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STRUCTURAL ECONOMIC ANALYSIS OF LOGISTICS SECTOR IN TURKEY: INPUT-OUTPUT ANALYSIS

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ABSTRACT

In terms of its contribution to the economy, logistics is a sector with a high back-and-forth linkage. Therefore, there is need for a faster, less costly and systematic logistics network for comprehensive development of key sectors that play crucial role in economic development. While logistics sector's share in economy is 12% in developed economies, it is only 8% in Turkey. This indicates that logistics sector does not receive sufficient importance in Turkey. This study aims to analyze the logistics sector in Turkey from a structural point of view, to determine its structural relations with other sectors, and to point out the connections with the sectors within the context of Input-Output Analysis. The Input-Output tables derived from the World Input-Output Data Bank are the basic data used in this study. First, we prepared an Industrial Operations Table and then we obtained Leontief Matrix and Leontief Inverse Matrix by mathematical formal operations. In addition, we calculated instruments such as production, income multipliers and coefficients of economic impact. Finally we evaluated and interpreted the obtained results.

Key Words: Logistics sector, Input-Output, Leontief Matrix, Structural relations

1. INTRODUCTION

Today, while globalization and competition are increasing rapidly, several concepts such speed, cost, reliability, quality and flexibility have become global catch words within supply and distribution processes. Logistics is an unprecedented and non-stop activity which continues 52 weeks of the year, 7 days of the week and 24 hours of the day that on earth (Bowersox et al., 2002: 31). Global trade has increased countries' share of Gross Domestic Product (GDP). Meanwhile, the transportation sector -one of the main cost elements- has undergone transformation and become the logistics sector which includes freight and passenger transport and warehousing.

Logistics expenditures in the world logistics market are increasing gradually. The annual growth rate of logistics market is 7-9% in Europe, 15% in North America and 20% in Asia (Ministry of Transport, 2015).

According to statistics of the Turkish Statistical Institute (TURKSTAT), the logistics sector in Turkey amounted USD 98 billion in 2013, while its share in GDP was 12.3%. In 2014, Turkey's GDP was 1,750 billion Turkish Liras (TL) at current prices, and 12% (210 billion TL) of it came from the logistics (transport and storage) sector. According to the 2015 data of the International Transportation Association, transportation and logistics sectors, and their subsidiaries employ close to 1 million people in Turkey. The general market volume of transportation and logistics sector in Turkey is estimated to be 258 billion dollars, while the logistic service provider market is around 22 billion dollars. According to the World Bank Logistics Performance Index, Turkey ranked 34th among 155 countries in 2007. In 2012, it ranked 27th with an overall logistics score of 3.51. In 2014, it ranked 30th with an overall logistics score of 3.50 among 160 countries.

This study aims to analyze the logistics sector in Turkey from a structural point of view, to reveal the structural logistics-related relations with other sectors, and finally to predict the connections between the sectors within the framework of Input-Output Analysis. Input-Output Tables are used to analyze the productional structure of a sector, to show intersectoral relations, and to examine productional structures of all sectors in the economy. In developing countries such as Turkey, the logistics sector has significant structural links with other sectors. It is important to know the industries that provide necessary input for production within the sector. Moreover, it is essential to identify which sector specific activities are requested by the industry. In addition, determining leading sub-sectors in the logistics sector is of vital importance in order to plan the investments in this sector. The Input-Output tables derived from the World Input-Output Data Bank are the basic data we used in this study. First of all, we prepared an Industrial Operations Table and then we obtained Leontief Matrix and Leontief Inverse Matrix by mathematical formal operations. In addition, we calculated instruments such as production, income multipliers and coefficients of economic impact. Finally we evaluated and interpreted the obtained results.

2. MATERIAL METHOD

The historical root of the Input-Output Analysis dates back to Dr. Quesnay's "Tableau Economique" in 1758. In his table, Dr Quesnay divided the economy into three classes, in which he examined the flows of goods and services among the classes. However, it was Leon Walras that did the the first comprehensive study in the field of Input-Output analysis.

In his general equilibrium analysis, Walras attempted to explain mathematically the relation between producer and consumer sectors by means of simultaneous linear equations. These studies served as a source of inspiration for Russian-American American Economist Professor Wassily W. Leontief in his Input-Output Analysis. The input-output model first developed by Wassily Leontief can be described as a general equilibrium model examining the cross-linking between production and consumption units that constitute economic construction. It focuses on economy, multi-sectoral and quantitative aspects. Later, in the 1930s, Leontief developed and formulated the Input-Output Tables (Özdil 1993: 112). In his works of 1941, 1951 and 1953, he developed the present- day model.

Economy is composed of many sectors which are in constant relation with each other in terms of production and consumption. Input-Output Tables not only enable us to analyze the relationship between input quantities and production quantities of the sectors, but also point out key sectors that deserve priority (Şatıroğlu, 1981).

The rows in the Input-Output Table show how the output of the sector in that line is divided into the production of the other sectors and the end-use, i.e. the demand for the output of the sector in question. Columns, on the other hand, indicate a breakdown of intermediate and basic inputs used by the related sector (Aydoğuş, 2010). In other words, the rows refer to the distribution of output from the sector, while columns represent the input composition that the industry needs for output (Miller and Blair, 1985).

In this study, we compiled Input-Output Tables from the last published World Output-Input Data Bank and reduced them to nine sectors. We applied mathematical operations on the matrices obtained from the aggregate Input-Output Tables to calculate the Matrix of Input Coefficients, Leontief Matrices and Leontief Inverse Matrices, which determine the logistics sector's position in the country's economy and its relation to other sectors. We analyzed the matrices and interpreted our findings.

Table. 1. Classification of the logistics sector

Agriculture
Mining
Production
Construction
Wholesale-Retail sector
Accommodation
Logistics
Real Estate-Leasing-Banking-Finance
Education-Security-Health sectors

In the aggregated Input-Output Matrix (Table 1) that we used to compute the Leontief Inverse Matrix, the set of simultaneous equations employed for the solution of the matrix algebra in the simultaneous equations system of each element involved is as follows:

$$x_{11} + x_{12} + x_{13} + Y_1 = X_1$$

$$x_{21} + x_{22} + x_{23} + Y_2 = X_2$$

$$x_{31} + x_{32} + x_{33} + Y_3 = X_3 \ldots..$$

(1) Here ;

x_{ij} = sales from i sector (row) to j sector (column)

Y_i = final demand sales from sector i

X_i = total output of the i sector

The elements in the tables: Aij = xij / Xj refers to inter-sector relationships. This equation can be rearranged.

$x_{ij} = a_{ij} . X_j$ here sales from sector *j* to sector *i* depend on the output quantity of sector j, and it expresses the technical coefficients of sector j's input requirement.

When a_{ij}s are placed, equivalence for the following producer sectors can be rewritten as follows

$$a_{11}X_1 + a_{12}X_2 + a_{13}X_3 + Y_1 = X_1$$

$$a_{21}X_1 + a_{22}X_2 + a_{23}X_3 + Y_2 = X_2$$

$$a_{31}X_1 + a_{32}X_2 + a_{33}X_3 + Y_3 = X_3 \quad ..... \quad (2)$$

(2) equality (2) indicates the interconnectivity of each sector over all sectors. Because a sector's output level depends on other sectors' output level. For this reason, if the final demand (Yi) is left on the right part of the equation.

$$X_1 – a_{11}X_1 –a_{12}X_2 – a_{13}X_3 = Y_1$$

$$– a_{21}X_2 + X_2 - a_{22}X_2 – a_{33}X_3 = Y_2$$

$$– a_{31}X_1 + a_{32}X_2 +X_3 – a_{33}X_3 = Y_3 \quad ..... \quad (3)$$

or,

$$(1-a_{11})X_1 - a_{12}X_2 - a_{13}X_3 = Y_1$$

$$-a_{21}X_1 + (1-a_{22})X_2 – a_{23} Y_3 = Y_2$$

$$-a_{31}X_1 – a_{32}X_2 + (1-a_{33}) X_3 = Y_3 \quad ..... \quad (4)$$

Matrix notation can be used to simplify the system.

$$\begin{bmatrix} (1-a_{11}) & -a_{12} & -a_{13} \\ -a_{21} & (1-a_{22}) & -a_{23} \\ -a_{31} & -a_{32} & (1-a_{33}) \end{bmatrix} \bullet \begin{bmatrix} X_1 \\ X_2 \\ X_3 \end{bmatrix} = \begin{bmatrix} Y_1 \\ Y_2 \\ Y_3 \end{bmatrix}$$

or it can be simplified further as

$$*A\ X=Y \quad .... \quad (5)$$

(5) The elements of the matrix *A are similar to those of the Technical Coefficients Matrix calculated from the Industrial Operations Table. This (*A) matrix differs from the Technical Coefficients Matrix: We subtract the diagonal elements of the matrix *A from number 1. The second difference is that the sign of the other elements is negative except for the diagonal elements. Input Coefficients (Technical Coefficients) Matrix is named A Matrix. *A matrix in Equation (5) is the matrix (1-A), which is called the LEONTIEF Matrix. This matrix can be found as follows: The diagonal elements of the Leontief matrix are positive while its other elements are negative (Haeussler and Paul 1987).

$$(1-A) = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix} - \begin{bmatrix} a_{11} & a_{12} & a_{13} \\ a_{21} & a_{22} & a_{23} \\ a_{31} & a_{32} & a_{33} \end{bmatrix}$$

Thus equation (5) can be written as

$$(1-A)\ X = Y \quad .... \quad (6)$$

$$(1-A) = *A$$

If Equation (6) is solved for equilibrium output level X,

$X = (1\text{-}A)^{-1} Y$..... (7) is obtained.

$X = (1\text{-}A)^{-1} Y$..... (7) is obtained.

Equation (7) is the equilibrium solution equation of the input-output system. We can use this equation to find the necessary amount (in monetary terms) to increase the output of all other sectors when the final demand (Y) changes (for example 1 unit increase). In Equation **(**1-A)$^{-1}$Leontief is called the inverse matrix. This Key Matrix (Leontief inverse matrix) shows the total economic contribution of all sectors of the economy in the level of final demand. The row and column totals of the elements of this matrix indicate the increase in production in all related sectors as direct (primary impact) and indirect contributions (secondary, tertiary + effects) (Jones 1997).

3. INPUT-OUTPUT ANALYSIS OF LOGISTICS SECTOR

In the Input-Output studies, aggregation is the process of combining similar sectors into tables. According to this process, the sectors that are considered similar in terms of input-output structure are aggregated. Various circumstances, such as the purpose of the study and the ease of computing and data facilities, affect the level of aggregation. Therefore, every Input-Output is a modalized aggregate model to a certain extent (Kayacan, 2007).

In the first phase of this study, we created an Industrial Operations Table required for the start of Input-Output Analysis. The composition of inputs of a sector from a table of nine sectors of aggregated Industrial Operations is located at the column of the related sector; the distribution of outputs of a sector is located at the column of the sector in question. Gross value added is one of the most useful sections of the inter-sectoral operations table. Although this section is not sine qua non essential for the Leontief Matrix, it is of great importance in terms of specifying the added value the sector creates. Gross value added elements include salary and wage payments, depreciation, interest, profits and indirect taxes.

Distribution of outputs of the sectors analyzed in the Industrial Operations Table indicate that use of a sector output as an intermediate input to other sectors points out an intensive relationship in terms of sectoral integration. In fact, intensive sectoral relations reflect the level of development in the economy.

We obtained a Direct Input Coefficient Matrix from the Industrial Operations Table (Table 2). The items of the agricultural sector located at the top of the table refer to the places where the outputs of the agricultural sector are used. For example; the Agricultural Sector has provided the Accommodation Sector with agricultural goods at the value of 0.8 TL for use as intermediate goods. The column values of the Agriculture Sector show where the sector provides the inputs that it needs to be able to produce. In the Table, columns show inputs, i.e. purchases; while rows indicate output, i.e. production. What matters here is to calculate how much value a sector receives from other sectors and how much of it it transfers to other sectors. For example, the Logistics Sector needs 0,05 units of goods from the Manufacturing Sector to be able to produce 1 unit (Table 2).

Table 2. Direct Input Coefficients Matrix - A Matrix.

	Agri.	Min.	Man.	Cons.	Whl-Ret	Acc.	Log	RE-Lea-Bnk-Fin	Ec-Sec-Heal.
Agri.	0,13	0,00	0,06	0,00	0,00	0,08	0,00	0,00	0,01
Min.	0,00	0,02	0,02	0,04	0,00	0,00	0,00	0,00	0,00
Manufact.	0,07	0,12	0,26	0,60	0,04	0,18	0,05	0,07	0,09
Construct.	0,00	0,00	0,00	0,03	0,00	0,00	0,00	0,01	0,01
Whosal-Ret.	0,05	0,07	0,08	0,22	0,04	0,05	0,04	0,02	0,03
Accom.	0,00	0,01	0,00	0,00	0,01	0,00	0,01	0,00	0,00
Logistics	0,02	0,05	0,05	0,13	0,08	0,06	0,18	0,02	0,05
R.E-Lea.-Bnk-Fin	0,02	0,04	0,03	0,11	0,11	0,07	0,07	0,11	0,09
Ec-Sec-Hea.	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,01
Col.Total	0,30	0,31	0,49	1,14	0,29	0,45	0,35	0,23	0,30

According to the Linear Input Coefficient Matrix, the Logistics Sector has to use goods at a value of 0.05 billion TL from the Manufacturing Sector and 0.07 billion TL from the Real Estate-Leasing-Bank-Finance Sector combination to produce an output value of 1 billion TL.

The status of the other sectors is given in Table 2. In terms of logistics, with 0.13, Construction Industry sector has the highest Input Coefficient; while Real Estate-Rental-Bank-Finance and Agriculture sectors have the lowest coefficient of 0,02. Of the 9 sectors, Mining Sector does not give input to 6 sectors. However, in order to produce, it gets input from other sectors especially from Manufacturing Industry. The table shows that

Construction Industry and Accommodation Sectors do not give goods as input to 6 sectors. Also, the Education-Security and Health Sector does not supply any other goods for other sectors.

These sectors interact with each other; therefore emergence of a current in one sector, its impacts on other sectors, and consequently its economic contribution are important. In the study there are two matrices that show the basic inputs of the sectors. They are are calculated from the values in the columns in the Industrial Operations Table. Components of the Input Coefficients Matrix (A) and Leontief Inverse Matrix (1-A)-1 show the direct (primary impact) and indirect (secondary impact) contributions of a sector on other sectors. The elements of the $(1-A)^{-1}$ Input Inverse Matrix express the total effect (direct + indirect effect). On the other hand, the difference between the Input Inverse Matrix $(1-A)^{-1}$ and the Input Coefficient Matrix corresponds directly to the effect. (Jones, 1997: 6)

Supposing that there is one unit increase in the final demand of a sector, the sector needs to increase its production one unit to meet this increase. Consequently, the sectors providing input to this sector will also have to increase their production. As the sectors that provide intermediate input increase their production, other sectors that provide input to this sector will increase their production again. Thus sectoral interactions will continue as a chain reaction. These interactions stem from the direct (first round effect) and indirect (second round effect) contribution of the first sector. These economic contributions through sectoral interaction can be expressed by Leontief Matrix (1-A) and Leontief Inverse Matrix $(1-A)^{-1}$. In our study, we have identified these contributions as production, employment and income multipliers. (Karkacier, 2001).

Table 3 shows the Leontief Matrix (I-A), created according the 2011 aggregated Input-Output Table. Here, I shows the unit matrix while A shows the Matrix of Input Coefficients. Leontief Matrix is obtained by subtracting Matrix A from unit matrix.

Table 3. Direct Input-Output Model Leontief Matrix (1-A Matrix).

	Agr.	Min.	Man.	Con.	Who-Re.	Acc.	Log.	Re.-Les-Bnk-Fin	Ec.-Sec-Heal.
Agr.	0,87	0,00	-0,06	0,00	0,00	-0,08	0,00	0,00	-0,01
Min.	0,00	0,98	-0,02	-0,04	0,00	0,00	0,00	0,00	0,00
Man.	-0,07	-0,12	0,74	-0,60	-0,04	-0,18	-0,05	-0,07	-0,09
Con.	0,00	0,00	0,00	0,97	0,00	0,00	0,00	-0,01	-0,01
Who-Re	-0,05	-0,07	-0,08	-0,22	0,96	-0,05	-0,04	-0,02	-0,03
Acc.	0,00	-0,01	0,00	0,00	-0,01	1,00	-0,01	0,00	0,00
Log	-0,02	-0,05	-0,05	-0,13	-0,08	-0,06	0,82	-0,02	-0,05
Re-Les-Bnk-Fin	-0,02	-0,04	-0,03	-0,11	-0,11	-0,07	-0,07	0,89	-0,09
Ec-Sec-Hea	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,99

Leontief Inverse Matrix $(1-A)^{-1}$ is created by taking the inverse of the Leontief Matrix (1-A). With this matrix, we can obtain the total input amounts that each sector receives from other sectors. The row and column sums of the coefficients of the Leontief Inverse Matrix give the production multipliers of final demand. Column sum shows the total effect (direct + indirect effect) that 1-unit increase in the final demand of a sector will result in the production (output) quantities of the sectors involved in the system. Line sum acquires a different meaning in terms of production multipliers of final demand. The row totals in a sector's reverse matrix shows the sum of production (output) that a sector has to realize in the event that the final demand increases by one in each of the the related sectors. (Şengül 1998: 80). For example, the total amount of input the Logistics Sector received from the combination of Real Estate-Leasing-Bank-Finance Sectors is 0,106305 while the total amount of input from the Manufacturing Sector is 0.09737. The total amount of input that Accommodation Sector received from the Logistics Sector is 0,10240. The total amount of input from the Logistics Sector to the Real Estate-Leasing-Bank-Finance Sector is 0.047802 (Table 4).

Table 4. Leontief Inverse Matrix $(1- A)^{-1}$ Matrix.

	Agr.	Min	Man.	Con.	Wh-Re	Acc.	Log	Re-Lea-Bnk-Fin	Ec-Sec-Hea	Row Tot.
Agr.	1,15204	0,01872	0,09228	0,06367	0,00817	0,10940	0,00867	0,00936	0,01822	1,4806
Min.	0,00348	1,02440	0,02615	0,05807	0,00692	0,00827	0,00252	0,00358	0,00538	1,1388
Man.	0,12800	0,18369	1,37852	0,91122	0,08759	0,28481	0,09737	0,11564	0,15592	3,3428
Con.	0,00279	0,00293	0,00183	1,03773	0,00369	0,00293	0,00216	0,00934	0,00864	1,0721
Wh-Re	0,07437	0,09347	0,12528	0,34039	1,05860	0,09039	0,06593	0,04043	0,05910	1,948
Acc.	0,00184	0,01193	0,00407	0,01324	0,01044	1,00429	0,01736	0,00488	0,00544	1,0735
Log	0,05226	0,08834	0,10116	0,26339	0,11772	0,10240	1,24353	0,04780	0,08657	2,1032
Re-Le-Bnk-Fin	0,04195	0,07304	0,06650	0,22165	0,14680	0,11250	0,10630	1,13436	0,12209	2,0252
Ec-Sec-Hea	0,00208	0,00435	0,00215	0,00406	0,00339	0,00171	0,00189	0,00326	1,01498	1,0379

Col.Tot.	1,45885	1,50091	1,79797	2,91347	1,44336	1,71674	1,54576	1,36868	1,47637

Table 5 shows row and column sums of the matrices in Table 4 as production multipliers. It enables us to analyze direct input production multipliers. According to the Direct Input Production Multiplier Table, a monetary increase of 1 unit in the final demand of the Logistics Sector will result in a total increase of 1,545765563 units of production in the 9 sectors surveyed. 1.545765563 represents the economic contribution of the Logistics Industry as a sector. Within the examined sectors, the Construction Sector, -which has a ratio of 2,913,447,164- provides the highest contribution to the economy in terms of sectoral integration. The fact that the Construction Industry has a higher sectoral integration than other sectors do is a major factor in this success (Table 5).

Another significant approach in terms of production multipliers is the row sums of Leontief Inverse Matrix $(1-A)^{-1}$. Row sums refer to the increase in the production of the sector in the relevant row in case all of the sectors increase their production by 1 unit. According to our calculations, in the Direct Input Production Multipliers table, the production multiplier coefficient of the Logistics Sector is 2,103210006. If each one of the 9 sectors in question increase their production by 1 unit, the Logistics Sector must increase the production of raw materials it provides these industries with by 2,103210006 units (Table 5).

Table 5. Total Impact

Direct Input Production Multipliers		
	Column Total	**Row Total**
Agriculture	1,458854686	1,480576863
Mining	1,500917268	1,138823984
Production	1,797974143	3,34281162
Construction	2,913471564	1,072079158
Wholesale-Retail sector	1,443362425	1,948013626
Accommodation	1,716747539	1,073516958
Logistics	1,545765563	2,103210006
Real Estate-Leasing-Banking-Finance	1,368685512	2,025221562
Education-Security-Health sectors	1,476374588	1,03789951

Leontief Inverse Matrix $(1-A)^{-1}$ is the total of rows and columns.

Table 6 shows the direct and indirect effects of the total effect.

To determine these effects, the difference in the column sums of the relevant sectors was found by subtracting the Input Coefficients Matrix (A) from the Leontief Inverse Matrix $(1- A)^{-1}$. If formulated; $(1- A)^{-1}- (A)$ shows indirect effect.

Total impact : $(1-A)^{-1}$

Direct impact : (A)

Indirect impact : $(1-A)^{-1} - (A)$

In view of the direct input-based economic contributions in Table 6, construction industry has the highest indirect contribution with 1,77483183. Real Estate-Leasing-Bank-Finance sector has the lowest indirect contribution with 1,134168939.

Table 6. Direct Input Production Multipliers

	Total Impact A Column total of Inverse 1-A	**Direct Impact B Column total of A Matrix**	**Indirect Impact C A-B**
Agriculture	1,458854686	0,295824996	1,16302969
Mining	1,500917268	0,31269825	1,188219017
Production	1,797974143	0,485903691	1,312070451
Construction	2,913471564	1,138639734	1,77483183
Wholesale-Retail sector	1,443362425	0,293047975	1,15031445
Accommodation	1,716747539	0,448512123	1,268235416
Logistics	1,545765563	0,353848015	1,191917548
Real Estate-Leasing-Banking-Finance	1,368685512	0,234516573	1,134168939
Education-Security-Health sectors	1,476374588	0,300169154	1,176205434

The Revenue Multiplier (Multiplier) Analysis is handled in a similar way to the employment multiplier analysis. However, in this analysis, the concept of income is expressed by the concept of gross value added. This includes payments for basic production factors such as wages, interest, depreciation, profits and indirect taxes. Just like the matrix of employment multipliers, the Matrix of Income Multipliers is obtained by multiplying the matrix whose diagonal elements are income coefficients directly with the Leontief matrix. For this process, the Industrial Operations Table is used to calculate the gross value added coefficients. Then the gross value added figures for the columns are compared to the zone productions and the income coefficients are found. Table 3.6 is Income Coefficients Matrix, while Table 8. shows Income Multipliers.

Table 3.6 Income Coefficients Matrix

	Agr.	Min.	Man.	Cont.	Wh-Re	Acc	Log	Re-Lea-Bnk-Fin	Ec-Sec-Hea
Agr.	0,629233	0	0	0	0	0	0	0	0
Min.	0	0,581858	0	0	0	0	0	0	0
Man.	0	0	0,269290	0	0	0	0	0	0
Con.	0	0	0	0,431871	0	0	0	0	0
Wh-Re	0	0	0	0	0,645726	0	0	0	0
Acc.	0	0	0	0	0	0,443405	0	0	0
Log	0	0	0	0	0		0,513737	0	0
Re-Lea-Bnk-Fin	0	0	0	0	0	0	0	0,722206	0
Ec-Sec-Hea	0	0	0	0	0	0	0	0	0,634468

Table 3.6 shows the increase in income in other sectors if each of the sectors examined increases their production in case of an increase in demand. In the Revenue Multipliers Matrix, Construction Sector occupies the first place according to the column sums. For instance, if the final demand for this sector increases by TL 1 billion, it would result in an increase of 1.29106 billion TL (Gross Value Added) in all other sectors. The Manufacturing Sector has the lowest income coefficient and the lowest revenue growth. Because the gross value added coefficient of this sector is 0,62937 and it is very low compared to other sectors.

Row sums show the revenue increase in each sector when/if all the sectors examined increase their production by 1 unit. Accordingly, the highest increase is in Real Estate-Leasing-Bank-Finance Sector (coefficient: 1,4626). This sector is followed by Logistics Sector with 1.080498.

Table 8. Income Multipliers

	Agr.	Min.	Man.	Con.	Wh-Re	Acc.	Log	Re-Lea-Bnk-Fin	Ec-Sec-Hea	Row Tot.
Agr.	0,72491	0,01178	0,05807	0,04006	0,00514	0,06884	0,00546	0,00589	0,01146	0,9316
Min.	0,00203	0,59606	0,0152	0,03379	0,00403	0,00482	0,00147	0,00208	0,00314	0,6626
Man.	0,03447	0,04947	0,37122	0,24538	0,02359	0,07669	0,02622	0,03114	0,04198	0,9002
Cons.	0,00121	0,00126	0,00079	0,4482	0,00159	0,00126	0,00094	0,00404	0,00373	0,4630
Wh-Re	0,04802	0,06036	0,08090	0,21980	0,68357	0,05837	0,04258	0,02611	0,03817	1,2579
Acc.	0,00082	0,00529	0,00180	0,00587	0,00463	0,44531	0,00769	0,00216	0,00241	0,4760
Log	0,02685	0,04539	0,05197	0,13532	0,06048	0,05261	0,63885	0,02456	0,04448	1,0805
Re-Lea-Bnk-Fin	0,0303	0,05275	0,04802	0,16008	0,10602	0,08125	0,07677	0,81924	0,08817	1,4626
Ec-Sec-Hea	0,00132	0,00276	0,00136	0,00258	0,00215	0,00108	0,0012	0,0021	0,64398	0,6585
Col.Tot.	0,86993	0,82513	0,62937	1,29106	0,89121	0,79025	0,80118	0,91730	0,87753	

4. CONCLUSION

According to the Direct Input Production Multipliers Tables, 1 unit monetary increase in the final demand of the Logistics Sector will lead to total increase of 1.55 units in production in the 9 sectors examined. This rise in value represents the sectoral economic contribution of the Logistics Sector. In the context of direct input-based economic contributions, Construction Industry excels as a sector with highest indirect contribution. Construction industry has higher rate of interactions with other sectors, which accounts for its higher sectoral integration. Direct Input Production Multipliers coefficient for Logistics Sector is 2.10. When the 9 sectors under examination increase their production by 1 unit, the Logistics Sector increases the production of raw materials supplied to these industries by 2.10 units.

Input Coefficients Matrices are called Technical Coefficients Matrices or A Matrices. In terms of logistics, the Construction Industry has the highest Input Coefficient (0.13) while the Agriculture Sector with the Real Estate-Leasing-Bank-Finance Sectors have the lowest coefficient (0,02).

Input Coefficients Matrix (A) and Leontief Inverse Matrix $(1\text{-}A)^{-1}$ in the study are calculated from the values in the columns in the Inter-Industry Activity Table which shows the basic inputs of the sectors. Elements of these matrices represent the direct and indirect contributions of the industry to other sectors. According to the Leontief Inverse Matrix, the total input the Logistics Sector received from Real Estate-Leasing-Bank-Finance Sectors is 0,106 while the total amount of input it received from the Manufacturing Sector is 0.097.

As in the Matrix of Employment Multipliers, the Revenue Multipliers Matrix is obtained by multiplying the Leontief matrix by the matrix whose diagonal elements are income coefficients. According to the Matrix of Revenue Multipliers, Construction Sector is in the first place. If the final demand for this sector increases by TL 1 billion, it would lead to an increase of 1.29 billion TL (Gross Value Added) in all other sectors.

There are various indicators in this study. They include information on a wide range of topics such as how much added value the sector will create, the amount of products that the sector will take from logistics and other industrial branches, the production and income increase which will be created on the other sectors of the economy.

In our analysis we have found that Construction Sector, and Real Estate-Leasing-Banking and Finance sectors in combination have the highest income coefficients. The Construction Sector, on the other hand, has the highest sectoral interaction.

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