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Evolutionary Process of Key Economic Sectors in the Turkish Economy during (1970-2012) and Their Impacts on SME Development

Dr. Sultan Ahmad Taraki[1], Dr. Mesut Murat Arslan[2]

[1]Assistant Professor, Herat University, Economics Faculty, University Street, Heart- Afghanistan

[2]Professor, YILDIRIM BYAZIT University, Faculty of Political Science, Department of Economic Esenboğa Campus, Ankara- Turkey

Abstract: ***Small and medium-sized enterprises (SMEs) constitute a major part of the economies of both advanced and developing countries. Definitely supporting the SMEs can provide a sustainable and well-adjusted economic growth and development. Thus, SMEs may have a vital role in capital formation and economic prosperity of developing countries. The integral role of SMEs within an economy has become a source of inspiration for many academicians to study SMEs from different perspectives.In this research unbalanced capital formation theory used as theoretical framework. According to this theory investment in key sectors are more suitable for SME development in capital formation for poverty reduction. To obtain the research objective and determine the Key sectors of the Turkish economy as well as to understand how key sectors evolved in the Turkish economy during the time, the input-output tables of 1973, 1979, 1990, 2002, and 2012 are analyzed. To complete the research and analysis input-output table a new proposal from network theory uses as research methodology. The research finding indicates that the number of key sectors in the Turkish economy has evolved during the time, and these key sectors through backward and forwards effects positively increased the number of SMEs.***

Keywords: Input-Output Analysis, Key Sectors of the Turkish Economy, Network Theory

1. Introduction

Turkish economics' policymakers have been trying to improve economic productivity of the Turkish economy to eliminate the productivity gap between the Turkish economy and advanced economies. To do so, they need to find answers to the questions such as; which sectors are critical for accelerating the economic productivity of Turkey? Also, which sectors make the Turkish economy unproductive?

However, there is a common sense that large distortions in key sectors cause productivity gap among economies. Traditional development theories have viewed distortions problems between agriculture or industry sectors. While modern development theories highlight the distortions problems in services, such as those with the presence of informality. Hence, it is still a big question that which sectors are able to explain the productivity gap between the countries (1).

The most recent development theories suggest that the source of underdevelopment and unproductivity of economy is not only because of the absence of economic resources such as physical capital, scaled works, entrepreneurship, or unique ideas. Misallocation or misuse of economic resource in developing countries is quite enough to explain a considerable part of economic productivity gap among developed and developing countries (2).

Leal (1) made two main relevant arguments about the source of unproductivity in developing economies. He argues the determination of the sectors which makes developing economies unproductive is important not only to understand which sectors have the highest rate of unproductivity gap with regard to the leading sector but also identifying of the degree of influence of each sector is vital. The degree of influence is characterized by sectorial linkage to each sector with the rest of the economy in input-output relationships. Some specific sectors have a crucial role in the input-output linkages because these sectors are the most important suppliers of intermediate inputs in the economy. 2) Secondly, he argues that in developing economies there are sector-specific distortions faced by enterprises, which does not have a direct relation with low productivity in industry level, but these sectorial distortions potentially could be a source of misallocation. Thus, they affect total productivity. Typical examples of these types of distortion are policies or market structures.

In the case of Turkey, lack of industrial policy during the transition period stalled the process of industrial development that Turkey was able to achieve and improve its productivity by avoiding misallocation of resources during 1980-2000. It was realized that lack of industrial policy interrupted the process of industrialization and technical improvement in the Turkish economy. Thus, the government of Turkey returned to industrial policy through preparation a comprehensive industrial policy in 2003. This policy was prepared based on the horizontal (functional) approach (3). The main objectives of Turkey's new industrial policy were the promotion of SMEs and entrepreneurship development. Within this policy, the government of Turkey obligated itself to develop plans and projects in ten areas, which were required by the European Charter (4).

By implementing the industrial policy and SME development strategy. The Turkish economy has achieved sizable improvement in labor productivity along with a change from the more old-fashioned exports such as textile to medium-level technology products like automobiles and other electronic apparatus. While the percentage of high-tech products in total exports of Turkey remained relatively lower than its counterpart countries. Furthermore, the manufacturing sector of Turkey became more depended on

foreign raw material and intermediate goods. On the other hand, Turkey needed to avoid the middle-income trap. This situation required a reconsideration of Turkish industrial and technical policies (5).

The evaluation process of technical and industrial policy indicated that integrated industrial policy, which is a combination of both horizontal and vertical industrial policies could be an appropriate industrial policy for Turkey (3). This is because integrated policy enables Turkey to avoid the middle-income trap by channeling economic resources in key sectors of the economy.

Identification of key sectors in the economy and their study gives an opportunity for policymakers and researchers to determine the sectors, which have high multipliers effect on both demand and supply sides of the economy. Hence, they are considered as the pillars of economic growth and development in the economies (6). To determine the key sectors of the Turkish economy, the New Proposal of Network Theory (multilevel indicators) is applied to analyze input-output tables of Turkey.

2. Research Theory

In this research, unbalanced growth theory will be used to determine key sectors of the Turkish economy and we evaluate how key sectors have been changed as the economic structure of Turkey changed over time. Furthermore, this research is interested in analyzing the impact of key sectors in capital formation for poverty reduction through SMEs development in Turkey. Recently this theory widely has been used in the field of economic analysis by many researchers all over the world. Holz(7) applied backward and forward linkages in Chines economic policy to determine the continued presence of the state with high-linkage sectors and the strategic withdrawal of the state from low-linkage sectors. Jahangard and Keshavarz(8) identified key sectors of Iran, South Korea, and Turkey by using input-output (IO) tables of these countries. Bekhet(9) searched how production structure in Malaysia economy changed, as the ranking sectors changed over the period 1983-2000, he used four IO tables, which has been published by Malaysia Department of Statistics, Bakhet (9) also employed the Leontief model.

Yay and Keçeli (10) determined the key sectors of Turkey using the application of the General Equilibrium theory. Trinh et al. (11) studied the multi-interregional input-output model of Vietnam. They used 2001 IO table of Vietnam. Their study covered seven regions and ten aggregated sectors. In this study, they showed type I and type II multipliers from national, single, and inter-regional IO models. IO model used by many researchers for the purpose of calculating national linkages coefficients across the countries.

3. Research Methodology

Economic growth and development models describe different approaches that a country can grow, but their achievements directly are related to the sectors and the amount of investment in those sectors. Investment in each economic sector does not provide an equal growth rate (8). Modern studies have largely emphasized that key sectors have a significant role in accelerating the process of economic development and modifying the industrial structure of the economy. Thus, it is essential to allocate a large amount of investment in the key sectors of the economy (12).

Efforts on the determination of key sectors in national economies based on domestic information, through the analyzing of national input-output tables, are numerous all over the world. However, one of the well-known of these efforts is related to the work of Meller and Marfan (1981). They investigated the relevance of small and large enterprises on employment in developing countries. Likewise, Cuadrado and Aurioles (1984) used the Andalusian economy's input-output table (1980) to analysis inter-sectorial relationships.

Muniz et al. (13) used Andalusia economy’s input-output table to identify key sectors of that economy. They concentrated on the social network theory and computed total, immediate andmediative effects. They found remarkable results that the productive relations are not organized around high-technologyindustries, which is found to be the main deterrent to the growth andpromotion ofproductive relations. They updated their method in 2008 by using Spanish IO and the EU IO for 1995(14). The updated model of Muniz et al. (2008) is known as a new proposal from network theory that applied in this research to determine key sectors of the Turkish economy.

The application of a new proposal from network theory, which also called multilevel indicator in input-output analysis concentrates on industrial linkages through three complementary effects and influences index. Hence this method is the extent of the traditional viewpoint of polarized growth sectors. The authors chose the label of multilevel indicators, because of the threefold level of the proposed analysis of key sectors and assume a generic label that collects three effects. Total effects define the relative total influence of a sector on the rest of the economy. Immediate effects indicate the immediacy of the implementation of the total effect. The meditative effects show the importance of specific sectors as transmission links of total effects produced by others (6).

3.1 Total Effects

As the title of this indicator denotes, total effects evaluate the overall effect of a sector and its relative impacts on other sectors in the economy. In the field of input-output analysis total effects basically determined by the number and length of the existing roads between the sectors through specified productive relationships (14).

Total effects are determined from a Markovian matrix $\tilde{A} = \{\tilde{a}_{ij}\}$ in which the relations between network nodes such that $\tilde{A} \geq 0$ are collected, and each of its rows sums is equal to one (8).

$$\sum_{i=1}^{n} = \tilde{a}_{ij} = 1, \forall_i = 1, \dots\dots, n \quad (1)$$

In fact, this matrix is the stochastic normalized matrix of technical coefficients, so there is a Markov chain of n states where the matrix $\tilde{A}$ gathers the transaction probabilities of one to another. In this sense, the Markov chain can be interpreted as a random walk for the weighted graph of the normalized coefficients stochastic matrix $\tilde{A} = \{\tilde{a}_{ij}\}$ where the weight $\tilde{a}_{ij}$ is attributed to the arc between the *i*th and *j*th nodes of the value graph.

Friedkin (15) represented, how the initial opinion of individuals Y^1 are evolved into final opinion $Y^{(t+1)}$ via a process that reflects the tendency to social $(\propto)$ and inter-personal $(\tilde{a}_{ij})$ influences. The process can be shown through the following equation (6):

$$Y^{(T+1)} = \propto (\tilde{a}_{i1} Y_1^{(1)} + \cdots + \tilde{a}_{in} Y_n^{(t+1)}) + (1-\propto) Y_i^{(1)} \; 0<a<1 \quad (2)$$

The matrix form of equation (2) is:

$$Y^{(t+1)} = \propto \tilde{A} Y^{(t)} + (1-\propto) Y^1 \quad (3)$$

By assuming that certain conditions are verified, then the initial opinions are transformed into an equilibrium solution such that:

$$Y^{\infty} = (I - \propto \tilde{A})^{-1} (1-\propto) Y^1 = V Y^1 (4)$$

In equation (4), V collects the effects generated between network notes. So V is equal to:

$$V = (I - \propto \tilde{A})^{-1} (1-\propto)$$

In general expression, the process of new opinion formation could be connected to the mechanism by which the total amount of goods and services to satisfy a final demand increase is determine exogenously. The total production will be at the equilibrium level, if the total output is equal to the total amounts of final demand and the sectoral influences. If the initial outline is developed through input-output model, the expression could be derived

$$X_i = \propto (\tilde{a}_{i1} X_1 + \cdots + \tilde{a}_{in} X_n) + (1-\propto) d_i \quad (5)$$

In equation (2) ,$X_i$and d_i reflect production and final demands for sector i respectively, $(\propto)$ offers a weighting that allows the effect of an exogenous change in the demand to be measured. In fact, $(\propto)$ is a sectorial relations weighting, and $\tilde{a}_{i1}$is a technical coefficient, which is normalized by the sum of the row of matrix A. It is obvious that $\tilde{a}_{i1}$ takes values between 0 and 1 and the sum of each row of $\tilde{A}$ matrix is equal to one.

The different weight attributed by the weighting $\propto$ to the final and intermediate demand allows the study of the influence that is supported by exogenous changes and/or relations between sectors for the leading sector. The influence weight is crucial to the development of economic policies. Determination of total effects will be primarily related to the length and number of the path between sectors through the relation (8).

Consequently, based on the input-output model V is equal to:

$$V = (I - \propto \tilde{A})^{-1} (1-\propto) = (I + \propto \tilde{A} + \propto^2 \tilde{A}^{-2} + \propto^3 \tilde{A}^{-3} + \cdots) (1-\propto) 0 \; <\propto< 1 \quad (6)$$

In equation (6), V refers to the total effect, which determines by the inverse Leontief matrix that is weighted with the coefficient $\propto$. Where $\propto$ is enter-sectorial relation weighting that allows the influence of power among the sectors and it has to be standardized. $\tilde{A}$ denotes the regulated input-output coefficient matrix, in brief, the total effect of a given sector on the other sectors in the economy is a weighted sum of the number of different channels that connect them in the network, while individual channels are weighted according to their size and the power of constituent links.

One can confirm that under the hypothesis $\lim_{k\to\infty} \tilde{A}^k = \tilde{A}^{\infty}$, $\propto$ approach to unity.

$$V = \lim_{a\to 1} -(I - a\tilde{A})^{-1} (1-a) = \tilde{A}^{\infty} = W \; (7)$$

So if $\propto$ increase to 1, V may reach to W, under definite conditions of matrix $\tilde{A}$. By given condition, matrix V approaches to the limit of $\tilde{A}$, in this circumstance the total effect is fixed for each*i*th sectors. Therefore, matrix W takes the form of a stationary state.

$$W = \begin{bmatrix} W_1 & \cdots & W_n \\ \vdots & \ddots & \vdots \\ W_1 & \cdots & W_n \end{bmatrix} \quad (8)$$

If a converge to zero, in other words if there is not additional information about weighting value a, then the total effect of each sector (TEC_j) is:

$$TEC_{(j)} = \frac{\sum_{i=1}^{n} V_{ij}}{n} = \frac{\sum_{i=1}^{n} W_{ij}}{n} = W_j \quad \forall j = 1 \dots n \; (9)$$

Or in matrix term:t=$\acute{V}\Phi$ (10)

In the above equation t is an $(n\ X\ 1)$ vector, $\Phi = \left(\frac{1}{n}\right)$ it is also a $(N\ X\ 1)$ vector, and $\acute{V}$ is the transposed matrix of V. So, the total effect of sector j is equal to the mean of the elements of column j in matrix V. The transposed matrix of V is the average of column elements of matrix V. Thus, the total effect of j with respect to all the economy will be more relevant on the size of this value.

There is some similarity between the classical approach in the IO model and the total effect indicator based on the social network theory.

Rasmussen (1956) applied the sum of the normalized columns of the inverse Leontief matrix to measure backward linkages of the sectors in the economy, however, for calculation of total effects index, he used the sum of the columns of the inverse Leontief matrix (6).

The Rasmussen coefficients can be therefore considered as a particular case where the influence coefficient matrix $\propto$ has not been specified. Likewise, Augustinovics (1970) by using the Ghosh model specified the forward linkages from the sum of the rows of the inverse distribution coefficients. Furthermore, it is possible to calculate total effects indicators in an identical approach of forward linkages (8).

3.2 Immediate Effects

Immediate effects measure the speed of transmission of the sectorial total effects in the network(14).The analysis of immediate effects is a critical feature in the estimation of economic policies. The sectors, which their effects are transmitted over a lengthy sequence of economic relations,

have a less economic impact than sectors with a high number of direct linkages. This critical feature determined by the index that is called immediate effects. Immediate effects are quantified from the Markov chain of $\tilde{A}$ matrix. In this sense, the Markov chain can be interpreted as a random walk for the weighted graph of the stochastic matrix of the normalized IO coefficients $\tilde{A} = [\tilde{a}_{ij}]$ and as mentioned above the weight $\tilde{a}_{ij}$ is attributed to the arc between the *i*th and *j*th sectors of the valued graph. Thus there is a Markov chain of n states where the matrix $\tilde{A}$ gathers the transaction probabilities of one sector to another so that the element (*i*,*j*) of the transition matrix of kth step $(\tilde{A}^k)$ will show the probability of passing from the *i*th sector to *j*th sector in kth steps exactly. From this stochastic, the immediacy of *j*th sector effect in the network can be determined by the length of weighting of the economic transaction sequences for the relation's strength (6).

$$\mathrm{M} = (I - Z + E\hat{z}_{dg})\hat{q} \quad (11)$$

In the above equation, $\hat{q}$ is a diagonal matrix with the elements of $q_{ji} = \frac{1}{w_i}$, and E is an (nxn) unity matrix, and $\hat{Z}_{dE}$ is a diagonal matrix of Z. While Z is the fundamental matrix whose expression is:

$$\mathrm{Z} = (\mathrm{I} - \tilde{A} + \tilde{A}^{\infty})^{-1} \quad (12)$$

In equation (12) $\tilde{A}^{\infty}$ match with the matrix W that collects the process stationary state $(w_1, \ldots, w_n)$ effects are determined from a Markovian matrix $\tilde{A} = \{\tilde{a}_{ij}\}$ in which the relations between network nodes such that $\tilde{A} \geq 0$ are gathered and each of its rows sums to be equal to one (8).

Immediate effects (IEC) are expressed as the reciprocal of the mean length of sequences of relations from one sector to another (6)

$$IEC_j = \left(\frac{\sum_{i=1}^{n} m_{ij}}{n}\right)^{-1} \forall j \quad (13)$$

where m_{ij} are the quantity element of each column of matrix M.

The matrix form, immediate effects can be determined by:

$$r = n\,\gamma \quad (14)$$

Here $\gamma = (\gamma_j) = \left\{\frac{1}{\sum_{i=1}^{n} m_{ij}}\right\}$ which is an (nx1) vector.

Immediate effects take into account the extent and strength of the sequences of productive relations (Muniz et al. 2008). As the IEC be larger, it means that the total effects of the sector tend to increase more rapidly, and the sector is less dependent on intervening sectors.

3.3 Mediative Effects

Mediative effects refer to the importance of given sectors as instruments of the transmission of total effects. The basic assumption of this measure is that sectors involved in many of the paths linking other sectors can affect the relations that occur along these paths. These sectors facilitate the operations and economic interconnections, so these sectors work like crossroads in the system and constitute key points for the entire development of the economy. For estimating the mean length of the sequences of productive relations, the previous matrix M can be decomposed in the number of steps from sector *j* to sector *i* via other intermediate sectors (14).

$$m_{ij} = \sum_{k=1}^{n} t_{(j)ik}\, i \neq j \neq k \quad (15)$$

Where $t_{(j)ik}$ is the ikth entry in the matrix T in:

$$T_j = \left(I - \tilde{A}_{(j)}\right)^{-1} \quad (16)$$

In equation (16) $\tilde{A}_{(j)}$ is a matrix which built from deleting the *j*th row and column of the matrix $\tilde{A}$.

Mediative effect of sector *j* shows the importance of sector *j* as a transmission link or a crossroad in the economic network relations. The following formula uses to calculate the meditative effect.

$$MEC_{(j)} = \frac{\sum_{k=1}^{n} \bar{t}_{(k)j}}{n} \quad (17)$$

$$\text{where } \bar{t}_{(k)j} = \frac{\sum_{i=1}^{n} t_{(k)j}}{n-1} \quad i \neq j \quad (18)$$

which gather the contribution of sector j in the transmission of the effects of sector k. This effect can be measured in a matrix form where:

$$\mathrm{T} = \{t_{(k)j}\} \rightarrow C = T\Phi \quad (19)$$

Here Φ is an (nx1) vector with the elements of $\frac{1}{n}$(19)

3.4Influence Index

The present measures of total effects, immediate effects, and meditative effects altogether indicate the three important and complementary structural features where the sectorial influence weighting plays a relevant role. In the case of absence of any additional information, the applied assumption is a coefficient ∝, which has an equal value for all sectors, and its value is near to one ($\propto \rightarrow 1^{-}$). However, this hypothesis is considered excessively restrictive in the input-output case, because the exogenous changes in the network would affect each sector differently. The existence of a different coefficient for each sector seems a reasonable assumption in an economic universe, where the agents have a very different degree of influence and the final and intermediate demand weight can have an unequal dominance in sectorial production necessities induced by variations in the final demand. This analysis would allow the differentiation of coefficients between sectors($\propto_i$) by the purpose of distinguishing the sector propensity to sectorial influences. Determination of (∝) that is also known as the influence index is necessary because this index allows researchers to know the influence capacity generated by the sectors in the input-output table (8).

Under this assumption, the new model specified as

$$X_i = \propto_i (\tilde{a}_{i1}\, X_1 + \cdots + \tilde{a}_{in} X_n) + (1 - \propto_i) di \quad (20)$$

Or it can be expressed in matrix terms:

$$\mathrm{X} = \hat{S}\tilde{A}X + (I - \hat{S})d \quad (21)$$

Here $\hat{S}$ presences a diagonal $(n\,X\,n)$ matrix that gathers the influence coefficients of each sector:

$$\hat{S} = \begin{bmatrix} \propto 1 & \cdots & 0 \\ \vdots & \ddots & \vdots \\ o & \cdots & \propto n \end{bmatrix} \quad (22)$$

$\tilde{A} = \{a_{ij}\}$ is a $(n\,X\,n)$ matrix which represents the normalized technical coefficients. $X = \{X_i\}$ and $d = \{d_i\}$are

also (n x 1) vectors that represent production and final demand of sector i, respectively. Leontief standard model is:

$$X_i = (a_{i1}X_1 + \cdots + a_{1n}X_n) + d_i \quad (23)$$

$$\mathrm{X} = AX + d \quad (24)$$

The determination of the output level from the equivalence between these two models is:

$$\hat{S}\check{A}X + (1 - \hat{S})d = \mathrm{AX} + \mathrm{d} \quad (25)$$

Alternatively, we can show in matrix terms:

$$\begin{pmatrix} a_1[(a_1X_2 + \cdots + a_{1n}X_n) + (\tilde{a}_{12}X_2 + \cdots + \tilde{a}_{1n}X_n)] \\ a_n\begin{bmatrix}(a_{n1}X_1 + \cdots + a_{n(n-1)}X_{n-1}) \\ + (\tilde{a}_{n1}X_1 + \cdots + \tilde{a}_{n(n-1)}X_{n-1})\end{bmatrix} \end{pmatrix} = \begin{pmatrix} a_{12} + \cdots + a_{1n}X_n \\ \cdots \\ a_{n1}X_1 + \cdots + a_{n(n-1)}X_{(n-1)} \end{pmatrix} \quad (28)$$

As mentioned earlier the normalized technical coefficients are $\tilde{a}_{ij} = \frac{a_{ij}}{\sum_{j=1}^{n} a_{ij}}$ then sectorial influence weighting coefficient can be found as follow (Muniz et al.2008):

$$\propto_i = \frac{1}{\left[1 + \left(\frac{1}{\sum_{j=1}^{n} a_{ij}}\right)\right]} \quad (29)$$

It is a measure related with the direct effects of sector i$\left(\sum_{j=1}^{n} a_{ij}\right)$on the rest of the productive sectors and allows the total effect generated for the sector to be recalibrated. In this new scenario, total effects must be revised.

Considering expression X= $\hat{S}\tilde{A}x + (1 - \hat{S})d$ so our next equation is:

$$\mathrm{X} = (1 - \hat{s}\check{A})^{-1}(I - \hat{s})D \quad (30)$$

where V is equal to:

$$\mathrm{V} = (I - \hat{s}\check{A})^{-1}(I - \hat{s}) \quad (31)$$

So revised total effects of j^{th} sector are:

$$\mathrm{TEC}_j^{*} = \frac{\sum_{i=1}^{n} v_{ij}}{n} \forall_i, j \quad (32)$$

This index will offer a more exact valuation of the impact of the sectors in the network. Multilevel indicators and the sectorial influence index allow the identification of sectors that work as crossroads in the economic structure.

$$\hat{S}(\check{A}X - d) = AX \quad (26)$$

Final demand can be found through the equation $d = X - AX$, and by inserting the final demand in equation (26) instead of d, then:

$$\hat{S}(\check{A} + A - I)\,X = AX \quad (27)$$

It is more useful to eliminate auto-consumptions of sectors as an integrant part of the degree of influence. If the auto-consumptions eliminated, the system of equations is:

4. Identification of Key Economic Sectors in the Turkish Economy

To determine the key sectors of the Turkish economy, the multilevel indicators method is applied to the respective 1973, 1979, 1990, 2002, and 2012 input-output tables.

The results that obtained from the multilevel analysis are presented below within individual graphic representations. The data used supplied by Turkish Statistical Institution. The input-output tables have 64 active branches for the years of 1973, 1979, 1990; IO tables for 2002 and 2012 have 94 active branches. The IO tables are classified according to the statistical classification of economic activities of the European countries (European Industrial Activity Classification) (NACE Rev.2). Hence, the IO tables of 1973, 1979, and 1990, have been classified into 13 sectors, which are represented in table 4.1. While the IO tables of 2002, and 2012 are categorized into 20 economic sectors that are shown in table 4.2.

Table 4.1: Classification of the 1973, 1979 and 1990 IO Tables of the Turkish Economy According to NACE Rve.2

Codes	*Economic Sectors of IO tables 1973, 1979 and 1990 of Turkey*	*Classification of economic sectors according to NACE Rev.2*	*Division*
A	Agriculture, animal husbandry, forestry, and fisheries	Agriculture, Forestry, and Fishing	01+02+03
B	Coal mining, crude petroleum and natural gas production, iron ore mining, non-ferrous ore mining, non-metallic mineral mining, stone quarrying	Mining and quarrying: Mining of coal lignite. Extraction of culture petroleum and natural gas. Mining of iron ores Other mining and quarrying. Mining support service activities.	05+06+07+08+09
C	Manufacturing sector: Slaughtering and preserved meat, Canning and preserving of fruits and vegetables. Manufacture of vegetable and animal oil and fat, grain mill products, sugar. Manufacturing of other food products, Alcoholic beverage, soft drinks and carbonated water industries, tobacco manufactures, ginning. Manufacture textiles. Manufacture of wearing apparel. Manufacture of leather and fur products. Manufacture of footwear, Manufacture of wood and wood products.	Manufacturing: Manufacture of food products. Manufacture of beverage. Manufacture of tobacco products. Manufacture of textiles. Manufacture of wearing apparel. Manufacture of leather and related products. Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting material. Manufacture of paper and paper product.	10+11+12 +13+14+15 +16+17+18 +19+20+21 +22+23+24 +25+26+27 +28+29+30 +31+32+33

	Manufacture of wood furniture and fixtures. Manufacture of paper and paper products, Printing and Allied industries. Manufacture of fertilizers. Manufacture of drug and medicines. Manufacture of other chemical products. Manufacture of refineries. Manufacturing of petroleum and coal products. Manufacturing of rubber products. Manufacture of plastic products. Manufacture glass and glass products. Manufacturing of cement. Manufacture of other non-metallic mineral products. Manufacture of iron and steel. Manufacture nonferrous metal, Manufacture of fabricated metal products. Manufacture of machinery except electrical. Manufacture of agricultural machinery and equipment. Manufacture electrical machinery. Manufacture of shipbuilding and repairing. Manufacture of railroad equipment. Manufacture land transport vehicles and equipment. Manufacture other transport equipment. Other manufacturing industries.	Printing and reproduction of recorded media. Manufacture of coke and refined petroleum products. Manufacture of chemicals and chemical products. Manufacture of basic pharmaceuticals products, and pharmaceutical preparations. Manufacture of rubber and plastic products. Manufacture of other non-metallic mineral products. Manufacture of basic metals. Manufacture of fabricated metal products, except machinery and equipment. Manufacture of computer, electronic and optical products. Manufacture of electrical equipment. Manufacture machinery and equipment n.e. c. Manufacture of motor vehicles, and semi-trailers. Manufacture of other transport equipment. Manufacture of furniture. Other manufacturing Repair and installation of machinery and equipment.	
D	Electricity, gas manufacture and waterworks	Electricity, gas, steam, and air-conditioning supply	35
F	Building construction, other construction	Construction: Construction of buildings, Civil engineering. Specialized construction activities.	41+42+43
G	Wholesale and retail trade	Wholesale and retail trade; repair of motor vehicles and motorcycles	45+46+47
H	Railway transport, other land transport, water transport, air transport	Transportation and storage	49+50+51+52+53
I	Hotel and restaurant	Accommodation and Food Services	55+56
J	Communication	Information and Communication: Publishing, audiovisual, and broadcasting activities, telecommunication, IT, and other Information services	58+59+60+61+62+63
K	Financial and Insurance activities	Financial institution and Insurance activities	68
L	Ownership of dwellings	Real estate activities	64+65+66
M	Personal and professional services	Professional, scientific, and technical activities: Legal, accounting, management, engineering, technical testing and analysis activities, scientific research and development, other professional, scientific, and technical activities.	69+70+71+72+73+75
O	Public services	Public administration and defense, compulsory social services.	84

Table 4.2: Classification of the 2002 and 2012 IO Tables of the Turkish Economy According to NACE, Rve.2

Codes	*Economic Sectors of IO tables 2002, 2012 of the Turkish economy*	*Classification of economic sectors according to NACE Rev.2*	*Divisions*
A	Agriculture, animal husbandry, forestry, and fisheries	Agriculture, Forestry, and Fishing	01+02+03
B	Mining of coal and lignite; extraction of peat. Extraction of crude petroleum and natural gas; Service activities incidental to oil and gas extraction excluding surveying. Mining of uranium and thorium ores. Mining of metal ores. Other mining and quarrying.	Mining and quarrying	05+06+07+08+09
C	Manufacturing sector: Manufacturing of food products and beverages. Manufacture of tobacco products. Manufacture of textiles. Manufacture of wearing apparel; dressing and dyeing of fur. Tanning and dressing of leather; manufacture of luggage, handbags, saddlery, harness, and footwear. Manufacture of wood and products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials. Manufacture of pulp, paper, and paper products. Manufacture of wood and wood products. Manufacture of wood furniture and fixtures. Publication, printing, and reproduction of recorded media. Manufacture of coke, refined petroleum products and nuclear fuels. Manufacture chemicals and chemical product. Manufacture of rubber and plastic products. Manufacture of other non-metallic mineral products. Manufacturing of basic metals. Manufacturing of fabricated metal products, except machinery equipment. Manufacture of machinery and equipment n.e c. Manufacture office machinery and computers. Manufacturing electrical	Manufacturing: Manufacturing of food products, beverages, and tobacco products. Manufacture of wood, paper products and printing. Manufacture Coke, and refined petroleum products. Manufacture of chemicals and chemical products. Manufacture of pharmaceuticals products, medicinal chemical and botanical products. Manufacture of basic metals and fabricated metal products, except machinery. Manufacture of computer, electronic and optical products. Manufacture of electrical equipment n.e.c, Manufacture of transport equipment. Other manufacturing and repair and installation of machinery and equipment.	10+11+12 +13+14+15 +16+17+18 +19+20+21 +22+23+24 +25+26+27 +28+29+30 +31+32+33

	machinery and apparatus n. etc.. Manufacture of radio, television and communication equipment and apparatus. Manufacture of medical, precision, and optical instruments, watches and clock. Manufacture of motor vehicles, trailers, and semi-trailers. Manufacture of other transport equipment. Manufacture of furniture; manufacturing n.e.c.		
D	Electricity, gas, steam, and hot water supply	Electricity, gas, steam, and air-conditioning supply	35
E	Recycling, Collection, Purification, and distribution of water. Sewage and refuse disposal and similar activities	Water supply; sewerage, waste management and remediation activities	36+37+38+39
F	Construction	Construction: Building construction, other construction	41+42+43
G	Sale, maintenance and repair of motor vehicles and motorcycles; retail sale services of automotive fuel. Wholesale trade and commission trade, except of motor vehicles and motorcycles. Retail trade except of motor vehicles and motorcycles; repair of personal and household goods.	Wholesale and retail trade, repair of motor vehicles and motorcycles	45+46+47
H	Land transport; transport via pipelines. Water transport. Air transport, railway transport, other land transport, water transport, air transport	Transportation and storage	49+50+51+52+53
I	Hotel and restaurant	Accommodation and Food Services	55+56
J	Post ant telecommunication.	Information and Communication: publishing, audiovisual, and broadcasting activities, telecommunication, IT, and other Information services	58+59+60+61+62 +63
K	Financial intermediation, except insurance and pension funding. Insurance, Insurance, and pension funding, except compulsory social security. Activities of auxiliary to financial intermediation.	Financial institution and Insurance activities	68
L	Real estate activities.	Real estate activities	64+65+66
M	Computer and related activities. Research and development.	Personal, scientific, and technical activities: legal, accounting, management, engineering, technical testing and analysis activities, scientific research and development, other professional, scientific, and technical activities.	69+70+71+72+73 +74+75
N	Supporting and auxiliary transport activities, activities of travel agencies. Renting of machinery and equipment without operator and of personal and household good. Other business activities.	Administrative and support service activities.	77+78+79+80+81 +82
O	Public administration and defense; compulsory social security.	Public administration and defense, compulsory social services.	84
P	Education	Education	85
Q	Health and social work	Human health and social work Activities	86+87+88
R	Activities of membership organization n.e.c. Recreational, cultural, and sporting activities.	Arts, Entertainment and Recreation	90+91+92+93
S	Other services activities	Other service activities	94+95+96
T	Private household with employed person Activities of households as employers, undifferentiated goods, and services, producing activities of households for own use.	Activities of households as employer, undifferentiated good- and services-producing activities of household for own use.	97+98

4.1Analysis of 1973's Input-Output Table of the Turkish Economy

The first representations (Figures 4.1, 4.2, and 4.3) refer to the total effects, immediate effects and mediative effects respectively under the assumption of influence coefficient ($\propto$) has equal value for all sector and tend to the unit($\propto \rightarrow 1^{-}$). It is a hypothesis applied in scenarios in which there is no additional information. However, the influence index (revised total effects) are represented in Figure 4.4. The figure is formed by using concentric circles. The sectors that are located in the center of the figures will have strong effects on the economic development of Turkey in the period of 1970s. while the sectors far from the center had relatively weaker effects in the economic development of Turkey in that period.

Total Effects:as the name of this indicator implies, total effect measures the total impacts of a sector and their virtual influence on the other sectors in the economic system. The total effects outcome of the analysis of input-output table 1973 of the Turkish economy is shown in Figure 4.1. The figure indicates all sectors according to their relative impacts on the economic development of Turkey. The position of economic sectors in the concentric circle shows their relative influence on the rest of the economy.

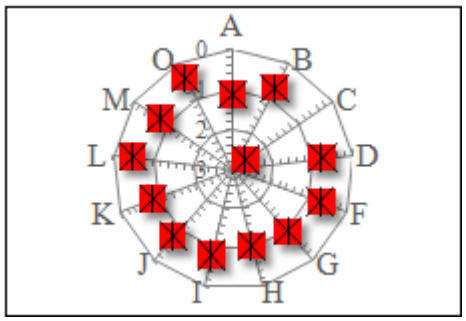

Figure4.1: The Total Effects of economic Sectors in 1973
Source: Author own elaboration from 1973's Input-output of Tukey

According to figure 4.1 the sectors such as manufacturing (C), agricultural, animal husbandry, forestry, and fishing sector (A), transportation and communication sector (H), wholesale, retail and retail trade, repair of motor vehicles and motorcycles sector (G), had the highest rate of total effect in the economic development of Turkey during the 1970s.

Immediate Effects: Immediate effects that refer to the speed of transmission of the sectorial total effects in the network of Turkish economy in 1973 are illustrated in Figure 4.2.

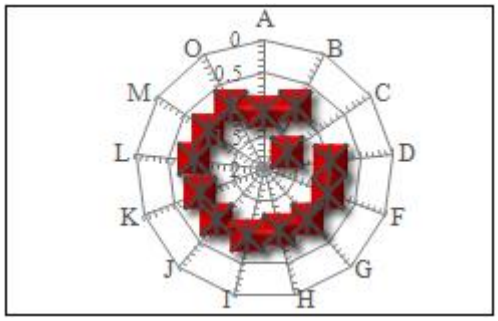

Figure4.2: Immediate Effects of Economic Sectors of Turkish Economy in 1973
Source: Author own elaboration from 1973's Input-output of Tukey

Based on Figure 4.2 among all other economic sectors just only the sectors like sector C Manufacturing sector (C), agriculture and animal husbandry, forestry, and fishing sector (A), transportation and communications sector (H) as well as Personal, scientific and technical activities sector (M) are able to transmit the impact of total effect of the key sectors on the rest of the Turkish economic. Therefore, these sectors played an important role in employment, and resource mobilization of Turkish economy in 1973.

Meditative Effect: This indicator shows impacts of some specific sectors, which had operated as a crossroads and connectors in the network system of the Turkish economy during the 1970s are indicated by Figure 5.3.

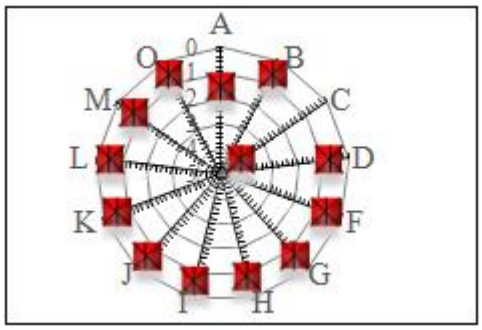

Figure4.3: Mediative Effect of Economic Sectors of Turkish Economy in 1973
Source: Author own elaboration from 1973's Input-output of Tukey

As the above figure illustrates the sectors such as the manufacturing sector (C), agriculture and animal husbandry, forestry, and fishing sector (A), including transportation and communication services sector (H), and personal, scientific, and technical activities sector (M) were operated as the crossroad in the transition of total effect in the rest of economic sectors of Turkish economy in 1997s.

Influence Index (Revised total effects): Until now the effects are calculated under the assumption that influence coefficient ($\propto$) whose value is equivalent for all economic sectors and tends to one ($\propto \to 1^{-}$). However, as mentioned earlier, this assumption is extremely restrictive in the input-output model, because any exogenous changes in the network system of the economy will affect economic sectors differently. The determination of a different influence index for each sector enables the researcher to represent the dominance capacity generated in an input-output table. This weighting will consequently affect the total effect that a sector can generate on the rest of the economy and allows a better fit in the total impact value. Diverse influence index for each sector of the IO table 1973 of the Turkish economy is computed and illustrated in Figure 4.4.

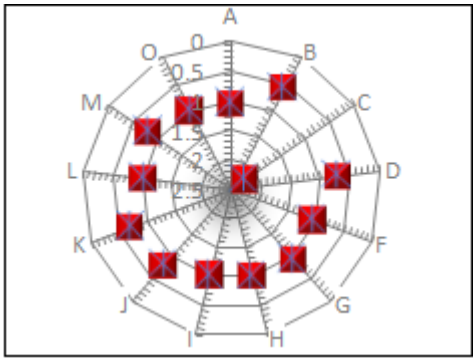

Figure4.4: Revised Total Effects of Economic Sectors of Turkish Economy in 1973
Source: Author own elaboration from 1973's Input-output of Tukey

The results show that different weight of influence index changed the total effects of the economic sectors in the economy. Figure 4.4 shows the revised total effects of some economic sectors have increased in Turkey economy. Consequently, as Figure 4.1 indicates only economic sectors which include (A, C and H) had enjoyed from the high total effects. While by computing different influence index for each sector (revised total effects) which illustrated in Figure 4.4 shows the total effects of economic sectors like

agriculture and animal husbandry, forestry, and fishing sector (A), manufacturing (C), transportation and storage (H), construction sector (F), wholesale and retail, repair of motor vehicles and motorcycle sector (G), accommodation and food services sector (I), real estate activities sector (L), and the sector of public administration and defense, compulsory social Security (O) increased, and the sectors with higher revised total effects in the economy are regarded as key sectors, because these sectors are the major supplies in the Turkish economy based on the 1973 IO table analysis.

4.2 Analysis of 1the 979's Input-Output Table of the Turkish Economy

The second illustrations (Figures 4.5, 4.6, and 4.7) are related to the analyzing of total effects, immediate effects, and mediative effects respectively for key sector identification in Turkish economy using 1979's input-output table of that country. These analyses are accomplishing under the assumption that influence coefficient ($\propto$) has an identical value for each economic sector and it tend to the one ($\propto \rightarrow 1^{-}$).

Total Effects: to identify the total effect of each economic sector on the economic development of Turkey during 1979 necessitates to analysis 1979's input-output table of Turkey. The analytical results of total effects of economic sectors from 1979 IO table are shown in Figure 4.5. Our estimations indicate that sectors like manufacturing sector (C), agriculture and animal husbandry, forestry, and fishing sector (A), accommodation and food services activities (I), transportation sector (H), had the highest total effects on the rest of Turkish economy in 1979.

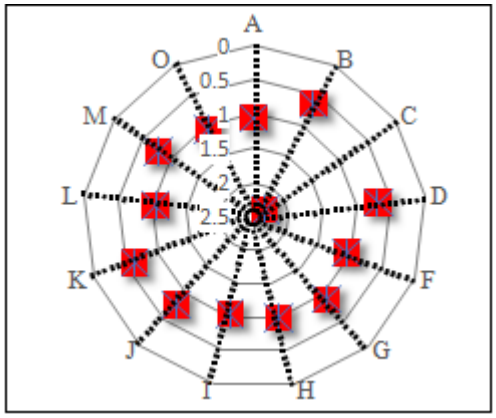

Figure 4. Error! No text of specified style in document.**:** Total Effects of Economic Sectors of Turkish Economy in 1979
Source: Author own elaboration from 1979 Input-output of Tukey

Immediate Effects: the following Figure 4.6 illustrates the immediate effects of economic sectors in the Turkish economy that obtained from the analysis of 1979's IO table of the Turkish economy. The figure indicates critical changes in the position of economic sectors for immediacy transmission of the total effects on the rest of the economy. The results show that agriculture and husbandry, forestry, fishing sector (A) to some extent had lost its position on immediacy effects. While this sector has enjoyed the higher total effect, but it has no easy access or immediacy to all productive sectors available in the economy. However, the mining sector (B) achieved a higher position in immediate effects than the other economic sectors. Hence based on the analysis of 1979's input-output table of Turkish economy only two sectors such as mining sector (B), and manufacturing sector (C) has the highest immediate effect than the other economic in the Turkish economy, thus were able to transmit the total effect on other productive sectors in the Turkish economy.

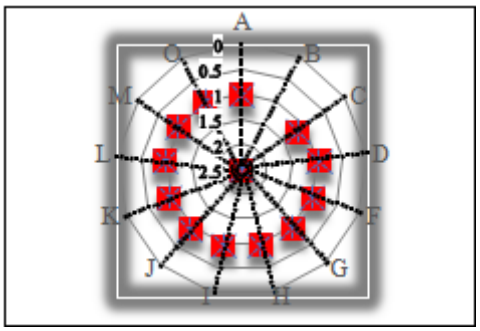

Figure 4.6: Immediate Effects of Economic Sectors of Turkish Economy in 1979
Source: Author own elaboration from 1979 Input-output of Tukey

***Meditative Effects*:** The third step for key sector determination by using the multilevel indicator method is the identification of mediative effects of economic sectors of Turkey. These effects are identified by analyzing the IO tables. In this regard the 1979 IO table of the Turkish economy analyzed, and the results are presented in Figure 4.7.

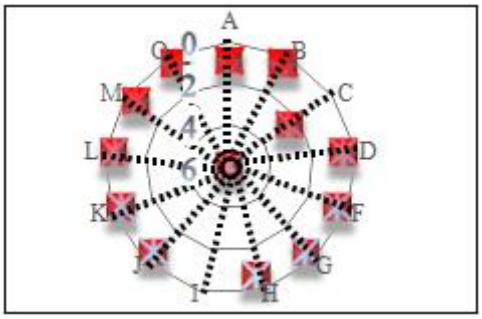

Figure 4.7: Mediative of Economic sectors on Turkish Economy in 1979
Source: Author own elaboration from 1979 Input-output of Tukey

As it is observable in Figure 4.7 that the economic sectors such as accommodation and food services (I), manufacturing sector (C), agriculture and husbandry, forestry, fishing sector (A) have the greatest mediative effects than the other economic sectors. These sectors play the role of the crossroad in connecting the network of Turkish economic system during 1979.

***Influence Index (Revised Total Effects)*:** So far in our analysis, it was assumed that influence index coefficient ($\propto$) equally effects to all economic sectors and its value tend to one ($\propto \rightarrow 1^{-}$). Indeed, any exogenous change in the economic system will affect economic sectors differently. Therefore, determination of a diverse influence index for each economic sector is needed for any research in IO table analysis to represent the dominance capacity produced in an IO table. This weighting will change the total effects that an economic sector can produce on the economy.

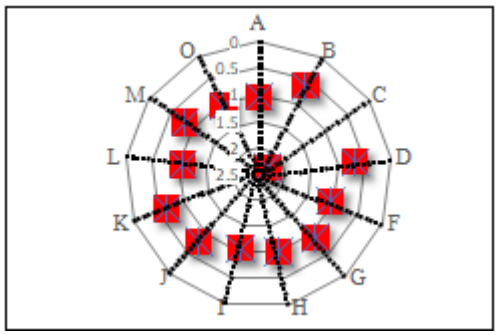

Figure 4.8: Revised Total Effects of Economic Sectors of Turkish Economy in 1979
Source: Author own elaboration from 1979 Input-output of Tukey

The research results represent that by computing diverse influence coefficient for available economic sectors in 1979 IO table of the Turkish economy, the total effects of some economic sectors increased. As Figure 4.8 indicates the sectors who gained higher total effects in the economy are as follows: agriculture and animal husbandry, forestry, fishing sector (A), manufacturing sector (C), accommodation and food services (I), construction sector (F), real estate activities, and public administration and defense; compulsory security sector (O), real estate activities sector (L).Thus these sectors are considered as the leading or key sectors because they were able to provide a strong inter-sectoral linkage in the economic system of Turkey during 1979.

4.3 Analysis of the 1990 Input-Output of the Turkish Economy

The third part of the research analytical section is devoted to the process of key sector identification in Turkish economy using 1990's input-output table. To determine key sectors in the first step, we need to calculate the total effects, immediate effects, and mediative effects by assuming that the influence coefficient $\propto$ equally affect all economic sectors and its value tends to the unit ($\propto \rightarrow 1^{-}$).
The analytical results of the three complimentary effects have been represented via the Figures (4.9, 4.10, and 4.11). The figures show the results of the total effects, immediate effects and mediative effects of productive sectors of the Turkish economy in 1990.

***Total Effects*:** to find the total effect of each economic sector of the Turkish economy during 1990, it is needed to analysis IO table 1990 of this country. The related IO table analyzed, and its results are depicted in Figure 4.9. The findings confirm substantial improvement in total effects of the wholesale and retail trade sectors in the Turkish economy. These total effects modifications mainly related to economic policy changes. At the begging of the 1980s, the government of Turkey completely modified its economic policies from the planned economy toward economic liberalization. Through this economic policy modification, the government provided more opportunities for private sector development by shrinking the government interventions in the economy. Therefore, 1980s can be regarded as a good switching period toward modernization of Turkey.

The analytical outcomes of the 1990's IO table of the Turkey economy which is shown in Figure 4.9 reveal that among all available productive sectors in 1990' IO table. The sectors such as agriculture and animal husbandry, forestry, fishing sector (A), manufacturing sector (C), wholesale and retail trade, repair of motor vehicles and motorcycles sector (G), and transportation and storage sector (H) are the sectors that have highest total effects on the rest of the Turkish economy in 1990.

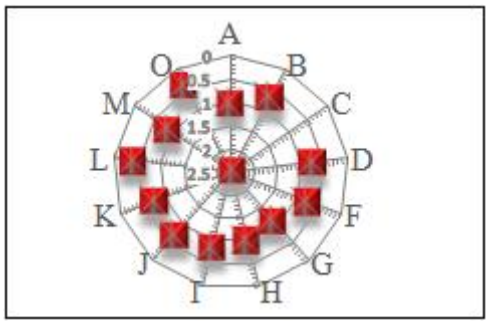

Figure 4.9: Total Effects of Economic Sectors of Turkish Economy in 1990
Source: Author own elaboration from 1979 Input-output of Tukey

***Immediate Effects*:** Figure 4.9, which obtained from the analysis of 1990's input-output table of Turkish economy indicate the immediate effect of economic sectors in the Turkish economy in1990.

The results indicate that agriculture and animal husbandry, forestry, fishing sector (A), transportation and storage sector (H) slightly lost their position in the transition of total effects on the rest of the economy. However, the manufacturing sectors (C), and trade sector: wholesale, and retail trade, repair of motor vehicles and motorcycles sector (G), have the highest immediate effects than the other economic sectors in the Turkish economy in 1990. These economic sectors had the ability of the immediacy transmission of the total effects on rest sectors of the Turkish economy.

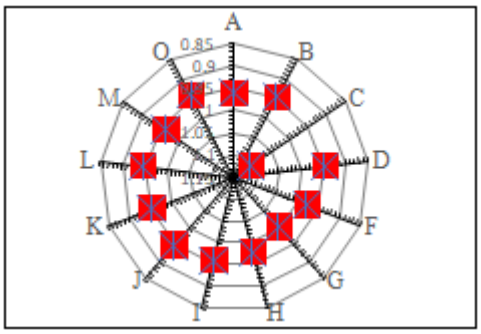

Figure 4.10: Immediate Effects of economic Sectors in the Turkish Economy During 1990
Source: Author own elaboration from 1979 Input-output of Tukey

***Meditative Effects*:** Figure (4.11) shows the mediative effects of productive sectors in the Turkish economy throughout 1990. The outcomes indicate that the following productive sectors were able to play as a crossroad in the network system of the Turkish economy in 1990.

Our results show that agriculture and animal husbandry, forestry, fishing sector (A), and manufacturing sector (C),

have the highest mediative effects on Turkish economy throughout 1990, while sector G slightly lost its position. That means the sectors mentioned above except sector (G) had the position to play a central role in connecting the economic network of Turkey during 1990.

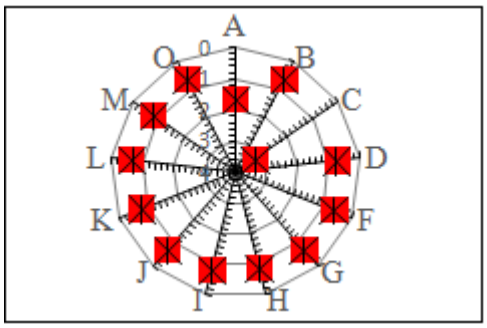

Figure4.12: Mediative Effects of Economic Sectors in Turkish during 1990
Source: Author own elaboration from 1979 Input-output of Tukey

***Influence Index (Revised Total Effects)*:** Each economic sector has a specific weight on the supply and the demand sides of the economy. Therefore, determination of the different influence index for each economic sector provides opportunity to investigators to uncover the dominance capacity produced in an IO table. Computing diverse influence index for each economic sector will change the total effects that an economic sector can produce on the economy.

According to the Figure 4.12, sectors such as agriculture and animal husbandry, forestry and fishing sector (A), manufacturing sector (C), construction sector (F), transportation and storage sector (H), wholesale and retail trade, repair of motor vehicles and motorcycles sector (G), accommodation, and food services sector (I), real estate activities sector (L), and public administration and defense; compulsory social security sector (O) all of these sectors by having the highest revised total effect are considered as the leading sectors in the Turkish economy during 1990.

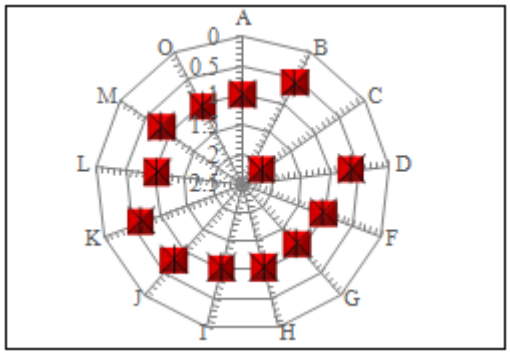

Figure4.12: Revise Total Effects of Economic Sectors of Turkish Economy in 1990
Source: Author own elaboration from 1979 Input-output of Tukey

4.4 Analysis of the 2002 Input-output table of the Turkish Economy

The fourth part of the input-output analysis is related to the key sector identification using 2002's Input-output table of Turkey economy under the assumption that influence index coefficient equally effects to all economic sectors. As the analysis shows, there is considerable expansion in the 2000 input-output table of the Turkish economy. During this period the IO has been expanded from 64 to 95 sectors. Hence in this section, the IO table of the Turkish economy is classified into 20 economic sectors. The expansion of the IO table conveys a considerable development in the number of key productive sector in the Turkish economy. Therefore, this period can be regarded as a switching point toward industrialization of Turkey.

***Total Effects*:** The consequences of Turkey's 2002 IO table analysis is represented via Figure 4.13. The figure shows that the following sectors had the highest total effects overall economic sectors of Turkey in 2002.

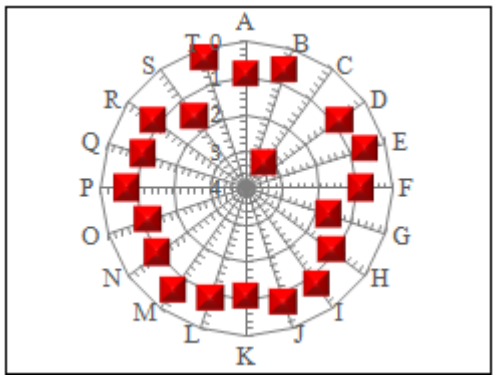

Figure 4.13: Total Effects of Economic Sectors of Turkish Economy in 2002
Source: Author own elaboration from 1979 Input-output of Tukey

According to Figure 5.13 the sectors such as manufacturing sector (C), wholesale, and retail trade, repair of motor vehicle and motorcycles sector (G), transportation and storage sector (H), financial and insurance activities sector (K), administrative and support services activities sector (N) , public administration and defense; compulsory services sector (O), human health and social work activities sector (Q), other services activities sector (S), all of these sectors had the highest total effects on the rest of the Turkish economy in 2002.

***Immediate Effects*:** The results of the 2002 IO table of Turkey concerning the identification of the immediate effects of productive sectors in the Turkish economy is shown in Figure 4.14.

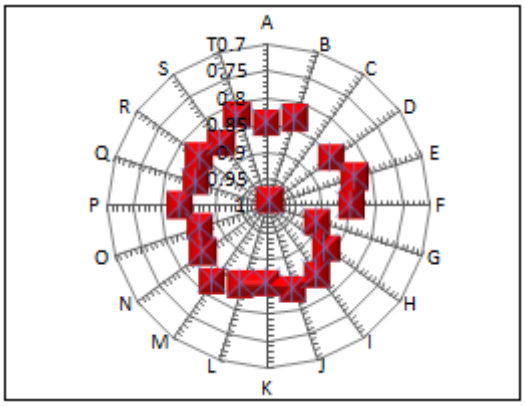

Figure4.14: Immediate Effects of Economic Sectors of Turkish Economy in 2002
Source: Author own elaboration from 1979 Input-output of Tukey

The results indicate that the sectors such as, manufacturing sector (C), electricity and gas, steam and air condition sector (D) , wholesale, and retail trade, repair of motor vehicle and motorcycles (G), transportation and storage sector (H), financial and insurance activities sector (K), administrative and support services activities (N), public administration and defense; compulsory services sector (O), human health and social work activities(Q), and other services activities sector (S) have the immediacy ability of transmission the total effects on other sectors in the economy.

***Meditative Effects*:** The analytical consequences of 2002 IO table of Turkish economy related to the determination of mediative effects is illustrated in Figure 4.15.

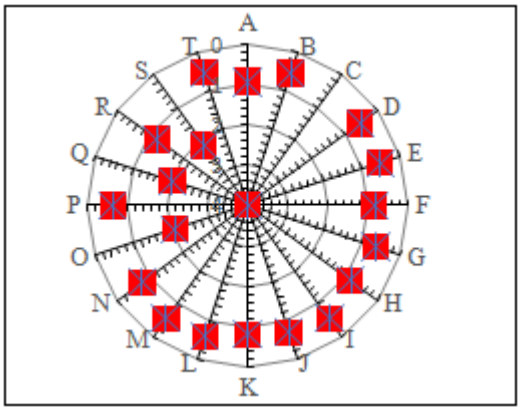

Figure 16: Mediative Effects of Economic Sectors of Turkish Economy 2002

As Figure 4.15 shows, the sectors such as agriculture and animal husbandry, forestry, fishing sector (A), manufacturing (C), construction (F), wholesale and retail trade, and repair of motor and motorcycles sector (G), transportation and storage sector (H), Financial and insurance activities sector (K), administrative and support services activities (N), public administration and defense; compulsory services sector (O), human health and social work activities(Q), other services activities (S) were able to play the role of crossroads in the economic network of the Turkish economy.

Influence index (Revised Total Effects): The three indicators (total effects, immediate effects, and mediative effects) are computed under the assumption of influence index ($\propto$) equally affect all productive sectors in the economy. In fact, this hypothesis employed in circumstances in which there is no statistical information about the influence index of individual sectors, and it is not common in IO model. Indeed, any external changes will affect differently on economic sectors. Thus, different influence index for each available economic sector of 2002 IO table of the Turkish economy is computed. The results are illustrated in Figure 4.16.

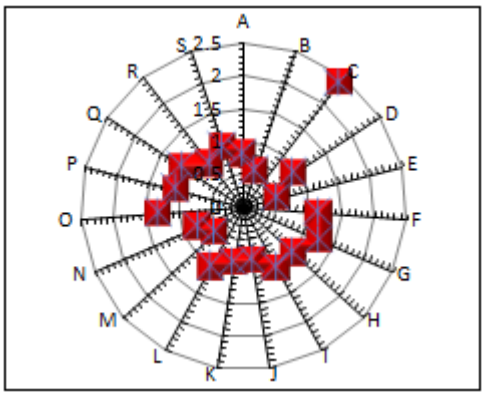

Figure4.16: Revised Total Effects of Economic Sectors of Turkish Economy in 2002
Source: Author own elaboration from 1979 Input-output of Tukey

By computing diverse influence index for each productive sector, the total effects of some sectors will change. The sectors those who lost their total effects are included, agriculture and animal, husbandry, forestry, fishing, sector (A), administrative and support services activities sector (N), and the other services activities sector (S). The sectors whose total effects have increased are as follows: the education sector(P), personal, scientific, and technical activities sectors(L).

As the Figure 4.16 reveals, the sectors such as sector manufacturing (C), electricity and gas, steam and air condition sector (D), construction sector (F), wholesale and retail trade, and repair of motor and motorcycles sector (G), transportation and storage sector (H), accommodation, and food services sector (I), real estate activities sector (L), public administration and defense; compulsory services sector (O), education sector (P), human health and social work activities sector (Q) have the highest total effects on other economic sectors. Thus, they are considered as the key or leading sectors in Turkish economy during 2002.

4.5 Analysis of the 2012 Input-Output table of the Turkish Economy

The fifth part of the input-output analysis is concerned to the identification of total effects, immediate effects and mediative effects for determination of key sector in the Turkish economy using its 2012 IO table. These analyses are accomplishing under the hypothesis that influence coefficient ($\propto$) equivalently affects all economic sectors of the economy and its value tends to one.

Total Effects: The outcome of the 2012 input-output analysis of Turkey economy, which is related to total effects determination has shown via Figure 4.17. The figure reveals the sectors those who had the strongest total effect on the rest of the Turkish economy in 2012.

Our findings show the sectors with more effective total effects are included, manufacturing sector (C), electricity and gas, steam, and air condition sector (D), construction sector (F), wholesale and retail trade, repair of motor vehicles, and motorcycles sector (G), transportation and storage sector (H), human health and social work activities sector (Q). These economic sectors had the highest total effects on the rest Turkish economy during 2012.

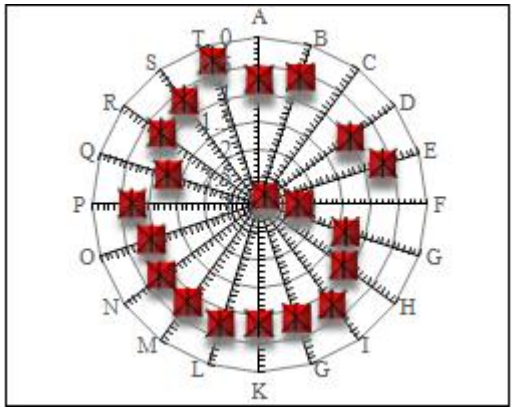

Figure4.17: Total Effects of Economic Sectors of Turkish Economy in 2012
Source: Author own elaboration from 1979 Input-output of Tukey

***Immediate Effect*:** The analytical results of the 2012 IO table of Turkish economy related to the determination of the immediate effects of economic sectors on Turkish economy in 2012 is depicted in Figure 4.18. The figure identifies that the following sectors had the immediacy ability for transmission of total effects on the rest of the economic sectors in the Turkish economy in 2012.

According to Figure 5.18 the economic sectors that had the highest immediate effects are included, manufacturing sector (C), electricity and gas, steam, and air condition sector (D), construction sector (F), wholesale and retail trade, repair of motor vehicles, and motorcycles sector (G), transportation and storage services sector (H), human health and social work activities(Q).

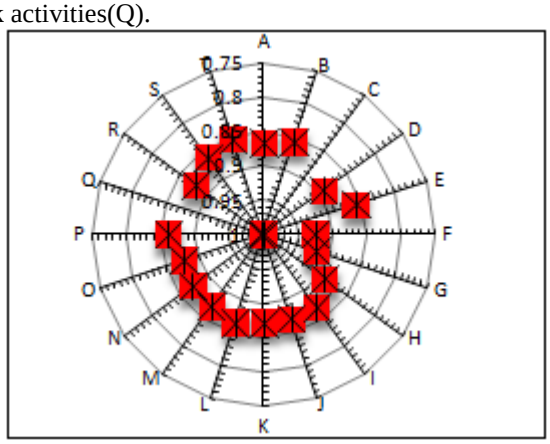

Figure 4.18: Immediate Effects of Economic Sectors of Turkish Economy in 2012
Source: Author own elaboration from 1979 Input-output of Tukey

***Meditative Effects*:** The outcomes of the 2012 input-output analysis of the Turkish economy about mediative effects of economic sectors have shown in Figure 4.19.

The figure illustrates that the following sectors such as agriculture and animal husbandry, forestry, fishing; manufacturing sector (C), electricity and gas, steam and air condition sector (D), construction sector (F), transportation and storage sector (H), human health and social work activities sector (Q), arts, entertainment and recreation sector (R), were able to perform as a crossroad in the economic network of Turkey in 2012.

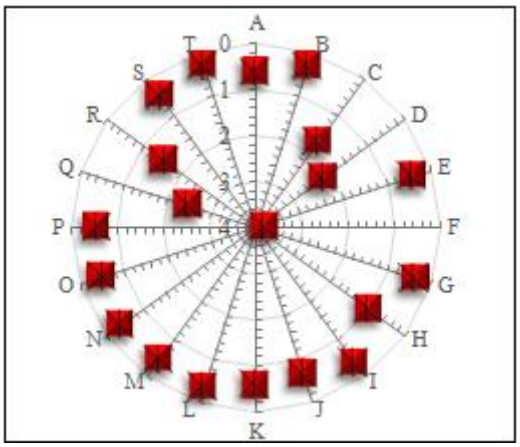

Figure 4.19: Mediative Effects of the Economic sector of Turkish Economy in 2012
Source: Author own elaboration from 1979 Input-output of Tukey

***Influence Index (Revised Total Effects)*:** In this section different influence index is computed for each economic sector, and the results are represented in the Figure 4.20

As Figure 4.20 indicates by computing diverse influence coefficient for each economic sectors the total effects of the economic sectors have changed. the sectors who has got the highest revised total effect are as follows: manufacturing sector (C), electricity and gas, steam and air condition sector (D), construction sector (F), trade sector: wholesale and retail trade, repair of motor vehicles, and motorcycles sector (G), transportation and storage sector (H), accommodation and food activities sector (I), public administration and defense compulsory social security sector (O), education services sector (P), human health and social work activities sector (Q), arts, entertainment and recreation sector (R), other services activities sector (S), Activities of households as employer sector (T). The sectors who obtained the highest total effects in the economy are considered as the leading sectors of Turkish economy in 2012.

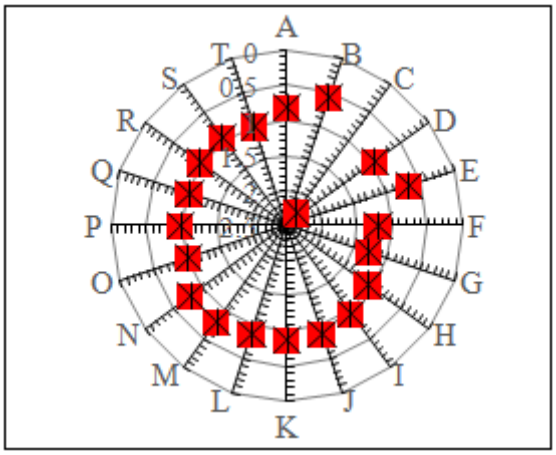

Figure4.20: Revised Total Effects of Economic Sectors of Turkish Economy in 2012
Source: Author own elaboration from 1979 Input-output of Tukey

5. Findings from Input-Output Analyses

Turkey as a developing county has implemented different industrial policies to prevent the misallocation of economic resources and reduces the productivity gap between Turkey and advanced economies. To identify and evaluate the

evolutionary process of the key economic sectors and their impact on SMEs development in the Turkish economy the IO tables of 1973, 1979, 1990, 2002 and 2012 of this country by using a new proposal from network theory method have analyzed. To determine key economic sectors through this input-output analysis method, it is essential to determine which sectors have the most significant productivity gap with respect to the leading sector. Also, it is needed to compute the influence index of each economic sectors separately. Hence it will be natural to think a sector with both a large productivity gap and a significant degree of influence as a key sector. By applying this method to the analytical part of the research, we obtained different results from the analysis of each IO table of the Turkish economy. The results have been shown in the following tables, and through the comparison of the results, one can find that the number of key economic sectors increased in the Turkish economy by improving the economic structure of this country during 1973- 2012.

Table 5.3 shows the analytical result of the 1973 IO table of the Turkish economy. the analytical result of this IO table shows that the economic sector such as agriculture and animal husbandry, forestry, and fishing sector (A), manufacturing (C), transportation and storage (H), construction sector (F), wholesale and retail, repair of motor vehicles and motorcycle sector (G), accommodation and food services sector (I), real estate activities sector (L), and the sector of public administration and defense, compulsory social Security (O) sectors with higher productivity gap and the highest degree of influence are regarded as the key economic sectors based on 1973's IO table.

Table 5.1: Analytical Results of the 1973 IO Table of the Turkish Economy

Code	Total Effect	Immediate Effects	Mediative Effects	Influence Index
A	1,081943606	0,983718318	1,46649114	1,0507218
B	0,715913606	2,495431424	0,75379373	0,62748449
C	2,616521254	1,142745897	3,70214034	2,30088804
D	0,724974839	0,957330142	0,8422217	0,68015035
F	0,740856909	0,986607183	0,74733499	1,05402924
G	0,878505462	0,981513673	0,75965162	0,90029016
H	0,981870398	0,984970058	0,98536588	0,99123613
I	1,063105272	0,965224988	8,65180151	1,0546238
J	0,729636026	0,958391112	0,81998012	0,79017114
K	0,805740145	0,970657399	0,75903362	0,63930904
L	0,46826105	0,960434124	0,74733499	1,05402924
M	0,78368395	0,96201137	0,88545646	0,80303734
O	0,425899528	0,955512065	0,74733499	1,05402924

Source: the author: Source: Author own elaboration from 1973 Input-Output Table of Turkey

Table 5.2 represent the analytical outcomes of the1979's IO table of the Turkish economy. The analytical results of this IO table highlight that the sectors like animal husbandry, forestry, fishing sector (A), manufacturing sector (C), Construction sector (F), accommodation and food services (I), transportation and storage sector (H), real estate activities sector (L), and public administration and defense; compulsory security sector (O) are accepted as the key sectors in the Turkish economy.

Table 5.2: Analytical Results of the 1979 IO Table of the Turkish Economy

Code	*Total Effect*	*Immediate Effects*	*Mediative Effects*	*Influence Index*
A	1,164350827	1,165688	2,13046785	1,24377666
B	0,740221979	0,952643	0,84378835	0,85093004
C	2,610205275	1,59151	5,2415403	1,98982047
D	0,768679774	0,976358	0,95541927	0,89512506
F	0,658767976	0,966963	0,8395019	1,03092239
G	0,915031878	0,981417	0,87246725	1,15578084
H	1,023118962	1,038197	1,05372656	1,2087345
I	0,812463068	0,962226	0,8395019	1,33350658
J	0,764788352	0,954124	0,8395019	0,98456638
K	0,884288763	0,976485	0,87247484	0,756344
L	0,497390533	0,950641	0,8395019	1,03092239
M	0,811410783	1,012341	1,13940688	0,93719293
O	0,450564346	0,945108	0,8395019	1,03092239

Source: the author: Source: Author own elaboration from 1979 Input-Output Table of Turkey

By comparing the analytical results of IO 1973 and 1979 of the Turkish economy, we do not see any improvement in the number of key sectors during the 1970s. One of the main reasons could be the implementation of the same industrial policy. Since the Turkey was ruled under the planned economy during 1970s, thus, there was not any development in the number of key sectors in the Turkish economy during the 1970s.

Table 5.3: illustrates the analytical outcomes of the 1990 IO table of the Turkish economy

Code	Total Effect	Immediate Effects	Mediative Effects	Influence Index
A	1,03491098	0,96235642	2,137987241	1,18604912
B	0,69451107	0,94591256	0,843131407	0,85300992
C	2,42564132	1,10538809	4,160852688	1,83751643
D	0,73818906	0,94657927	0,971948821	0,86804522
F	0,756762	0,97746794	0,84159181	1,05145931
G	1,14697868	1,001384	0,922678836	1,21839964
H	1,02881053	0,97800491	1,121537228	1,15621509
I	0,86958298	0,95967232	1,056950155	1,2621064
J	0,73123222	0,9468996	0,925066674	0,8646975
K	0,79632962	0,95362097	0,992860098	0,69138959
L	0,44323668	0,94545704	0,84159181	1,05145931
M	0,88937092	0,96400392	1,013237988	0,9170114
O	0,41917691	0,94279224	0,84159181	1,05145931

Source: the author: Source: Author own elaboration from 1990 Input-Output Table of Turkey

As the outcomes show, the sectors that have selected as the key sectors are included agriculture and animal husbandry, forestry and fishing sector (A), manufacturing sector (C), construction sector (F), transportation and storage sector (H), wholesale and retail trade, repair of motor vehicles and motorcycles sector (G), accommodation, and food services sector (I), real estate activities sector (L), and public administration and defense; compulsory social security sector (O).

When we compare the analytical outcomes of 1979 and 1990 IO table of the Turkish economy; we will find an improvement in the number of key economic sector in the Turkish economy. Since at the beginning of 1980s the Turkish government radically changed its economic policy from planned economy to market economy, because of the

liberal economic policy trade sector became one of the key sectors in the economy. However, because of the absence of specific industrial policy and some economic problems during the economic liberalization of Turkey in the 1980-1990, the number of key sectors slowly developed.

Table 5.4 illustrates the analytical results of the 2002 IO table of the Turkish economy. The outcomes show a considerable improvement in the number of key economic sectors in Turkish economy, which is observable from table 5.4.

Table 5.4: Analytical Results of the 2002 IO Table of the Turkish Economy

Code	Total Effect	Immediate Effects	Mediative Effects	Influence Index
A	0,91228552	0,84811022	0,913230649	0,803199506
B	0,626381616	0,83095882	0,533446765	0,568143251
C	3,171683391	0,98906385	3,98591012	2,383499269
D	0,873378607	0,85112604	0,521553705	0,920956135
E	0,592783022	0,82866935	0,532369457	0,537773521
F	0,882153127	0,84404607	0,827805503	1,149307082
G	1,651280132	0,90257151	0,644966873	1,275626429
H	1,132747623	0,86405585	0,824461836	1,029549851
I	0,771316117	0,8419316	0,528022227	1,060136565
J	0,755054628	0,83861553	0,663055652	0,824990938
K	1,060080383	0,85721692	0,795104468	0,859396111
L	0,856253071	0,84754928	0,570963474	1,02484206
M	0,598726312	0,82881039	0,530939282	0,57408916
N	1,006176311	0,85517858	0,75021715	0,753381425
O	1,206003779	0,87189636	2,088705176	1,28928878
P	0,769363372	0,84097358	0,643927439	1,055052976
Q	1,041591739	0,86348009	2,023427028	1,112637155
R	0,884142931	0,84660389	1,206200011	0,820488932
S	1,602001785	0,85815505	2,14606147	0,957640854
T	0,307499185	0,82613503	0,521180827	0,803199506

Source: the author: Source: Author own elaboration from 1990 Input-Output Table of Turkey

According to the analytical results of 2002's IO table the sectors like manufacturing (C), construction sector (F), wholesale and retail trade, and repair of motor and motorcycles sector (G), transportation and storage sector (H), accommodation, and food services sector (I), real estate activities sector (L), public administration and defense; compulsory services sector (O), education sector (P), human health and social work activities sector (Q) are recognized as the key economic sectors in the Turkish economy. Therefore, this period is regarded as a switching point toward industrialization of Turkey.

Table 5.5 illustrates the analytical outcomes of the 2012 IO table of the Turkish economy. During the period between 2002 and 2012 the government of useful industrial policies in order to facilitate the process of industrialization in Turkey. Thus, as the economic structure of the Turkish economy improved, the number of key economic sectors in the Turkish economy increased too.

Table 5.5: Analytical Results of the 2012 IO Table of the Turkish Economy

Code	Total Effect	Immediate Effects	Mediative Effects	Influence Index
A	0,795488313	0,86671316	0,649214744	0,82503743
B	0,630543664	0,8578779	0,337855066	0,58433293
C	2,813400825	0,99956859	1,711198987	2,27200747
D	0,991649332	0,89155239	2,182281947	0,95126543
E	0,686104983	0,85946525	0,421870207	0,6698066
F	2,301147809	0,92490518	3,79661339	1,19782624
G	1,3857886	0,91980059	0,371158765	1,26881673
H	1,141406011	0,88992421	0,96167734	1,06722247
I	0,783799914	0,86843927	0,357356662	0,94645597
J	0,860549294	0,87045447	0,64775827	0,88542128
K	0,856265318	0,87192503	0,584595749	0,8763751
L	0,757023374	0,8655299	0,359060135	0,88511475
M	0,839972612	0,86994527	0,455718606	0,79830917
N	0,839840661	0,8718941	0,385473818	0,80376418
O	0,98024679	0,8771862	0,510475238	1,01410148
P	0,742944735	0,86049999	0,573071761	0,98663662
Q	1,304825406	0,99660097	2,46880932	1,0440652
R	0,855001506	0,87759477	1,563325689	0,97167307
S	0,723465691	0,86120597	0,493769137	0,94021715
T	0,32446022	0,85412915	0,324115339	1,01155072

Source: the author: Source: Author own elaboration from 2012 Input-Output Table of Turkey

Through a comparison of the analytical outcomes of the IO tables of 2002 and 2012 we will easily find that the number of key economic sectors considerably increased in 2012. This development mainly related to specific industrial policies that the Turkish government implemented since 2003. The government introduced a horizontal industrial policy in 2003, and then in order to avoid the middle-income trap by channeling the economic resources in key economic sectors of the economy the government applied integrated industrial policy

The research findings have been supported by KOSGEB information concerning the distribution of SMEs in economic sectors. According to the SMEs classification Turkey had 3,524,333 active enterprises with less than 250 employees in 2013, out of which 3,206,214 or roughly 91% of the SMEs were operated in key economic sectors of Turkish economy. Table 5.8 indicates the distribution of enterprises in Turkish economy

Table 5.6: Distribution of Enterprises by Sector and employees

SECTOR (NACE Rev.2)	*Number of Enterprises by Number of Employees*				
	0-9	10-49	50-249	0-249	>250
A–Agriculture, Forestry and Fishery	28.619	1.537	211	30.367	22
B - Mining and quarrying	5.475	1.437	352	7.264	60
C –Manufacturing	371.608	44.668	8.882	425.158	1.627
D- Electricity, Gas, steam and hot water production and distribution	3.931	418	167	4.516	62
E – Water supplying; Sewer, Waste Management and Treatment Activities	3.044	384	103	3.531	81
F – Construction	210.095	36.027	7.115	253.237	510
G - Wholesale and retail trade; repair of motorized vehicle, motorbike	1.189.401	47.583	4.272	1.241.256	472
H – Transportation and storage	548.578	10.929	1.387	560.894	219

I – Accommodation and Restaurant Services Activities	290.907	12.715	1.597	305.219	307
J - Information and Communication	37.877	2.401	426	40.704	86
K –Activities on Finance and Insurance	24.702	1.026	161	25.889	75
L –Activities on Real Estates	49.662	1.562	160	51.384	15
M – Vocational, Scientific and Technique Activities	182.344	9.697	738	192.779	117
N –Administrative and Support Services	39.727	5.382	2.84	47.949	876
P – Education	21.307	6.284	885	28.476	345
Q - Healthcare and social services	37.682	3.995	870	42.547	291
R –Culture, Art, Entertainment, Resting and Sports	33.47	837	138	34.445	13
S –Other Personal Services	224.781	3.672	263	228.716	32
TOTAL	3.303.210	190.554	30.567	3.524.331	5.21
Distribution of enterprises by scale	%93,6	%5,4	%0,9	%99,9	%0,1

Source: (16)

6. Conclusion

Finally, our findings based on the theoretical framework of this research bring us to a conclusion that, the identification and investment in the key sectors are the most efficient way of SME promotion in developing countries. particularly in Turkey, because the existing of remarkable numbers of key sectors in the Turkish economy has a significant impact on capital formation for poverty reduction through private sector development. The Private investors through their investment in key sectors of the economy in the form of SMEs provide new employment opportunities, generate new income, and diversify the products.

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Author Profiles

Dr. Sultan Ahmad Taraki, Assistant Professor, Herat University, Economics Faculty, University Street, Heart- Afghanistan

Dr. Mesut Murat Arslan, Professor, YILDIRIM BYAZIT University, Faculty of Political Science, Department of Economic Esenboğa Campus, Ankara- Turkey