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AN INPUT-OUTPUT MODEL OF THE ECONOMIC STRUCTURE OF THE EARTHQUAKE AFFECTED REGION IN TÜRKİYE FOR EFFECTIVE AND EFFICIENT RECOVERY[1]

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Abstract

Türkiye is frequently exposed to earthquakes due to its location in one of the most active earthquake zones in the world. Following the recent earthquakes in the southeastern part of the country, the need to quickly recover from the losses in the local and regional economies of the affected areas makes it extremely important to analyze economic structure to ensure a planned economic development. In view of this, this study aims to investigate the key economic sectors that should be prioritized for investment in the reconstruction process of these places for an effective and efficient economic recovery. In doing so, a static explicit Input-Output (I-O) Model based on Leontief's work is adopted. The key sectors that require investment priority for the recovery and development of local economies in the shortest possible time have been identified using a categorical classification methodology based on the unbalanced growth model proposed by Hirschman.

Keywords: Earthquake, Economic Impact, Input-Output Model, Key Sectors, Recovery Strategies

JEL Classification:C67, R15

Article Type: Research Article

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Öz

Türkiye, dünyanın en aktif deprem kuşaklarından birinde yer alması nedeniyle sık sık depreme maruz kalmaktadır. Ülkenin güneydoğu kesiminde meydana gelen son depremlerin ardından, etkilenen bölgelerin yerel ve bölgesel ekonomilerindeki kayıpların hızla telafi edilmesi ihtiyacı, planlı bir ekonomik kalkınmanın sağlanması için ekonomik yapının analiz edilmesini son derece önemli hale getirmektedir. Bunu göz önünde bulunduran bu çalışma, etkili ve verimli bir ekonomik toparlanma için bu yerlerin yeniden yapılandırılması sürecinde yatırım için öncelik verilmesi gereken kilit ekonomik sektörleri araştırmayı amaçlamaktadır. Bunu yaparken, Leontief'in çalışmasına dayanan statik bir açık Girdi-Çıktı (I-O) Modeli benimsenmiştir. Yerel ekonomilerin mümkün olan en kısa sürede toparlanması ve kalkınması için yatırım önceliği gerektiren kilit sektörler, Hirschman tarafından önerilen dengesiz büyüme modeline dayanan kategorik bir sınıflandırma metodolojisi kullanılarak belirlenmiştir.

Anahtar Kelimeler: Deprem, Ekonomik Etki, Girdi-Çıktı Modeli, Kilit Sektörler, İyileştirme Stratejileri

JEL Sınıflandırması:C67, R15

Makale Türü: Araştırma Makalesi

I. INTRODUCTION

Disaster is generally defined as "a natural, technological or human-induced event that causes physical, economic and social losses for the whole or certain segments of the society, stops or interrupts social life and human activities, and the coping capacity of the affected society is not sufficient" (AFAD, 2014, p.23). The Disaster and Emergency Management Presidency (AFAD) categorizes disasters into two groups: natural disasters and man-made disasters. Natural disasters can develop slowly, such as severe cold, drought and famine, or suddenly, such as earthquakes, floods, floods, fires, landslides, rockfalls, avalanches, storms, tornadoes, volcanic eruptions, etc. Human-induced disasters are defined as nuclear, biological, chemical and industrial accidents, transportation accidents, accidents caused by overcrowding, migrants and displaced persons, etc. (Web 1, 2022).

Natural disasters are occurrences that almost every country in the world inevitably faces in one way or the other. In recent years, the most common natural disasters affecting humanityremain earthquakes, floods, landslides, and wildfires.Among them, earthquakes are more destructive events -physically, socially, and economically- than other disasters.Earthquakes cause significant damage to the economy of the affected region, depending on the magnitude and location of the earthquake and the level of development of the affected country.This damage is much greater in underdeveloped or developing countries.When an earthquake occurs, it causes huge costs in the economic structure of that region, including labour, income and production losses, debris removal costs, humanitarian aid costs and the costs involved in the reconstruction process (Karagoz, 2007).

As in many other countries, Türkiye is a country where natural disasters occur frequently due to its geological structure, geomorphological, and meteorological characteristics. The country’s location within one of the world’s most active earthquake zones puts earthquakes at the head of the aforementioned list of natural disasters. Having caused so much loss of lives and properties in Türkiye so far, these frequently occurring earthquakes are still expected in the coming years. The losses incurred due to quakes go beyond physical and social to economic losses. Post quakes reconstruction comes along with high costs which often leads not only to failure to reach targeted goals but also comes along with periods of economic contractions. In view of this, there is an urgent need for a planned redevelopment approach if the physical, social, and economic problems resulting from earthquakes are to be minimized.

In order to achieve quick recovery from earthquake impacts and to create a planned development, first, the economic impact of the earthquake should be determined. Even though most scientific studies on earthquakes are often handled of its social and physical effects with the economic dimension sufficiently explored.In light of this therefore, studies that explore the economic dimension/s of earthquakes gain importance of in understanding the economic impacts of these earthquakes. In understanding and determining the economic impact, it becomes a matter of utmost importance to analyze the economic structure and how the various (economic) sectors relate within the affected area. This study therefore adopts the I-O model to determine the economic impacts of the earthquakes in the stated regions. In the modern sense, the model is based on the work of Wassily Leontief (1936), which is a balanced model that evaluates the relations between all the units that make up the economic structure at the sectoral level. Several other types of I-O models exist such as the static and dynamic, open, semi-open, and closed, national, regional, and interregional. In this work, the national and regional open static I-O models are used.

First, national and international literature on the subject is presented. Next, the concepts and methods used are discussed. The definition and mathematical expression of the input-output model used as the method of the study are explained. Another method used in the study is the location quotient (LQ) method. Last, regional input-output tables were prepared for the earthquake-affected provinces of Adana, Adıyaman, Diyarbakır, Gaziantep, Hatay, Hatay, Kahramanmaraş, Kilis, Malatya, Osmaniye, and Şanlıurfa using the location quotient method. With the help of these tables, forward and backward linkage effects of sectors in the regional economy are calculated; Hirschman categories and key sectors are identified. The results of the study are presented and evaluations are made in line with the findings.

This work presents recommendations based on strategic approached that are geared towards mitigating the economic impacts the 7.7 mw earthquake that occurred in Gaziantep province Şehitkamil district and the 7.6 mw earthquake that occurred in Ekinözü district of Kahramanmaraş province on 6 February 2023 (KOERI, 2023) along the East Anatolian Fault Lines (EAF). Despite generally expressed as specific points (based on epicenters), earthquakes impact on a wide geography owing to the tectonic movements which occur along the fault line and over a wide area during earthquakes. Areas affected by earthquakes are shown in FigureI and Figure II.

Figure I: Initial Quake, 4:17 a.m. **Figure II: Large Aftershock, 1:24 p.m.**

Source: NYT, 2023

The 10 provinces most affected by earthquakes are Adana, Adıyaman, Diyarbakır, Gaziantep, Hatay, Kahramanmaraş, Kilis, Malatya, Osmaniye, and Şanlıurfa. Apart from the loss of lives and properties, it can reasonably be estimated that these provinces have also been negatively impacted in economic terms as previously indicated.

These earthquakes have already affected more than 15 million people, claimed the lives of more than 48,000 people, damaged more than half a million buildings, communications and energy structures, and caused significant economic losses.A total of 332 tent-cities and 360,167 tents have already installed, 1,440,668 citizens have been sheltered in these. A large number of temporary residential works is underway to build and install 189 container-cities and 90,914 container-homes. Currently 34,120 families have beensheltered in these containers (Republic of Türkiye Presidential Strategy and Budget Department, 2023).

Since February 6, the earthquakes have caused 1.739 trillion TL (56.9 billionUSD) of housing damage to the Turkish economy. The second largest loss was the destruction of public infrastructure and damage to public service facilities (242.5 billion TL, 12.9 billion USD). Damage to the non-residential private sector such as manufacturing, energy, telecommunications, tourism, health, education, small businesses and places of worship is estimated at 222.4 billion TL (11.8 billion USD). It is estimated that the damage caused by the earthquake in the form of severely damaged or demolished houses that had to be demolished urgently, amounted to822.9 billionTL, while the damage to moderately damaged

houses amounted to209 billionTL. Accordingly, the total economic damage to residential buildings amounted to 1,031.9 billion TL (54.7 billionUSD). Furthermore, taking into account losses in the insurance sector and macroeconomic impacts, the total damage of the earthquake on the Turkish economy is estimated at 2 trillion TL (103.6 billionUSD), which could amount to 9% of GDP in 2023(Republic of Türkiye Presidential Strategy and Budget Department, 2023).

II. LITERATURE

The I-O model was formally developed and used for the first time by Wassily Leontief. The first examples of input-output tables, which form the basis of interindustrial economics, were prepared for the US economy in 1919 and 1929. The first I-O model was "QuantitativeInput-Output relations in the Economics System of the United States" published by W. Leontief in 1936 (Aydogus, 2010). By the end of the 1950s, the studies were more related to intersectorallinkages, with progress made within the framework of the analysis of the forward and backward linkage coefficients. Chenery and Watanabe (1958) defined the forward and backward linkage coefficient in their study and compared the production structure of four countries, namely the USA, Japan, Norway, and Italy, using the I-O analysis method. On the other hand, Hirschman (1958) focused on identifying key sectors in line with the studies on forward and backward linkage coefficients. And accordingly, he categorized sectors into four categories as:*industries with high forward and backward linkage*;*industries with high backward linkage and low forward linkage*;*industries with high forward linkage and low backward linkage*; and *industries with low forward and backward linkage* so that he emphasized the need to prioritize those sectors with both high forward and backward linkage for investments.

Among the various economic models used to predict the effects of disasters, the most widely used model is the I-O method. Cochrane (1974, 1997), Wilson (1982), Kawashima et al. (1991), Boisvert (1992), Rose et al. (1997, 1998), Gordon and Richardson (1998), Okuyama et al. (1999, 2004, 2009, 2014, 2015), Hallegatte (2008), Wu et al. (2012), and Arto et al. (2014, 2015) come to mind as international studies.

The first I-O study prepared on a national scale in Türkiye was carried out by the State Planning Organization (SPO) for 1959. The study is a model prepared by consolidating the Turkish economy into 15 sectors. The second study by SPO, which is more comprehensive than the first study, is based on an open static model with 37 sectors prepared for 1963

(Korum, 1967). After the SPO, the input-output tables for the years 1968, 1973, 1979, 1985, and 1990 on a national scale were prepared by the State Institute of Statistics (SIS). Thereafter, tables for the years 1998, 2002, and 2012 were prepared by the SIS under its new name, Turkish Statistical Institute (TURKSTAT) (Aydogus, 2010).

In this study, since the economic effects of earthquakes are calculated at the regional level, studies based on the regional I-O model are emphasized in the literature. Studies on the regional I-O model are summarized in Table I.

Table I: Regional Input-Output Model Studies

Literature	Divitcioglu (1966)	Toraman (1973)	Ozturk (1978)	Ozyurt (1982)	Flegg et al. (1995)	Ersungur (1996)	Fritz et al. (2003)	Bazzazan et al. (2005)	IDA (2012)	WBDA (2014)	Sel (2015)	Demir (2019)
	Antalya	East Marmara	Eastern Anatolia	Trabzon	Avon	Erzurum	Upper Austria	Yazd	Izmir	West Blacksea	Sivas	Adana
Base Year	1963	1963	1968	1980	1984	1995	1995	2000	2008	2011	2014	2017
Number of Sectors	19	20	39	64	32	64	55	22	36	26	8	69
National Coefficient Used		X										
National Coefficient Converted to Regional Coefficient			X		X				X	X		
Directly Measured Coefficient	X			X		X	X	X			X	X
Primary Data	X		X	X	X	X	X	X	X	X	X	X
Secondary Data		X	X	X		X	X	X	X	X	X	
Interindustry Linkage				X		X	X		X	X	X	X
Multiplier Analysis				X	X	X		X	X	X	X	X

Source: The table was created by the authors

In these studies, made use of various methods such as the survey method, cross-industry location quotient (CILQ) method, location quotient (LQ) method, and data from official institutions were used to transform the national input-output table into a regional input-output table.

III. MATERIALS AND METHODS

This work makes use of the most current input-output table published by TURKSTAT in 2012. And as per this table, there is a total of 62 sectors in the Turkish economy.The 62 sectors are grouped into 18 subsectors in the regional input-output table. The reason for the grouping is that it is easier to compile the data and that the LQ method used in the study can be calculated with the employment data. Also, since the amount of employment is obtained from the most up-to-date SSI data for 2021 and these data are compiled by SSI in only 18 sectors, the national input-output table has been grouped in the same direction so that calculations can be made. These sectors, which are grouped based on the national input-output table of 2012 are shown in Table II.

Table II: Consolidated Sectors

Sector Code	NACE Code	Grouping	2012 Input-Output Table Sector Numbers
1	A	Agriculture, Forestry, and Fishing	1-3
2	B	Mining and Quarrying	4
3	C	Manufacturing Industry	5-23
4	D, E	Electricity, Gas, Steam, Water, and Sewage	24-26
5	F	Construction and Public Works	27
6	G	Wholesale and Retail Trade	28-30
7	H	Transportation and Storage	31-35
8	I	Accommodation and Food Service	36
9	J	Information and Communication	37-40
10	K	Finance and Insurance Activities	41-43
11	L	Real Estate Activities	44
12	M	Professional, Scientific, and Technical Activities	46-50
13	N	Administrative and Support Service Activities	51-54
14	O	Public Administration and Defense	55
15	P	Education Services	56
16	Q	Human Health and Social Work Activities	57-58
17	R	Culture, Art, Entertainment, Recreation, and Sports	59-60
18	S	Other Service Activities	61-63

Source: The table was created by the authors

Based on the aggregated national table, technical coefficients matrix, Leontief matrix, and Leontief inverse matrixfor 18 sectors were calculated for each individual province and one for theregion covering the 10 provinces (thereafter referred as ‘the region’). With the help

of these matrices, the linkages between the sectors that make up the economic structure of the affected by the earthquakes 10 provinces and the region has been determined.Total forward and backward linkage coefficients expressing interindustry linkages were calculated with the Leontief inverse matrix. Thus, the structure of the regional economy, which includes each province and the region, was analyzed and comparisons made.

III.I. The Input-Output (I-O) Model

The I-O model was developed by Wassily Leontief in the late 1920s and early 1930s. This analysis, which came to prominence in the United States during the Second World War, was originally designed to be applied at the national level (Isard, 1998). However, the I-O model is a flexible model which canshow variations according to the research topic or the researcher's goals. Depending on the nature of the study, it can be created at the national level as well as at the regional or interregional level.

In order to use the I-Omodel, an input-output table is needed. The economic activity of a region associated with a number, say n, of producing 'sectors.' These thought of as 'industries' and might include resource-based activities, manufacturing, and services. Each of the sectors in the region assumed produces a single, unique product. I-O model attempt to interconnections of an economy by recording, for a given period (say one year), the economic transactions that occur in the economy. These transactions can be seen of view of either the selling sector in the region or the buying sector in the region(Isard, 1998).The input-output table that forms the basis of the I-O model is shown in Table III.

Table III: Input-Output Table

		Interindustry Sales (Z)					Sales to Final Demand (Y)				Total Sales (X)
	z_{11}	z_{12}	…	z_{1j}	…	z_{1n}	c_1	i_1	g_1	e_1	x_1
	z_{21}	z_{22}	…	z_{2j}	…	z_{2n}	c_2	i_2	g_2	e_2	x_2
	…	…	…	…	…	…	…	…	…	…	…
	z_{i1}	z_{i2}	…	z_{ij}	…	z_{in}	c_i	i_i	g_i	e_i	x_i
	…	…	…	…	…	…	…	…	…	…	…
	z_{n1}	z_{n2}	…	z_{nj}	…	z_{nn}	c_n	i_n	g_n	$e_{n\_}$	x_n
Value Added	l_1	l_2	…	l_j	…	l_n					L
	ov_1	ov_2	…	ov_j	…	ov_n					OV
Imports	m_1	m_2	…	m_j	…	m_n					M
Total Outlays (X)	x_1	x_2	…	x_j	…	x_n	C	I	G	E	

Source: Isard et al., 1998

In Table III, the rows show the sectors that provide the product, and the columns contain the sectors that buy the product. The parameters in the relevant table are listed below with their notations:

z_{ij}: the amount of production of sector *i* that is consumed by sector *j*

Y_i: the value of sales of sector *i* goods to final consumers(households, exports, investment, and all levels of government)

x_i: the total value of goods produced by sector *i* (sector *i*'s gross output)

c_i: personal consumption expenditures of sector *i*

i_i: purchases of *i*goods as investments

g_i: government purchases of sector *i*

e_i: exports of sector *i*

l_j: payments for labor servicesof sector *j*

ov_j: payments for all other value added items of sector *j*

m_j: payments for imported inputs of sector *j*

Based on the input-output table, two equations are formed for the total production. The total production is shown as *row sum* of the input-output table in Equation (1), and the total production as *column sum* in Equation (2). Accordingly, both equations (total level of input and output of sectors)are equal to each other (Isard et al., 1998).

$$x_i = z_{i1} + z_{i2} + \ldots + z_{ij} + \ldots + z_{in} + c_i + i_i + g_i + e_i \text{for } \forall\, i \qquad (1)$$

$$x_j = z_{1j} + z_{2j} + \ldots + z_{ij} + \ldots + z_{nj} + l_j + ov_j + m_j \text{for } \forall\, j \qquad (2)$$

In order to calculate the direct and indirect effects of the changes on the final demand specific to the sectors, with the help of the input-output table, the proportional sizes of the values are found. With the help of these proportional values(a_{ij}), how much input from which sector is needed for a unit of service and products produced on the basis of each sector can then be calculated. Direct input coefficients are obtained by dividing the total amount of products produced by sector *i* and received by sector *j* (z_{ij}) bythe total production expenditures for products and services produced by sector *j*(x_j)(Isard et al., 1998). This calculation is shown in Equation (3).

$$a_{ij} = \frac{z_{ij}}{x_j} \qquad (3)$$

Starting from Equation (3), after determining the input coefficients in this way for each sector in the economy, a square matrix is formed from these coefficients. This matrix is called input coefficients matrix, technical coefficients matrix or technology matrix. In order to obtain the matrix, the interindustry relations section of the input-output table is used. The input coefficients matrix shows the *direct effects* of bring about in that sector of an increase in the final demand of any sector (Bocutoglu, 1990).

$$\mathbf{A} = \begin{bmatrix} a_{11} & a_{12} & \cdots & a_{1j} & \cdots & a_{1n} \\ a_{21} & a_{22} & \cdots & a_{2j} & \cdots & a_{2n} \\ \vdots & \vdots & \vdots & \vdots & \vdots & \vdots \\ a_{i1} & a_{i2} & \cdots & a_{ij} & \cdots & a_{in} \\ \vdots & \vdots & \vdots & \vdots & \vdots & \vdots \\ a_{n1} & a_{n2} & \cdots & a_{nj} & \cdots & a_{nn} \end{bmatrix} \quad (4)$$

In Equation (4), the input coefficients matrix, which directly shows the input coefficients, is expressed with the symbol **A** in the equation solution**.** The numbers in the indices of the coefficients indicate the relevant row and column. For example, the coefficient a_{12}shows the proportional value of the production of the sector in the 1st row and 2nd column of the table.

Equations (1) and (2), which form the basis of the input-output model are expressed as a matrix, and in Equation (5), they are expressed as a vector of sector-based production totals. Equation (6) shows the final demand vector on the basis of sector.

$$\mathbf{X} = \begin{bmatrix} x_1 \\ \vdots \\ x_j \\ \vdots \\ x_n \end{bmatrix} \quad (5)$$

$$\mathbf{Y} = \begin{bmatrix} y_1 \\ \vdots \\ y_j \\ \vdots \\ y_n \end{bmatrix} \quad (6)$$

The total production obtained from the sum of the row elements of the input-output table in Equation (1) is shown in Equation (7) in terms of the matrices specified in Equation (4), Equation (5), and Equation (6).

$$\mathbf{X} = \mathbf{AX} + \mathbf{Y} \quad (7)$$

For the solution of the model, the production vector must be isolated from the equation and created in terms of the input coefficients vector and the final demand vector (Aydogus, 2010).This process is illustrated in Equation (8).

$$\mathbf{X} - \mathbf{AX} = \mathbf{Y} \qquad (8)$$

For the solution of Equation (8), it is necessary to know that the product of any matrix with the diagonal elements 1 and the identity (**I**) matrix whose other elements are 0 is equal to itself. Equation (9) is obtained when X matrix is placed in common brackets.

$$(\mathbf{I} - \mathbf{A})\mathbf{X} = \mathbf{Y} \qquad (9)$$

The equation where$(\mathbf{I} - \mathbf{A})$isfoundis called Leontief matrix, named after Wassily Leontief who is regarded as the founder of the I-O model. Leontief matrix $(\mathbf{I} - \mathbf{A})$shows the final demand for one unit of production of sectors (Ersungur, 1996).

If both sides of Equation (9) are multiplied by the Leontief inverse matrix$(\mathbf{I} - \mathbf{A})^{-\mathbf{1}}$, Equation (10) is formed, since the product of a matrix inverse and itself is equal to the unit matrix, and the product of the unit matrix and a vector does not change the value of the vector (Aydogus, 2010).

$$\mathbf{X} = (\mathbf{I} - \mathbf{A})^{-\mathbf{1}}\mathbf{Y} \qquad (10)$$

Leontief inverse matrix $(\mathbf{I} - \mathbf{A})^{-\mathbf{1}}$forms the basis of input-output analysis by establishing the relationship between final demand and output levels. This matrix, expressed in Equation (11), shows both the direct and indirect effects of the sectors within the economic structure.

$$(\mathbf{I} - \mathbf{A})^{-\mathbf{1}} = \begin{bmatrix} \beta_{11} & \beta_{12} & \cdots & \beta_{1j} & \cdots & \beta_{1n} \\ \beta_{21} & \beta_{22} & \cdots & \beta_{2j} & \cdots & \beta_{2n} \\ \vdots & \vdots & \vdots & \vdots & \vdots & \vdots \\ \beta_{i1} & \beta_{i2} & \cdots & \beta_{ij} & \cdots & \beta_{in} \\ \vdots & \vdots & \vdots & \vdots & \vdots & \vdots \\ \beta_{n1} & \beta_{n2} & \cdots & \beta_{nj} & \cdots & \beta_{nn} \end{bmatrix} \qquad (11)$$

The production and final demand vectors in Equation (10) are also considered as $\mathbf{\Delta X}$ and $\mathbf{\Delta Y}$ as marginal values or increments. The increases in the final demand of only one sector or all industries are written as Equation (12), assuming an increase of $\mathbf{\Delta Y}$ (Ersungur**,** 1996).

$$\Delta \mathbf{X} = (\mathbf{I} - \mathbf{A})^{-1} \Delta \mathbf{Y} (12)$$

In this way, input-output analysis is thus, used as a planning tool. Accordingly, the total production of industries in the economy can be calculated by multiplying the inverse Leontief matrix with the final demand vector (Ersungur, 1996).

The input-output model helps to determine how important the sectors are to each other by taking into account the intersectoral exchanges of intermediate goods. In the input-output tables, it is shown how much input each sector in the economy receives from other sectors to produce and how much of the outputs produced in the sector are used in which sectors(Aydogus, 2010).The exchange of goods between sectors is what backward and forward linkages, or economic "connectedness"(Miller and Blair, 2009).

The direct backward linkage of sector j – the amount by which sector j production depends on interindustry inputs – is given the sum of the elements in the jth column of the directinput coefficients matrix is shown in Equation (13) (Miller and Blair, 2009). $\mathrm{BL(d)_j} = \sum_{i=1}^{n} a_{ij} (13)$

The direct forward linkageof sector j is given the sum of the row elements of the input coefficients matrix and is shown in Equation (14) (Miller and Blair, 2009).$\mathrm{FL(d)_i} = \sum_{j=1}^{n} a_{ij} (14)$

However, the direct linkage reflect *only direct exchanges* between sectors. The linkages between the sectors gives more accurate results when the total linkages are calculated.

To capture both direct and indirect linkages in an economy, column sums of the Leontief inverse matrix, were proposed as a total backward linkage measureand it is shown in Equation (15) (Miller and Blair, 2009).

$$\mathrm{BL(t)_j} = \sum_{i=1}^{n} l_{ij} (15)$$

The total forward linkage, is given the sum of the row elements of the Leontief inverse matrix and it is shown in Equation (16) (Miller and Blair, 2009).

$$\mathrm{FL(t)_i} = \sum_{j=1}^{n} l_{ij} (16)$$

Hirschman's unbalanced growth model is based on interindustry linkages. He argues that the linkages have the quality of feeding and stimulating each other's production of the

sectors, and that these should be taken into account in investment decisions. Sectors with high linkages are chosen as the key sector because they increase production, employment, and income more than investments made in other sectors (Altan, 1996). According to Hirschman, priority is given to the sectors with the highest total linkages while making development decisions. For this reason, it makes more sense to consider the ones with high backward linkage. Because entrepreneurs know that there is a buyer to whom they can sell goods, which creates a safer harbor in making investment decisions (Savas, 1987). In view of this, sectors are divided into four groups according to their backward and forward linkages by Hirschman (Hirschman, 1958):

- Category I: Industries with high backward and forward linkages
- Category II: Industries with high backward linkage and low forward linkage
- Category III: Industries with high forward linkage and low backward linkage
- Category IV: Industries with low backward and forward linkages

Accordingly, *industries with high forward and backward linkages*in category Iare the key sectors with the highest investment priorities for the economy. Both linkages are above the average value. By producing intermediate goods and receiving inputs to a significant extent, it affects both the sectors where goods are purchased and sold (Iloglu, 1993). CategoryII sectors are those *with high backward linkage and low forward linkage.* It consists of sectors with a backward linkage above the average and a forward linkage below the average. If there are still unused resources after directing resources to key sectors, they should be redirected to these sectors (Yilanci, 2008). Category III sectors consist of those *with high forward linkage and low backward linkage.* They include sectors with a forward linkage above the average and a backward linkage below the average. These sectors need to be stimulated by the key sector. Generally, by producing intermediate goods, the production of the sectors that demand these goods increases and new industries emerge. CategoryIVsectorsare those*with low forward and backward linkages.* Both forward and backward linkages of the sectors in this category are low. Also, both linkages are below the average value. These sectors also need to be stimulated by the key sectors. It has no direct effects on other sectors (Yilanci, 2008).

III.II. Location Quotient (Lq) Method

Location quotient (LQ) method is preferred as a method in this study since it is one of the most frequently used techniques in creating a regional I-O model. This method is

calculated as the ratio of the share of any sector in the region to its share in the country according to a certain indicator -such as the number of enterprises, the number of employees, turnover, gross investments, among others- and shows the concentration level of the sector in terms of the country average regarding the said indicator. The indicator determined for this study is the number of employment. The calculation of LQ according to the employment is shown in Equation (17) (Isard et al., 1998).

$$LQ_i^J = \frac{E_i^J / E^J}{E_i / E} \quad (17)$$

LQ_i^J: location quotient in sector *i* based on employment in a given region*J*

E_i^J: employment in activity *i* in a given region *J*

E^J: total employment in a given region *J*

E_i: employment in activity *i* in the nation

E : total employment in the nation

When that location quotient is greater than 1, it indicates that the sector is concentrated in the region above the country average. The coefficient being equal to 1 indicates that the concentration level of the sector in the region is equal to the country average. And when that the coefficient is less than 1, it indicates that the sector is less concentrated in the region than the country average. While preparing the regional input-output table, in cases where the LQ values calculated for the sector are greater than or equal to 1, the sector values in the national coefficients table are written in the same way in the regional table. In cases where the LQ value is less than 1, the calculated LQ value is multiplied by the sector values in the national table and written in the regional table (Miller and Blair, 2009). These values are calculated using Equation (18).

$$\begin{matrix} (LQ_i^J)a_{ij} & \text{if} \quad LQ_i^J < 1 \\ a_{ij} & \text{if} \quad LQ_i^J \geq 1 \end{matrix} \quad (18)$$

Thus, by converting national input-output tables into regional input-output tables, the relationships between industries in the local economy can then be analyzed.

IV. ANALYSIS AND RESULTS

The Gross Domestic Product (GDP) and Per Capita GDP values of the 10 provinces and the region in general which is determined as the study area are shown in Table IV according to the 2021 TURKSTAT data, and the highest GDP values in the region belong to the provinces of Gaziantep and Adana. The ratio of the GDP of the region to the country corresponds to 9%.

Table IV: 2021 GDP and Per Capita GDP Values of 10 Provinces and the Region

Provinces	GDP (thousand TRY)	Population	Per Capita GDP (TRY)	Percentage Within the Region	Percentage Countrywide
Adana	141,672,580	2,263,373	62,594	21%	1.95%
Adıyaman	23,236,012	632,148	36,757	3%	0.32%
Diyarbakır	62,494,019	1,791,373	34,886	9%	0.86%
Gaziantep	148,588,413	2,130,432	69,746	22%	2.05%
Hatay	101,461,596	1,670,712	60,730	15%	1.40%
Kahramanmaraş	63,004,412	1,171,298	53,790	9%	0.87%
Kilis	7,006,880	145,826	48,050	1%	0.10%
Malatya	38,831,203	808,692	48,017	6%	0.54%
Osmaniye	30,945,765	553,012	55,959	5%	0.43%
Şanlıurfa	57,589,407	2,143,020	26,873	9%	0.79%
Region-wide	674,830,287	13,309,886	50,701	100%	9.31%
Türkiye	7,248,788,983	84,680,273	85,602		100%

Source: TURKSTAT, 2021

Per capita GDP is obtained by dividing the GDP value by the population is mapped and shown in Figure III. The highest per capita GDP is in Gaziantep, Adana, and Hatay provinces.

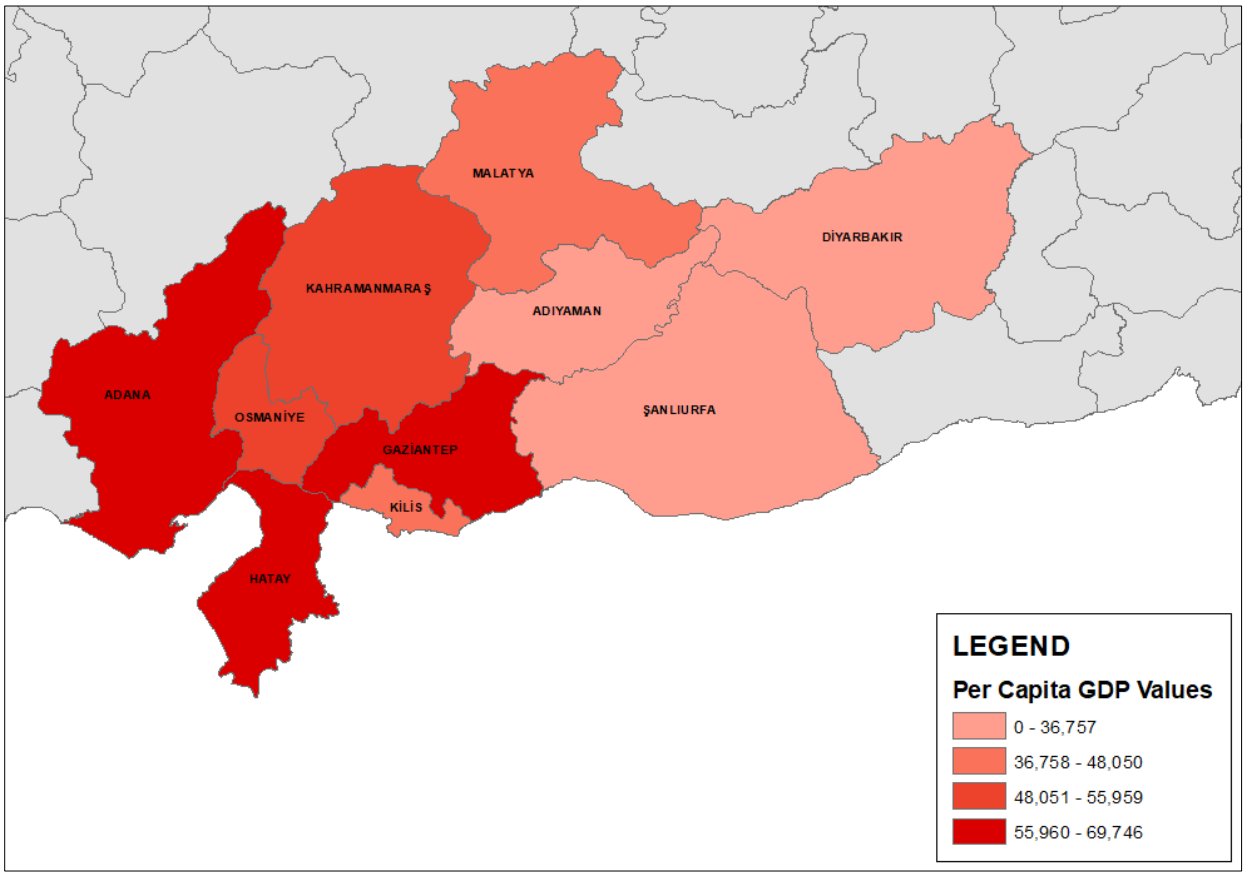

Figure III: Per Capita GDP Values of 10 Provinces

Source: The figure was created by the authors

The GDP values of the sectors included in the economy of 10 provinces in TURKSTAT data are shown in Table V. Accordingly, the sectors of industry, services, public administration, education, human health and social work activities come to the fore.

Table V: 2021 GDP Values of 10 Provinces and the Region by Sectors

Industries	Adana	Adıyaman	Diyarbakır	Gaziantep	Hatay	Kahramanmaraş	Kilis	Malatya	Osmaniye	Şanlıurfa	Region-wide	Türkiye
Agriculture, forestry, and fishing	10,208,479	3,051,387	8,748,301	5,129,481	5,417,056	5,594,743	984,387	3,683,770	2,494,150	11,954,732	57,266,486	401,805,954
Industry	40,811,795	5,528,508	7,047,039	67,634,889	34,006,357	25,526,896	1,115,360	9,148,529	12,851,755	7,454,519	211,125,65	1,888,148,628
Manufacturing industry	34,083,264	2,977,099	3,295,816	64,370,044	30,064,809	20,580,196	974,781	8,082,860	11,896,242	5,112,579	181,437,690	1,609,778,714
Building	6,402,174	1,043,590	4,490,251	6,396,756	3,504,000	3,013,742	520,073	2,540,967	1,005,974	2,952,971	31,870,498	367,218,833
Services	33,430,456	3,090,977	8,983,972	27,224,338	25,593,721	7,959,208	984,497	5,676,003	4,327,717	9,298,675	126,569,563	1,772,670,048
Information and communication	1,371,847	96,451	1,107,784	423,353	185,296	280,012	55,627	234,551	63,683	238,892	4,057,496	199,576,584
Finance and insurance activities	3,179,299	333,578	937,536	1,740,011	1,020,893	566,473	76,493	596,022	222,833	575,113	9,248,250	211,640,623
Real estate activities	5,866,329	1,693,664	4,064,139	5,715,300	4,754,904	2,986,190	493,921	2,784,245	1,720,868	2,866,531	32,946,091	358,675,847
Professional, administrative, and support service activities	5,493,009	626,916	2,557,138	3,909,846	2,624,950	1,317,158	164,282	1,197,32	447,886	2,098,582	20,437,086	345,474,812
Public administration, education, human health, and social work activities	17,392,110	5,049,643	16,958,608	13,556,882	12,660,768	8,528,149	1,800,990	8,158,457	4,279,205	12,784,629	101,169,440	769,000,822
Other service activities	2,514,928	260,764	981,563	1,123,062	949,564	560,107	69,271	699,382	254,751	1,266,441	8,679,831	166,979,807

Source:TURKSTAT, 2023

The national input-output table was then converted into a regional input-output table in order to make economic analyzes of the 10 provinces and the region affected by the earthquakes. LQ values calculated for 18 sectors according to 2021 by using equation (17) are shown in Table VI.

Table VI: LQ Values of 18 Sectors in 10 Provinces Affected by Earthquakes and Throughout the Region

Industries	Adana	Adıyaman	Diyarbakır	G.antep	Hatay	K.maraş	Kilis	Malatya	Osmaniye	Ş.urfa	Region-wide
Agriculture, Forestry, and Fishing	**2.24**	**1.09**	0.82	0.53	0.96	**1.18**	0.73	0.93	**1.27**	**2.37**	**1.31**
Mining and Quarrying	0.80	**3,52**	**1.37**	0.24	0.58	**1.51**	0.43	**1.02**	0.37	0.30	0.84
Manufacturing Industry	0.92	**1.03**	0.58	**1.52**	0.71	**1.46**	0.65	**1.14**	**1.18**	0.58	**1.03**
Electricity, Gas, Steam, Water, and Sewage	**1.23**	**1.52**	**1.68**	0.56	0.93	**2.79**	0.77	0.73	**1.32**	**1.16**	**1.23**
Construction and Public Works	0.91	**1.44**	**1.36**	**1.06**	**1.09**	**1.03**	**2.13**	**1.32**	**1.30**	**1.04**	**1.11**
Wholesale and Retail Trade	**1.06**	0.70	0.87	0.85	**1.07**	0.70	0.44	0.85	0.91	0.63	0.87
Transport and Storage	0.82	0.98	**1.17**	0.74	**1.94**	0.72	0.95	0.65	0.75	**1.12**	0.98
Accommodation and Food Service	0.66	0.55	0.61	0.45	0.72	0.50	0.48	0.73	0.45	0.37	0.56
Information and Communication	0.38	0.23	0.47	0.26	0.21	0.36	0.20	0.53	0.28	0.28	0.33
Finance and Insurance Activities	0.87	0.34	0.53	0.54	0.63	0.39	0.19	0.67	0.51	0.47	0.59
Real Estate Activities	0.88	**1.26**	**1.16**	0.79	0.66	0.91	0.28	0.86	0.25	0.47	0.81
Professional, Scientific, and Technical Activities	0.72	0.41	0.52	0.55	0.61	0.41	0.34	0.47	0.58	0.74	0.58
Administrative and Support Service Activities	**1.06**	0.99	**1.60**	**1.01**	**1.07**	0.66	**1.47**	0.96	0.91	**1.93**	**1.15**
Public Administration and Defense	0.88	**2.17**	**3.02**	**1.19**	**1.62**	**1.61**	0.66	**2.34**	0.57	**2.76**	**1.67**
Education Services	0.91	**1.34**	**1.91**	0.99	**1.46**	0.96	**3.31**	**1.04**	**1.75**	**2.18**	**1.32**
Human Health and Social Work Activities	**1.23**	**1.06**	**1.46**	**1.26**	**1.30**	0.99	**1.61**	**1.22**	**1.07**	**1.38**	**1.25**
Culture, Art, Entertainment, Recreation, and Sports	0.88	0.74	0.70	0.40	0.79	0.69	0.55	0.99	0.80	0.59	0.70
Other Service Activities	0.88	0.84	0.61	0.98	**1.33**	0.76	**1.93**	**1.11**	0.74	0.91	0.93

Source: The table was created by the authors

According to Table VI, the sectors with an LQ value equal to or above 1 are the sectors that have gained specialization in that province by concentrating above the country average. These sectors are expressed in bold font and darker tones in the relevant table for 10 provinces and the total region.

- Specialized sectors in **Adana**include**;**agriculture, forestry, and fishing;electricity, gas, steam, water, and sewage;wholesale and retail trade; administrative and support service activities; human health and social work activities.
- Specialized sectors in **Adıyaman**are**;** Agriculture, forestry, and fishing; mining and quarrying; manufacturing industry; electricity, gas, steam, water, and sewage; construction and public works; real estate activities; public administration and defense; educational services; human health and social work activities.
- In **Diyarbakır,**mining and quarrying; manufacturing industry; electricity, gas, steam, water, and sewage; construction and public works; transportation and storage; real estate activities; administrative and support service activities; public administration and defense; educational services; human health and social work activities sectors are specialized.
- In **Gaziantep,**manufacturing industry; construction and public works; administrative and support service activities; public administration and defense; human health and social work activities sectors are specialized.
- In **Hatay,**construction and public works; wholesale and retail trade; transportation and storage; administrative and support service activities; public administration and defense; educational services; human health and social work activities; other service activities sectors are specialized.
- In **Kahramanmaraş,** there is specialization inagriculture, forestry, and fishing; mining and quarrying; manufacturing industry; electricity, gas, steam, water, and sewage; construction and public works;public administration and defense sectors.
- In **Kilis,**there is specialization in construction and public works; administrative and support service activities; educational services; human health and social work activities; specializes in other service activities sectors.
- In **Malatya,** there is specialization in mining and quarrying;manufacturing industry; construction and public works; public administration and defense; educational services; human health and social work activities; specializes in other service activities sectors.

- In **Osmaniye**,agriculture, forestry, and fishing;manufacturing industry; electricity, gas, steam, water, and sewage; construction and public works; educational services; human health and social work activities sectors are specialized.
- In **Şanlıurfa,**agriculture, forestry, and fishing; electricity, gas, steam, water, and sewage; construction and public works; transportation and storage; administrative and support service activities; public administration and defense; educational services; human health and social work activities sectors are specialized.
- **Across the region,** agriculture, forestry, and fishing; manufacturing industry; electricity, gas, steam, water, and sewage; construction and public works; administrative and support service activities; public administration and defense; educational services; human health and social work activities sectors are specialized.

In creating the regional input-output table for the 10 provinces affected by the earthquakes and the region, where the LQ values calculated for each sector as specified in Equation (17) are equal to or greater than 1, the sector values in the national input coefficients matrix (**A** matrix in Table A.I) arewritten in the same way on the regional table. In cases where the LQ value is less than 1, the calculated LQ value is multiplied by the sector values in the national input coefficients matrix (**A**matrix) and written into the regional input coefficients matrix**.** By using this method, the 2021 regional input coefficients matrix (**A**matrix) was created for the 10 provinces and the region(Table A.II in appendix). Starting from the **A**matrix**,** the total forward and backward linkages were calculated by forming the matrix for the total of 10 provinces and regions with Equation (7, 8, 9, and 10) to determine the industrial linkagesfrom Leontief inverse matrix$(\mathbf{I}-\mathbf{A})^{-1}$.As an illustration, Table A.III in appendix provides regional Leontief inverse matrix.

According to Hirschman, priority is given to the sectors with the highest total backward linkage while making development decisions. Regarding these analyses,**the total backward linkage**of the sectors in the 10 provinces affected by the earthquakes and the region are shown together in Table VII. Accordingly, the sectors with the highest total backward linkage in each province are electricity, gas, steam, water, and sewerage, manufacturing industry sector, construction and public works. It was observed that this situation is the same throughout the region. The sectors with a total backward linkage above the average throughout the region are the manufacturing industry, electricity, gas, steam, water, and sewage, construction and public works, transportation and storage, accommodation

and food service activities,and other service activities. These are the sectors that demand the most intermediate inputs from other sectors and have priority in determining the key sectors.

Table VII: Affected by EarthquakesTotal Backward Linkage of Sectors in 10 Provinces and the Region

Industries	Adana	Adıyaman	Diyarbakır	G.antep	Hatay	K.maraş	Kilis	Malatya	Osmaniye	Ş.urfa	Region-wide
Agriculture, Forestry, and Fishing	1,613	1,647	1,412	1,436	1,495	1,627	1,350	1,594	1,618	1,433	1,660
Mining and Quarrying	1,650	1,698	1,507	1,490	1,512	1,650	1,367	1,620	1,582	1,408	1,708
Manufacturing Industry	**2,278**	**2,394**	**1,869**	**2,015**	**1,950**	**2,345**	**1,688**	**2,275**	**2,241**	**1,750**	**2,405**
Electricity, Gas, Steam, Water, and Sewage	**2,450**	**2,558**	**2,442**	**1,582**	**2,145**	**2,524**	**1,793**	**2,101**	**2,191**	**2,077**	**2,496**
Construction and Public Works	**2,143**	**2,259**	**1,785**	**2,090**	**1,898**	**2,220**	**1,706**	**2,213**	**2,186**	**1,720**	**2,289**
Wholesale and Retail Trade	1,569	1,577	1,459	1,469	1,467	1,522	1,323	1,523	1,477	1,392	1,597
Transport and Storage	**1,749**	**1,823**	**1,622**	**1,653**	**1,683**	**1,690**	**1,522**	**1,674**	**1,697**	**1,572**	**1,856**
Accommodation and Food Service	**1,847**	**1,900**	**1,567**	**1,709**	**1,632**	**1,867**	**1,441**	**1,836**	**1,810**	**1,498**	**1,913**
Information and Communication	1,422	1,374	1,351	1,331	1,314	1,375	1,225	1,425	1,353	1,292	1,416
Finance and Insurance Activities	1,452	1,308	1,330	1,314	1,336	1,303	1,168	1,377	1,296	1,280	1,379
Real Estate Activities	1,322	1,339	1,243	1,260	1,248	1,323	1,180	1,311	1,297	1,203	1,343
Professional, Scientific, and Technical Activities	1,536	1,480	1,417	1,420	1,443	1,447	1,299	1,491	1,450	1,384	1,531
Administrative and Support Service Activities	1,383	1,388	1,271	1,336	1,302	1,354	1,219	1,376	1,356	1,243	1,404
Public Administration and Defense	1,575	1,597	1,456	1,497	1,488	1,549	1,373	1,553	1,551	1,423	1,620
Education Services	1,250	1,261	1,220	1,188	1,216	1,234	1,164	1,218	1,223	1,195	1,266
Human Health and Social Work Activities	**1,685**	1,701	1,511	**1,584**	1,537	**1,664**	**1,406**	**1,668**	**1,641**	1,452	1,721
Culture, Art, Entertainment, Recreation, and Sports	1,604	1,569	1,480	1,446	1,506	1,519	1,357	1,572	1,530	1,436	1,591
Other Service Activities	**1,763**	**1,768**	1,524	**1,663**	**1,589**	**1,727**	**1,420**	**1,745**	**1,706**	**1,480**	**1,809**
Average	**1,683**	**1,702**	**1,526**	**1,527**	**1,542**	**1,663**	**1,389**	**1,643**	**1,623**	**1,458**	**1,722**

Source: The table was created by the authors

The total forward linkage of the sectors in the 10 provinces affected by the earthquakes and the region are shown together in Table VIII. And accordingly, the sectors with the highest total forward linkage in each province are the manufacturing industry, electricity, gas, steam, water, and sewage, and transportation and storage sectors. It was observed that this situation is the same across the region. The sectors with a total forward linkage above the average throughout the region are agriculture, forestry, and fishing, mining and quarrying, manufacturing industry, electricity, gas, steam, water, and sewage, wholesale and retail trade, transportation and storage sectors. These are the sectors in which other sectors demand the most intermediate inputs.

Table VIII: Affected by EarthquakesTotal Forward Linkage of Sectors in 10 Provinces and the Region

Industries	Adana	Adıyaman	Diyarbakır	G.antep	Hatay	K.maraş	Kilis	Malatya	Osmaniye	Ş.urfa	Region-wide
Agriculture, Forestry, and Fishing	**1,733**	**1,788**	1,447	1,364	**1,589**	**1,776**	**1,399**	**1,716**	**1,762**	**1,555**	**1,789**
Mining and Quarrying	**1,793**	**2,053**	**1,839**	1,186	1,483	**2,040**	1,305	**1,900**	1,362	1,233	**1,878**
Manufacturing Industry	**5,034**	**5,681**	**3,126**	**5,277**	**3,740**	**5,563**	**3,289**	**5,551**	**5,430**	**3,041**	**5,697**
Electricity, Gas, Steam, Water, and Sewage	**2,777**	**2,832**	**2,594**	**1,728**	**2,434**	**2,816**	**2,009**	**2,094**	**2,765**	**2,538**	**2,833**
Construction and Public Works	1,438	1,488	1,478	1,459	1,474	1,485	**1,447**	1,476	1,478	**1,466**	1,491
Wholesale and Retail Trade	**1,915**	1,670	**1,691**	**1,735**	**1,824**	1,651	1,331	**1,786**	**1,820**	**1,474**	**1,846**
Transport and Storage	**1,990**	**2,235**	**2,133**	**1,808**	**2,150**	**1,846**	**1,977**	**1,752**	**1,861**	**2,069**	**2,257**
Accommodation and Food Service	1,132	1,100	1,110	1,082	1,135	1,090	1,080	1,135	1,085	1,069	1,108
Information and Communication	1,197	1,108	1,231	1,127	1,103	1,177	1,088	1,269	1,139	1,134	1,168
Finance and Insurance Activities	1,508	1,183	1,275	1,278	1,333	1,208	1,086	1,370	1,274	1,234	1,335
Real Estate Activities	1,440	1,472	1,460	1,365	1,310	1,424	1,114	1,415	1,120	1,207	1,398
Professional, Scientific, and Technical Activities	1,589	1,320	1,399	1,415	1,467	1,319	1,236	1,370	1,453	**1,547**	1,473
Administrative and Support Service Activities	1,445	1,432	1,424	1,415	1,423	1,283	**1,393**	1,416	1,388	1,410	1,445
Public Administration and Defense	1,028	1,029	1,029	1,028	1,029	1,029	1,017	1,030	1,017	1,028	1,030
Education Services	1,043	1,046	1,045	1,045	1,046	1,043	1,043	1,046	1,046	1,045	1,047
Human Health and Social Work Activities	1,068	1,068	1,068	1,068	1,068	1,068	1,068	1,068	1,068	1,068	1,068
Culture, Art, Entertainment, Recreation, and Sports	1,103	1,083	1,079	1,043	1,090	1,077	1,061	1,116	1,091	1,066	1,079
Other Service Activities	1,057	1,052	1,037	1,060	1,062	1,046	1,057	1,063	1,046	1,054	1,060
Average	**1,683**	**1,702**	**1,526**	**1,527**	**1,542**	**1,663**	**1,389**	**1,643**	**1,623**	**1,458**	**1,722**

Source: The table was created by the authors

The sectors for which their total forward and backward linkages were determined are categorized as per Hirschman's categorization in the following manner:

Category I*:sectors with high backward and forward linkages;*

Category II*: sectors with high backward linkage and low forward linkage;*

Category III*: sectors with high forward linkage and low backward linkage;*

Category IV *:sectors*with *low backward and forward linkages.*

Since the sectors in **Category I** and **Category II** have the quality of feeding and stimulating each other's production, these should be taken into account primarily in investment decisions. Accordingly, the sectors in **Category I and Category II** in each of the 10 provinces affected by the earthquakes and the regionare shown together in Table IX. Sectors in **Category I** in each province and across the region are manufacturing industry, electricity, gas, steam, water, and sewage, transportation and storage sectors. However, since the construction and public works sector in Kilis and Şanlıurfa provinces is also in **Category I**, it is classified as a key sector.

Sectors in **Category II** in Adana, Gaziantep, Kahramanmaraş, Malatya, and Osmaniye are construction and public works, accommodation and food service activities, human health and social work activities, and other service activities sectors. Category II sectors in Adıyaman, Hatay, and the region are construction and public works, accommodation and food service activities, and other service activities sectors. Construction and public works, accommodation and food service activities are the sectors in Category II in Diyarbakır. Category II sectors in Kilis include accommodation and food service activities, human health and social work activities, and other service activities. In Şanlıurfa, this category includes accommodation and food service activities, and other service activities sectors, these sectors are classified as key sectors.

Table IX: Affected by EarthquakesKey Sectors in Category I and Category II in 10 Provinces and the Region

Industries	Category I											Category II										
	Adana	Adıyaman	Diyarbakır	Gaziantep	Hatay	Kahramanmaraş	Kilis	Malatya	Osmaniye	Şanlıurfa	Region-wide	Adana	Adıyaman	Diyarbakır	Gaziantep	Hatay	Kahramanmaraş	Kilis	Malatya	Osmaniye	Şanlıurfa	Region-wide
Agriculture, Forestry, and Fishing																						
Mining and Quarrying																						
Manufacturing Industry	X	X	X	X	X	X	X	X	X	X	X											
Electricity, Gas, Steam, Water, and Sewage	X	X	X	X	X	X	X	X	X	X	X											
Construction and Public Works							X			X		X	X	X	X	X	X		X	X		X
Wholesale and Retail Trade																						
Transport and Storage	X	X	X	X	X	X	X	X	X	X	X											
Accommodation and Food Service												X	X	X	X	X	X	X	X	X	X	X
Information and Communication																						
Finance and Insurance Activities																						
Real Estate Activities																						
Professional, Scientific, and Technical Activities																						
Administrative and Support Service Activities																						
Public Administration and Defense																						
Education Services																						
Human Health and Social Work Activities												X			X		X	X	X	X		
Culture, Art, Entertainment, Recreation, and Sports																						
Other Service Activities												X	X		X	X	X	X	X	X	X	X

Source: The table was created by the authors

Within the scope of the study, 62 sectors in the 2012 National Input-Output table were aggregated into 18 sectors in order to categorize the data in line with the SSI data, so the key sectors handled in a very general category. However, the regional specialization coefficients (LQ) calculated for 99 sectors based on the SSI data for 10 provinces and the region are shown in Table A.IV in appendix. According to this table, it is observed that there is also a differentiation in the sub-sectors within the priority sectors determined in the 18 sectoral classification and those with high specialization values are highlighted in bold and dark tones. Sectors highlighted according to their level of specialization should be considered as sectors that should be given priority. Considering the region in general, in the *manufacturing industry sector,* which is one of the key sectors, food products manufacturing, beverage manufacturing, textile products manufacturing, leather and related products manufacturing, paper and paper products manufacturing, chemical products manufacturing, rubber and plastic products manufacturing, basic metal industry; in the *electricity, gas, steam, water, andsewage sector,* which is one of the key sectors, treatment and distribution of electricity, gas, steam, and air systems, water collection production distribution; in the *construction and public works sector,* which is one of the key sectors, construction of buildings, construction of non-building structures; *in the transportation and storage sector*, which is one of the key sectors, landtransportation and pipeline transportation activities stand out (Table A.IV).Identifying priority areaswithin these sub-sectors in the key sectors and prioritizing these areas in incentives would be the most appropriate strategy for a faster recovery locally and across the region. In addition, for the priority sub-sectors under the key sectors that were determined as a result of the I-O analysis in the policies for the provinces, the sectors above the value of 1 in descending order of LQ values of the relevant province in Table A.IV should be selected.

V. DISCUSSION

The economic structure of the provinces of Adana, Adıyaman, Diyarbakır, Gaziantep, Hatay, Kahramanmaraş, Kilis, Malatya, Osmaniye, Şanlıurfa, and the sectors in the region covering these provinces which were affected by two major earthquakes in the provinces of Kahramanmaraş and Gaziantep in the Southeastern Anatolia Region were analyzed with the I-O model. In the economies of these provinces and the region, it was found that the manufacturing industry in general, electricity, gas, steam, water, and sewage, transportation and storage,andthe mining and quarrying sectors are the sectors with high *total forward linkage*.These are the sectors from which other sectors demand the most intermediate

inputs.On the other hand, the sectors with the highest *total backward linkage*are electricity, gas, steam, water, and sewage,manufacturing industry,and construction and public works sectors. These sectors are the sectors that demand the most intermediate inputs from other sectors.

Despite the fact that it is not known at this stage how much the 10 provinces affected by the earthquakes suffered economically, when the pre-earthquake situation of the provinces is analyzed; however, the sectors that were evaluated as key sectors need to be prioritized at the initial phase in order to develop the economy of the region and bring the region to its pre-disaster state in a shorter time. According to the four categories determined by Hirschman, the first category which includes the manufacturing industry, electricity, gas, steam, water, and sewage, and transportation and storage sectors; and second category encompassing construction and public works in the category, accommodation and food service activities,and other service activities sectors are the key sectors. In case of any negative impact on the economy, transferring the available scarce resources to these sectors will enable the local economy of the provinces and the region to recover in a shorter time.

In order to compile the data used within the scope of this study so as to enhance its estimation, the sectors were discussed under 18 headings in a general framework. However, there are sectors that provide specialization by concentrating locally in 10 provinces and the region among the sub-sectors within these 18 titles. These sub-sectors are shown in Table A.IV in appendix. In the table, the sub-sectors with an LQ value above 1 in the region are colored, and these sectors with an LQ value above 1 in each province are expressed in bold. For additional details, a pre-implementation review of the sub-sectors under the main sector of the relevant table would be helpful for the right policies.

It is clear that earthquakes cause a lot of structural damage at places where they occur. After the February 6, 2023 earthquakes, meeting the shelter needs of earthquake victims and renewing the building stock is a priority state policy. In order to keep the population in the earthquake zone, to prevent migration and to return the outgoing population, the sectoral structure should also be given importance. In future studies, calculations can be made In future studies, calculations can be made taking into account the post-earthquake economic impacts, but this is beyond the scope of this study. In this connection, as a future study, this work can be developed further in this light when more reliable information about the effects of earthquakes is obtained.

APPENDIX

Table A.I: National Input Coefficients Matrix (A Matrix)

Sector Code	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1	0,165	0,004	0,072	0,000	0,000	0,001	0,000	0,041	0,000	0,000	0,000	0,002	0,004	0,012	0,002	0,001	0,003	0,001
2	0,003	0,059	0,061	0,183	0,016	0,003	0,002	0,001	0,000	0,000	0,011	0,002	0,001	0,000	0,000	0,003	0,000	0,003
3	0,118	0,134	0,366	0,021	0,309	0,085	0,136	0,237	0,053	0,019	0,065	0,059	0,088	0,086	0,025	0,137	0,048	0,185
4	0,008	0,030	0,050	0,431	0,002	0,016	0,003	0,028	0,011	0,009	0,021	0,008	0,003	0,021	0,025	0,027	0,022	0,014
5	0,002	0,003	0,002	0,017	0,159	0,010	0,002	0,006	0,007	0,003	0,019	0,008	0,003	0,045	0,005	0,006	0,035	0,006
6	0,028	0,036	0,057	0,009	0,047	0,025	0,052	0,048	0,008	0,007	0,013	0,017	0,023	0,028	0,005	0,025	0,011	0,040
7	0,015	0,060	0,037	0,008	0,020	0,065	0,213	0,015	0,014	0,011	0,005	0,043	0,015	0,031	0,029	0,010	0,024	0,032
8	0,000	0,002	0,002	0,001	0,001	0,008	0,002	0,008	0,005	0,007	0,000	0,049	0,010	0,006	0,005	0,012	0,008	0,009
9	0,001	0,004	0,004	0,004	0,001	0,020	0,004	0,005	0,155	0,032	0,001	0,056	0,007	0,010	0,008	0,026	0,009	0,031
10	0,001	0,011	0,010	0,017	0,009	0,022	0,015	0,008	0,013	0,158	0,013	0,014	0,007	0,007	0,007	0,010	0,021	0,015
11	0,000	0,004	0,007	0,002	0,003	0,059	0,011	0,048	0,022	0,041	0,013	0,017	0,013	0,009	0,010	0,023	0,025	0,028
12	0,003	0,027	0,011	0,007	0,031	0,042	0,014	0,014	0,049	0,046	0,004	0,109	0,021	0,026	0,004	0,026	0,058	0,062
13	0,002	0,005	0,005	0,011	0,006	0,015	0,007	0,006	0,024	0,013	0,014	0,013	0,038	0,046	0,017	0,041	0,042	0,017
14	0,000	0,000	0,000	0,001	0,001	0,002	0,000	0,000	0,002	0,006	0,000	0,000	0,000	0,005	0,000	0,001	0,003	0,001
15	0,000	0,000	0,000	0,000	0,000	0,001	0,000	0,000	0,001	0,004	0,000	0,002	0,002	0,013	0,012	0,001	0,002	0,002
16	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,062	0,001	0,001
17	0,000	0,000	0,000	0,000	0,000	0,001	0,000	0,002	0,008	0,000	0,000	0,004	0,001	0,000	0,000	0,001	0,085	0,000
18	0,000	0,000	0,001	0,000	0,000	0,004	0,001	0,002	0,003	0,002	0,000	0,005	0,001	0,000	0,000	0,001	0,001	0,026

Source: The table was created by the authors

Table A.II: Regional Input Coefficients Matrix for the Region (A matrix)

Sector Code	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1	0,165	0,004	0,072	0,000	0,000	0,001	0,000	0,041	0,000	0,000	0,000	0,002	0,004	0,012	0,002	0,001	0,003	0,001
2	0,002	0,050	0,051	0,154	0,014	0,003	0,001	0,001	0,000	0,000	0,009	0,001	0,001	0,000	0,000	0,003	0,000	0,003
3	0,118	0,134	0,366	0,021	0,309	0,085	0,136	0,237	0,053	0,019	0,065	0,059	0,088	0,086	0,025	0,137	0,048	0,185
4	0,008	0,030	0,050	0,431	0,002	0,016	0,003	0,028	0,011	0,009	0,021	0,008	0,003	0,021	0,025	0,027	0,022	0,014
5	0,002	0,003	0,002	0,017	0,159	0,010	0,002	0,006	0,007	0,003	0,019	0,008	0,003	0,045	0,005	0,006	0,035	0,006
6	0,025	0,032	0,050	0,007	0,041	0,022	0,045	0,042	0,007	0,006	0,011	0,015	0,020	0,025	0,004	0,022	0,010	0,035
7	0,015	0,059	0,037	0,008	0,020	0,064	0,209	0,014	0,014	0,011	0,005	0,042	0,015	0,030	0,028	0,010	0,023	0,031
8	0,000	0,001	0,001	0,000	0,001	0,005	0,001	0,004	0,003	0,004	0,000	0,028	0,006	0,004	0,003	0,007	0,004	0,005
9	0,000	0,001	0,001	0,001	0,000	0,007	0,001	0,002	0,051	0,011	0,000	0,019	0,002	0,003	0,003	0,009	0,003	0,010
10	0,001	0,007	0,006	0,010	0,005	0,013	0,009	0,005	0,007	0,094	0,008	0,008	0,004	0,004	0,004	0,006	0,013	0,009
11	0,000	0,003	0,006	0,002	0,003	0,048	0,009	0,039	0,018	0,033	0,011	0,014	0,010	0,008	0,008	0,019	0,020	0,023
12	0,002	0,016	0,006	0,004	0,018	0,024	0,008	0,008	0,029	0,027	0,002	0,063	0,012	0,015	0,003	0,015	0,034	0,036
13	0,002	0,005	0,005	0,011	0,006	0,015	0,007	0,006	0,024	0,013	0,014	0,013	0,038	0,046	0,017	0,041	0,042	0,017
14	0,000	0,000	0,000	0,001	0,001	0,002	0,000	0,000	0,002	0,006	0,000	0,000	0,000	0,005	0,000	0,001	0,003	0,001
15	0,000	0,000	0,000	0,000	0,000	0,001	0,000	0,000	0,001	0,004	0,000	0,002	0,002	0,013	0,012	0,001	0,002	0,002
16	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,062	0,001	0,001
17	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,001	0,005	0,000	0,000	0,003	0,001	0,000	0,000	0,001	0,059	0,000
18	0,000	0,000	0,001	0,000	0,000	0,003	0,001	0,002	0,002	0,002	0,000	0,005	0,001	0,000	0,000	0,001	0,001	0,024

Source: The table was created by the authors

Table A.III: Regional Leontief Inverse Matrix for the Region $(\mathbf{I} - \mathbf{A})^{-1}$

Sector Code	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1	1,219	0,030	0,146	0,017	0,057	0,018	0,027	0,088	0,011	0,006	0,013	0,017	0,021	0,033	0,008	0,027	0,018	0,033
2	0,024	1,082	0,119	0,300	0,065	0,023	0,026	0,042	0,013	0,008	0,026	0,016	0,015	0,023	0,013	0,032	0,019	0,034
3	0,254	0,277	1,683	0,171	0,647	0,196	0,310	0,442	0,123	0,062	0,136	0,155	0,174	0,211	0,067	0,282	0,147	0,361
4	0,043	0,086	0,162	1,791	0,070	0,052	0,040	0,096	0,035	0,027	0,052	0,035	0,024	0,061	0,053	0,081	0,060	0,065
5	0,005	0,008	0,010	0,038	1,194	0,016	0,006	0,012	0,012	0,006	0,025	0,014	0,006	0,058	0,008	0,012	0,048	0,012
6	0,048	0,057	0,102	0,038	0,092	1,042	0,079	0,075	0,019	0,014	0,023	0,032	0,034	0,046	0,012	0,045	0,026	0,064
7	0,041	0,102	0,102	0,055	0,077	0,099	1,290	0,053	0,031	0,024	0,018	0,071	0,034	0,060	0,043	0,037	0,048	0,071
8	0,001	0,003	0,003	0,002	0,003	0,006	0,003	1,006	0,004	0,006	0,001	0,031	0,007	0,005	0,003	0,009	0,007	0,007
9	0,001	0,003	0,005	0,005	0,003	0,009	0,004	0,004	1,056	0,013	0,001	0,022	0,004	0,005	0,003	0,012	0,005	0,013
10	0,005	0,013	0,017	0,025	0,015	0,019	0,017	0,012	0,011	1,106	0,011	0,013	0,008	0,009	0,007	0,012	0,019	0,016
11	0,005	0,010	0,018	0,009	0,014	0,055	0,019	0,047	0,023	0,040	1,014	0,020	0,015	0,014	0,011	0,027	0,027	0,032
12	0,007	0,024	0,019	0,017	0,033	0,032	0,017	0,017	0,036	0,034	0,006	1,073	0,017	0,022	0,005	0,023	0,044	0,047
13	0,006	0,011	0,016	0,026	0,015	0,021	0,014	0,013	0,030	0,018	0,017	0,018	1,042	0,053	0,020	0,051	0,051	0,024
14	0,000	0,001	0,001	0,002	0,001	0,002	0,001	0,001	0,002	0,007	0,000	0,001	0,000	1,006	0,000	0,002	0,004	0,001
15	0,000	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,001	0,004	0,000	0,003	0,002	0,013	1,012	0,001	0,002	0,002
16	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	1,066	0,001	0,001
17	0,000	0,000	0,000	0,000	0,000	0,001	0,000	0,002	0,006	0,000	0,000	0,003	0,001	0,000	0,000	0,001	1,063	0,000
18	0,001	0,001	0,002	0,001	0,001	0,004	0,002	0,003	0,003	0,002	0,000	0,006	0,001	0,001	0,001	0,002	0,002	1,026

Source: The table was created by the authors

For the 10 provinces affected by the earthquakes and the region, location quotient (LQ) values for 2021 for 99 sectors included in the 2021 Social Security Institution (SSI) data are presented in Table A.IV and the employment values from which these values are calculated are presented in Table A.V. Sectors with LQ values of at 1 and more than 1are shown in bold font as they are sectors that show specialization by concentrating locally. The sectors identified as key sectors in this study are shown in light orange background color.

Table A.IV: Location Quotient (LQ) Values of 99 Sectors in 10 Provinces and the Region Affected by Earthquakes

Industries	Industries	Adana	Adıyaman	Diyarbakır	G.antep	Hatay	K.maraş	Kilis	Malatya	Osmaniye	Ş.urfa	Region-wide
Agriculture, Forestry, and Fishing	Crop and animal production, hunting and related service activities	**2.81**	**1.27**	**2.96**	0.68	**1.02**	0.96	0.76	**1.15**	0.65	**3.47**	**1.56**
	Forestry and logging	**1.80**	0.87	0.79	0.07	0.73	**1.55**	0.90	0.34	**3.68**	0.43	0.90
	Fishing and aquaculture	0.37	0.23	0.12	0.42	**1.16**	**2.01**	-	0.72	0.02	0.22	0.59
Mining and Quarrying	Mining of coal and lignite	0.43	0.08	-	-	0.00	**4.27**	-	0.27	-	-	0.54
	Extraction of crude petroleum and natural gas	0.23	**26.60**	**53.21**	-	**1.29**	-	-	-	-	**2.52**	**3.61**
	Mining of metal ores	**1.71**	**3.94**	-	0.37	0.63	0.09	-	**2.12**	0.10	-	0.82
	Other mining and quarrying	0.71	**1.98**	**3.40**	0.34	0.92	0.91	**1.01**	0.63	0.81	0.52	0.76
	Mining support service activities	0.66	**17.80**	**19.34**	0.05	0.38	0.29	-	**2.61**	0.04	0.68	**1.94**
Manufacturing Industry	Manufacture of food products	**1.15**	0.60	**1.75**	**1.49**	0.64	0.90	**1.40**	**1.41**	0.93	0.65	**1.03**
	Manufacture of beverages	**3.14**	0.34	**1.99**	0.12	0.47	0.60	-	0.98	**3.00**	0.73	**1.12**
	Manufacture of tobacco products	**1.05**	**1.48**	0.08	0.01	0.09	-	-	0.81	-	-	0.34
	Manufacture of textiles	**1.47**	**1.70**	**1.09**	**6.75**	0.23	**7.86**	**1.13**	**2.16**	**2.86**	0.62	**3.01**
	Manufacture of wearing apparel	0.77	**3.93**	**3.66**	0.25	0.07	0.51	0.32	**3.25**	0.34	**1.25**	0.94
	Manufacture of leather and related products	0.57	0.02	0.06	**2.86**	0.60	0.14	0.02	0.68	0.30	**3.82**	**1.26**
	Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials	**1.21**	0.14	**1.26**	0.81	**1.03**	0.43	0.25	0.53	0.75	0.16	0.72
	Manufacture of paper and paper products	**1.28**	0.06	**1.27**	**3,52**	0.14	**1.70**	0.08	0.33	**1.19**	0.11	**1.33**
	Printing and reproduction of recorded media	0.48	0.11	0.75	0.60	0.31	0.20	0.03	0.42	0.04	0.13	0.36
	Manufacture of coke and refined petroleum products	0.67	-	0.05	0.09	**1.04**	0.02	**1.04**	0.20	**1.00**	0.34	0.37
	Manufacture of chemicals and chemical products	**3.48**	0.09	**1.29**	**2.39**	0.62	0.46	0.93	0.16	**1.69**	0.31	**1.50**

Industries	Industries	Adana	Adıyaman	Diyarbakır	G.antep	Hatay	K.maraş	Kilis	Malatya	Osmaniye	Ş.urfa	Region-wide
Manufacturing Industry	Manufacture of basic pharmaceutical products and pharmaceutical preparations	0.45	0.67	**1.18**	0.17	-	0.08	-	0.01	0.01	0.83	0.29
	Manufacture of rubber and plastic products	**1.18**	0.16	**1.07**	**2.67**	0.57	0.37	**1.85**	0.36	0.50	0.52	**1.08**
	Manufacture of other non-metallic mineral products	0.66	**1.13**	**2.63**	0.38	0.58	**1.04**	**1.06**	0.79	0.63	0.94	0.72
	Manufacture of basic metals	0.75	0.04	**1.36**	0.33	**6.66**	0.55	0.01	0.19	**8.29**	0.16	**1.43**
	Manufacture of fabricated metal products, except machinery and equipment	**1.02**	0.33	0.92	0.39	0.57	**1.59**	0.16	0.47	**1.15**	0.23	0.67
	Manufacture of computer, electronic and optical products	0.28	-	0.77	0.24	0.05	0.01	0.03	0.08	0.00	0.53	0.20
	Manufacture of electrical equipment	0.37	0.23	0.85	0.16	0.11	0.05	0.25	0.37	0.20	0.50	0.26
	Manufacture of machinery and equipment n.e.c.	0.86	0.06	0.50	0.54	0.82	0.33	0.19	0.42	0.63	0.19	0.51
	Manufacture of motor vehicles, trailers and semi-trailers	0.47	0.08	0.25	0.09	0.65	0.01	0.05	0.04	0.25	0.05	0.22
	Manufacture of other transport equipment	0.20	0.00	0.02	0.22	0.01	0.01	0.28	0.01	0.00	0.00	0.09
	Manufacture of furniture	0.80	0.50	**2.00**	0.68	0.96	0.48	0.11	0.55	0.48	0.39	0.66
	Other manufacturing	0.67	0.06	**1.02**	0.77	0.19	**1.55**	**3.80**	0.22	0.20	0.48	0.64
	Repair and installation of machinery and equipment	0.86	0.39	**1.66**	0.38	0.57	0.62	0.06	0.44	0.29	0.52	0.56
Electricity, Gas, Steam, Water, and Sewage	Electricity, gas, steam and air conditioning supply	**1.49**	**1.66**	**5.21**	0.58	**1.17**	**4.62**	**1.17**	**1.06**	**1.72**	**2.11**	**1.66**
	Water collection, treatment and supply	**1.73**	0.29	**6.73**	0.82	**1.10**	**5.01**	-	0.54	**1.66**	0.06	**1.54**
	Sewerage	**1.60**	**1.53**	**7.38**	0.03	0.12	0.65	-	**1.00**	0.03	0.05	0.84
	Waste collection, treatment and disposal activities; materials recovery	0.96	**1.59**	**2.04**	0.63	0.84	0.87	0.58	0.28	**1.21**	0.57	0.79
	Remediation activities and other waste management services	0.93	-	**14.20**	0.01	0.36	0.04	-	-	-	-	0.80
Construction and Public Works	Construction of buildings	0.90	**1.67**	**3.60**	**1.21**	**1.15**	**1.18**	**2.11**	**1.49**	**1.48**	**1.25**	**1.21**
	Civil engineering	**1.05**	**1.46**	**4.77**	0.61	0.78	0.69	**3,53**	**1.29**	**1.27**	**1.10**	**1.04**
	Specialised construction activities	**1.08**	0.65	**2.93**	0.87	**1.28**	0.92	0.69	0.76	0.83	0.61	0.94
Wholesale and Retail Trade	Wholesale and retail trade and repair of motor vehicles	**1.22**	0.78	**3.46**	0.83	**1.27**	0.67	0.22	0.84	0.95	0.60	0.96
	Wholesale trade, except of motor vehicles and motorcycles	**1.16**	0.36	**2.14**	**1.03**	0.89	0.52	0.27	0.63	0.61	0.60	0.84
	Retail trade, except of motor vehicles and motorcycles	**1.10**	0.87	**2.31**	0.72	**1.14**	0.80	0.58	0.97	**1.08**	0.70	0.90

Industries	Industries	Adana	Adıyaman	Diyarbakır	G.antep	Hatay	K.maraş	Kilis	Malatya	Osmaniye	Ş.urfa	Region-wide
Transport and Storage	Land transport and transport via pipelines	0.93	**1.47**	**4.42**	0.94	**2.29**	0.77	**1.40**	0.80	**1.11**	**1.74**	**1.25**
	Water transport	0.52	-	-	0.02	0.30	-	-	0.04	-	0.01	0.15
	Air transport	0.40	-	-	0.01	-	0.27	-	-	-	-	0.11
	Warehousing and support activities for transportation	0.79	0.19	**1.33**	0.39	**1.86**	0.20	0.17	0.39	0.25	0.35	0.61
	Postal and courier activities	**1.00**	0.66	**2.40**	0.61	0.60	**2.63**	0.90	0.83	0.42	0.62	0.94
Accommodation and Food Service	Accommodation	0.41	0.48	**1.06**	0.40	0.60	0.26	0.84	0.50	0.28	0.41	0.42
	Food and beverage service activities	0.81	0.58	**1.87**	0.45	0.77	0.59	0.36	0.81	0.52	0.39	0.62
Information and Communication	Publishing activities	0.59	0.64	**2.68**	0.41	0.57	0.28	0.93	0.52	**1.03**	0.75	0.59
	Motion picture, video and television programme production, sound recording and music publishing activities	0.30	0.19	**1.05**	0.14	0.18	0.11	0.04	0.13	0.10	0.06	0.19
	Programming and broadcasting activities	0.18	0.04	**2.70**	0.21	0.22	0.26	0.14	0.53	0.24	0.34	0.32
	Telecommunications	0.57	0.25	**2.70**	0.53	0.53	0.30	0.50	0.19	0.83	0.65	0.55
	Computer programming, consultancy and related activities	0.29	0.19	0.52	0.19	0.10	0.32	0.03	0.67	0.08	0.18	0.24
	Information service activities	0.83	0.06	**1.79**	0.21	0.11	**1.10**	0.15	0.47	0.10	0.16	0.47
Finance and Insurance Activities	Financial service activities, except insurance and pension funding	0.69	0.30	**1.13**	0.49	0.47	0.32	0.16	0.62	0.46	0.46	0.50
	Insurance, reinsurance and pension funding, except compulsory social security	**1.46**	0.30	**1.28**	0.30	0.64	0.37	0.03	0.83	0.41	0.51	0.65
	Activities auxiliary to financial services and insurance activities	**1.05**	0.41	**1.98**	0.68	0.86	0.52	0.30	0.68	0.65	0.55	0.74
Real Estate Activities	Real estate activities	0.94	**1.26**	**3.16**	0.77	0.66	0.91	0.28	0.86	0.26	0.50	0.82
Professional, Scientific, and Technical Activities	Legal and accounting activities	**1.04**	0.51	**1.39**	**1.00**	**1.20**	0.55	0.31	0.69	0.72	0.50	0.82
	Activities of head offices; management consultancy	0.58	0.21	0.67	0.41	0.14	0.13	0.22	0.13	0.09	0.16	0.30
	Architectural and engineering activities; technical	0.77	0.66	**3.06**	0.60	0.73	0.74	0.68	0.77	0.66	0.98	0.78
	Scientific research and development	0.29	0.05	0.33	0.16	0.06	0.18	-	0.13	0.02	0.15	0.16
	Advertising and market research	0.77	0.04	0.79	0.35	0.14	0.11	0.07	0.25	0.08	0.09	0.32
	Other professional, scientific and technical activities	0.97	0.43	0.95	0.52	**1.07**	0.29	0.07	0.84	0.63	0.32	0.63

Industries	Industries	Adana	Adıyaman	Diyarbakır	G.antep	Hatay	K.maraş	Kilis	Malatya	Osmaniye	Ş.urfa	Region-wide
Professional, Scientific, and Technical Activities	Veterinary activities	**1.15**	0.90	**1.84**	0.48	0.57	0.63	0.15	0.67	0.85	**1.08**	0.76
	Rental and leasing activities	**1.10**	**1.48**	**2.44**	**1.03**	**1.38**	0.52	0.20	0.52	0.37	**1.07**	0.97
	Employment activities	0.73	0.02	0.87	0.09	0.31	0.48	0.61	0.30	**2.07**	**3.26**	0.72
	Travel agency, tour operator and other reservation service and related activities	0.24	0.66	0.89	0.19	0.57	0.29	0.08	0.25	0.11	0.31	0.30
Administrative and Support Service Activities	Security and investigation activities	**1.00**	0.59	**5.37**	**1.26**	0.59	0.75	**1.40**	0.82	0.53	0.89	**1.03**
	Services to buildings and landscape activities	**1.41**	0.55	**3.85**	**1.29**	**1.45**	0.56	**1.20**	0.85	**1.12**	**2.75**	**1.35**
	Office administrative, office support and other business support activities	0.90	**1.64**	**4.38**	0.53	0.96	0.71	**1.79**	**1.14**	0.91	**1.91**	**1.04**
Public Administration and Defense	Public administration and defence; compulsory social security	0.93	**2.18**	**8.23**	**1.16**	**1.62**	**1.62**	0.66	**2.33**	0.58	**2.92**	**1.69**
Education Services	Education	0.97	**1.35**	**5.22**	0.96	**1.47**	0.96	**3.32**	**1.04**	**1.77**	**2.31**	**1.34**
Human Health and Social Work Activities	Human health activities	**1.35**	0.99	**3.76**	**1.25**	**1.27**	0.98	**1.49**	**1.17**	**1.05**	**1.39**	**1.25**
	Residential care activities	0.95	**1.18**	**2.55**	0.55	**1.25**	**1.14**	**1.46**	**1.97**	**1.84**	0.78	**1.02**
	Social work activities without accommodation	**1.01**	**1.90**	**7.47**	**1.36**	**1.70**	**1.08**	**3.10**	**1.14**	0.90	**2.78**	**1.60**
Culture, Art, Entertainment, Recreation, and Sports	Creative, arts and entertainment activities	0.59	0.42	**1.69**	0.04	0.14	0.11	0.12	-	-	0.25	0.26
	Libraries, archives, museums and other cultural activities	0.68	0.80	**1.31**	0.28	**1.20**	0.75	**3.05**	0.95	0.65	0.46	0.67
	Gambling and betting activities	**2.39**	**1.21**	**3.68**	0.48	0.62	0.28	0.46	**1.01**	0.48	0.44	**1.02**
	Sports activities and amusement and recreation activities	0.90	0.77	**1.83**	0.47	0.93	0.87	0.43	**1.24**	**1.07**	0.75	0.79
Other Service Activities	Activities of membership organisations	0.71	**1.35**	**1.30**	**2.09**	**2.30**	0.87	**5.26**	**1.32**	0.67	**2.23**	**1.45**
	Repair of computers and personal and household goods	**1.10**	0.91	**2.38**	0.67	**1.36**	0.69	0.81	**1.62**	**1.57**	0.81	0.99
	Other personal service activities	0.99	0.52	**1.52**	0.42	0.77	0.73	0.55	0.74	0.41	0.29	0.64

Source: The table was created by the authors using SSI 2021 data

Table A.V: 2021 Employment Values of 99 Sectors in 10 Provinces and the Region Affected by Earthquakes

Industries	Industries	Adana	Adıyaman	Diyarbakır	G.antep	Hatay	K.maraş	Kilis	Malatya	Osmaniye	Ş.urfa	Region-wide	Türkiye
Agriculture, Forestry, and Fishing	Crop and animal production, hunting and related service activities	6,864	613	1,424	1,762	1,415	1,180	107	988	290	4,249	18,892	115,903
	Forestry and logging	1,449	139	125	63	334	631	42	95	547	174	3,599	38,305
	Fishing and aquaculture	108	13	7	130	194	296	-	74	1	32	855	13,878
Mining and Quarrying	Mining of coal and lignite	345	13	-	-	2	1,742	-	77	-	-	2,179	38,349
	Extraction of crude petroleum and natural gas	11	249	498	-	35	-	-	-	-	60	853	2.252
	Mining of metal ores	1,242	564	-	290	261	33	-	539	14	-	2,943	34.446
	Other mining and quarrying	973	538	924	499	722	630	80	305	205	360	5,236	65.405
	Mining support service activities	162	868	943	13	53	36	-	226	2	85	2,388	11,732
Manufacturing Industry	Manufacture of food products	12,484	1,294	3,758	17,341	3,974	4,941	878	5,398	1,868	3,555	55,491	516,398
	Manufacture of beverages	1,180	25	148	47	100	114	-	130	208	137	2,089	17,859
	Manufacture of tobacco products	140	39	2	2	7	-	-	38	-	-	228	6,357
	Manufacture of textiles	15,485	3,523	2,266	75,868	1,361	41,742	683	7,974	5,543	3,266	157,711	499,569
	Manufacture of wearing apparel	10,923	11,078	10,298	3,837	560	3,676	265	16,290	883	8,939	66,749	677,395
	Manufacture of leather and related products	857	5	18	4,620	515	106	2	363	83	2,900	9,469	71,685
	Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials	1,854	41	381	1,325	905	336	22	286	212	120	5,482	72,995
	Manufacture of paper and paper products	2003	19	392	5,882	129	1,343	7	181	342	83	10,381	74,222
	Printing and reproduction of recorded media	495	23	153	657	185	102	2	152	7	66	1,842	48,937
	Manufacture of coke and refined petroleum products	134	-	2	19	119	2	12	14	37	34	373	9.521
	Manufacture of chemicals and chemical products	7,842	40	574	5,756	795	522	121	123	702	348	16,823	107,120
	Manufacture of basic pharmaceutical products and pharmaceutical preparations	339	99	176	137	-	30	-	2	1	315	1,099	35,754
	Manufacture of rubber and plastic products	6,132	160	1,105	14,884	1,681	972	554	659	483	1,367	27,997	247,522
	Manufacture of other non-metallic mineral products	3,304	1,118	2,607	2,062	1,662	2,633	306	1,390	585	2,379	18,046	238,127
	Manufacture of basic metals	3,027	35	1,078	1,418	15,295	1,117	3	271	6,153	318	28,715	191.351

Industries	Industries	Adana	Adıyaman	Diyarbakır	G.antep	Hatay	K.maraş	Kilis	Malatya	Osmaniye	Ş.urfa	Region-wide	Türkiye
Manufacturing Industry	Manufacture of fabricated metal products, except machinery and equipment	9,143	577	1,620	3,709	2,938	7,192	84	1,470	1,905	1,030	29,668	425,733
	Manufacture of computer, electronic and optical products	328	-	180	298	37	4	2	34	1	315	1,199	56,275
	Manufacture of electrical equipment	1,436	178	643	647	239	104	55	498	142	968	4,910	182.995
	Manufacture of machinery and equipment n.e.c.	3,762	54	430	2,508	2,030	718	49	646	509	419	11,125	207,473
	Manufacture of motor vehicles, trailers and semi-trailers	2,361	79	252	487	1,858	27	15	66	234	129	5,508	238,098
	Manufacture of other transport equipment	319	1	5	381	6	6	26	5	1	4	754	77,560
	Manufacture of furniture	3,179	393	1,566	2,876	2,167	961	25	763	350	776	13,056	188,677
	Other manufacturing	1,152	19	347	1,421	191	1,349	376	131	64	412	5,462	81.673
	Repair and installation of machinery and equipment	2,890	257	1,106	1,369	1,090	1,065	12	527	183	890	9,389	160,289
Electricity, Gas, Steam, Water, and Sewage	Electricity, gas, steam and air conditioning supply	3,646	805	2,525	1,521	1,638	5,731	165	914	779	2,600	20,324	116.618
	Water collection, treatment and supply	366	12	282	187	133	537	-	40	65	6	1,628	10,079
	Sewerage	753	142	687	17	32	154	-	165	3	12	1,965	22,390
	Waste collection, treatment and disposal activities; materials recovery	1,777	581	742	1,246	888	812	62	184	411	529	7,232	87,711
	Remediation activities and other waste management services	126	-	381	1	28	3	-	-	-	-	539	6,456
Construction and Public Works	Construction of buildings	19,305	7,049	15,198	27,633	14,036	12,732	2,598	11,222	5,838	13,391	129,002	1,016,670
	Civil engineering	7,116	1,947	6,353	4,379	2,987	2,353	1,373	3,061	1,574	3,739	34,882	320,772
	Specialised construction activities	6,636	789	3,565	5,731	4,491	2,853	244	1,638	944	1,905	28,796	293,236
Wholesale and Retail Trade	Wholesale and retail trade and repair of motor vehicles and motorcycles	6,481	815	3,639	4,700	3,855	1,798	66	1,568	928	1,608	25,458	252,960
	Wholesale trade, except of motor vehicles and motorcycles	19,138	1,163	6,995	18,118	8,387	4,360	253	3,669	1,872	4,989	68,944	784,830
	Retail trade, except of motor vehicles and motorcycles	33,882	5,292	14,071	23,765	20,018	12,506	1,031	10,486	6,146	10,928	138,125	1.466.382
Transport and Storage	Land transport and transport via pipelines	12,169	3,805	11,418	13,091	17,105	5,100	1,055	3,656	2,665	11,429	81,493	620,859
	Water transport	189	-	-	9	63	-	-	5	-	2	268	17,411

Industries	Industries	Adana	Adıyaman	Diyarbakır	G.antep	Hatay	K.maraş	Kilis	Malatya	Osmaniye	Ş.urfa	Region-wide	Türkiye
Transport and Storage	Air transport	243	-	-	5	-	82	-	-	-	-	330	28,792
	Warehousing and support activities for transportation	4,973	235	1,647	2,643	6,672	625	62	871	290	1,111	19,129	298,361
	Postal and courier activities	1,666	218	795	1,097	571	2,224	87	491	129	520	7,798	79,542
Accommodation and Food Service	Accommodation	2,302	534	1,183	2,422	1932	733	271	992	292	1,157	11,818	267,742
	Food and beverage service activities	12,737	1,783	5,768	7,453	6,887	4,666	321	4,436	1,511	3,055	48,617	743,975
Information and Communication	Publishing activities	318	68	286	235	174	75	29	99	102	203	1,589	25,634
	Motion picture, video and television programme production, sound recording and music publishing activities	117	15	82	58	40	21	1	18	7	12	371	18,786
	Programming and broadcasting activities	46	2	133	56	32	33	2	46	11	42	403	11,847
	Telecommunications	377	33	350	370	200	100	19	43	101	215	1,808	31,192
	Computer programming, consultancy and related activities	851	109	298	603	158	466	5	678	45	268	3,481	137,868
	Information service activities	390	6	166	107	30	260	4	78	9	38	1,088	22,303
Finance and Insurance Activities	Financial service activities, except insurance and pension funding	1,281	112	416	972	504	297	17	405	159	430	4,593	88,385
	Insurance, reinsurance and pension funding, except compulsory social security	759	31	131	164	189	96	1	151	39	132	1,693	24,697
	Activities auxiliary to financial services and insurance activities	1,280	99	476	887	599	317	21	291	146	337	4,453	57,736
Real Estate Activities	Real estate activities	3,237	859	2,152	2,824	1,302	1,593	55	1,038	164	869	14,093	163,940
Professional, Scientific, and Technical Activities	Legal and accounting activities	3,781	362	993	3,860	2,473	1,014	64	873	480	909	14,809	172.228
	Activities of head offices; management consultancy activities	2,521	178	571	1,922	354	282	56	199	69	354	6,506	206.110
	Architectural and engineering activities; technical testing and analysis	2,915	493	2,274	2,401	1,564	1,406	147	1,015	457	1,860	14,532	178,718
	Scientific research and development	99	3	22	58	11	31	-	15	1	25	265	16,034
	Advertising and market research	973	10	197	474	103	67	5	111	19	56	2015	59,735
	Other professional, scientific and technical activities	1,001	87	194	572	630	151	4	303	119	165	3,226	49,037

Industries	Industries	Adana	Adıyaman	Diyarbakır	G.antep	Hatay	K.maraş	Kilis	Malatya	Osmaniye	Ş.urfa	Region-wide	Türkiye
Professional, Scientific, and Technical Activities	Veterinary activities	266	41	84	118	75	74	2	54	36	125	875	10,964
	Rental and leasing activities	578	154	254	580	414	137	6	97	36	284	2,540	25,011
	Employment activities	1,407	6	330	194	337	466	68	203	733	3,149	6,893	91,273
	Travel agency, tour operator and other reservation service and related activities	254	136	183	207	339	152	5	93	21	165	1,555	49,597
Administrative and Support Service Activities	Security and investigation activities	5,194	604	5,523	7,004	1,765	1976	420	1,493	508	2,317	26,804	247,299
	Services to buildings and landscape activities	14,338	1,096	7,732	14,027	8,419	2,896	706	3,036	2,103	14,069	68,422	483.775
	Office administrative, office support and other business support activities	9,153	3,301	8,805	5,714	5,543	3,658	1,050	4,078	1,711	9,752	52,765	483.345
Public Administration and Defense	Public administration and defence; compulsory social security	5,902	2,712	10,253	7,831	5,850	5,155	240	5,169	672	9,250	53,034	299,901
Education Services	Education	14,366	3,931	15,224	15,165	12,350	7,151	2,825	5,407	4,827	17,133	98,379	701.985
Human Health and Social Work Activities	Human health activities	23,459	3,395	12,869	23,203	12,589	8,588	1,493	7,160	3,355	12,095	108,206	824,215
	Residential care activities	973	239	515	603	727	590	86	710	347	402	5,192	48,632
	Social work activities without accommodation	1,477	550	2,166	2,137	1,424	801	262	589	243	2,048	11,697	69,729
Culture, Art, Entertainment, Recreation, and Sports	Creative, arts and entertainment activities	164	23	93	11	23	15	2	-	-	35	366	13,236
	Libraries, archives, museums and other cultural activities	74	17	28	32	74	41	19	36	13	25	359	5,140
	Gambling and betting activities	270	27	82	58	40	16	3	40	10	25	571	5,356
	Sports activities and amusement and recreation activities	985	166	395	554	581	482	27	478	215	412	4,295	51,965
Other Service Activities	Activities of membership organisations	994	372	358	3,107	1,829	610	422	644	171	1,562	10,069	66,158
	Repair of computers and personal and household goods	1,278	208	544	829	901	401	54	657	335	474	5,681	54,997
	Other personal service activities	2,378	247	721	1,094	1,058	885	76	627	183	349	7,618	114.411
Total		**338,884**	**66,916**	**183,177**	**362,357**	**193,284**	**171,182**	**19,512**	**119,047**	**62,449**	**170,297**	**1,687,105**	**16,099,880**

Source: SSI, 2021

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