value is between 0 and 1. The index value approaching 1, and the intra-industry trade approaching 0 indicates the intensity of inter-industry trade. If the index value is between 0.50 and 1, intra-industry trade and between 0 and 0.50 are inter-industry trade.

4.7 Export Similarity Index (ESI)

The export similarity index developed by Finger and Kreinin [91] is used to identify the closest competitors for products in a country's target market. On the basis of the product, if the export similarity between countries increases, the index value approaches 100, and when the similarity decreases, the index approaches 0.

The formulation is as follows;

$$ESI = \sum min\ [X_k\ (jw),\ X_k\ (mw)] \times 100 \qquad (4.10)$$

X_k (jw) represents the share of total exports in the country's total exports of j country for k product.

X_k (mw) represents the share of total exports in the country's total exports of m country for k product.

4.8 Comparative Export Performance Index (CEP)

CEP Index used to measure the level of expertise in a particular product group or product. According to index, structure of international competition is based on the relative export shares of countries [92].

If the index value is greater than 1, country has advantage in export.

If the index value is smaller than 1, country has disadvantage in export.

The formulation is as follows:

$$CEP_{irj} = (X_{ij}\ /\ X_{rj})\ /\ (\textstyle\sum X_{it}\ /\ \textstyle\sum X_{rt}) \qquad (4.11)$$

CEP_{irj} show the comparative export performance index of the country group or two country for j product.

X_{ij} show the export of i country for j product.

X_{rj} show the export of competing countries for j product.

$\sum X_{it}$ express the total export of i country.

- $\sum X_{rt}$ express the total export

In this study, the Balassa RCA Index and Trade Balance Index were used to determine the strongest and the most competitive manufacturing industries according to export data. For the export expertise of the regions, the most widely used Balassa RCA Index was selected. Other competitiveness measurement methods were not chosen as they were not used for regional data.

CHAPTER 5
EXPERIMENTAL STUDY

In this study; the universities that were included in the EIUI for 7 years were identified and a ranking was made among them by taking the trimmed mean of the index scores obtained for 7 years.

Then, the activity codes of the sectors of NUTS 2 regions where these universities are located, which are experts in manufacturing industry, foreign trade and a having strong comparative advantage are determined according to 4 digit ISIC system and are determined with RCA Index and Trade Balance Index values. Then, the ISIC Code explanations of the activity codes determined for the regions were examined, and keywords related to the sectors included in the activity codes were obtained.

Finally, these keywords were searched through YOKTEZ database [93] between 2011 and 2018 and the number of graduate thesis completed by the universities in the sector activity in the relevant activity codes was discovered.. These numbers were divided by the total number of academicians of universities in the relevant year in 2011-2018. Thus, the average number of graduate thesis per professors was calculated in the relevant activity code of the university.

5. 1 Selection of Universities

There is not a source where all the information-based academic studies of the universities and their activities aimed at increasing society's welfare are reported and explained together. EIUI, which was announced in 2011, has enabled this research to have information about the academic titles and the transfer of this academic knowledge to the cooperating institutions and organizations. Although there are discussions about the dimensions, weights and other calculation methods in the calculation of index points, it is a fact that since 2011, it has contributed to the development of universities and their own promotions. Studies of universities are also encouraged by YÖK and TÜBİTAK in order to be in the top 50 in the index ranking, and to find a place in the top rankings. This soft competition in Turkey is intended to keep the universities in a

modern and contemporary context in a global sense, the state is stipulated by the university's ranking in the index as well as the requirement to consult some of the projects supported by private sector. For this reason, universities were selected among the universities in EIUI announced between 2011 and 2018. Selected universities and their EIUI scores, rankings and averages are shown in Table 5.1.

Table 5.1 Selected universities and EIUI index scores by years, their ranking and their mean

UNIVERSITIES	2012	2013	2014	2015	2016	2017	2018	Avg. 2012-2018
Sabancı University	84.0	85.8	81.4	88.4	95.0	91.0	85.5	86.9
Middle East Technical University	83.0	86.0	83.1	86.0	85.8	87.3	93.2	85.6
İ.D. Bilkent University	70.0	82.7	75.0	78.1	82.6	81.6	84.4	80.0
Boğaziçi University	65.0	76.3	76.3	79.7	80.1	82.2	83.3	78.9
Koç University	57.0	61.7	73.6	76.4	78.6	78.8	68.9	71.8
Ozyegin University	69.0	67.4	73.1	73.5	75.3	74.4	65.4	71.5
İzmir Institute of Technology	58.0	68.1	67.8	70.5	68.7	77.5	75.6	70.1
Gebze Technical University	57.0	54.7	56.8	60.4	77.8	85.2	77.8	66.0
TOBB ETU	54.0	57.0	69.3	66.6	63.8	68.0	61.8	63.4
Yıldız Technical University	41.0	49.6	57.4	63.9	67.6	68.7	81.4	61.4
Selcuk University	43.0	55.2	59.6	59.1	58.7	52.4	57.9	56.7
Hacettepe University	49.0	56.7	53.5	54.4	51.6	52.5	75.9	53.7
Ege University	47.0	53.0	49.7	54.3	55.2	54.0	70.7	53.2
Anadolu University	30.0	47.9	54.5	53.2	50.4	50.9	57.0	51.4
Erciyes University	46.0	44.5	42.7	56.4	52.9	51.4	61.4	50.2
Gazi University	44.0	54.9	48.1	49.5	50.3	46.3	66.8	49.8
Atılım University	35.0	44.6	47.3	41.8	50.6	55.5	47.6	46.4
Gaziantep University	33.0	41.7	40.8	42.9	51.6	52.7	51.6	45.7
Bursa Uludağ University	37.0	39.9	43.2	46.9	45.3	47.4	54.5	44.5
Çankaya University	43.0	45.8	42.5	45.5	50.8	39.1	37.8	43.2
Cukurova University	41.0	46.9	43.3	43.1	42.9	40.8	45.5	43.2
Yeditepe University	40.0	45.9	39.5	42.6	43.4	43.9	43.3	42.6
Kocaeli University	37.0	44.0	41.8	41.3	41.8	43.3	50.1	42.4
Suleyman Demirel University	45.0	44.5	42.8	40.6	39.2	33.6	43.4	42.1
Ankara University	37.0	41.8	38.9	38.4	46.6	42.1	59.9	41.6
Dokuz Eylül University	35.0	38.3	37.8	43.0	43.5	41.4	61.6	40.8
Akdeniz University	39.0	42.0	35.9	40.3	42.1	37.0	51.1	40.1
Istanbul University	30.0	32.4	38.1	39.4	42.5	40.6	67.1	38.6
Bahçeşehir University	43.0	42.5	39.3	35.8	38.8	34.6	34.0	38.2
Mersin University	33.0	41.8	38.8	32.9	42.1	40.2	35.5	37.9
İzmir University of Economics	31.0	32.1	39.0	34.0	42.7	45.2	39.7	37.5
Karadeniz Technical University	32.0	39.7	32.5	35.8	38.0	36.5	40.8	36.5
Pamukkale University	29.0	29.8	28.8	33.2	40.9	42.1	42.6	35.0
Fırat University	29.0	33.3	29.6	32.1	38.3	31.4	40.5	32.9

The rankings of the universities are not sorted on the basis of dimensions, but rather on the total score obtained from all dimensions. According to the Table 5.1, it is observed that 34 state and foundation universities are consistently in the last 7 EIU indices. According to the latest 7 EIU Index average, the top 5 places are Sabancı University, Middle East Technical University, İ.D Bilkent University, Boğaziçi University and Koç University. The last 5 universities of the EIU Index are Mersin University, İzmir University of Economics, Karadeniz Technical University, Pamukkale University, and Fırat University.

5. 2 Determination of the regions where the universities are located

Statistical Regions Nuts 2 regionalization of the cities where 34 universities are located is as follows in Table 5.2.

Table 5.2 Statistical Regions Nuts 2 regionalization of the cities where 34 universities are located

Universities	City	NUTS 2
Sabancı University	İstanbul	
Istanbul University	İstanbul	
Yıldız Technical University	İstanbul	
Boğaziçi University	İstanbul	TR10- Istanbul
Ozyegin University	İstanbul	
Koç University	İstanbul	
Yeditepe University	İstanbul	
Bahçeşehir University	İstanbul	
Ege University	İzmir	
İzmir Institute of Technology	İzmir	
Dokuz Eylül University	İzmir	TR31- Izmir
İzmir University of Economics	İzmir	
Pamukkale University	Denizli	TR32- Aydin-Denizli-Muğla
Bursa Uludağ University	Bursa	TR41- Bursa-Eskişehir-Bilecik
Anadolu University	Eskişehir	
Kocaeli University	Kocaeli	TR42- Kocaeli-Sakarya-Düzce-Bolu-Yalova
Gebze Technical University	Kocaeli	
Middle East Technical University	Ankara	
İ.D. Bilkent University	Ankara	
TOBB University of Economics and Technology	Ankara	
Gazi University	Ankara	
Atılım University	Ankara	TR51-Ankara
Çankaya University	Ankara	
Ankara University	Ankara	
Hacettepe University	Ankara	

Selcuk University	Konya	TR52- Konya-Karaman
Suleyman Demirel University	Isparta	TR61- Antalya-Isparta-Burdur
Akdeniz University	Antalya	
Cukurova University	Adana	TR62- Adana -Mersin
Mersin University	Mersin	
Erciyes University	Kayseri	TR72- Kayseri-Sivas-Yozgat
Karadeniz Technical University	Trabzon	TR90-Trabzon-Ordu-Giresun-Rize-Artvin-Gümüşhane
Fırat University	Elazığ	TRB1-Malatya-Elaziğ-Bingöl-Tunceli
Gaziantep University	Gaziantep	TRC1-Gaziantep-Adiyaman-Kilis

As seen in the Table 5.2 TR10 Istanbul universities are Sabancı University, Istanbul University, Yıldız Technical University, Boğaziçi University, Ozyegin University, Koç University, Yeditepe University and Bahçeşehir University. TR31 Izmir universities are Ege University, İzmir Institute of Technology, Dokuz Eylül University and İzmir University of Economics. In TR32 Aydın-Denizli-Muğla there is only one university; Pamukkale University. TR41 Bursa-Eskişehir-Bilecik universities are Bursa Uludağ University and Eskişehir Anadolu University. TR42 Kocaeli-Sakarya-Düzce-Bolu-Yalova universities are Kocaeli University and Gebze Technical University. TR51 Ankara universities are Middle East Technical University, İ.D. Bilkent University, TOBB University of Economics and Technology, Gazi University, Atılım University, Çankaya University, Ankara University and Hacettepe University. There is one university in TR 52 Konya-Karaman; Selçuk University. TR61 Antalya-Isparta-Burdur universities are Suleyman Demirel University and Akdeniz University. TR62 Adana – Mersin universities are Çukurova University and Mersin University. There is one university in TR72 Kayseri-Sivas-Yozgat; Erciyes University and similarly the only university in TR90 Trabzon-Ordu-Giresun-Rize-Artvin-Gümüşhane is Karadeniz Technical University. Elazığ Fırat University is in TRB1 Malatya-Elazığ-Bingöl-Tunceli and Gaziantep University is in TRC1 Gaziantep-Adıyaman-Kilis Level 2.

5. 3 Determining the Comparative Advantages of Manufacturing Industries in Regions

Foreign trade values are an important indicator of the regional expertise in the manufacturing industry. This is one of the most important parameters of choice in determining the sectors in which one region has a comparative advantage over another.

In addition, when examining foreign trade values, it is very important to evaluate the import capacity, as well as the export capacity of a sector. Sectors with greater import value than export value adversely affects the development of the national economy, no matter how much comparative advantage they have.

In this part of the study, the manufacturing industry foreign trade data of the regions, the Rev3 4 digit values of ISIC (International Standard Industrial Classification) coding which is prepared by United Nations Statistical Office and proposed to be used all over the world, are used. This data was taken from the Turkish Statistical Institute. Turkey's foreign trade data is recorded by various institutions depending on the city, region and country. Although this is a fact, it has been concluded that the use of the ISIC Rev3 4 digit manufacturing industry data to make a regional assessment with a comprehensive data set is more meaningful. For the purpose of the study, the ISIC Rev3 4 digit manufacturing industry data set for 2011-2018 was used to cover the same time period as the EIUI. The Balassa RCA index and The Trade Balance Index were used to determine the strongest and the most competitive sectors in the manufacturing industry which covers 13 regions. The Balassa RCA values were then classified according to the Classification of RCA Index Value values proposed by Hinloopen and Marrewijk [54]. Then, the first 20, depending on the RCA value are given in tables.

The export specialization index for regional data is as follows:

$$RCA = (X_{ij} / X_{it}) / (X_{jw} / X_w) \hspace{2cm} \text{Equation (12)}$$

X_{ij} shows j goods exports of i region,

X_{it} shows total exports of region i,

X_{jw} shows country export of product j,

X_w shows total country exports.

$RCA < 1 \Rightarrow$ means that the competitiveness of the region has a comparative disadvantage in the product j.

$RCA > 1 \Rightarrow$ means that the competitiveness of the region has a comparative advantage in the product j.

RCA = 0 $\Rightarrow$ means that the region does not export j goods

5. 3. 1 TR10 Istanbul Region

The average Balassa RCA values, classification of the RCA values and classification of the TBI values for the first 20 sub-sectors of manufacturing industry in TR10 Istanbul region between 2011 and 2018 are shown in Table 5.3.

Table 5.3 Classification of RCA Values and classification of TBI values within the context of first 20 sub-sectors of manufacturing industry in TR10 Istanbul Region

ISIC Code	Avg. RCA 2011-2018	Avg. TBI 2011-2018	Class. of RCA	Class. of TBI
2230	1.873	-0.493	Weak	NI
3691	1.870	0.719	Weak	NE
2212	1.848	-0.325	Weak	NI
3230	1.827	0.127	Weak	NE
1820	1.766	0.563	Weak	NE
3330	1.765	-0.757	Weak	NI
1551	1.704	-0.619	Weak	NI
2930	1.680	0.572	Weak	NE
1912	1.627	-0.311	Weak	NI
3694	1.617	-0.826	Weak	NI
2720	1.606	-0.308	Weak	NI
2221	1.480	-0.193	Weak	NI
1730	1.466	0.704	Weak	NE
1810	1.462	0.632	Weak	NE
2219	1.455	-0.272	Weak	NI
3000	1.451	-0.908	Weak	NI
3150	1.438	-0.356	Weak	NI
2211	1.400	-0.293	Weak	NI
2423	1.398	-0.719	Weak	NI
3220	1.398	-0.934	Weak	NI

According to the findings, the TR10 Istanbul region consists of sectors with weak comparative advantage in manufacturing industry with export expertise and disadvantaged sectors without export expertise. According to Figure 5.1, sectors with a weak comparative advantage with export expertise consist of 41% of all sectors and disadvantaged sectors with no export expertise comprise of 59% of all sectors. According to the export and import balance, 14 of the 49 sub-sectors with weak comparative advantage with export expertise are Net Exporters and 35 are Net

Importers. Of the 71 sub-sectors with no export expertise and comparative advantage, 43 are Net Exporters and 28 are Net Importers. For the TR-10-Istanbul region, there are no sub-sectors with strong and moderate comparative advantage.
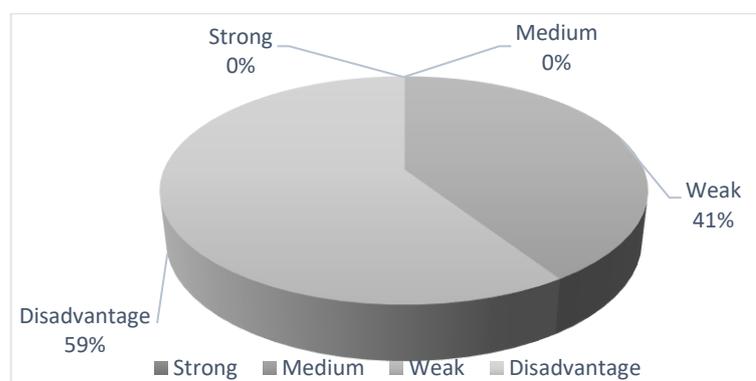
Figure 5.1 Classification of RCA Values within the context of manufacturing industry in TR10 Istanbul Region

5.3.2 TR31 İzmir Region

The average Balassa RCA values, classification of the RCA values and classification of the TBI values for the first 20 sub-sectors of manufacturing industry in TR31 Izmir region between 2011 and 2018 are shown in Table 5.4.

Table 5.4 Classification of RCA values and classification of TBI values within the context of first 20 sub-sectors of manufacturing industry in TR31 Izmir Region

ISIC Code	Avg. RCA 2011-2018	Avg. TBI 2011-2018	Class. of RCA	Class. of TBI
2222	9.440	0.033	Strong	NE
1600	8.906	0.427	Strong	NE
2101	4.896	-0.407	Strong	NI
1512	4.873	0.230	Strong	NE
2102	4.171	0.741	Strong	NE
1513	3.503	0.909	Medium	NE
2693	3.172	0.824	Medium	NE
2411	3.128	-0.126	Medium	NI
1553	3.016	-0.464	Medium	NI
2421	2.877	-0.674	Medium	NI
1514	2.845	-0.313	Medium	NI
3592	2.530	-0.473	Medium	NI
3311	2.527	-0.192	Medium	NI
1520	2.409	0.492	Medium	NE
1911	2.349	-0.111	Medium	NI

3313	2.317	-0.598	Medium	NI
2695	2.194	0.783	Medium	NE
2923	2.065	0.344	Medium	NE
2413	2.055	-0.603	Medium	NI
2912	2.035	0.093	Medium	NE

According to the findings, the TR31 Izmir region consists of strong, medium and weak comparative advantage sectors with export expertise in manufacturing industry, and disadvantaged sectors without export expertise. According to Figure 5.2 sectors with a strong comparative advantage with export expertise consist of 4% of all sectors, sectors with medium comparative advantage consist of 13%, sectors with weak comparative advantage consist of 25% and disadvantaged sectors without export expertise comprise of 58% of all sectors. According to the export and import balance, 4 of the 5 sub-sectors with a strong comparative advantage with export expertise are Net Exporters, 1 is a Net Importer. 6 of the15 sub-sectors with a medium comparative advantage are Net Exporters and 9 are Net Importers. 17 of 30 the sub-sectors with weak comparative advantage with export expertise are Net Exporters, 13 are Net Importers and 21 of 70 the sub-sectors with disadvantaged sub-sectors without export expertise are Net Exporters and 49 of them are Net Importers.
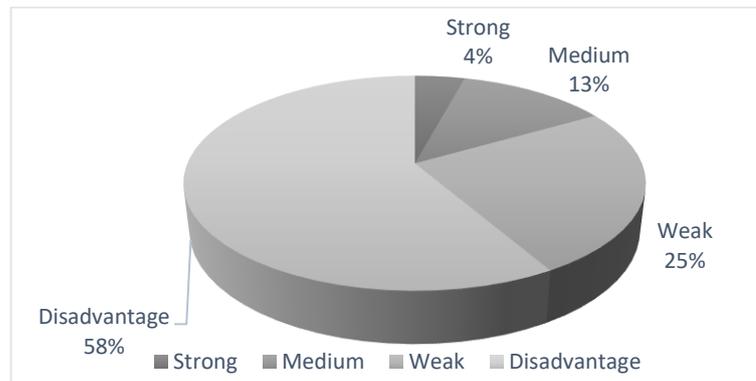
Figure 5.2 Classification of RCA Values within the context of manufacturing industry in TR31 Izmir Region

The strongest and the most competitive sub-sectors of manufacturing industry in TR31 Izmir region are shown in Table 5.5.

Table 5.5 The strongest and the most competitive sub-sectors of manufacturing industry in TR31 Izmir Region

ISIC Code	Avg. RCA 2011-2018	Avg. TBI 2011-2018	Class. of RCA	Class. of TBI
2222	9.440	0.033	Strong	NE
1600	8.906	0.427	Strong	NE
1512	4.873	0.230	Strong	NE
2102	4.171	0.741	Strong	NE

5.3.3 TR32 Aydın-Denizli-Muğla Region

The average Balassa RCA values, classification of the RCA values and classification of the TBI values for the first 20 sub-sectors of manufacturing industry in TR32 Aydın-Denizli-Muğla region between 2011 and 2018 are shown in Table 5.6.

Table 5.6 Classification of RCA values and classification of TBI values within the context of first 20 sub-sectors of manufacturing industry in TR 32 Aydın-Denizli-Muğla Region

ISIC Code	Avg. RCA 2011-2018	Avg. TBI 2011-2018	Class. of RCA	Class. of TBI
1512	11.293	0.168	Strong	NE
1721	11.024	0.986	Strong	NE
3130	7.620	0.989	Strong	NE
2696	7.579	0.966	Strong	NE
3512	5.148	0.542	Strong	NE
2923	4.232	0.823	Strong	NE
2919	3.171	0.752	Medium	NE
2899	2.298	0.938	Medium	NE
1711	1.915	-0.072	Medium	NI
1533	1.879	0.022	Medium	NE
1513	1.731	0.891	Medium	NE
2926	1.611	-0.581	Medium	NI
2413	1.453	0.053	Medium	NE
2710	1.422	0.154	Medium	NE
2925	1.273	0.769	Medium	NE
1810	1.219	0.944	Medium	NE
2219	1.124	-0.004	Medium	NI
1552	0.959	0.556	Disadvantage	NE
1520	0.925	0.492	Disadvantage	NE
2720	0.843	-0.760	Disadvantage	NI

According to the findings, the TR32 Aydın- Denizli- Muğla region is consists of strong, medium and weak comparative advantage sectors with export expertise in

manufacturing industry and disadvantaged sectors without export expertise. According to Figure 5.3 sectors with strong comparative advantage with export expertise consist of 7% of all sectors, sectors with medium comparative advantage consist of 5%, sectors with weak comparative advantage consist of 14% and disadvantaged sectors without export expertise comprise of 74% of all sectors. According to the export and import balance, 5 of the 8 sub-sectors with strong comparative advantage with export expertise are Net Exporters, 3 is Net Importers. 6 sub-sectors with medium comparative advantage are Net Exporters. 11 of 17 the sub-sectors with a weak comparative advantage with export expertise are Net Exporters, 6 are Net Importers and 28 of 89 the sub-sectors with disadvantaged sub-sectors without export expertise are Net Exporters 61 of them are Net Importers.
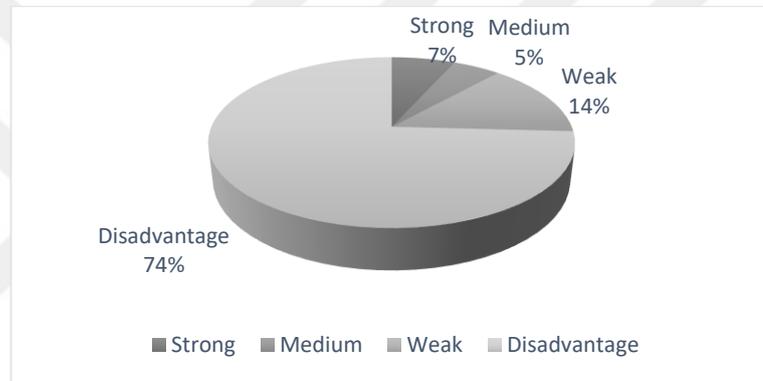
Figure 5.3 Classification of RCA Values within the context of manufacturing industry in TR32 Aydın-Denizli-Muğla Region

The strongest and the most competitive sub-sectors of manufacturing industry in TR32 Aydın-Denizli-Muğla region are shown in Table 5.7.

Table 5.7 The strongest and the most competitive sub-sectors of manufacturing industry in TR32 Aydın-Denizli-Muğla Region

ISIC Code	Avg. RCA 2011-2018	Avg. TBI 2011-2018	Class. of RCA	Class. of TBI
2696	14.413	0.927	Strong	NE
2021	14.094	0.690	Strong	NE
2023	6.241	0.988	Strong	NE
2694	4.198	0.993	Strong	NE
2022	4.173	0.583	Strong	NE

5.3.4 TR41 Bursa-Eskişehir-Bilecik Region

The average Balassa RCA values, classification of the RCA values and classification of the TBI values for the first 20 sub-sectors of manufacturing industry in TR41 Bursa-Eskişehir-Bilecik region between 2011 and 2018 are shown in Table 5.8.

Table 5.8 Classification of RCA values and classification of TBI values within the context of first 20 sub-sectors of manufacturing industry in TR41 Bursa-Eskişehir-Bilecik Region

ISIC Code	Avg. RCA 2011-2018	Avg. TBI 2011-2018	Class. of RCA	Class. of TBI
2922	6.694	0.115	Strong	NE
3190	4.994	-0.185	Strong	NI
3430	4.755	0.274	Strong	NE
3591	4.064	0.975	Strong	NE
3530	3.697	0.628	Medium	NE
3610	3.636	0.794	Medium	NE
2412	3.532	-0.404	Medium	NI
1711	2.740	0.284	Medium	NE
2912	2.536	0.001	Medium	NE
1554	2.475	0.955	Medium	NE
2893	2.469	0.133	Medium	NE
3410	2.229	0.400	Medium	NE
2519	2.177	0.389	Medium	NE
2692	1.854	0.153	Weak	NE
2915	1.680	0.062	Weak	NE
3520	1.573	-0.377	Weak	NI
1721	1.559	0.888	Weak	NE
2924	1.410	0.718	Weak	NE
3312	1.365	-0.740	Weak	NI
2911	1.302	-0.268	Weak	NI

According to the findings, the TR41 Bursa-Eskişehir-Bilecik is consists of strong, medium and weak comparative advantage sectors with export expertise in manufacturing industry and disadvantaged sectors without export expertise. According to Figure 5.4 sectors with strong comparative advantage with export expertise consist of 3% of all sectors, sectors with medium comparative advantage consist of 8%, sectors with weak comparative advantage consist of 14% and disadvantaged sectors without export expertise comprise of 75% of all sectors. According to the export and import balance, 3 of the 4 sub-sectors with a strong comparative advantage with export

expertise are Net Exporters, 1 is a Net Importer. 8 of the 9 sub-sectors with a medium comparative advantage are Net Exporters and 1 is a Net Importer. 11 of 17 the sub-sectors with a weak comparative advantage with export expertise are Net Exporters, 6 are Net Importers and 30 of the 90 the sub-sectors with disadvantaged sub-sectors without export expertise are Net Exporters and 60 of them are Net Importers.
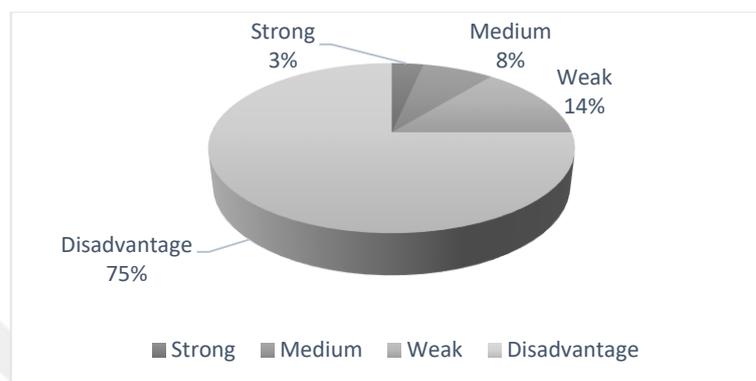
Figure 5. 4 Classification of RCA Values within the context of manufacturing industry in TR41 Bursa-Eskişehir-Bilecik Region

The strongest and the most competitive sub-sectors of manufacturing industry in TR41 Bursa-Eskişehir-Bilecik region are shown in Table 5.9.

Table 5.9   The strongest and the most competitive sub-sectors of manufacturing industry in TR41 Bursa-Eskişehir-Bilecik Region

ISIC Code	Avg. RCA 2011-2018	Avg. TBI 2011-2018	Class. of RCA	Class. of TBI
2922	6.694	0.115	Strong	NE
3430	4.755	0.274	Strong	NE
3591	4.064	0.975	Strong	NE

5.3.5   TR42 Kocaeli-Sakarya-Düzce-Bolu-Yalova Region

The average Balassa RCA values, classification of the RCA values and classification of the TBI values for the first 20 sub-sectors of manufacturing industry in TR42 Kocaeli-Sakarya-Duzce-Yalova region between 2011 and 2018 are shown in Table 5.10.

Table 5.10 Classification of RCA values and classification of TBI values within the
context of first 20 sub-sectors of manufacturing industry in TR42 Kocaeli-
Sakarya-Duzce-Yalova Region

ISIC Code	Avg. RCA 2011-2018	Avg. TBI 2011-2018	Class. of RCA	Class. of TBI
2330	11.473	-0.332	Strong	NI
2320	8.863	0.709	Strong	NE
3693	7.481	0.982	Strong	NE
3511	3.912	0.974	Medium	NE
3420	3.876	0.381	Medium	NE
2914	3.624	0.206	Medium	NE
3110	3.347	0.444	Medium	NE
2923	3.293	0.346	Medium	NE
2519	2.666	0.364	Medium	NE
2511	2.431	0.489	Medium	NE
3313	2.167	-0.160	Medium	NI
2021	2.073	0.083	Medium	NE
3410	1.984	0.572	Weak	NE
2899	1.893	0.303	Weak	NE
2813	1.845	0.542	Weak	NE
1729	1.789	0.396	Weak	NE
1511	1.742	0.816	Weak	NE
2429	1.697	-0.342	Weak	NI
3430	1.624	-0.160	Weak	NI
2929	1.524	-0.413	Weak	NI

According to the findings, the TR42 Kocaeli-Sakarya-Düzce-Yalova is consists of strong, medium and weak comparative advantage sectors with export expertise in manufacturing industry and disadvantaged sectors without export expertise. According to Figure 5.5 sectors with a strong comparative advantage with export expertise consist of 2% of all sectors, sectors with a medium comparative advantage consist of 8%, sectors with a weak comparative advantage consist of 17% and disadvantaged sectors without export expertise comprise of 73% of all sectors. According to the export and import balance, 2 of the 3 sub-sectors with a strong comparative advantage with export expertise are Net Exporters, 1 is a Net Importer. 11 of the 20 sub-sectors with a medium comparative advantage are Net Exporters and 9 are Net Importers. 11 of 17 the sub-sectors with a weak comparative advantage with export expertise are Net Exporters, 6 are Net Importers and 28 of 88 the sub-sectors with disadvantaged sub-sectors without export expertise are Net Exporters 60 of them are Net Importers.

Figure 5.5 Classification of RCA Values within the context of manufacturing industry in TR42 Kocaeli-Sakarya-Düzce-Yalova Region

The strongest and the most competitive sub-sectors of manufacturing industry in TR42 Kocaeli-Sakarya-Duzce-Yalova region are shown in Table 5.11.

Table 5.11 The strongest and the most competitive sub-sectors of manufacturing industry in TR42 Kocaeli-Sakarya-Duzce-Yalova Region

ISIC Code	Avg. RCA 2011-2018	Avg. TBI 2011-2018	Class. of RCA	Class. Of TBI
2320	8.863	0.709	Strong	NE
3693	7.481	0.982	Strong	NE

5.3.6 TR51 Ankara Region

The average Balassa RCA values, classification of the RCA values and classification of the TBI values for the first 20 sub-sectors of manufacturing industry in TR51 Ankara region between 2011 and 2018 are shown in Table 5.12.

Table 5.12 Classification of RCA values and classification of TBI values within the context of first 20 sub-sectors of manufacturing industry in TR51 Ankara Region

ISIC Code	Avg. RCA 2011-2018	Avg. TBI 2011-2018	Class. of RCA	Class. of TBI
1542	14.867	0.594	Strong	NE
1552	10.902	0.726	Strong	NE
2921	10.683	0.604	Strong	NE
3320	10.380	-0.390	Strong	NI
3530	10.180	0.042	Strong	NE
2927	9.444	0.261	Strong	NE
2924	6.970	-0.127	Strong	NI

2213	6.717	-0.407	Strong	NI
3140	6.582	0.388	Strong	NE
2913	6.345	0.145	Strong	NE
3699	6.129	-0.312	Strong	NI
2411	6.027	0.648	Strong	NE
3311	5.049	-0.623	Strong	NI
3312	4.178	-0.633	Strong	NI
2695	3.935	0.520	Medium	NE
2811	3.871	0.798	Medium	NE
2211	3.735	0.293	Medium	NE
3220	3.522	-0.839	Medium	NI
2915	2.946	-0.364	Medium	NI
2423	2.928	-0.664	Medium	NI

According to the findings, the TR51 Ankara region is consists of strong, medium and weak comparative advantage sectors with export expertise in manufacturing industry and disadvantaged sectors without export expertise. According to Figure 5.6 sectors with a strong comparative advantage with export expertise consist of 12% of all sectors, sectors with a medium comparative advantage consist of 9%, sectors with a weak comparative advantage consist of 19% and disadvantaged sectors without export expertise comprise of 60% of all sectors. According to the export and import balance, 8 of the 14 sub-sectors with a strong comparative advantage with export expertise are Net Exporters, 10 are Net Importers. 5 of the 11 sub-sectors with a medium comparative advantage are Net Exporters and 6 are Net Importers. 7 of 23 the sub-sectors with a weak comparative advantage with export expertise are Net Exporters, 16 are Net Importers and 21 of 72 the sub-sectors with disadvantaged sub-sectors without export expertise are Net Exporters 51 of them are Net Importers.

Figure 5.6 Classification of RCA Values within the context of manufacturing industry in TR51 Ankara Region

The strongest and the most competitive sub-sectors of manufacturing industry in TR51 Ankara region are shown in Table 5.13.

Table 5.13 The strongest and the most competitive sub-sectors of manufacturing industry in TR 51 Ankara Region

ISIC Code	Avg. RCA 2011-2018	Avg. TBI 2011-2018	Class. of RCA	Class. of TBI
1542	14.867	0.594	Strong	NE
1552	10.902	0.726	Strong	NE
2921	10.683	0.604	Strong	NE
3530	10.180	0.042	Strong	NE
2927	9.444	0.261	Strong	NE
3140	6.582	0.388	Strong	NE
2913	6.345	0.145	Strong	NE
2411	6.027	0.648	Strong	NE

5.3.7 TR52 Konya-Karaman Region

The average Balassa RCA values, classification of the RCA values and classification of the TBI values for the first 20 sub-sectors of manufacturing industry in TR52 Konya-Karaman region between 2011 and 2018 are shown in Table 5.14.

Table 5.14 Classification of RCA values and classification of TBI values within the context of first 20 sub-sectors of manufacturing industry in TR52 Konya-Karaman Region

ISIC Code	Avg. RCA 2011-2018	Avg. TBI 2011-2018	Class. of RCA	Class. of TBI
1541	24.096	0.999	Strong	NE
2925	22.538	0.597	Strong	NE
1543	10.414	0.727	Strong	NE
3420	9.756	0.832	Strong	NE
2921	8.502	0.723	Strong	NE
1520	7.014	0.702	Strong	NE
2912	6.356	0.761	Strong	NE
2913	5.595	0.227	Strong	NE
2927	4.779	0.990	Strong	NE
1544	4.677	0.994	Strong	NE
3599	3.901	0.714	Medium	NE
2915	3.566	0.046	Medium	NE
2922	3.565	-0.275	Medium	NI
3430	3.423	0.767	Medium	NE
1531	2.740	0.982	Medium	NE
2692	2.730	0.414	Medium	NE

1542	2.642	-0.385	Medium	NI
2421	2.573	-0.217	Medium	NI
3220	2.343	0.725	Medium	NE
2914	2.107	-0.097	Medium	NI

According to the findings, the TR52 Konya-Karaman is consists of strong, medium and weak comparative advantage sectors with export expertise in manufacturing industry and disadvantaged sectors without export expertise. According to Figure 5.7 sectors with a strong comparative advantage with export expertise consist of 9% of all sectors, sectors with a medium comparative advantage consist of 8%, sectors with a weak comparative advantage consist of 10% and disadvantaged sectors without export expertise comprise of 73% of all sectors. According to the export and import balance, 10 of the 10 sub-sectors with a strong comparative advantage with export expertise are Net Exporters. 6 of the 10 sub-sectors with a medium comparative advantage are Net Exporters and 4 are Net Importers. 6 of 12 the sub-sectors with a weak comparative advantage with export expertise are Net Exporters, 6 are Net Importers and 41 of 88 the sub-sectors with disadvantaged sub-sectors without export expertise are Net Exporters 47 of them are Net Importers.

Figure 5.7 Classification of RCA Values within the context of manufacturing industry in TR52 Konya- Karaman Region

The strongest and the most competitive sub-sectors of manufacturing industry in TR52 Konya-Karaman region are shown in Table 5.15.

Table 5.15 The strongest and the most competitive sub-sectors of manufacturing industry in TR52 Konya-Karaman Region

ISIC Code	Avg. RCA 2011-2018	Avg. TBI 2011-2018	Class of RCA	Class of TBI
1541	24.096	0.999	Strong	NE
2925	22.538	0.597	Strong	NE
1543	10.414	0.727	Strong	NE
3420	9.756	0.832	Strong	NE
2921	8.502	0.723	Strong	NE
1520	7.014	0.702	Strong	NE
2912	6.356	0.761	Strong	NE
2913	5.595	0.227	Strong	NE
2927	4.779	0.990	Strong	NE
1544	4.677	0.994	Strong	NE

5.3.8 TR61 Antalya-Isparta-Burdur Region

The average Balassa RCA values, classification of the RCA values and classification of the TBI values for the first 20 sub-sectors of manufacturing industry in TR61 Antalya-Isparta-Burdur region between 2011 and 2018 are shown in Table 5.16.

Table 5.16 Classification of RCA values and classification of TBI values within the context of first 20 sub-sectors of manufacturing industry in TR61 Antalya-Isparta-Burdur Region

ISIC Code	Avg. RCA 2011-2018	Avg. TBI 2011-2018	Class. of RCA	Class. of TBI
2696	14.413	0.927	Strong	NE
2021	14.094	0.690	Strong	NE
2412	8.317	-0.663	Strong	NI
2023	6.241	0.988	Strong	NE
2010	4.446	-0.838	Strong	NI
2911	4.272	-0.621	Strong	NI
2694	4.198	0.993	Strong	NE
2022	4.173	0.583	Strong	NE
2429	3.824	0.328	Medium	NE
3693	3.448	0.265	Medium	NE
2421	3.440	-0.437	Medium	NI
2927	3.065	0.984	Medium	NE
1512	2.534	0.376	Medium	NE
1520	2.394	0.262	Medium	NE
3599	1.950	0.086	Weak	NE
2102	1.917	0.984	Weak	NE

1820	1.689	0.663	Weak	NE
2925	1.663	0.267	Weak	NE
3150	1.654	0.202	Weak	NE
2893	1.626	0.363	Weak	NE

According to the findings, the TR61 Antalya-Isparta-Burdur is consists of strong, medium and weak comparative advantage sectors with export expertise in manufacturing industry and disadvantaged sectors without export expertise. According to Figure 5.8 sectors with a strong comparative advantage with export expertise consist of 7% of all sectors, sectors with a medium comparative advantage consist of 5%, sectors with a weak comparative advantage consist of 14% and disadvantaged sectors without export expertise comprise of 74% of all sectors. According to the export and import balance, 5 of the 8 sub-sectors with strong comparative advantage with export expertise are Net Exporters, 3 are Net Importers. 6 sub-sectors with a medium comparative advantage are Net Exporters. 7 of 12 the sub-sectors with a weak comparative advantage with export expertise are Net Exporters, 5 are Net Importers and 38 of 96 the sub-sectors with disadvantaged sub-sectors without export expertise are Net Exporters 58 of them are Net Importers.


Figure 5.8 Strong Comparative Advantage and Net Exporter within the context of sub-sectors of manufacturing industry in TR61 Antalya-Isparta-Burdur Region between 2011 and 2018

The strongest and the most competitive sub-sectors of manufacturing industry in TR61 Antalya-Isparta-Burdur region are shown in Table 5.17.

Table 5.17 The strongest and the most competitive sub-sectors of manufacturing industry in TR61 Antalya-Isparta-Burdur Region

ISIC Code	Avg. RCA 2011-2018	Avg. TBI 2011-2018	Class. of RCA	Class of TBI
2696	14.413	0.927	Strong	NE
2021	14.094	0.690	Strong	NE
2023	6.241	0.988	Strong	NE
2694	4.198	0.993	Strong	NE
2022	4.173	0.583	Strong	NE

5.3.9 TR62 Adana-Mersin Region

The average Balassa RCA values, classification of the RCA values and classification of the TBI values for the first 20 sub-sectors of manufacturing industry in TR62 Adana-Mersin region between 2011 and 2018 are shown in Table 5.18.

Table 5.18 Classification of RCA values and classification of TBI values within the context of first 20 sub-sectors of manufacturing industry in TR62 Adana-Mersin Region

ISIC Code	Avg. RCA 2011-2018	Avg. TBI 2011-2018	Class. of RCA	Class of TBI
1532	14.590	0.391	Strong	NE
1511	7.197	0.921	Strong	NE
1531	7.197	0.754	Strong	NE
2413	6.565	-0.391	Strong	NI
1723	6.343	0.902	Strong	NE
2023	5.958	0.924	Strong	NE
1533	5.571	0.837	Strong	NE
2022	5.404	0.956	Strong	NE
1514	5.246	-0.087	Strong	NI
2010	4.744	-0.371	Strong	NI
1544	4.690	0.996	Strong	NE
2813	3.679	0.962	Medium	NE
2430	3.222	-0.326	Medium	NI
1711	2.913	0.478	Medium	NE
2924	2.729	0.736	Medium	NE
1554	2.515	0.989	Medium	NE
2923	2.314	0.808	Medium	NE
1549	2.284	0.659	Medium	NE
1520	2.115	0.815	Medium	NE
2921	2.109	0.412	Medium	NE

According to the findings, the TR62 Adana-Mersin region is consists of strong, medium and weak comparative advantage sectors with export expertise in manufacturing industry and disadvantaged sectors without export expertise. According to Figure 5.9 sectors with a strong comparative advantage with export expertise consist of 9% of all sectors, sectors with a medium comparative advantage consist of 8%, sectors with a weak comparative advantage consist of 13% and disadvantaged sectors without export expertise comprise of 70% of all sectors. According to the export and import balance, 8 of the 11 sub-sectors with a strong comparative advantage with export expertise are Net Exporters, 3 are Net Importers. 8 of the 9 sub-sectors with a medium comparative advantage are Net Exporters and 1 is a Net Importer. 5 of 11 the sub-sectors with a weak comparative advantage with export expertise are Net Exporters, 6 are Net Importers and 31 of 84 the sub-sectors with disadvantaged sub-sectors without export expertise are Net Exporters 53 of them are Net Importers.
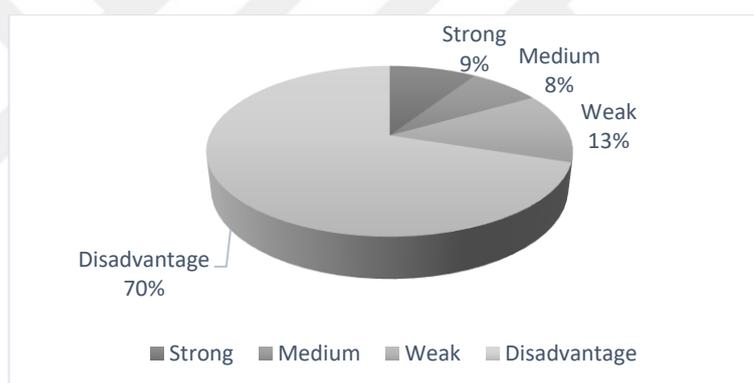
Figure 5.9 Classification of RCA Values within the context of manufacturing industry in TR62 Adana-Mersin Region

The strongest and the most competitive sub-sectors of manufacturing industry in TR62 Adana-Mersin region are shown in Table 5.19.

Table 5.19 The strongest and the most competitive sub-sectors of manufacturing industry in TR62 Adana-Mersin Region

ISIC Code	Avg. RCA 2011-2018	Avg. TBI 2011-2018	Class. of RCA	Class. of TBI
1532	14.590	0.391	Strong	NE
1511	7.197	0.921	Strong	NE
1531	7.197	0.754	Strong	NE
1723	6.343	0.902	Strong	NE
2023	5.958	0.924	Strong	NE
1533	5.571	0.837	Strong	NE
2022	5.404	0.956	Strong	NE

ISIC Code			Strong	NE
1544	4.690	0.996	Strong	NE

5.3.10 TR72 Kayseri-Sivas-Yozgat Region

The average Balassa RCA values, classification of the RCA values and classification of the TBI values for the first 20 sub-sectors of manufacturing industry in TR72 Kayseri-Sivas-Yozgat rxxegion between 2011 and 2018 are shown in Table 5.20.

Table 5.20 Classification of RCA values and classification of TBI values within the context of first 20 sub-sectors of manufacturing industry in TR72 Kayseri-Sivas-Yozgat

ISIC Code	Avg. RCA 2011-2018	Avg. TBI 2011-2018	Class. Of RCA	Class. Of TBI
3610	14.435	0.897	Strong	NE
3130	5.693	0.935	Strong	NE
2021	4.904	0.700	Strong	NE
1711	4.101	0.734	Strong	NE
2930	3.825	0.899	Medium	NE
2913	3.725	0.823	Medium	NE
2022	3.607	0.913	Medium	NE
2811	3.461	0.943	Medium	NE
2691	3.290	0.769	Medium	NE
2899	2.497	0.806	Medium	NE
2023	2.373	0.955	Medium	NE
2922	2.147	-0.161	Medium	NI
3311	1.742	-0.135	Weak	NI
2696	1.632	0.925	Weak	NE
1542	1.573	0.285	Weak	NE
2010	1.510	-0.720	Weak	NI
1729	1.415	0.434	Weak	NE
2926	1.392	-0.651	Weak	NI
1541	1.262	0.999	Weak	NE
3320	1.191	-0.755	Weak	NI

According to the findings, the TR72 Kayseri-Sivas-Yozgat region is consists of strong, medium and weak comparative advantage sectors with export expertise in manufacturing industry and disadvantaged sectors without export expertise. According to Figure 5.10 sectors with a strong comparative advantage with export expertise consist of 3% of all sectors, sectors with a medium comparative advantage consist of 7%, sectors with a weak comparative advantage consist of 10% and disadvantaged

sectors without export expertise comprise of 80% of all sectors. According to the export and import balance, 4 of the 4 sub-sectors with a strong comparative advantage with export expertise are Net Exporters. 7 of the 8 sub-sectors with a medium comparative advantage are Net Exporters and 1 is a Net Importer. 7 of 12 the sub-sectors with a weak comparative advantage with export expertise are Net Exporters, 5 are Net Importers and 38 of 96 the sub-sectors with disadvantaged sub-sectors without export expertise are Net Exporters 58 of them are Net Importers.
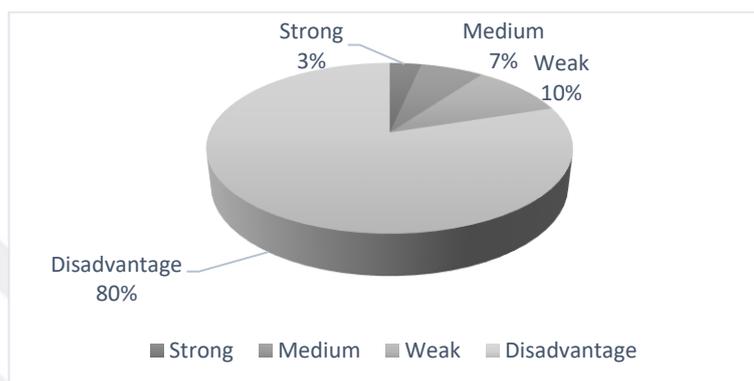
Figure 5.10 Classification of RCA Values within the context of manufacturing industry in TR72 Kayseri-Sivas-Yozgat Region

The strongest and the most competitive sub-sectors of manufacturing industry in TR72 Kayseri-Sivas-Yozgat region are shown in Table 5.21.

Table 5.21 The strongest and the most competitive sub-sectors of manufacturing industry in TR72 Kayseri-Sivas-Yozgat Region

ISIC Code	Avg. RCA 2011-2018	Avg. TBI 2011-2018	Class. of RCA	Class. of TBI
3610	14.435	0.897	Strong	NE
3130	5.693	0.935	Strong	NE
2021	4.904	0.700	Strong	NE
1711	4.101	0.734	Strong	NE

5.3.11 TR90 Trabzon-Ordu-Giresun-Rize-Artvin-Gümüşhane Region

The average Balassa RCA values, classification of the RCA values and classification of the TBI values for the first 20 sub-sectors of manufacturing industry in TR90 Trabzon-Ordu-Giresun-Rize-Artvin-Gümüşhane region between 2011 and 2018 are shown in Table 5.22.

Table 5.22 Classification of RCA values and classification of TBI values within the context of first 20 sub-sectors of manufacturing industry in TR90 Trabzon-Ordu-Giresun-Rize-Artvin-Gümüşhane Region

ISIC Code	Avg. RCA 2011-2018	Avg. TBI 2011-2018	Class. of RCA	Class. Of TBI
1513	12.931	0.961	Strong	NE
1554	3.640	0.944	Medium	NE
2010	2.609	-0.479	Medium	NI
3599	2.219	0.989	Medium	NE
2694	1.773	1.000	Weak	NE
2695	1.742	0.970	Weak	NE
2422	1.499	0.988	Weak	NE
1549	1.491	0.850	Weak	NE
2925	1.255	0.652	Weak	NE
1531	1.242	0.901	Weak	NE
1514	1.217	0.305	Weak	NE
1533	1.128	0.935	Weak	NE
1512	1.051	-0.260	Weak	NI
2927	0.962	0.703	Disadvantage	NE
2915	0.767	0.506	Disadvantage	NE
2924	0.608	0.564	Disadvantage	NE
1600	0.471	0.998	Disadvantage	NE
2424	0.454	0.985	Disadvantage	NE
2691	0.436	0.923	Disadvantage	NE
1723	0.397	-0.777	Disadvantage	NI

According to the findings, the TR90 Trabzon-Ordu-Giresun-Rize-Artvin-Gümüşhane region is consist of strong, medium and weak comparative advantage sectors with export expertise in manufacturing industry and disadvantaged sectors without export expertise. According to Figure 5.11, sectors with a strong comparative advantage with export expertise consist of 1% of all sectors, sectors with a medium comparative advantage consist of 2% sectors with a weak comparative advantage consist of 8% and disadvantaged sectors without export expertise comprise of 89% of all sectors. According to the export and import balance, 1 sub-sector with a strong comparative advantage with export expertise is a Net Exporter. 2 of the 3 sub-sectors with a medium comparative advantage are Net Exporters and 1 is a Net Importer. 8 of 9 the sub-sectors with a weak comparative advantage with export expertise are Net Exporters, 1 is a Net Importer and 68 of 107 the sub-sectors with disadvantaged sub-sectors without export expertise are Net Exporters 39 of them are Net Importers.
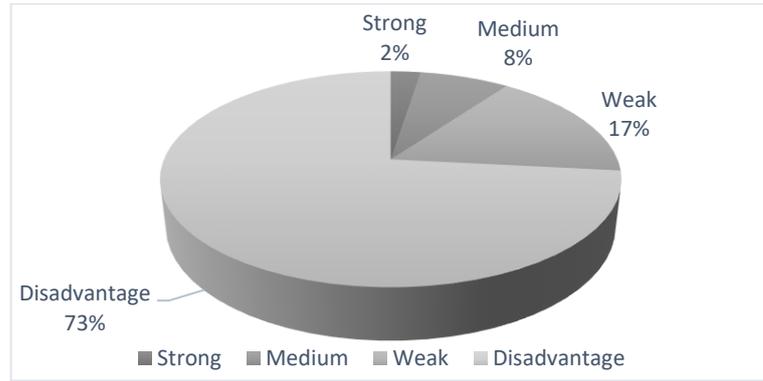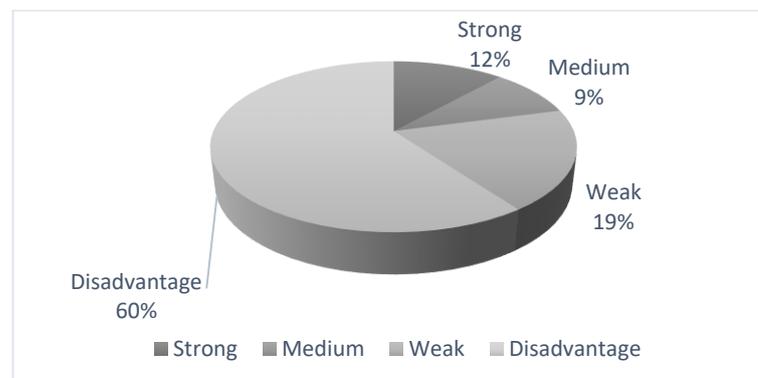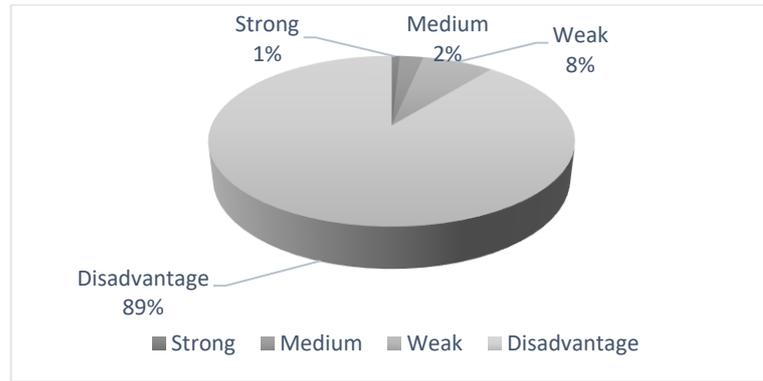
Figure 5.11 Classification of RCA Values within the context of manufacturing industry in TR90 Trabzon-Ordu-Giresun-Rize-Artvin-Gümüşhane Region

The strongest and the most competitive sub-sectors of manufacturing industry in TR90 Trabzon-Ordu-Giresun-Rize-Artvin-Gümüşhane region are shown in Table 5.23.

Table 5.23 The strongest and the most competitive sub-sectors of manufacturing industry in TR90 Trabzon-Ordu-Giresun-Rize-Artvin-Gümüşhane Region

ISIC Code	Avg. RCA 2011-2018	Avg. TBI 2011-2018	Class. of RCA	Class off TBI
1513	12.931	0.961	Strong	NE

5.3.12 TRB1 Malatya-Elazığ-Bingöl-Tunceli Region

The average Balassa RCA values, classification of the RCA values and classification of the TBI values for the first 20 sub-sectors of manufacturing industry in TRB1 Malatya-Elazığ-Bingöl-Tunceli region between 2011 and 2018 are shown in Table 5.24.

Table 5.24 Classification of RCA values and classification of TBI values within the context of first 20 sub-sectors of manufacturing industry in TRB1 Malatya-Elazığ-Bingöl-Tunceli Region

ISIC Code	Avg. RCA 2011-2018	Avg. TBI 2011-2018	Class. of RCA	Class. of TBI
1513	15.801	0.973	Strong	NE
1511	12.710	0.985	Strong	NE
1512	3.979	0.982	Medium	NE
2914	3.674	0.899	Medium	NE
2710	3.402	0.954	Medium	NE
2696	3.039	0.909	Medium	NE
2925	2.438	0.787	Medium	NE
1520	2.082	0.556	Medium	NE

2021	1.522	-0.056	Weak	NI
2813	1.319	0.368	Weak	NE
2022	1.159	0.574	Weak	NE
1531	1.010	1.000	Weak	NE
3110	0.923	0.626	Disadvantage	NE
1730	0.798	0.976	Disadvantage	NE
3599	0.731	0.977	Disadvantage	NE
1549	0.596	0.738	Disadvantage	NE
1711	0.512	0.593	Disadvantage	NE
1541	0.482	1.000	Disadvantage	NE
3610	0.468	0.982	Disadvantage	NE
2520	0.323	0.484	Disadvantage	NE

According to the findings, the TRB1 Malatya-Elazığ-Bingöl-Tunceli region is consists of strong, medium and weak comparative advantage sectors with export expertise in manufacturing industry and disadvantaged sectors without export expertise. According to Figure 5.12 sectors with a strong comparative advantage with export expertise consist of 2% of all sectors, sectors with a medium comparative advantage consist of 5%, sectors with weak comparative advantage consist of 3% and disadvantaged sectors without export expertise comprise of 90% of all sectors. According to the export and import balance, 2 sub-sectors with a strong comparative advantage with export expertise are Net Exporters. 6 sub-sectors with a medium comparative advantage are Net Exporters. 3 of 4 the sub-sectors with a weak comparative advantage with export expertise are Net Exporters, 1 is a Net Importer and 30 of 108 the sub-sectors with disadvantaged sub-sectors without export expertise are Net Exporters 68 of them are Net Importers.
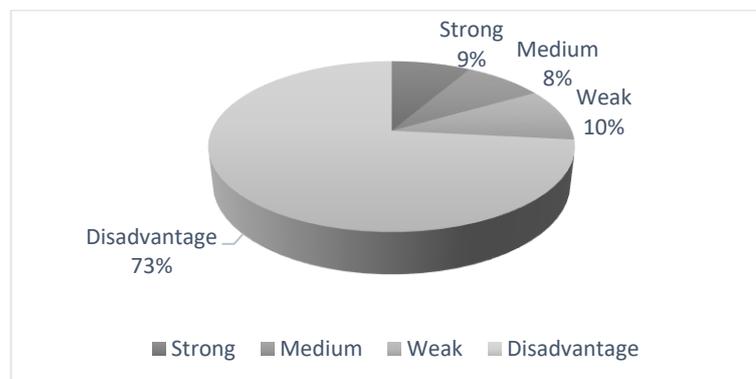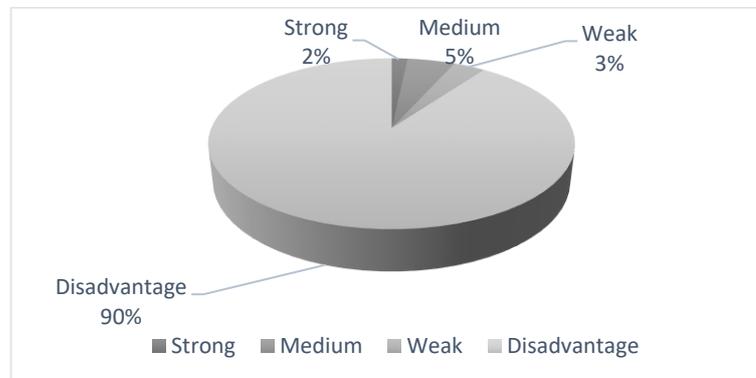

Figure 5.12 Classification of RCA Values within the context of manufacturing industry in TRB1 Malatya-Elazığ-Bingöl-Tunceli Region

The strongest and the most competitive sub-sectors of manufacturing industry in TRB1 Malatya-Elazığ-Bingöl-Tunceli region are shown in Table 5.25.

Table 5.25 The strongest and the most competitive sub-sectors of manufacturing industry in TRB1 Malatya-Elazığ-Bingöl-Tunceli Region

ISIC Code	Avg. RCA 2011-2018	Avg. TBI 2011-2018	Class. of RCA	Class. of TBI
1513	15.801	0.973	Strong	NE
1511	12.710	0.985	Strong	NE

5.3.13 TRC1 Gaziantep-Adıyaman-Kilis Region

The average Balassa RCA values, classification of the RCA values and classification of the TBI values for the first 20 sub-sectors of manufacturing industry in TRC1 Gaziantep-Adıyaman-Kilis region between 2011 and 2018 are shown in Table 5.26.

Table 5.26 Classification of RCA values and classification of TBI values within the context of first 20 sub-sectors of manufacturing industry in TRC1 Gaziantep-Adıyaman-Kilis Region

ISIC Code	Avg. RCA 2011-2018	Avg. TBI 2011-2018	Class. of RCA	Class. of TBI
1722	15.221	0.999	Strong	NE
1544	12.912	1.000	Strong	NE
1514	8.740	-0.205	Strong	NI
1533	6.822	0.996	Strong	NE
1541	5.620	1.000	Strong	NE
2109	3.835	0.951	Medium	NE
1729	3.746	0.748	Medium	NE
1531	3.701	0.949	Medium	NE
1711	3.694	0.472	Medium	NE
1543	3.667	0.931	Medium	NE
1920	3.527	0.933	Medium	NE
2430	3.492	-0.606	Medium	NI
1553	3.427	1.000	Medium	NE
1723	2.763	0.639	Medium	NE
2424	2.636	0.749	Medium	NE
1549	2.418	0.873	Medium	NE
2520	2.297	0.795	Medium	NE
2694	1.777	0.999	Weak	NE
1721	1.742	0.988	Weak	NE
2926	1.615	-0.817	Weak	NI

According to the findings, the TRC1 Gaziantep-Adıyaman-Kilis Region is consists of strong, medium and weak comparative advantage sectors with export expertise in manufacturing industry and disadvantaged sectors without export expertise. According to Figure 5.13 sectors with a strong comparative advantage with export expertise consist of 4% of all sectors, sectors with a medium comparative advantage consist of 10%, sectors with a weak comparative advantage consist of 7% and disadvantaged sectors without export expertise comprise of 79% of all sectors. According to the export and import balance, 4 of the 5 sub-sectors with a strong comparative advantage with export expertise are Net Exporters, 10 are Net Importers. 12 sub-sectors with a medium comparative advantage are Net Exporters. 7 of 8 the sub-sectors with a weak comparative advantage with export expertise are Net Exporters, 1 is a Net Importer and 43 of 95 the sub-sectors with disadvantaged sub-sectors without export expertise are Net Exporters 52 of them are Net Importers.
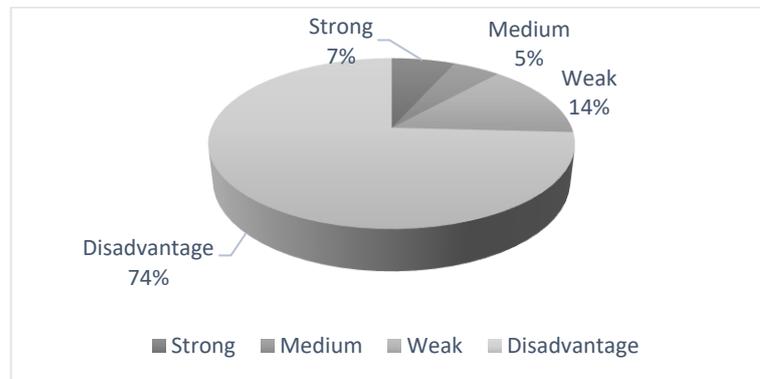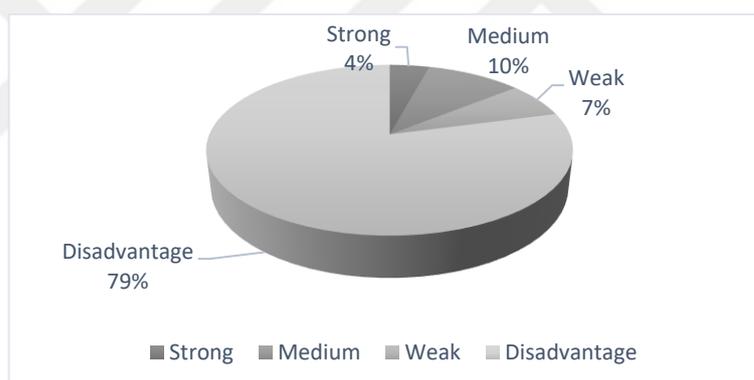

Figure 5.13 Classification of RCA Values within the context of manufacturing industry in TRC1 Gaziantep-Adıyaman-Kilis Region

The strongest and the most competitive sub-sectors of manufacturing industry in TRC1 Gaziantep-Adıyaman-Kilis region are shown in Table 5.27.

Table 5.27 The strongest and the most competitive sub-sectors of manufacturing industry in TRC1 Gaziantep-Adıyaman-Kilis Region

ISIC Code	Avg. RCA 2011-2018	Avg. TBI 2011-2018	Class. of RCA	Class. of TBI
1722	15.221	0.999	Strong	NE
1544	12.912	1.000	Strong	NE
1533	6.822	0.996	Strong	NE
1541	5.620	1.000	Strong	NE

5.4 The Relationship between Universities and the Competitive Industries of Their Regions

In this part, the relationship between the regions having the strongest and the most competitive sectors in the manufacturing industry and the universities determined in the regions are analyzed.

In the analysis study, the activity content of the sectors were identified and examined with detailed explanations in ISIC code system. Keywords are determined for each region and their sectors. According to the product and service definitions, the identified keywords were determined generally for some sectors, and on the basis of product for some other sectors. For this reason, differences were observed.

The determined keywords were thoroughly searched by taking all disciplines into consideration via the YÖKTEZ database where graduate studies of universities are published online. By using the advanced search option, thesis, titles, authors, supervisors, abstracts, keywords, years, universities…etc. can be easily found. However, this scanning process was the most difficult and tiring part of the analysis. The main reason for this difficulty is that the titles, abstracts and keywords of some theses do not give clear information about the sectors. For this reason, the search criteria for keywords are determined as title, abstract, keyword and university. Since the EUIE data covers the years 2011-2018, this date range has been used to determine the theses. Accessible theses were examined in studies where the focus of the thesis was not clear. Theses found to be related to the searched keywords were added to the score of the related university. Then, the number of professors (full, associate and assistant) were found for each year between 2011 and 2018 in the YÖK database. Finally, the number of thesis obtained from the YÖKTEZ database was divided by the number of professors and the number of sector-oriented graduate thesis per professors was determined. These values were calculated separately for 26 universities and the university scores were obtained in this manner.

5.4.1 TR31 İzmir Region

For the strongest and the most competitive sectors identified in TR31 İzmir region, the determined keywords according to the ISIC Code explanations are given in Table 5.28.

Table 5.28 The keywords for the strongest and the most competitive sectors identified in TR31 region

ISIC Code	ISIC Name	Keywords
1512	Processing and preserving of fish and fish products	"fish", "fish products". "frozen fish, "cooked fish", "fermented fish" "fish paste", "fish balls", "caviar", fish "fillet"
1600	Manufacture of tobacco products	"tobacco", "cigarette", "cigar", "pipe tobacco", "chewing tobacco", "snuff"
2102	Manufacture of corrugated paper and paperboard and of containers of paper and paperboard	"corrugated ", "corrugated paper", " corrugated paperboard, "corrugated paper container", "corrugated paperboard container"
2222	Service activities related to printing	"printing", "bookbinding", "printing plate", "lithographic stones",

5.4.1.1 Ege University

The number and years of graduate theses completed by Ege University for the keywords identified in Table 5.28 are given in Table 5.29.

Table 5.29 The number of graduate thesis for the 4 sub-sectors in Ege University

ISIC Code	2011	2012	2013	2014	2015	2016	2017	2018
1512	2	1	1	0	0	2	1	1
1600	0	0	1	0	0	0	0	0
2102	0	0	0	0	0	0	0	0
2222	0	0	0	0	0	0	0	0

According to Table 5.29, it is seen that the sub-sector with the highest number of thesis of Ege University is "1512 Processing and preserving of fish and fish products" of which 8 theses were conducted. The activity code "1600 Manufacture of tobacco products" there is only one thesis which was conducted in 2013. For the other sub-sectors "2102 Manufacture of corrugated paper and paperboard and of containers of paper and paperboard" and "2222 Service activities related to printing", no thesis could be found matching with the keywords.

The number of professors (full, associate and assistant) by years in Ege University is given in the Table 5.30.

Table 5.30 The number of Professors by years in Ege University

Titles	2011	2012	2013	2014	2015	2016	2017	2018
Prof. Dr.	762	808	818	879	891	907	921	921
Assoc. Prof. Dr.	273	293	319	336	352	361	394	382
Assist. Prof. Dr.	458	431	452	472	442	437	393	373
Total	1493	1532	1589	1687	1685	1705	1708	1676

Finally the average number of graduate thesis per professors of Ege University's graduate thesis is shown in Table 5.31. In 2014 and 2015, the average number of thesis per professors in the sub-sector with the code 1512 for Ege University was calculated. In the sub-sector with the code 1600, the average number of thesis per professors was calculated only for 2013. In the subsectors of Ege University with codes 2102 and 2222, the value of 0 is given because there are no matching graduate thesis.

Table 5.31 The average number of graduate thesis per professors for the 4 sub-sectors in Ege University

ISIC Code	2011	2012	2013	2014	2015	2016	2017	2018
1512	0.0013	0.0007	0.0006	0	0	0.0012	0.0006	0.0006
1600	0	0	0.0006	0	0	0	0	0
2102	0	0	0	0	0	0	0	0
2222	0	0	0	0	0	0	0	0
Total	**0.0013**	**0.0007**	**0.0013**	**0.0000**	**0.0000**	**0.0012**	**0.0006**	**0.0006**

5.4.1.2 İzmir Institute of Technology

The number and years of graduate theses completed by İzmir Institute of Technology for the keywords identified in Table 5.28 are given in Table 5.32.

Table 5.32 The number of graduate thesis for the 4 sub-sectors in İzmir Institute of Technology

ISIC Code	2011	2012	2013	2014	2015	2016	2017	2018
1512	0	0	0	0	0	0	0	0
1600	0	0	0	0	0	0	0	0
2102	0	0	0	0	0	0	0	0
2222	0	0	0	0	0	0	0	0

According to Table 5.32, it is seen that the sub-sectors with codes "1512 Processing and preserving of fish and fish products", "1600 Manufacture of tobacco products", "2102 Manufacture of corrugated paper and paperboard and containers of paper and paperboard" and "2222 Service activities related to printing", no thesis could be found matching with the keywords.

The number of professors (full, associate and assistant) by years in Izmir Institute of Technology is given in the Table 5.33.

Table 5.33 The number of professors by years in Izmir Institute of Technology

Titles	2011	2012	2013	2014	2015	2016	2017	2018
Prof. Dr.	38	50	55	58	62	60	62	73
Assoc. Prof. Dr.	41	42	42	40	45	53	52	55
Assist. Prof. Dr.	80	75	71	85	79	79	77	64
Total	159	167	168	183	186	192	191	192

In this Table 5.34, the average number of graduate thesis per professors of İzmir Institute of Technology with codes 1512, 1600, 2102 and 2222, the value of 0 is given because there are no matching graduate thesis for the sub-sectors.

Table 5.34 The average number of graduate thesis per professors for the 4 sub-sectors in İzmir Institute of Technology

ISIC Code	2011	2012	2013	2014	2015	2016	2017	2018
1512	0	0	0	0	0	0	0	0
1600	0	0	0	0	0	0	0	0
2102	0	0	0	0	0	0	0	0
2222	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0

5.4.1.3 Dokuz Eylül University

The number and years of graduate theses completed by Dokuz Eylül University for the keywords identified in Table 5.28 are given in Table 5.35.

Table 5.35 The number of graduate thesis for the 4 sub-sectors in Dokuz Eylül University

ISIC Code	2011	2012	2013	2014	2015	2016	2017	2018
1512	0	0	1	0	1	0	0	0
1600	0	0	0	0	0	0	0	0
2102	0	0	0	0	0	0	0	0
2222	0	0	0	0	1	0	0	0

According to Table 5.35, it is seen that the sub-sector with the highest number of thesis of Dokuz Eylül University is "1512 Processing and preserving of fish and fish products" of which 2 thesis were conducted. The activity code "2222 Service activities related to printing" there is only one study which was conducted in 2015. For the other sub-sectors "1600 Manufacture of tobacco products" and "2102 Manufacture of corrugated paper and paperboard and of containers of paper and paperboard", no thesis could be found matching with the keywords.

The number of professors by years in Dokuz Eylül University is given in the Table 5.36.

Table 5. 36 The number of professors by years in Dokuz Eylül University

Titles	2011	2012	2013	2014	2015	2016	2017	2018
Prof. Dr.	574	558	620	636	653	697	696	758
Assoc. Prof. Dr.	265	296	293	327	393	393	356	314
Assist. Prof. Dr.	533	565	573	588	587	596	605	583
Total	1372	1419	1486	1551	1633	1686	1657	1655

Finally the average number of graduate thesis per professors of Dokuz Eylül University is shown in Table 5.31. In 2013 and 2015, the average number of thesis per professors in the sub-sector with the code 1512 for Dokuz Eylül University was calculated. In the sub-sector with the code 2222, the average number of thesis per professors was calculated only for 2015. In the subsectors with codes 2102 and 2222, the value of 0 is given because there are no matching graduate thesis.

Table 5.37 The average number of graduate thesis per professors for the 4 sub-sectors in Dokuz Eylül University

ISIC Code	2011	2012	2013	2014	2015	2016	2017	2018
1512	0	0	0.0007	0	0.0006	0	0	0
1600	0	0	0	0	0	0	0	0
2102	0	0	0	0	0	0	0	0
2222	0	0	0	0	0.0006	0	0	0
Total	**0**	**0**	**0.0007**	**0**	**0.0012**	**0**	**0**	**0**

5.4.1.4 İzmir University of Economics

The number and years of graduate theses completed by İzmir University of Economics for the keywords identified in Table 5.28 are given in Table 5.38.

Table 5.38 The number of graduate thesis for the 4 sub-sectors in İzmir University of Economics

ISIC CODE	2011	2012	2013	2014	2015	2016	2017	2018
1512	0	0	0	0	0	0	0	0
1600	0	0	0	0	0	0	0	0
2102	0	0	0	0	0	0	0	0
2222	0	0	0	0	0	0	0	0

According to Table 5.38, it is seen that the sub-sectors with codes "1512 Processing and preserving of fish and fish products", "1600 Manufacture of tobacco products",

"2102 Manufacture of corrugated paper and paperboard and containers of paper and paperboard" and "2222 Service activities related to printing", no thesis could be found matching with the keywords.

The number of professors by years in İzmir University of Economics is given in the Table 5.39

Table 5.39 The number of professors by years in İzmir University of Economics

TITLES	2011	2012	2013	2014	2015	2016	2017	2018
Prof. Dr.	26	33	35	42	35	47	41	47
Assoc. Prof. Dr.	19	19	26	31	40	48	46	51
Assist. Prof. Dr.	85	87	87	87	94	98	93	91
Total	**130**	**139**	**148**	**160**	**169**	**193**	**180**	**189**

Finally, in this Table 5.40, the average number of graduate thesis per professors of İzmir Institute of Technology with codes 1512, 1600, 2102 and 2222, the value of 0 is given because there are no matching graduate thesis for the sub-sectors.

Table 5.40 The average number of graduate thesis per professors for the 4 sub-sectors in Izmir University of Economics

ISIC CODE	2011	2012	2013	2014	2015	2016	2017	2018
1512	0	0	0	0	0	0	0	0
1600	0	0	0	0	0	0	0	0
2102	0	0	0	0	0	0	0	0
2222	0	0	0	0	0	0	0	0
Total	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

5.4.2 TR32 Aydın-Denizli-Muğla Region

For the strongest and the most competitive sectors identified in TR32 Aydın-Denizli-Muğla region, the determined keywords according to the ISIC Code explanations are given in the Table 5.41.

Table 5.41 The keywords for the strongest and the most competitive sectors identified in TR32 region

ISIC Code	ISIC Name	Keywords
1512	Processing and preserving of fish and fish products	"fish", "fish products". "frozen fish, "cooked fish", "fermented fish" "fish paste", "fish balls", "caviar", fish "fillet"
1721	Manufacture of made-up textile articles, except apparel	"textile", "made-up textile", "blanket", "linen", "made-up furnishing", "flags", "banners"," parachute"
2696	Cutting, shaping and finishing of stone	"cutting stone", "shaping stone", "finishing stone"

2923	Manufacture of machinery for metallurgy	"metallurgy machinery", "casting machine", "metal rolling mill", "rolling"
3130	Manufacture of insulated wire and cable	"insulated wire", "cable", "insulated conductor", "insulated strip"
3512	Building and repairing of pleasure and sporting boats	"yacht", "vessel", "rowing boat", "cano", "inflatable boat", "sport fisherman", "cabin cruiser"," dori", "skiff", "oared life-boat", "racing shell", "pedalo"

5.4.2.1 Pamukkale University

The number and years of graduate theses completed by Pamukkale University for the keywords identified in Table 5.41 are given in Table 5.42.

Table 5.42 The number of graduate thesis for the 6 sub-sectors in Pamukkale University

ISIC Code	2011	2012	2013	2014	2015	2016	2017	2018
1512	0	0	1	0	0	0	0	2
1721	8	2	7	8	3	6	7	4
2696	0	0	0	1	0	1	0	1
2923	0	0	0	0	0	0	0	0
3130	0	0	0	1	0	0	0	0
3512	0	0	0	0	0	0	0	0

According to Table 5.42, it is seen that the sub-sector with the highest number of thesis of Pamukkale University is "1721 Manufacture of made-up textile articles, except apparel" of which 45 theses were conducted. The activity code "1512 Processing and preserving of fish and fish products" and "2696 Cutting, shaping and finishing of stone" had three graduate theses which were conducted. Also the activity code "3130 Manufacture of insulated wire and cable" there is only one graduate thesis which was conducted. For the other sub-sectors "2923 Manufacture of machinery for metallurgy" and "3512 Building and repairing pleasure and sporting boats in the activity code", no thesis could be found matching with the keywords.

The number of professors by years in Pamukkale University is given in the Table 5.43

Table 5.43 The number of professors by years in Pamukkale University

TITLES	2011	2012	2013	2014	2015	2016	2017	2018
Prof. Dr.	100	122	133	225	233	237	237	292
Assoc. Prof. Dr.	75	139	153	204	223	241	192	209
Assist. Prof. Dr.	308	339	346	405	399	403	349	412
Total	**483**	**600**	**632**	**834**	**855**	**881**	**778**	**913**

Finally the average number of graduate thesis per professors of Pamukkale University's graduate thesis is shown in Table 5.44. In 2011-2018, the average number of thesis per professors in the sub-sector with the code 1721 for Pamukkale University was calculated. In the sub-sector with the code 1512, the average number of thesis per professors was calculated for 2013 and 2018. In the sub-sector with the code 2696, the average number of thesis per professors was calculated for 2014, 2016 and 2018. Also in the sub-sectors with the codes 2923 and 3130 the average number of thesis per professors was calculated for only 2014. Finally in with code 3512, the value of 0 is given because there are no matching graduate thesis.

Table 5.44 The average number of graduate thesis per professors for the 6 sub-sectors in Pamukkale University

ISIC Code	2011	2012	2013	2014	2015	2016	2017	2018
1512	0	0	0.0016	0	0	0	0	0.0022
1721	0.0166	0.0033	0.0111	0.0096	0.0035	0.0068	0.0090	0.0044
2696	0	0	0	0.0012	0	0.0011	0	0.0011
2923	0	0	0	0.0000	0	0	0	0
3130	0	0	0	0.0012	0	0	0	0
3512	0	0	0	0	0	0	0	0
Total	**0.0166**	**0.0033**	**0.0127**	**0.0120**	**0.0035**	**0.0079**	**0.0090**	**0.0077**

5.4.3   TR41 Bursa-Eskişehir-Bilecik Region

For the strongest and the most competitive sectors identified in TR41 Bursa-Eskişehir-Bilecik region, the determined keywords according to the ISIC Code explanations are given in the Table 5.45.

Table 5.45 The keywords for the strongest and the most competitive sectors identified in TR41 region

ISIC Code	ISIC Name	Keywords
2922	Manufacture of machine-tools	"machine-tool", "nailing machine", "stapling machine", "gluing machine", "gas or electric welding machine", brazing machine", "soldering machine", "plasma arc", "lighter photon beam", "ultrasonic waves", "electron beam", " magnetic pulse", "chucks", "face plates" "drill machine", "chain saw", "filing machine", "wire brush machine", "hammer", "riveter machine", "sheet metal cutter machine"
3430	Manufacture of parts and accessories for motor vehicles and their engines	"motor vehicle part", "engine", "accessories", "brake", "gear box", "axle", "road wheel", "suspension shock absorber", "radiator", "silencer", "exhaust pipe", "clutches", "steering wheel", steering "column", "steering box"

3591	Manufacture of motorcycles	"motorcycle", "auxiliary engine", "motorcycle engine"

5.4.3.1 Bursa Uludağ University

The number and years of graduate theses completed by Bursa Uludağ University for the keywords identified in Table 5.45 are given in Table 5.46.

Table 5.46 The number of graduate thesis for the 3 sub-sectors in Bursa Uludağ University

ISIC CODE	2011	2012	2013	2014	2015	2016	2017	2018
2922	0	0	0	0	0	0	0	0
3430	0	0	2	2	4	2	5	4
3591	0	0	0	0	0	1	0	0

According to Table 5.46, it is seen that the sub-sector with the highest number of thesis of Bursa Uludağ University is "3430 Manufacture of parts and accessories for motor vehicles and their engines" of which 19 theses were conducted. The activity code "3591 Manufacture of motorcycles" there is only one study which was conducted. For the other sub-sector "2922 Manufacture of machine-tools", no thesis could be found matching with the keywords.

The number of professors by years in Bursa Uludağ University is given in the Table 5.47

Table 5.47 The number of professors by years in Bursa Uludağ University

Titles	2011	2012	2013	2014	2015	2016	2017	2018
Prof. Dr.	387	426	427	443	464	496	496	504
Assoc. Prof. Dr.	250	216	255	255	274	295	284	281
Assist. Prof. Dr.	216	284	259	299	277	277	294	296
Total	853	926	941	997	1015	1068	1074	1081

Finally the average number of graduate thesis per professors of Bursa Uludağ University's graduate thesis is shown in Table 5.48. In 2013-2018, the average number of thesis per professors in the sub-sector with the code 3430 for Bursa Uludağ University was calculated. In the sub-sector with the code 3591, the average number of thesis per professors was calculated only for 2016. In the subsector with code 2922, the value of 0 is given because there are no matching graduate thesis.

Table 5.48 The average number of graduate thesis per professors for the 3 sub-sectors in Bursa Uludağ University

ISIC Code	2011	2012	2013	2014	2015	2016	2017	2018
2922	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
3430	0.0000	0.0000	0.0021	0.0020	0.0039	0.0019	0.0047	0.0037
3591	0.0000	0.0000	0.0000	0.0000	0.0000	0.0009	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0021**	**0.0020**	**0.0039**	**0.0028**	**0.0047**	**0.0037**

5.4.3.2 Anadolu University

The number and years of graduate theses completed by Anadolu University for the keywords identified in Table 5.45 are given in Table 5.49.

Table 5.49 The number of graduate thesis for the 3 sub-sectors in Anadolu University

ISIC CODE	2011	2012	2013	2014	2015	2016	2017	2018
2922	0	0	0	0	0	0	0	0
3430	0	0	0	0	0	0	0	0
3591	0	0	0	0	0	0	0	0

According to Table 5.49, it is seen that the sub-sectors with codes "3430 Manufacture of parts and accessories for motor vehicles and their engines", "3591 Manufacture of motorcycles" and "2922 Manufacture of machine-tools", no thesis could be found matching with the keywords.

The number of professors by years in Anadolu University is given in the Table 5.50

Table 5.50 The number of professors by years in Anadolu University

TITLES	2011	2012	2013	2014	2015	2016	2017	2018
Prof. Dr.	170	204	206	250	261	295	314	323
Assoc. Prof. Dr.	140	167	173	241	269	283	274	286
Assist. Prof. Dr.	377	452	446	503	494	484	466	451
Total	**687**	**823**	**825**	**994**	**1024**	**1062**	**1054**	**1060**

Finally, in this Table 5.51, the average number of graduate thesis per professors of Anadolu University with codes 2922, 3430 and 3591, the value of 0 is given because there are no matching graduate thesis for the sub-sectors.

Table 5.51 The average number of graduate thesis per professors for the 3 sub-sectors in Anadolu University

ISIC Code	2011	2012	2013	2014	2015	2016	2017	2018
2922	0	0	0	0	0	0	0	0
3430	0	0	0	0	0	0	0	0
3591	0	0	0	0	0	0	0	0
Total	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

5.4.4 TR42 Kocaeli-Sakarya-Düzce-Bolu-Yalova Region

For the strongest and the most competitive sectors identified in TR42 Kocaeli-Sakarya-Düzce-Bolu-Yalova region, the determined keywords according to the ISIC Code explanations are given in the Table 5.52.

Table 5.52 The keywords for the strongest and the most competitive sectors identified in TR42 region

ISIC Code	ISIC Code Name	Keyword
2320	Manufacture of refined petroleum products	"petroleum", "petroleum product", "liquid fuel", "gaseous fuel"," illuminating oil" , "lubricating oil", "paraffin"," wax"
3693	Manufacture of sports goods	"sports good", "gymnastic equipment", "athletics equipment", "outdoor equipment", "indoor game equipment", "swimming pool", "paddling pool", "ball", "racket", "bat", "hunting equipment", "mountain climbing equipment", " sporting activity equipment", "sport glove", "headgear"

5.4.4.1 Kocaeli University

The number and years of graduate theses completed by Kocaeli University for the keywords identified in Table 5.52 are given in Table 5.53.

Table 5.53 The number of graduate thesis for the 2 sub-sectors in Kocaeli University

ISIC CODE	2011	2012	2013	2014	2015	2016	2017	2018
2320	0	1	1	0	0	0	1	3
3693	0	0	0	0	0	0	0	1

According to Table 5.53, it is seen that the sub-sector with the highest number of thesis of Dokuz Eylül University is "2320 Manufacture of refined petroleum product" of which 6 theses were conducted. The activity code "3693 Manufacture of sports goods" there is only one study which was conducted.

The number of professors by years in Kocaeli University is given in the Table 5.54

Table 5. 54 The number of professors by years in Kocaeli University

TITLES	2011	2012	2013	2014	2015	2016	2017	2018
Prof. Dr.	162	159	157	227	237	249	236	232
Assoc. Prof. Dr.	111	108	106	188	191	195	200	206
Assist. Prof. Dr.	389	383	377	463	487	502	470	492
Total	**662**	**650**	**640**	**878**	**915**	**946**	**906**	**930**

Finally the average number of graduate theses per professors of Kocaeli University's graduate thesis is shown in Table 5.31. In 2012. 2013. 2017 and 2018, the average number of thesis per professors in the sub-sector with the code 2320 for Kocaeli University was calculated. In the sub-sector with the code 3693, the average number of thesis per professors was calculated only for 2018.

Table 5.55 The average number of graduate thesis per professors for the 2 sub-sectors in Kocaeli University

ISIC Code	2011	2012	2013	2014	2015	2016	2017	2018
2320	0	0.0015	0.0016	0	0	0	0.0011	0.0032
3693	0	0	0	0	0	0	0	0.0011
Total	**0**	**0.0015**	**0.0016**	**0**	**0**	**0**	**0.0011**	**0.0043**

5.4.4.2 Gebze Technical University

The number and years of graduate theses completed by Gebze Technical University for the keywords identified in Table 5.52 are given in Table 5.56.

Table 5.56 The number of graduate thesis for the 2 sub-sectors in Gebze Technical University

ISIC CODE	2011	2012	2013	2014	2015	2016	2017	2018
2320	1	0	0	1	3	1	2	2
3693	0	0	0	0	0	0	0	0

According to Table 5.56, it is seen that the sub-sector with the highest number of theses of Gebze Technical University is "2320 Manufacture of refined petroleum product" of which 10 theses were conducted. For the other sub-sector "3693 Manufacture of sports goods", no thesis could be found matching with the keywords.

The number of professors by years in Gebze Technical University is given in the Table 5.57.

Table 5.57 The number of professors by years in Gebze Technical University

Titles	2011	2012	2013	2014	2015	2016	2017	2018
Prof. Dr.	46	48	52	60	74	33	86	92
Assoc. Prof. Dr.	56	58	64	63	64	17	55	59
Assist. Prof. Dr.	60	59	61	63	56	27	76	90
Total	**162**	**165**	**177**	**186**	**194**	**77**	**217**	**241**

Finally the average number of graduate theses per professors of Gebze Technical University's graduate thesis is shown in Table 5.58. In 2011, 2014, 2015, 2016, 2017 and 2018 the average number of theses per professors in the sub-sector with the code 2320 for Gebze Technical University was calculated. In the subsector with code 3693, the value of 0 is given because there are no matching graduate thesis.

Table 5.58 The average number of graduate thesis per professors for the 2 sub-sectors in Gebze Technical University

ISIC Code	2011	2012	2013	2014	2015	2016	2017	2018
2320	0.0062	0	0	0.0054	0.0155	0.0130	0.0092	0.0083
3693	0	0	0	0	0	0	0	0
TOTAL	**0.0062**	**0**	**0**	**0.0054**	**0.0155**	**0.0130**	**0.0092**	**0.0083**

5.4.5 TR51 Ankara Region

For the strongest and the most competitive sectors identified in TR51 Ankara region, the determined keywords according to the ISIC Code explanations are given in the Table 5.59.

Table 5.59 The keywords for the strongest and the most competitive sectors identified in TR51 region

ISIC Code	ISIC Name	Keywords
1542	Manufacture of sugar	"sugar". "cane", "beet", "molasses"
1552	Manufacture of wines	"wine"
2411	Manufacture of basic chemicals, except fertilizers and nitrogen compounds	"industrial gases", "inorganic acid", "inorganic compound", "metal", "organic chemical" , "alloy", "organic compound", "inorganic pigment", "synthetic organic dyestuff", "synthetic tanning agent"
2913	Manufacture of bearings, gears, gearing and driving elements	"bearing", "gear", "gearing". "Driving element"," "cam shaft", "crank shaft", "crank" "transmission shaft", "pillow block", "articulated link chain"," speed Drive"," clutche"," "flywheels", "articulated link chain"
2921	Manufacture of agricultural and forestry machinery	"agricultural machinery", "forestry machinery", "tractor", "trailer"
2927	Manufacture of weapons and ammunition	"gun", "weapon", "ammunition", "tank", "armoured supply vehicle", artillery, "rocket

		projector", "torpedo tube", "heavy machine gun", "machine gun", "bomb", "grenade", "torpedo", "mine", "rocket"
3140	Manufacture of accumulators, primary cells and primary batteries	"accumulator", "primary cell", "primary battery"
3530	Manufacture of aircraft and spacecraft	"aircraft", "spacecraft", "aeroplane", "balloon", "helicopter", "rotors", "aircraft engine", "turbo jet", "rocket engine", "turbo propeller"

5.4.5.1 Middle East Technical University

The number and years of graduate theses completed by Ege University for the keywords identified in Table 5.59 are given in Table 5.60.

Table 5.60 The number of graduate thesis for the 8 sub-sectors in Middle East Technical University

ISIC CODE	2011	2012	2013	2014	2015	2016	2017	2018
1542	0	2	0	0	0	0	0	0
1552	0	0	0	0	0	0	0	1
2411	0	0	5	4	1	1	2	2
2913	1	1	1	3	1	0	1	5
2921	0	0	0	0	2	0	0	0
2927	5	5	9	7	5	5	7	12
3140	1	0	2	0	0	2	0	1
3530	8	10	7	17	23	14	10	19

According to Table 5.85, it is seen that the sub-sector with the highest number of theses of Middle East Technical University is "3530 Manufacture of aircraft and spacecraft" of which 108 graduate theses were conducted. The sub-sector with the second highest number of theses from Middle East Technical University is "2927 Manufacture of weapons and ammunition" of which 55 graduate theses were conducted. The activity codes "1542 Manufacture of sugar" and "2921 Manufacture of agricultural and forestry machinery" had two graduate theses which were conducted. In the other sub-sector code "1552 Manufacture of wines" there is only one graduate theses which was conducted. The sub-sector with the "2411 Manufacture of basic chemicals, except fertilizers and nitrogen compounds" code had 11 graduate theses were conducted. The sub-sector "2921 Manufacture of agricultural and forestry machinery" had 13 graduate theses conducted. Finally, for the activity code "3140 Manufacture of accumulators, primary cells and primary batteries" there were 6 graduate theses conducted.

The number of professors by years in Middle East Technical University is given in the Table 5.61

Table 5.61 The number of professors by years in Middle East Technical University

Titles	2011	2012	2013	2014	2015	2016	2017	2018
Prof. Dr.	375	385	364	372	382	390	379	389
Assoc. Prof. Dr.	145	139	151	170	179	197	204	190
Assist. Prof. Dr.	233	253	244	256	299	280	271	286
Total	**753**	**777**	**759**	**798**	**860**	**867**	**854**	**865**

Finally the average number of graduate thesis per professors of Middle East Technical University's graduate thesis is shown in Table 5.62. In the sub-sectors with the codes 1542, 1552, 2411, 2913, 2921, 2927, 3140 and 3530 the average number of theses per professors was calculated for Middle East Technical University.

Table 5.62 The average number of graduate thesis per professors for the 8 sub-sectors in Middle East Technical University

ISIC Code	2011	2012	2013	2014	2015	2016	2017	2018
1542	0	0.0026	0	0	0	0	0	0
1552	0	0	0	0	0	0	0	0.0012
2411	0	0	0.0066	0.0050	0.0012	0.0012	0.0023	0.0023
2913	0.0013	0.0013	0.0013	0.0038	0.0012	0	0.0012	0.0058
2921	0	0	0	0	0.0023	0	0	0
2927	0.0066	0.0064	0.0119	0.0088	0.0058	0.0058	0.0082	0.0139
3140	0.0013	0	0.0026	0	0	0.0023	0	0.0012
3530	0.0106	0.0129	0.0092	0.0213	0.0267	0.0161	0.0117	0.0220
Total	**0.0199**	**0.0232**	**0.0316**	**0.0388**	**0.0372**	**0.0254**	**0.0234**	**0.0462**

5.4.5.2 İ.D. Bilkent University

The number and years of graduate theses completed by Ege University for the keywords identified in Table 5.59 are given in Table 5.63.

Table 5.63 The number of graduate thesis for the 8 sub-sectors in İ.D. Bilkent University

ISIC Code	2011	2012	2013	2014	2015	2016	2017	2018
1542	0	0	0	0	0	0	0	0
1552	0	0	0	0	0	0	0	0
2411	0	2	0	0	0	0	0	0
2913	0	0	0	0	0	0	0	0

2921	0	0	0	0	0	0	0	0
2927	1	0	0	0	0	2	3	0
3140	0	2	1	0	2	2	3	3
3530	0	0	0	0	0	0	1	0

According to Table 5.63, it is seen that the sub-sector with the highest number of thesis of İ.D. Bilkent University is "3140 Manufacture of accumulators, primary cells and primary batteries" of which 13 graduate theses were conducted. The sub-sector is "2411 Manufacture of basic chemicals, except fertilizers and nitrogen compounds" had two graduate theses were conducted. The activity codes "2927 Manufacture of weapons and ammunition" had 6 graduate theses which were conducted. In the other sub-sector code "3530 Manufacture of aircraft and spacecraft" there is only one graduate theses which was conducted. For the other sub-sectors "1542 Manufacture of sugar", "1552 Manufacture of wines", "2913 Manufacture of bearings, gears, gearing and driving elements" and "2921 Manufacture of agricultural and forestry machinery", no thesis could be found matching with the keywords.

The number of professors by years in İ.D. Bilkent University is given in the Table 5.64

Table 5.64 The number of professors by years in İ.D. Bilkent University

Titles	2011	2012	2013	2014	2015	2016	2017	2018
Prof. Dr.	93	95	96	99	97	103	103	111
Assoc. Prof. Dr.	59	65	73	79	77	85	79	71
Assist. Prof. Dr.	160	164	167	187	185	186	187	175
Total	**312**	**324**	**336**	**365**	**359**	**374**	**369**	**357**

Finally the average number of graduate thesis per professors of İ.D. Bilkent University's graduate thesis is shown in Table 5.62. In the sub-sectors with the codes 2411, 2927, 3140 and 3530 the average number of theses per professors was calculated for İ.D. Bilkent University. In the subsectors with codes 1542, 1552, 2913, and 2921 the value of 0 is given because there are no matching graduate theses.

Table 5.65 The average number of graduate thesis per professors for the 8 sub-sectors in İ.D. Bilkent University

ISIC Code	2011	2012	2013	2014	2015	2016	2017	2018
1542	0	0	0	0	0	0	0	0
1552	0	0	0	0	0	0	0	0
2411	0	0.0062	0	0	0	0	0	0
2913	0	0	0	0	0	0	0	0

ISIC Code								
2921	0	0	0	0	0	0	0	0
2927	0.0032	0	0	0	0	0.0053	0.0081	0
3140	0	0.0062	0.0030	0	0.0056	0.0053	0.0081	0.0084
3530	0	0	0	0	0	0	0.0027	0
Total	**0.0032**	**0.0123**	**0.0030**	**0**	**0.0056**	**0.0107**	**0.0190**	**0.0084**

5.4.5.3 TOBB University of Economics and Technology

The number and years of graduate theses completed by Ege University for the keywords identified in Table 5.59 are given in Table 5.66.

Table 5.66 The number of graduate thesis for the 8 sub-sectors in TOBB University of Economics and Technology

ISIC Code	2011	2012	2013	2014	2015	2016	2017	2018
1542	0	0	0	0	0	0	0	0
1552	0	0	0	0	0	0	0	0
2411	0	0	0	0	0	0	0	0
2913	0	0	0	1	0	0	0	0
2921	0	0	0	0	0	0	0	0
2927	0	1	1	3	1	1	3	6
3140	0	1	0	0	0	2	1	0
3530	0	1	1	2	2	3	3	6

According to Table 5.63, it is seen that the sub-sector with the highest number of theses of TOBB University of Economics and Technology is "3530 Manufacture of aircraft and spacecraft" of which 18 graduate theses were conducted. The sub-sector is "2927 Manufacture of weapons and ammunition" of which 16 graduate theses were conducted. In the other sub-sector code "2913 Manufacture of bearings, gears, gearing and driving elements" there is only one graduate theses which was conducted. The activity codes "3140 Manufacture of accumulators, primary cells and primary batteries" had 4 graduate theses which were conducted. For the other sub-sectors "1542 Manufacture of sugar", "1552 Manufacture of wines", "2411 Manufacture of basic chemicals, except fertilizers and nitrogen compounds" and "2921 Manufacture of agricultural and forestry machinery", no thesis could be found matching with the keywords.

The number of professors by years in TOBB University of Economics and Technology is given in the Table 5.67.

Table 5.67 The number of professors by years in TOBB University of Economics and
Technology

Titles	2011	2012	2013	2014	2015	2016	2017	2018
Prof. Dr.	31	28	33	38	43	49	75	80
Assoc. Prof. Dr.	15	20	34	48	47	50	49	50
Assist. Prof. Dr.	82	89	86	83	88	84	82	85
Total	128	137	153	169	178	183	206	215

Finally the average number of graduate thesis per professors of TOBB University of
Economics and Technology's graduate thesis is shown in Table 5.68. In the sub-sectors
with the codes 2913, 2927, 3140 and 3530 the average number of theses per professors
was calculated for TOBB University of Economics. In the subsectors with codes 1542,
1552, 2411, and 2921 the value of 0 is given because there are no matching graduate
theses.

Table 5.68 The average number of graduate thesis per professors for the 8 sub-sectors
in TOBB University of Economics and Technology

ISIC Code	2011	2012	2013	2014	2015	2016	2017	2018
1542	0	0	0	0	0	0	0	0
1552	0	0	0	0	0	0	0	0
2411	0	0	0	0	0	0	0	0
2913	0	0	0	0.0059	0	0	0	0
2921	0	0	0	0	0	0	0	0
2927	0	0.0073	0.0065	0.0178	0.0056	0.0055	0.0146	0.0279
3140	0	0.0073	0	0	0	0.0109	0.0049	0
3530	0	0.0073	0.0065	0.0118	0.0112	0.0164	0.0146	0.0279
Total	0	0.0219	0.0131	0.0355	0.0169	0.0328	0.0340	0.0558

5.4.5.4 Gazi University

The number and years of graduate theses completed by Gazi University for the
keywords identified in Table 5.59 are given in Table 5.29.

Table 5.69 The number of graduate thesis for the 8 sub-sectors in Gazi University

ISIC Code	2011	2012	2013	2014	2015	2016	2017	2018
1542	0	1	2	1	1	0	1	0
1552	0	0	0	0	0	0	0	0
2411	1	2	0	3	1	2	4	1
2913	1	0	2	2	1	0	3	4
2921	0	3	0	0	1	0	0	0

2927	2	7	6	1	7	2	2	5
3140	2	4	0	2	2	0	0	0
3530	0	0	0	0	0	0	0	0

According to Table 5.63, it is seen that the sub-sector with the highest number of theses of Gazi University is "2927 Manufacture of weapons and ammunition" of which 18 graduate theses were conducted. The sub-sector the "1542 Manufacture of sugar" within which 6 graduate theses were conducted. In the other sub-sector code "2411 Manufacture of basic chemicals, except fertilizers and nitrogen compounds" had 14 graduate theses which were conducted. The activity code "2921 Manufacture of agricultural and forestry machinery" had 4 graduate theses which were conducted. In the other sub-sector code "3140 Manufacture of accumulators, primary cells and primary batteries" there were 10 graduate theses conducted. For the other sub-sectors "1542 Manufacture of sugar", "1552 Manufacture of wines", and "3530 Manufacture of aircraft and spacecraft", no thesis could be found matching with the keywords.

The number of professors by years in Gazi University is given in the Table 5.70.

Table 5.70 The number of professors by years in Gazi University

Titles	2011	2012	2013	2014	2015	2016	2017	2018
Prof. Dr.	809	911	899	954	949	924	906	992
Assoc. Prof. Dr.	396	424	436	506	534	524	491	478
Assist. Prof. Dr.	724	706	702	627	560	552	456	399
Total	**1929**	**2041**	**2037**	**2087**	**2043**	**2000**	**1853**	**1869**

Finally the average number of graduate thesis per professors of Gazi University's graduate thesis is shown in Table 5.68. In the sub-sectors with the codes 1542, 2411, 2913, 2921, 2927 and 3140 the average number of theses per professors was calculated for Gazi University. In the subsectors with codes 1552 and 3530 the value of 0 is given because there are no matching graduate theses.

Table 5.71 The average number of graduate thesis per professors for the 8 sub-sectors in Gazi University

ISIC Code	2011	2012	2013	2014	2015	2016	2017	2018
1542	0	0.0005	0.0010	0.0005	0.0005	0	0.0005	0
1552	0	0	0	0	0	0	0	0
2411	0.0005	0.0010	0	0.0014	0.0005	0.0010	0.0022	0.0005
2913	0.0005	0	0.0010	0.0010	0.0005	0	0.0016	0.0021

ISIC Code								
2921	0	0.0015	0	0	0.0005	0	0	0
2927	0.0010	0.0034	0.0029	0.0005	0.0034	0.0010	0.0011	0.0027
3140	0.0010	0.0020	0	0.0010	0.0010	0	0	0
3530	0	0	0	0	0	0	0	0
Total	**0.0031**	**0.0083**	**0.0049**	**0.0043**	**0.0064**	**0.002**	**0.0054**	**0.00535**

5.4.5.5 Atılım University

The number and years of graduate theses completed by Atılım University for the keywords identified in Table 5.59 are given in Table 5.72.

Table 5.72 The number of graduate thesis for the 8 sub-sectors in Atılım University

ISIC Code	2011	2012	2013	2014	2015	2016	2017	2018
1542	0	0	0	0	0	0	0	0
1552	0	0	0	0	0	0	0	0
2411	0	0	0	0	0	0	0	0
2913	0	0	0	1	1	0	1	0
2921	0	0	0	0	0	0	0	0
2927	0	2	0	1	1	0	0	0
3140	0	0	0	0	0	0	0	0
3530	0	0	1	0	1	0	1	0

According to Table 5.72, it is seen that the sub-sector with the highest number of theses of Atılım University is "2927 Manufacture of weapons and ammunition" of which 4 graduate theses were conducted. The sub-sectors are "2913 Manufacture of bearings, gears, gearing and driving elements" and "3530 Manufacture of aircraft and spacecraft" of which 3 graduate theses were conducted. For the other sub-sectors "1542 Manufacture of sugar", "1552 Manufacture of wines", "2411 Manufacture of basic chemicals, except fertilizers and nitrogen compounds", "2921 Manufacture of agricultural and forestry machinery" and "3140 Manufacture of accumulators, primary cells and primary batteries", no thesis could be found matching with the keywords.

The number of professors by years in Atılım University is given in the Table 5.73.

Table 5.73 The number of professors by years in Atılım University

Titles	2011	2012	2013	2014	2015	2016	2017	2018
Prof. Dr.	44	48	41	49	58	59	59	62
Assoc. Prof. Dr.	17	18	17	31	34	38	37	39
Assist. Prof. Dr.	82	86	91	113	109	107	104	114
Total	143	152	149	193	201	204	200	215

Finally the average number of graduate thesis per professors of Atılım University's graduate thesis is shown in Table 5.74. In the sub-sectors with the codes 2913, 2927 and 3530 the average number of theses per professors was calculated for TOBB University of Economics. In the subsectors with codes 1542, 1552, 2411, 2921, 2927 and 3530 the value of 0 is given because there are no matching graduate theses.

Table 5.74 The average number of graduate thesis per professors for the 8 sub-sectors in Atılım University

ISIC Code	2011	2012	2013	2014	2015	2016	2017	2018
1542	0	0	0	0	0	0	0	0
1552	0	0	0	0	0	0	0	0
2411	0	0	0	0	0	0	0	0
2913	0	0	0	0.0052	0.0050	0	0.0050	0
2921	0	0	0	0	0	0	0	0
2927	0	0.0132	0	0.0052	0.0050	0	0	0
3140	0	0	0	0	0	0	0	0
3530	0	0	0.0067	0	0.0050	0	0.0050	0
Total	0	0.0132	0.0067	0.0104	0.0149	0	0.0100	0

5.4.5.6 Çankaya University

The number and years of graduate theses completed by Ege University for the keywords identified in Table 5.59 are given in Table 5.75.

Table 5.75 The number of graduate thesis for the 8 sub-sectors in Çankaya University

ISIC Code	2011	2012	2013	2014	2015	2016	2017	2018
1542	0	0	0	0	0	0	0	0
1552	0	0	0	0	0	0	0	0
2411	0	0	0	0	0	0	0	0
2913	0	0	0	0	0	0	0	0
2921	0	0	0	0	0	0	0	0
2927	0	0	0	0	0	0	0	2
3140	0	0	0	0	0	0	0	0
3530	2	0	0	0	0	0	0	0

According to Table 5.72, it is seen that the sub-sector with the highest number of theses of Çankaya University are "2927 Manufacture of weapons and ammunition" and "3530 Manufacture of aircraft and spacecraft" of which 2 graduate theses were conducted. For the other sub-sectors "1542 Manufacture of sugar", "1552 Manufacture of wines", "2411 Manufacture of basic chemicals, except fertilizers and nitrogen compounds", "2913 Manufacture of bearings, gears, gearing and driving elements", "2921 Manufacture of agricultural and forestry machinery" and "3140 Manufacture of accumulators, primary cells and primary batteries", no thesis could be found matching with the keywords.

The number of professors by years in Çankaya University is given in the Table 5.76

Table 5.76 The number of professors by years in Çankaya University

TITLES	2011	2012	2013	2014	2015	2016	2017	2018
Prof. Dr.	31	37	39	43	41	35	42	47
Assoc. Prof. Dr.	10	13	14	10	18	23	26	22
Assist. Prof. Dr.	53	75	78	91	91	94	102	110
Total	**94**	**125**	**131**	**144**	**150**	**152**	**170**	**179**

Finally the average number of graduate thesis per professors of Atılım University's graduate thesis is shown in Table 5.77. In the sub-sectors with the codes 2927 and 3530 the average number of theses per professors was calculated for Çankaya University. In the subsectors with codes 1542, 1552, 2411, 2913, 2921 and 2927 the value of 0 is given because there are no matching graduate theses.

Table 5.77 The average number of graduate thesis per professors for the 8 sub-sectors in Çankaya University

ISIC Code	2011	2012	2013	2014	2015	2016	2017	2018
1542	0	0	0	0	0	0	0	0
1552	0	0	0	0	0	0	0	0
2411	0	0	0	0	0	0	0	0
2913	0	0	0	0	0	0	0	0
2921	0	0	0	0	0	0	0	0
2927	0	0	0	0	0	0	0	0.0112
3140	0	0	0	0	0	0	0	0
3530	0.0213	0	0	0	0	0	0	0
Total	**0.0213**	**0**	**0**	**0**	**0**	**0**	**0**	**0.0112**

5.4.5.7 Ankara University

The number and years of graduate theses completed by Ankara University for the keywords identified in Table 5.59 are given in Table 5.78.

Table 5.78 The number of graduate thesis for the 8 sub-sectors in Ankara University

ISIC Code	2011	2012	2013	2014	2015	2016	2017	2018
1542	2	2	0	0	1	0	0	1
1552	4	0	3	0	0	1	3	1
2411	0	0	0	0	2	0	1	1
2913	2	0	0	0	0	0	1	0
2921	0	2	1	0	1	2	2	0
2927	0	1	2	0	1	1	0	1
3140	0	1	0	0	0	0	0	0
3530	0	0	0	0	0	0	0	0

According to Table 5.78, it is seen that the sub-sector with the highest number of theses of Ankara University is "1552 Manufacture of wines" of which 12 graduate theses were conducted. The sub-sector the "2921 Manufacture of agricultural and forestry machinery" code had 8 graduate theses conducted. In the other sub-sector code "1542 Manufacture of sugar" and "2411 Manufacture of basic chemicals, except fertilizers and nitrogen compounds" had 4 graduate theses which were conducted. The activity codes "2913 Manufacture of bearings, gears, gearing and driving elements" had 3 graduate theses which were conducted. In the other sub-sector code "2927 Manufacture of weapons and ammunition" had 5 graduate theses which were conducted. Finally the sub-sector is "3140 Manufacture of accumulators, primary cells and primary batteries" of which 1 graduate thesis was conducted. For the other sub-sector "3530 Manufacture of aircraft and spacecraft", no thesis could be found matching with the keywords.

The number of professors by years in Ankara University is given in the Table 5.79.

Table 5.79 The number of professors by years in Ankara University

Titles	2011	2012	2013	2014	2015	2016	2017	2018
Prof. Dr.	1141	1205	1161	1198	1234	1233	1211	1202
Assoc. Prof. Dr.	297	293	325	326	310	312	303	284
Assist. Prof. Dr.	291	305	308	328	343	333	290	295
Total	1729	1803	1794	1852	1887	1878	1804	1781

Finally the average number of graduate thesis per professors of Ankara University's graduate thesis is shown in Table 5.80. In the sub-sectors with the codes 1542, 1552, 2411, 2913, 2921, 2927 and 3140 the average number of theses per professors was calculated for Çankaya University. In the subsectors with code 3530 the value of 0 is given because there are no matching graduate theses.

Table 5.80 The average number of graduate thesis per professors for the 8 sub-sectors in Ankara University

ISIC Code	2011	2012	2013	2014	2015	2016	2017	2018
1542	0.0012	0.0011	0	0	0.0005	0	0	0.0006
1552	0.0023	0	0.0017	0	0	0.0005	0.0017	0.0006
2411	0	0	0	0	0.0011	0	0.0006	0.0006
2913	0.0012	0	0	0	0	0	0.0006	0
2921	0	0.0011	0.0006	0	0.0005	0.0011	0.0011	0
2927	0	0.0006	0.0011	0	0.0005	0.0005	0	0.0006
3140	0	0.0006	0	0	0	0	0	0
3530	0	0	0	0	0	0	0	0
Total	0.0046	0.0033	0.0033	0.0000	0.0026	0.0021	0.0039	0.0022

5.4.5.8 Hacettepe University

The number and years of graduate theses completed by Hacettepe University for the keywords identified in Table 5.59 are given in Table 5.81.

Table 5.81 The number of graduate thesis for the 8 sub-sectors in Hacettepe University

ISIC Code	2011	2012	2013	2014	2015	2016	2017	2018
1542	1	0	0	0	1	0	1	0
1552	0	0	0	0	0	0	1	0
2411	0	0	1	0	1	2	3	1
2913	0	0	0	1	2	0	0	1
2921	0	0	0	0	0	0	0	0
2927	1	0	0	2	0	0	1	4
3140	0	0	0	1	1	0	1	1
3530	1	2	0	1	2	0	1	6

According to Table 5.81, it is seen that the sub-sector with the highest number of theses of Hacettepe University is "3530 Manufacture of aircraft and spacecraft" of which 13 graduate theses were conducted. The sub-sector "1542 Manufacture of sugar" of which 3 graduate theses were conducted. In the other sub-sector code "1552 Manufacture of wines" there is only one graduate thesis which was conducted. The activity codes

"2411 Manufacture of basic chemicals, except fertilizers and nitrogen compound" and "2927 Manufacture of weapons and ammunition" had 8 graduate theses which were conducted. In the other sub-sector code "2913 Manufacture of bearings, gears, gearing and driving elements" and "3140 Manufacture of accumulators, primary cells and primary batteries" had 4 graduate theses which were conducted. For the other sub-sector "2921 Manufacture of agricultural and forestry machinery", no thesis could be found matching with the keywords.

The number of professors by years in Hacettepe University is given in the Table 5.82.

Table 5.82 The number of professors by years in Hacettepe University

Titles	2011	2012	2013	2014	2015	2016	2017	2018
Prof. Dr.	812	794	834	861	861	868	856	858
Assoc. Prof. Dr.	314	291	307	344	409	410	367	352
Assist. Prof. Dr.	253	271	320	422	443	454	470	521
Total	**1379**	**1356**	**1461**	**1627**	**1713**	**1732**	**1693**	**1731**

Finally the average number of graduate thesis per professors of Ankara University's graduate thesis is shown in Table 5.83. In the sub-sectors with the codes 1542, 1552, 2411, 2913, 2927, 3140 and 3530 the average number of theses per professors was calculated for Çankaya University. In the subsectors with code 2921 the value of 0 is given because there are no matching graduate theses.

Table 5.83 The average number of graduate thesis per professors for the 8 sub-sectors in Hacettepe University

ISIC Code	2011	2012	2013	2014	2015	2016	2017	2018
1542	0.0007	0	0	0	0.0006	0	0.0006	0
1552	0	0	0	0	0	0	0.0006	0
2411	0	0	0.0007	0	0.0006	0.0012	0.0018	0.0006
2913	0	0	0	0.0006	0.0012	0	0	0.0006
2921	0	0	0	0	0	0	0	0
2927	0.0007	0	0	0.0012	0	0	0.0006	0.0023
3140	0	0	0	0.0006	0.0006	0	0.0006	0.0006
3530	0.0007	0.0015	0	0.0006	0.0012	0	0.0006	0.0035
Total	**0.0022**	**0.0015**	**0.0007**	**0.0031**	**0.0041**	**0.0012**	**0.0047**	**0.0075**

5.4.6 TR52 Konya-Karaman Region

For the strongest and the most competitive sectors identified in TR52 Konya-Karaman region, the determined keywords according to the ISIC Code explanations are given in the Table 5.84.

Table 5.84 The keywords for the strongest and the most competitive sectors identified in TR52 region

ISIC Code	ISIC Name	Keywords
1520	Manufacture of dairy products	"milk". "milk processing", "cream", "butter", "ghee", "cheese", "curd", "ice cream",
1541	Manufacture of bakery products	"bakery product", "bread", "biscuits", "pastry", "cakes", "pies", "tarts"
1543	Manufacture of cocoa, chocolate and sugar confectionery	"cocoa", "chocolate", "sugar confectionery", "chewing gum", "boiled sweet"
1544	Manufacture of macaroni, noodles, couscous and similar farinaceous products	"macaroni", "noodles", "couscous", "pasta"
2912	Manufacture of pumps, compressors, taps and valves	"pump", "compressor", "tap", "valves", "hydraulic power engines", "compressors"
2913	Manufacture of bearings, gears, gearing and driving elements	"bearing", "gear", "gearing". "driving element"," "cam shaft", "crank shaft", "crank" "transmission shaft", "pillow block", "articulated link chain"," "speed drive"," clutche"," "flywheels", "articulated link chain"
2921	Manufacture of agricultural and forestry machinery	"agricultural machinery", "forestry machinery", "tractor", "trailer"
2925	Manufacture of machinery for food, beverage and tobacco processing	"food processing", "dairy industry machinery", "cream separator", "milk processing machinery", "milk converting machinery", "cheese-making machines", "grain milling", "macaroni machine", "grinding mill", "wine machinery", "cider machinery", "fruit juice machinery", "tobacco machinery"
2927	Manufacture of weapons and ammunition	"gun", "weapon", "ammunition", "tank", "armored supply vehicle", artillery, "rocket projector", "torpedo tube", "heavy machine gun", "machine gun", "bomb", "grenade", "torpedo", "mine", "rocket"
3420	Manufacture of bodies (coachwork) for motor vehicles; manufacture of trailers and semi-trailers	"coachwork", "motor vehicles", "bodywork"," chassis", "motor vehicle chassis", "vehicle" "trailer", "semi-trailer"

5.4.6.1 Selçuk University

The number and years of graduate theses completed by Selçuk University for the keywords identified in Table 5.84 are given in Table 5.85.

Table 5.85 The number of graduate thesis for the 10 sub-sectors in Selçuk University

ISIC Code	2011	2012	2013	2014	2015	2016	2017	2018
1520	2	1	0	2	0	1	2	2
1541	4	1	2	2	0	1	2	3
1543	1	0	0	1	0	0	1	0
1544	0	0	0	0	0	0	0	0
2912	0	0	0	1	1	3	5	4
2913	1	1	0	0	0	0	0	0
2921	2	2	1	1	1	1	0	3
2925	0	0	0	0	0	0	0	0
2927	0	0	0	1	2	1	0	1
3420	1	0	0	0	0	0	0	0

According to Table 5.85, it is seen that the sub-sector with the highest number of theses of Selçuk University is "1541 Manufacture of bakery products" of which 15 graduate theses were conducted. The sub-sector with the second highest number of theses from Selçuk University is "2912 Manufacture of pumps, compressors, taps and valves" of which 14 graduate theses were conducted. The activity code "1520 Manufacture of dairy products" had 10 graduate theses which were conducted. In the other sub-sector code "1543 Manufacture of cocoa, chocolate and sugar confectionery" there are 3 graduate theses which were conducted. The sub-sector with the "2913 Manufacture of bearings, gears, gearing and driving elements" code had 3 graduate theses conducted. The sub-sector with the "2921 Manufacture of agricultural and forestry machinery" of which 11 graduate theses were conducted. The activity code "2927 Manufacture of weapons and ammunition" had 5 graduate theses which were conducted. The activity code is "3420 Manufacture of bodies (coachwork) for motor vehicles, manufacture of trailers and semi-trailers" there is only one graduate thesis which was conducted. For the other sub-sectors "1544 Manufacture of macaroni, noodles, couscous and similar farinaceous products" and "2925 Manufacture of machinery for food, beverage and tobacco processing", no thesis could be found matching with the keywords.

The number of professors by years in Selçuk University is given in the Table 5.86.

Table 5.86 The number of professors by years in Selçuk University

Titles	2011	2012	2013	2014	2015	2016	2017	2018
Prof. Dr.	483	494	307	338	339	361	384	476
Assoc. Prof. Dr.	261	273	203	218	239	239	243	265
Assist. Prof. Dr.	683	689	499	500	500	468	472	491
Total	1427	1456	1009	1056	1078	1068	1099	1232

Finally the average number of graduate thesis per professors of Selçuk University's graduate thesis is shown in Table 5.87. In the sub-sectors with the codes 1520, 1541, 1543, 2912, 2913, 2921, 2927 and 3420 the average number of theses per professors was calculated for Selçuk University. In the subsectors with codes 1544 and 2925, the value of 0 is given because there are no matching graduate theses.

Table 5.87 The average number of graduate thesis per professors for the 10 sub-sectors in Selçuk University

ISIC Code	2011	2012	2013	2014	2015	2016	2017	2018
1520	0.0014	0.0007	0	0.0019	0	0.0009	0.0018	0.0016
1541	0.0028	0.0007	0.0020	0.0019	0	0.0009	0.0018	0.0024
1543	0.0007	0	0	0.0009	0	0	0.0009	0
1544	0	0	0	0	0	0	0	0
2912	0	0	0	0.0009	0.0009	0.0028	0.0045	0.0032
2913	0.0007	0.0007	0	0	0	0	0	0
2921	0.0014	0.0014	0.0010	0.0009	0.0009	0.0009	0	0.0024
2925	0	0	0	0	0	0	0	0
2927	0	0	0	0.0009	0.0019	0.0009	0	0.0008
3420	0.0007	0	0	0	0	0	0	0
Total	**0.0077**	**0.0034**	**0.0030**	**0.0076**	**0.0037**	**0.0066**	**0.0091**	**0.0106**

5.4.7 TR61 Antalya-Isparta-Burdur Region

For the strongest and the most competitive sectors identified in TR61 Antalya-Isparta-Burdur region, the determined keywords according to the ISIC Code explanations are given in the Table 5.88.

Table 5.88 The keywords for the strongest and the most competitive sectors identified in TR61 region

ISIC Code	ISIC Name	Keywords
2021	Manufacture of veneer sheets; manufacture of plywood, laminboard, particle board and other panels and boards	"wood", "veneer sheet", "plywood", "laminboard", "particle board", "board", "panels",

2022	Manufacture of builders' carpentry and joinery	"forest product","wooden product", "wood", "lumber", "timber","builders' carpentry", "cellular wood panel", "wooden beading","mouldings", "shingles","shakes"." Joinery"
2023	Manufacture of wooden containers	"wood""wooden packing", "wood box", "wood crate", "wood Dr.um", "wood pallet", "wood box" "load boards of wood" "wood barrel", "wood vat", "wood tub", "cooper"
2694	Manufacture of cement, lime and plaster	"cement", "lime", "plaster", "hydraulic cements", "guicklime", "slaked lime", "hydraulic lime"
2696	Cutting, shaping and finishing of stone	"cutting stone", "shaping stone", "finishing stone"

5.4.7.1 Süleyman Demirel University

The number and years of graduate theses completed by Ege University for the keywords identified in Table 5.88 are given in Table 5.89.

Table 5.89 The number of graduate thesis for the 5 sub-sectors in Suleyman Demirel University

ISIC Code	2011	2012	2013	2014	2015	2016	2017	2018
2021	1	2	1	2	1	1	2	1
2022	4	3	1	1	3	1	3	2
2023	0	0	0	0	0	0	0	0
2694	0	1	1	0	0	1	2	1
2696	0	0	0	1	3	3	4	1

According to Table 5.89, it is seen that the sub-sector with the highest number of theses of Süleyman Demirel University is "2022 Manufacture of builders' carpentry and joinery" of which 18 graduate theses were conducted. The sub-sector with the second highest number of theses from Süleyman Demirel University is "2696 Cutting, shaping and finishing of stone" of which 12 graduate theses were conducted. The activity code "2021 Manufacture of veneer sheets" had 11 graduate theses which were conducted. In the other sub-sector code "2694 Manufacture of cement, lime and plaster" had 6 graduate theses which were conducted. For the other sub-sector "2023 Manufacture of wooden container activity codes", no thesis could be found matching with the keywords.

The number of professors by years in Süleyman Demirel University is given in the Table 5.90.

Table 5.90 The number of professors by years in Süleyman Demirel University

TITLES	2011	2012	2013	2014	2015	2016	2017	2018
Prof. Dr.	812	794	834	861	861	868	856	858
Assoc. Prof. Dr.	314	291	307	344	409	410	367	352
Assist. Prof. Dr.	253	271	320	422	443	454	470	521
Total	1379	1356	1461	1627	1713	1732	1693	1731

Finally the average number of graduate thesis per professors of Süleyman Demirel University's graduate thesis is shown in Table 5.91. In 2011-2018 the average number of theses per professors in the sub-sectors with the codes 2021 and 2022 for Suleyman Demirel University was calculated. In the sub-sector with the code 2694, the average number of theses per professors was calculated for 2012, 2013, 2016, 2017 and 2018. In the sub-sector with code 2696, the average number of theses per professors was calculated only for 2013. In 2014-2018 the average number of theses per professors in the sub-sectors with the codes 2696 for Suleyman Demirel University was calculated.

Table 5.91 The average number of graduate thesis per professors for the 5 sub-sectors in Suleyman Demirel University

ISIC Code	2011	2012	2013	2014	2015	2016	2017	2018
2021	0.0012	0.0024	0.0011	0.0020	0.0010	0.0010	0.0021	0.0010
2022	0.0049	0.0036	0.0011	0.0010	0.0031	0.0010	0.0031	0.0019
2023	0	0	0	0	0	0	0	0
2694	0	0.0012	0.0011	0	0	0.0010	0.0021	0.0010
2696	0	0	0	0.0010	0.0031	0.0030	0.0041	0.0010
TOPLAM	0.0061	0.0071	0.0034	0.0041	0.0072	0.0059	0.0113	0.0048

5.4.7.2 Akdeniz University

The number and years of graduate theses completed by Akdeniz University for the keywords identified in Table 5.28 are given in Table 5.29.

Table 5.92 The number of graduate thesis for the 5 sub-sectors in Akdeniz University

ISIC Code	2011	2012	2013	2014	2015	2016	2017	2018
2021	0	0	0	0	0	0	0	0
2022	0	0	0	0	0	0	0	0
2023	0	0	0	0	0	0	0	0
2694	0	0	0	0	0	1	0	2
2696	0	0	0	0	0	0	0	1

According to Table 5.962, it is seen that the sub-sector with the highest number of theses of Akdeniz University is "2694 Manufacture of cement, lime and plaster" of which 3 graduate theses were conducted. The activity code "2696 Cutting, shaping and finishing of stone" there is only one graduate theses which was conducted. For the other sub-sectors "2021 Manufacture of veneer sheets", "2022 Manufacture of builders' carpentry and joinery" and "2023 Manufacture of wooden containers", no thesis could be found matching with the keywords.

The number of professors by years in Akdeniz University is given in the Table 5.93.

Table 5.93 The number of professors by years in Akdeniz University

Titles	2011	2012	2013	2014	2015	2016	2017	2018
Prof. Dr.	294	337	347	363	371	396	401	441
Assoc. Prof. Dr.	166	168	193	188	223	249	239	239
Assist. Prof. Dr.	370	412	449	488	513	489	482	532
Total	**830**	**917**	**989**	**1039**	**1107**	**1134**	**1122**	**1212**

Finally, the average number of graduate thesis per professors of Akdeniz University's graduate thesis is shown in Table 5.94. In 2016 and 2018 the average number of theses per professors in the sub-sector with the code 2694 for Akdeniz University was calculated. In the sub-sector with the code 2696, the average number of theses per professors was calculated only for 2018. In the subsectors with codes 2021, 2022 and 2023, the value of 0 is given because there are no matching graduate thesis.

Table 5.94 The average number of graduate thesis per professors for the 5 sub-sectors in Akdeniz University

ISIC Code	2011	2012	2013	2014	2015	2016	2017	2018
2021	0	0	0	0	0	0	0	0
2022	0	0	0	0	0	0	0	0
2023	0	0	0	0	0	0	0	0
2694	0	0	0	0	0	0.0009	0	0.0017
2696	0	0	0	0	0	0	0	0.0008
Total	**0**	**0**	**0**	**0**	**0**	**0.0009**	**0**	**0.0097**

5.4.8 TR62 Adana-Mersin Region

For the strongest and the most competitive sectors identified in TR62 Adana-Mersin region, the determined keywords according to the ISIC Code explanations are given in the Table 5.95.

Table 5.95 The keywords for the strongest and the most competitive sectors identified in TR62 region

ISIC Code	ISIC Name	Keywords
1511	Production, processing and preserving of meat and meat products	"slaughterhouses", "slaughtering", "meat", "meat products", "poultry", "fresh meat", "chilled meat", "frozen meat", "Sausage"
1531	Manufacture of grain mill products	"grain milling", "Rice milling", "vegetable milling", "flour". "groats", "breakfast food", "blended flour", "dough"
1532	Manufacture of starches and starch products	"starches", "starch products", "wet corn", "glucose", "glucose syrup", "maltose", "gluten", "corn oil", "tapioca"
1533	Manufacture of prepared animal feeds	"pet food", "feed", "animal feed", "dog feed", "cat feed", "bird feed", "fish feed"," farm animal feed", "feed concentrates"," feed supplement",
1544	Manufacture of macaroni, noodles, couscous and similar farinaceous products	"macaroni", "noodles", "couscous", "pasta"
1723	Manufacture of cordage, rope, twine and netting	"cord", "rope", "twine", "netting"," "ship's fenders", "nets"
2022	Manufacture of builders' carpentry and joinery	"forest product", "wooden product", "wood", "lumber", "timber", "builders' carpentry", "cellular wood panel", "wooden beading", "moldings", "shingles", "shakes"." Joinery"
2023	Manufacture of wooden containers	"wood", "wooden packing", "wood box", "wood crate", "wood drum", "wood pallet", "wood box" "load boards of wood" "wood barrel", "wood vat", "wood tub", "cooper"

5.4.8.1 Mersin University

The number and years of graduate theses completed by Mersin University for the keywords identified in Table 5.95 are given in Table 5.96.

Table 5.96 The number of graduate thesis for the 8 sub-sectors in Mersin University

ISIC Code	2011	2012	2013	2014	2015	2016	2017	2018
1511	0	0	0	0	0	0	0	0
1531	0	1	1	1	0	2	0	1
1532	0	1	0	0	0	1	0	1
1533	0	0	0	0	0	0	1	1

1544	0	0	0	0	0	0	0	1
1723	0	0	0	0	0	0	0	0
2022	0	0	0	0	0	0	0	0
2023	0	0	0	0	0	0	0	0

According to Table 5.96, it is seen that the sub-sector with the highest number of theses of Mersin University is "1531 Manufacture of grain mill" of which 6 graduate theses were conducted. The sub-sector with the second highest number of theses from Mersin University is "1532 Manufacture of Starches and Starch Products" within which 3 graduate theses were conducted. The activity code "1533 Manufacture of prepared animal feeds" had two graduate theses which was conducted. In the other sub-sector code "1544 Manufacture of macaroni, noodles, couscous and similar farinaceous products" there is only one graduate thesis which was conducted. For the other sub-sectors "1511 Production, processing and preserving of meat and meat products", "1723 Manufacture of cordage, rope, twine and netting", "2022 Manufacture of builders' carpentry and joinery" and "2023 Manufacture of wooden containers", no thesis could be found matching with the keywords.

The number of professors by years in Mersin University is given in the Table 5.97.

Table 5.97 The number of professors by years in Mersin University

TITLES	2011	2012	2013	2014	2015	2016	2017	2018
Prof. Dr.	120	140	184	217	220	245	262	275
Assoc. Prof. Dr.	130	133	123	137	149	154	158	150
Assist. Prof. Dr.	272	256	273	308	305	301	317	340
Total	**522**	**529**	**580**	**662**	**674**	**700**	**737**	**765**

Finally, the average number of graduate thesis per professors of Mersin University's graduate thesis is shown in Table 5.98. In 2012, 2013, 2014, 2016 and 2018 the average number of theses per professors in the sub-sector with the code 1511 for Mersin University was calculated. In the sub-sector with the code 1531, the average number of theses per professors was calculated for 2012, 2013, 2016 and 2018. In the other sub-sector with code 1533, the average number of theses per professors was calculated for 2017 and 2018. In 2018, the average number of theses per professors in the sub-sector with the code 1544 was calculated. In the subsectors with codes 1511, 1723, 2022 and 2023, the value of 0 is given because there are no matching graduate thesis.

Table 5.98 The average number of graduate thesis per professors for the 8 sub-sectors in Mersin University

ISIC Code	2011	2012	2013	2014	2015	2016	2017	2018
1511	0	0	0	0	0	0	0	0
1531	0	0.0019	0.0017	0.0015	0	0.0029	0	0.0013
1532	0	0.0019	0.0000	0	0	0.0014	0	0.0013
1533	0	0	0	0	0	0	0.0014	0.0013
1544	0	0	0	0	0	0	0	0.0013
1723	0	0	0	0	0	0	0	0
2022	0	0	0	0	0	0	0	0
2023	0	0	0	0	0	0	0	0
TOTAL	**0**	**0.0038**	**0.0017**	**0.0015**	**0**	**0.0043**	**0.0014**	**0.0052**

5.4.8.2 Çukurova University

The number and years of graduate theses completed by Çukurova University for the keywords identified in Table 5.95 are given in Table 5.99.

Table 5.99 The number of graduate thesis for the 8 sub-sectors in Çukurova University

ISIC Code	2011	2012	2013	2014	2015	2016	2017	2018
1511	1	0	1	2	1	0	1	1
1531	0	2	1	1	0	1	0	3
1532	0	0	1	0	0	0	0	0
1533	0	0	0	0	0	0	0	0
1544	0	0	0	0	0	0	0	0
1723	1	5	3	3	1	2	4	1
2022	0	0	0	0	0	0	0	0
2023	0	0	0	0	0	0	0	0

According to the Table 5.99, it is seen that the sub-sector with the highest number of theses of Çukurova University is "1723 Manufacture of Cordage, Rope, Twine and Netting" of which 20 graduate theses were conducted. The sub-sector with the second highest number of theses from Çukurova University is "1531 Manufacture of grain mill products" of which 8 graduate theses were conducted. The activity code "1511 Production, processing and preservation of meat and meat products" had 7 graduate theses which were conducted. In the other sub-sector code "1532 Manufacture of starches and starch products" there is only one graduate thesis which was conducted. For the other sub-sectors "1533 Manufacture of prepared animal feeds", "1544 Manufacture of macaroni, noodles, couscous and similar farinaceous products" and

"2023 Manufacture of builders' carpentry and joinery", no thesis could be found matching with the keywords.

The number of professors by years in Çukurova University is given in the Table 5.100.

Table 5.100 The number of professors by years in Çukurova University

TITTLES	2011	2012	2013	2014	2015	2016	2017	2018
Prof. Dr.	120	140	184	217	220	245	262	275
Assoc. Prof. Dr.	130	133	123	137	149	154	158	150
Assist. Prof. Dr.	272	256	273	308	305	301	317	340
Total	**522**	**529**	**580**	**662**	**674**	**700**	**737**	**765**

Finally the average number of graduate thesis per professors of Çukurova University's graduate thesis is shown in Table 5.101. In 2011, 2013, 2014, 2015, 2017 and 2018 the average number of theses per professors in the sub-sector with the code 1511 for Çukurova University was calculated. In the sub-sector with the code 1531, the average number of theses per professors was calculated for 2012, 2013, 2014, 2016 and 2018. In the sub-sector with code 1532, the average number of theses per professors was calculated only for 2013. Finally, in 2011- 2018 the average number of theses per professors in the sub-sector with the code 1511, was calculated. In the subsectors with codes 2022 and 2023, the value of 0 is given because there are no matching graduate thesis.

Table 5.101 The average number of graduate thesis per professors for the 8 sub-sectors in Çukurova University

ISIC Code	2011	2012	2013	2014	2015	2016	2017	2018
1511	0.0014	0	0.0013	0.0021	0.0010	0	0.0010	0.0010
1531	0	0.0027	0.0013	0.0010	0	0.0010	0	0.0029
1532	0	0	0.0013	0	0	0	0	0
1533	0	0	0	0	0	0	0	0
1544	0	0	0	0	0	0	0	0
1723	0.0014	0.0066	0.0039	0.0031	0.0010	0.0019	0.0040	0.0010
2022	0	0	0	0	0	0	0	0
2023	0	0	0	0	0	0	0	0
Total	**0.0028**	**0.0093**	**0.0078**	**0.0063**	**0.0020**	**0.0029**	**0.0050**	**0.0049**

5.4.9   TR72 Kayseri-Sivas-Yozgat Region

For the strongest and the most competitive sectors identified in TR72 Kayseri-Sivas-Yozgat region, the determined keywords according to the ISIC Code explanations are given in the Table 5.102.

Table 5.102 The keywords for the strongest and the most competitive sectors xxxxxxxxx   identified in TR72 region

ISIC Code	ISIC Name	Keywords
1711	Preparation and spinning of textile fibers; weaving of textiles	"textile" , "yarn", "woven fabric", "woven", "textile fiber", " weaving", "Spinning"
2021	Manufacture of veneer sheets; manufacture of plywood, laminboard, particle board and other panels and boards	"wood", "veneer sheet", "plywood", "laminboard", "particle board", "board", "panels",
3130	Manufacture of insulated wire and cable	"insulated wire", "cable", "insulated conductor", "insulated strip"
3610	Manufacture of furniture	"furniture"

5.4.9.1 Erciyes University

The number and years of graduate theses completed by Erciyes University for the keywords identified in Table 5.102 are given in Table 5.103.

Table 5.103 The number of graduate thesis for the 4 sub-sectors in Erciyes University

ISIC Code	2011	2012	2013	2014	2015	2016	2017	2018
1711	3	4	7	4	4	3	6	5
2021	0	0	0	1	0	0	0	0
3130	0	0	0	1	0	0	0	1
3610	1	1	0	2	0	1	0	0

According to the Table 5.103, it is seen that the sub-sector with the highest number of theses of Erciyes University is "1711 Preparation and spinning of textile fibers; weaving of textiles" of which 36 theses were conducted. The activity code "2021 Manufacture of veneer sheets manufacture of plywood, laminboard, particle board and other panels and boards" there is only one study which was conducted. In the other sub-sector code "3130 Manufacture of insulated wire and cable" had 2 graduate theses which were conducted. Finally, the activity code "3610 Manufacture of furniture" had 6 graduate theses which were conducted.

The number of professors by years in Erciyes University is given in the Table 5.104.

Table 5.104 The number of professors by years in Erciyes University

TITLES	2011	2012	2013	2014	2015	2016	2017	2018
Prof. Dr.	225	314	350	366	381	394	394	423
Assoc. Prof. Dr.	115	186	246	277	290	307	261	251
Assist. Prof. Dr.	197	412	381	395	419	432	380	420
Total	**537**	**912**	**977**	**1038**	**1090**	**1133**	**1035**	**1094**

Finally the average number of graduate theses per professors of Erciyes University's graduate thesis is shown in Table 5.105. In 2011-2018, the average number of thesis per professors in the sub-sector with the code 1711 for Erciyes University was calculated. In the sub-sector with the code 2021, the average number of theses per professors was calculated for 2011 and 2014. In addition, in the subsector with code 3130, the average number of theses per professors was calculated for 2011, 2014 and 2018.Finally, in the subsector with code 3610, the average number of thesis per professors was calculated for 2011, 2012, 2014 and 2016.

Table 5.105 The average number of graduate thesis per professors for the 4 sub-sectors in Erciyes University

ISIC Code	2011	2012	2013	2014	2015	2016	2017	2018
1711	0.0056	0.0044	0.0072	0.0039	0.0037	0.0026	0.0058	0.0046
2021	0.0000	0	0	0.0010	0	0	0	0
3130	0.0000	0	0	0.0010	0	0	0	0.0009
3610	0.0019	0.0011	0	0.0019	0	0.0009	0	0
Total	**0.0074**	**0.0055**	**0.0072**	**0.0077**	**0.0037**	**0.0035**	**0.0058**	**0.0055**

5.4.10 TR90 Trabzon-Ordu-Giresun-Rize-Artvin-Gümüşhane Region

For the strongest and the most competitive sector identified in TR90 Trabzon-Ordu-Giresun-Rize-Artvin-Gümüşhane region, the determined keywords according to the ISIC Code explanations are given in the Table 5.106.

Table 5.106 The keywords for the strongest and the most competitive sector identified in TR90 region

ISIC Code	ISIC Name	Keyword
1513	Processing and preserving of fruit and vegetables	"fruit", "vegetables", "vegetable juices, "fruit juices", cooked fruit", "uncooked fruit", "cooked vegetable", "uncooked vegetable", "potatoes", "potato flour", "jams", "marmalades", "jellies", "fruit canning", "vegetable canning"

5.4.10.1 Karadeniz Technical University

The number and years of graduate theses completed by Karadeniz Technical University for the keywords identified in Table 5.106 are given in Table 5.107.

Table 5.107 The number of graduate thesis for the one sub-sectors in Karadeniz Technical University

ISIC Code	2011	2012	2013	2014	2015	2016	2017	2018
1513	0	1	0	0	1	1	0	0

According to the Table 5.107, it is seen that the sub-sector with the number of theses from Karadeniz Technical University is "1513 Processing and preserving of fruit and vegetables" of which 3 theses were conducted.

The number of professors by years in Karadeniz Technical University is given in the Table 5.108.

Table 5.108 The number of professors by years in Karadeniz Technical University

Titles	2011	2012	2013	2014	2015	2016	2017	2018
Prof. Dr.	278	294	311	329	335	377	377	413
Assoc. Prof. Dr.	159	168	206	242	277	264	251	220
Assist. Prof. Dr.	357	413	372	391	405	465	465	480
Total	**794**	**875**	**889**	**962**	**1017**	**1106**	**1093**	**1113**

Finally the average number of graduate theses per professors of Karadeniz Technical University's graduate thesis is shown in Table 5.109. In 2012, 2015 and 2016, the average number of thesis per professors in the sub-sector with the code 1513 for Karadeniz Technical University was calculated.

Table 5.109 The average number of graduate thesis per professors for the one sub-sectors in Karadeniz Technical University

ISIC Code	2011	2012	2013	2014	2015	2016	2017	2018
1513	0	0.0011	0	0	0.0010	0.0009	0	0
TOTAL	**0**	**0.0011**	**0**	**0**	**0.0010**	**0.0009**	**0**	**0**

5.4.11 TRB1 Malatya-Elazığ-Bingöl-Tunceli Region

For the strongest and the most competitive sectors identified in TRB1 Malatya-Elazığ-Bingöl-Tunceli region, the determined keywords according to the ISIC Code explanations are given in the Table 5.110.

Table 5.110 The keywords for the strongest and the most competitive sectors identified in TRB1 region

ISIC Code	ISIC Name	Keywords
1511	Production, processing and preserving of meat and meat products	"slaughterhouses", "slaughtering", "meat", "meat products", "poultry", "fresh meat", "chilled meat", "frozen meat", "sausage"
1513	Processing and preserving of fruit and vegetables	"fruit", "vegetables", "vegetable juices, "fruit juices", cooked fruit", "uncooked fruit", "cooked vegetable", "uncooked vegetable", "potatoes", "potato flour", "jams", "marmalades", "jellies", "fruit canning", "vegetable canning"

5.4.11.1 Fırat University

The number and years of graduate theses completed by Fırat University for the keywords identified in Table 5.110 are given in Table 5.111.

Table 5.111 The number of graduate thesis for the 2 sub-sectors in Fırat University

ISIC CODE	2011	2012	2013	2014	2015	2016	2017	2018
1511	0	1	1	0	1	0	1	4
1513	0	0	0	0	0	0	0	0

According to the Table 5.111, it is seen that the sub-sector with the highest number of theses from Fırat University is "1511 Production, processing and preserving of meat and meat products" of which 8 graduate theses were conducted. For the other sub-sector "1513 Processing and preserving of fruit and vegetables", no thesis could be found matching with the keywords.

The number of professors by years in Fırat University is given in the Table 5.111.

Table 5.112 The number of professors by years in Fırat University

TITILES	2011	2012	2013	2014	2015	2016	2017	2018
Prof. Dr.	207	253	292	324	356	352	352	373
Assoc. Prof. Dr.	158	165	193	201	196	189	189	169
Assist. Prof. Dr.	315	366	356	353	374	358	358	391
Total	680	784	841	878	926	899	899	933

Finally the average number of graduate theses per professors of Fırat University's graduate thesis is shown in Table 5.113. In 2012, 2013, 2014, 2015, 2017 and 2018 the average number of thesis per professors in the sub-sector with the code 1511 for Fırat University was calculated. In the subsector with code 1513, the value of 0 is given because there are no matching graduate thesis.

Table 5.113 The average number of graduate thesis per professors for the 2 sub-sectors in Fırat University

ISIC CODE	2011	2012	2013	2014	2015	2016	2017	2018
1511	0	0.0013	0.0012	0	0.0011	0	0.0011	0.0043
1513	0	0	0	0	0	0	0	0
TOTAL	0	0.0013	0.0012	0	0.0011	0.0000	0.0011	0.0043

5.4.12   TRC1 Gaziantep-Adıyaman-Kilis Region

For the strongest and the most competitive sectors identified in TRC1 Gaziantep-Adıyaman-Kilis region, the determined keywords according to the ISIC Code explanations are given in the Table 5.114.

Table 5.114 The keywords for the strongest and the most competitive sectors identified in TRC1 region

ISIC Code	ISIC Name	Keywords
1533	Manufacture of prepared animal feeds	"pet food", "feed", "animal feed", "dog feed", "cat feed", "bird feed", "fish feed"," farm animal feed", "feed concentrates"," feed supplement",
1541	Manufacture of bakery products	"bakery product", "bread", "biscuits", "pastry", "cakes", "pies", "tarts"
1544	Manufacture of macaroni, noodles, couscous and similar farinaceous products	"macaroni", "noodles", "couscous", "pasta"
1722	Manufacture of carpets and rugs	"carpet", "rug", "mat"

5.4.12.1 Gaziantep University

The number and years of graduate theses completed by Gaziantep University for the keywords identified in Table 5.114 are given in Table 5.115.

Table 5.115 The number of graduate thesis for the 4 sub-sectors in Gaziantep University

ISIC Code	2011	2012	2013	2014	2015	2016	2017	2018
1533	0	0	0	0	0	0	0	0
1541	0	0	0	0	0	0	0	1
1544	0	0	0	0	0	0	0	1
1722	0	0	0	4	1	1	2	3

According to Table 5.115, it is seen that the sub-sector with the highest number of theses of Gaziantep University is "1722 Manufacture of carpets and rugs" of which 11 graduate theses were conducted. The activity codes "1541 Manufacture of bakery products" and "1544 Manufacture of macaroni, noodles, couscous and similar farinaceous products" there is only one study which was conducted. For the other sub-sector "1533 Manufacture of prepared animal feeds", no thesis could be found matching with the keywords.

The number of professors by years in Gaziantep University is given in the Table 5.116.

Table 5.1056 The number of professors by years in Gaziantep University

TITTLES	2011	2012	2013	2014	2015	2016	2017	2018
Prof. Dr.	95	96	94	170	178	192	169	170
Assoc. Prof. Dr.	76	77	73	116	144	142	107	105
Assist. Prof. Dr.	192	191	197	290	330	370	335	336
Total	363	364	364	576	652	704	611	611

Finally the average number of graduate thesis per professors of Gaziantep University's graduate thesis is shown in Table 5.117. In 2018, the average number of thesis per professors in the sub-sector with the codes 1541 and 1544 for Gaziantep University was calculated. In the sub-sector with the code 1722, the average number of thesis per professors was calculated for 2014, 2015, 2016, 2017 and 208. In the sub-sector with code 1533, the value of 0 is given because there is no matching graduate thesis.

Table 5.117 The average number of graduate thesis per professors for the 4 sub-sectors in Gaziantep University

ISIC Code	2011	2012	2013	2014	2015	2016	2017	2018
1533	0	0	0	0	0	0	0	0
1541	0	0	0	0	0	0	0	0.0016
1544	0	0	0	0	0	0	0	0.0016
1722	0	0	0	0.0069	0.0015	0.0014	0.0033	0.0049
Total	**0**	**0**	**0**	**0.0069**	**0.0015**	**0.0014**	**0.0033**	**0.0082**

CHAPTER 6
RESULTS AND DISCUSSION

According to the analysis results, Sabancı University, Bogazici University, Koc University, Ozyegin University, Yildiz Technical University, Yeditepe University, Istanbul University and Bahcesehir University were excluded from the evaluation since they were not the strongest or the most competitive sectors in the TR10 Istanbul region.

In order to facilitate the interpretation of the analysis results of 26 universities, a score type named Scientific Contribution per Academician (SCPA) was found. The SCPA score is represented by the total average number of graduate thesis per professors, performed for the strongest and the most competitive sectors. In Table 6.1, the comparison of SCPA scores and EIUI scores showing between 2011 and 2018 are given.

METU has been ranked first in the SPCA score, and also ranked first in the EIUI score. METU's SCPA ranking is same as EIUI ranking. METU has completed the highest number of graduate theses for the strongest and the most competitive sectors in the manufacturing industry of its region. İ.D. Bilkent University has been ranked 2nd in the EIUI and 4th in the SCPA. İ.D Bilkent University's SCPA ranking is in close in similarity to the EIUI ranking. The TOBB University of Economics and Technology has been ranked 5th in EIUI and 2nd in SCPA ranking. The SCPA ranking of TOBB University of Economics and Technology is in close in similarity to the EIUI rankings.

The results for other universities in TR51 Ankara region were observed as follows.

Hacettepe University has been ranked 7th in the EIUI and 13th in the SCPA ranking. Hacettepe University's SCPA ranking is not similar to the EIUI ranking. Gazi University has been ranked 11th in the EIUI rankings and 11th in the SCPA rankings. Gazi University's SCPA ranking is same as EIUI ranking. Atılım University has been ranked 12th in the EIUI and 6th in the SCPA ranking. Atılım University's SCPA

ranking is not similar to the EIUI ranking. Çankaya University has been ranked 15th in the EIUI and 12th in the SCPA ranking.

Table 6.1 Comparison of EIUI and SCPA

EIUI		UNIVERSITIES	SCPA	
Avg.2012-2018	Ranking		Ranking	Score
86,9	**1**	Middle East Technical University	**1**	0,2458
85,6	**2**	İ.D. Bilkent University	**4**	0,0622
80,0	**3**	İzmir Institute of Technology	**24**	0,0000
78,9	**4**	Gebze Technical University	**5**	0,0575
71,8	**5**	TOBB University of Economics and Technology	**2**	0,2099
71,5	**6**	Selcuk University	**7**	0,0516
70,1	**7**	Hacettepe University	**13**	0,0249
66,0	**8**	Ege University	**20**	0,0056
63,4	**9**	Anadolu University	**25**	0,0000
61,4	**10**	Erciyes University	**9**	0,0463
56,7	**11**	Gazi University	**11**	0,0398
53,7	**12**	Atılım University	**6**	0,0552
53,2	**13**	Gaziantep University	**15**	0,0214
51,4	**14**	Bursa Uludağ University	**16**	0,0192
50,2	**15**	Çankaya University	**12**	0,0324
49,8	**16**	Cukurova University	**10**	0,0409
46,4	**17**	Kocaeli University	**19**	0,0085
45,7	**18**	Suleyman Demirel University	**8**	0,0499
44,5	**19**	Ankara University	**14**	0,0222
43,2	**20**	Dokuz Eylül University	**23**	0,0019
43,2	**21**	Akdeniz University	**21**	0,0034
42,6	**22**	Mersin University	**17**	0,0179
42,4	**23**	İzmir University of Economics	**26**	0,0000
42,1	**24**	Karadeniz Technical University	**22**	0,0030
41,6	**25**	Pamukkale University	**3**	0,0727
40,8	**26**	Fırat University	**18**	0,0089

Çankaya University's SCPA ranking is not similar to the EIUI ranking. Finally, Ankara University has been ranked 19th in the EIUI and 14th in the SCPA ranking. Ankara University's SCPA ranking is not similar to the EIUI ranking.

The results for universities in TR31 İzmir region were observed as follows.

İzmir Institute of Technology has been ranked 3th in the EIUI and 24th in the SCPA ranking. Izmir Institute of Technology's SCPA ranking is not similar to the EIUI ranking. Izmir Institute of Technology is at the end of the SCPA ranking. Ege University has been ranked 8th in the EIUI and 20th in the SCPA ranking. Although the results of SCPA ranking is not similar to the EIUI ranking, Ege University is the first in the SCPA rankings of the TR31 İzmir region. Dokuz Eylül University has been

ranked 20th in the EIUI and 23rd in the SCPA ranking. The SCPA ranking of Dokuz Eylül University is closely similar to the EIUI rankings. Finally, İzmir University of Economics has been ranked 23rd in the EIUI and 26th in the SCPA ranking. The SCPA ranking of İzmir University of Economics is in closely similar to the EIUI rankings. However, İzmir University of Economics was last in the SCPA ranking with the Izmir Institute of Technology.

The results for universities in TR42 Kocaeli-Sakarya-Düzce-Bolu-Yalova region were observed as follows.

Gebze Technical University has been ranked 4th in the EIUI and 5th in the SCPA ranking. Gebze Technical University's SCPA ranking is closely similar to the EIUI ranking. Kocaeli University has been ranked 17th in the EIUI and 19th in the SCPA ranking. Kocaeli University's SCPA ranking is closely similar to the EIUI ranking.

Selçuk University has been ranked 6th in the EIUI and 7th in the SCPA ranking. Selçuk University's SCPA ranking is closely similar to the EIUI ranking.

The results for universities in TR41 Bursa-Eskişehir-Bilecik region were observed as follows.

Anadolu University has been ranked 9th in the EIUI and 25th in the SCPA ranking. Anadolu University's SCPA ranking is not similar to EIUI ranking. Anadolu University is at the end of the SCPA ranking. Bursa Uludağ University has been ranked 14th in the EIUI and 16th in the SCPA ranking. Bursa Uludağ University's SCPA ranking is closely similar to the EIUI ranking.

Erciyes University has been ranked 10th in the EIUI and 9th in the SCPA ranking. Erciyes University's SCPA ranking is closely similar to the EIUI ranking.

Gaziantep University has been ranked 10th in the EIUI and 9th in the SCPA ranking. Gaziantep University's SCPA ranking is closely similar to the EIUI ranking.

The results for universities in TR62 Adana-Mersin region were observed as follows.

Çukurova University has been ranked 16th in the EIUI and 10th in the SCPA ranking. Çukurova University's SCPA ranking is not similar to the EIUI ranking. Mersin

University has been ranked 22nd in the EIUI and 17th in the SCPA ranking. Mersin University's SCPA ranking is not similar to the EIUI ranking.

The results for universities in TR61 Antalya-Isparta-Burdur region were observed as follows.

Süleyman Demirel University has been ranked 18th in the EIUI and 8th in the SCPA ranking. Süleyman Demirel University's SCPA ranking is not similar to the EIUI ranking. Akdeniz University has been ranked 21th in the EIUI and 21th in the SCPA ranking. Akdeniz University's SCPA ranking is same as the EIUI ranking

Karadeniz Technical University has been ranked 24th in the EIUI and 22th in the SCPA ranking. Karadeniz Technical University's SCPA ranking is closely similar to the EIUI ranking.

Pamukkale University has been ranked 25th in the EIUI and 3th in the SCPA ranking. Pamukkale University's SCPA ranking is not similar to the EIUI ranking.

Finally, Fırat University has been ranked 26th in the EIUI and 18th in the SCPA ranking. Fırat University's SCPA ranking is not similar to the EIUI ranking.

In this context, the TURKSTAT database used to provide regional export data is limited in terms of sectoral elaboration of regional data. Therefore, more detailed data should be used for sectors of comparative advantage selected for the manufacturing industry of the regions. In addition, the fact that graduate theses recorded in the YÖKTEZ database are being uploaded by individuals and not by universities, this process may not be followed and the search engine of YOKTEZ database not working efficiently may prevent all graduate theses from being accessed. In addition, this comparison can be evaluated effectively if there is a source to access all studies carried out by the regions of the universities for the manufacturing industry.

Beyond these, this study is the first example in the field. It is a pioneer in contributing to the literature in order to establish and measure the basis of the strategies to be used to highlight the comparative advantages of a region in all areas, and to make academic contributions to these areas. It has the basic characteristics of the studies to be done in the future.

CONCLUSION

The manufacturing industry continues to be the main driving force of the economy in Turkey. As of 2018, the manufacturing industry accounted for 93.9% of total foreign trade. The share of high technology products in the manufacturing industry's products exports was 3.5%, the share of medium high technology products was 36.4%, the share of medium low technology products was 27.6% and the share of low technology products was 32.6% [95].

Turkey's development of the region and between the levels of development are constructed on the basis of an innovation strategy which helps to reduce the difference. For this reason, universities are encouraged to take an active role in ensuring the continuation of this process effectively. It is expected that the competitiveness of the region will be sustained by identifying the areas where the regions have a comparative advantage and transferring information onwards from these areas. In this context, the dynamics of the region are designed to convey the information produced regarding the economic advantages and to continue studies in these fields in order to maintain this advantage.

Within the scope of this study, it is seen that 34 universities in 7 EIUIs consistently carry out value-added studies within the framework of EIUI assessment dimensions and indicators. In addition, these universities are the central universities of the 13 NUTS 2 regions where they are located in terms of the number of academicians and students. Within the comparative advantage areas of the regions, it is seen that the manufacturing industry is the driving force. For this reason, identifying the strongest and the most competitive sectors of the manufacturing industry is of strategic importance. Further examination of the sub-groups of the identified sectors will increase the success likelihood of the smart specialization strategy to be created to produce the information and technology required by the sector for competition.

In the calculated export and import-export balance indices, 12 other regions except TR10 Istanbul, which include Sabancı University, Istanbul University, Yıldız Technical University, Boğaziçi University, Özyeğin University, Koç University, Yeditepe University and Bahçeşehir University, have a strong comparative advantage in the manufacturing industry, also they are net exporter sectors.

It is seen that the technology levels of the strongest and the most competitive sectors of the manufacturing industry in regions including TR31 Izmir, TR32 Aydın-Denizli-Muğla, TR62 Adana-Mersin, TR72 Kayseri-Sivas-Yozgat, TR90 Trabzon-Ordu-Giresun-Rize-Artvin-Gümüşhane, TRB1 Malatya-Elazig-Bingöl-Tunceli and TRC1 Gaziantep-Adiyaman-Kilis regions are composed of low-tech sectors; TR61 Antalya-Isparta-Burdur region have medium low technology; It is seen that TR41 Bursa-Eskişehir-Bilecik, TR42 Kocaeli-Sakarya-Düzce-Bolu-Yalova, TR51 Ankara and TR52 Konya-Karaman regions are composed of medium high technology sectors.

It can be said that METU, which has the highest score in EIUI and SCPA rankings, carried out its graduate theses in the focus of selected high-tech manufacturing industry sectors in the TR51 Ankara region. In addition, it can be considered that graduate theses of METU contribute to the assessment dimensions for the EIUI score. It can be also interpreted that it is the region which has the most successful university that carries out the strategy of supporting the sectors specialized in export with academic knowledge.

The following comments can be made for Gebze Technical University, TOBB University of Economics and Technology and Selçuk University, Erciyes University, Gazi University, Gaziantep University and Bursa Uludağ University, which are in the top 15 in EIUI rankings and contribute to the assessment dimensions for EIUI score. They can also support their activities in EIUI assessment dimensions with their graduate theses. Thus, thanks to the revised strategy, it can be assumed that the outcomes of the universities' graduate theses will increase their contribution to both themselves and their regions.

İzmir Institute of Technology, Anadolu University and İzmir University of Economics between 2011 and 2018 did not take place in the focus of the strongest or the most competitive sectors. It is thought that the activities in the assessment dimensions of EIUI do not increase the number of graduate theses. In addition, it can be interpreted

that the strategies of supporting the region's competitive sectors with academic knowledge should be reviewed urgently.

The results can be interpreted as follows for Atılım University, Çankaya University, Çukurova University, Kocaeli University, Süleyman Demirel University and Fırat University. It can be considered that the postgraduate theses of these universities do not contribute sufficiently to the EIUI scores. It can be thought that these universities should develop a strategy to transfer the results of their graduate theses to selected sectors.

Finally, another finding that needs to be emphasized is the EIUI and SCPA rankings of Pamukkale University. It can be thought that SCPA results of Pamukkale University do not contribute to EIUI ranking. Therefore, it can be said that a strategy is necessary to increase the contribution of the results of Pamukkale University graduate theses.

As a result, in this study, it is tried to analyze the relationship between universities and competitive sectors in their regions. 26 universities in the EIUI rankings were selected for this analysis. The total number of graduate theses per academician for the selected sectors was determined as the analysis method. A ranking was created for the total number of graduate theses per academician of universities for the selected sectors (SCPA). The SCPA and EIUI rankings were compared. Thus, it was aimed to measure the academic contribution of universities to regional development, which is seen as a deficiency in EIUI evaluation dimension. The contribution of the universities to regional development has attempted to be measured by the number of graduate theses on the strongest and the most competitive sectors in the manufacturing industry. Although there is no data set for the evaluation of all the theses performed by universities in this field, and were compared with SCPA based only on graduate theses, the findings of the study are remarkable.

As mentioned above, the EIUI and SCPA rankings of most universities vary. The knowledge transfer strategies applied by universities for the export-oriented manufacturing industry sectors also differ. Therefore, the reasons for these differences and the strategies to be implemented should be discussed in detail. The most important objective of this study is to make use of decision makers in smart specialization strategies to be developed within the scope of government-university-industry

cooperation. In addition, this study is expected to provide a basis for future specialization strategies for the regional development-oriented studies of universities.

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