Import Dependency of Sectors and Major Determinants: An Input Output Analysis

Associate Professor Dr. Necla AYAS[1]*

[1]*Department of Economics and Administrative Sciences, University of Bulent Ecevit, Zonguldak, Turkey*

Corresponding Author email: necla.ayas@beun.edu.tr

Abstract

Many efforts have been devoted to import dependency of economies. In this study, import effects of sectors and their determinants have been researched by using input output models. Main determinants of sectoral import dependency were classified as base of three elements such as intensity of imported input, share of sectors in output and inter sectoral linkages. By the use of National Turkish Input-Output Tables from 1995 to 2011 which have been published World Input Output Database, import dependency of Turkish Economy was examined by sectors. With respect to finding of the study; Turkish Economy has been more import dependent during this period and change in the import dependency of sectors exhibited large diversity during 1995-2011. Import multipliers exhibiting total import effects of sectors seem to have changed in narrow band and closer to each other in 1995-1998 while it has been observed an expansion of import multipliers band and an increase in differences among sectors after 1998.

1. INTRODUCTION

The body of empirical works on import dependency has been ever growing and several studies have been made to test import dependency of the economy by using input output model. Knuuttila et al. (2014) examined import dependency of food production by using Input Output Model. Bravo and Alvarez (2012) researched import dependency of the Spain Economy comparative to Germany, France and Italy). Östblom (1989) studied changes in the requirements of imports in the Swedish Economy. Marshall (2011) examined change in factor content of Chinese Economy. Paul (2014) examined trends and patterns of import intensity in India Economy. Loschky and Ritter (2007) studied import content of exports for Germany, Cuihong and Jiansuo (2007) revealed the dependency of Chinese export on import and Milner, Meng, and Zhihong (2010) studied import content of trade.

Within the literature, although input output analysis is widely used to study import dependency of both sectors and economies, there are a limited number of studies analyzing import dependency of Turkish Economy by using input output model. (Şenesen and Şenesen, 2003; Şenesen, 2005; Ersungur and Kızıltan, 2007; Ersungur et al., 2011; Demir and Kula, 2008; Eşiyok, 2008; Yükseler and Türkan, 2008; Saygılı et al., 2009, 2010, 2012; Saygılı and Saygılı, 2011; Aydoğuş et al., 2015). Most of the studies, searching this subject with input output model are based on the 2002 or/and previous input-output tables which were published by Turkish Statistical Association (TSA). Since these studies varies according to research period and sector classifications, it is difficult to compare to their results. The notable other studies that have examined the import dependency by using input output models are (Atan, 2011; Duman and Özgüzer, 2012; Şenesen and şenesen, 2001). Common

finding of these studies are; (1) İmport input intensity of output is generally high and has an upward tendency, (2) major changes observed in import intensity and import effects of sectors in Turkish Economy during research periods. As it known none of these studies used Turkish National Input Output Table published by World Input Output Database (WIOD). In this sense to the best of our knowledge, import dependency findings of input-output model for Turkish Economy are only available to 2002 and there is no study by using more up-to-date input-output tables. The Turkish Input Output Tables published by WIO have been used first time in this study to analyze import dependency of Turkish Economy.

The main objective of this article is to analyze the dependency of Turkish Economy on import in sectorial level between 1995 and 2011 by using input output models. This study also sheds light on the determinants of total import effect of sectors; such as import intensity, share of sectors in output and inter sectorial input output relations. For this purpose, recently available 17 National Turkish Input-Output Tables published in World Input Output Database (WIOD) from 1995 to 2011 were used in the study.
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2. INVESTIGATION IMPORT DEPENDENCY BY USING INPUT OUTPUT MODEL

Gross output which can be estimated by using both demand and supply side methods in input output models is a significant indicator of the economy. According to demand side methods, it is measured roughly as the sum of intermediate inputs and final demand while it is measured by sum of intermediate input and value added with regard to supply side methods. Seeing that value added elements (such as labor, capital etc.) and final demand elements (consumption, export) are determined outside of the production process and they are accepted as external factors. Since import dependency of the economies are mainly effected usage of intermediate imported inputs, the study focused on supply side models.

Since Input-Output Model is enable to estimate the economy wide (direct and indirect) effects and it is more commonly used for studying import dependency owing to its inter sectorial context, we examined import dependency of Turkish Economy by using Input Output Model. This model works with own data in the form of input output tables and each sector takes place two times in these tables. (Once in the row and once in the column). While row values show the distribution of sector outputs as demand factors, column values indicate sources of the output such as intermediate inputs (domestic and imported) and value added factors (labor and capital).

It is possible to formulate the demand equations of sectors using the Input Output Model which is an application of Leontief's basic model.

$$X_i = \sum X_{ij} + F_i \tag{1}$$

In the equation; X_i: shows sectoral output, $\sum X_{ij}$: shows quantity of sectoral output which is demanded as intermediate input and F_j: shows final demand to outputs of sector. By dividing quantity of intermediate input demand of sectors by their total outputs, output coefficients (bij) are calculated and corresponded coefficients entitled as Direct Forward Linkage (DFL) coefficients.

$$b_{ij} = \frac{X_{ij}}{X_i} \qquad (i=1, 2, 3\ldots\ldots.n); \qquad DFL = \sum b_{ij} \tag{2}$$

Sum of the output coefficients exhibit quantity of the sectorial output which is demanded as intermediate input from other sectors in the economy. Other things are equal, DFL coefficients can be taken into account as indicator of intermediate supply capacity of sectors in the economy.

Output value of sectors composed of intermediate input and primary input (value added). Column values of input output tables present the input composition of sectorial output and sectorial output value can be formulated as follows in accordance with the input output methods.

$$X_j = \sum X_{ij} + V_j \tag{3}$$

In the equation 3; X_j: shows output value of sector j, while $\sum X_{ij}$: indicates intermediate input demand of sector j, from other sectors of the economy and V_j : indicates sum of value added elements such as labor and capital to complete production process. By dividing quantity of intermediate input demand of the sector by their total output, input coefficients (aij) are calculated and these coefficients are also entitled as Direct Backward Linkage (DBL) coefficients (Ayaş, 2012; Chenery and Watanabe, 1958; Chenery and Clark, 1965).

$$a_{ij} = \frac{X_{ij}}{X_j} \qquad (j=1, 2, 3………n) \quad ; \quad DBL = \sum a_{ij}$$

$$(4)$$

Sum of the input coefficients exhibit quantity of the input usage and also show intermediate input content of the sectorial output. Seeing that DBL coefficients exhibit, if the final demand of sectors increase one unit, how much output would be necessary from each of sectors to respond changing final demand also defined as direct production effects of the sectors. Total production effects which comprises of both direct and indirect effects are accounted by using Leontief Inverse Matrix (LIM). (Knuuttila et al. 2014; Ezzahid and Chatri, 2015). It is possible to calculate Leontief Inverse Matrix by making the necessary arrangements in Equation 1.

$$X = (I - A)^{-1}F \qquad\qquad (5)$$

In the equation 5; X is the vector of output, F is the final demand, A is a matrix of input coefficients and I is the identity matrix. Leontief Inverse Matrix elements $(I - A)^{-1}$ indicates a multiplier used to calculate overall relationships in industrial output caused by final demand. The sum of the column elements of Leontief Inverse Matrix indicates total production effects in the economy, when one unit final demand of sector j increase and referred as production multipliers (Miller and Blair 2009).

The industry's output also contains imported input since intermediate input demand is responded from domestically or by way of import. In this case, it is possible to write sectorial intermediate input demand equation in the form of domestic and imported inputs as follows.

$$\sum X_{ij} = M_{ij} + D_{ij} \qquad\qquad (6)$$

In the equation 6; M_{ij} shows quantity of imported input and D_{ij} shows quantity of domestic input. Import (domestic) input coefficients were obtained by dividing their imported input (domestic input) quantity to their total output (Aydoğuş 2010; Aydoğuş et. al. 2015; Boutoğlu 1990; Şenesen and Şenesen 2003).

$$m_{ij} = M_{IJ}/X_{IJ} \qquad\qquad (7)$$

$$d_{ij} = D_{IJ}/X_{IJ} \qquad\qquad (8)$$

Imported input coefficient (mij) indicates the import intensity of sectors and measures the only direct import requirement resulting from one unit increase in final demand. Both direct and indirect import effects are essential to evaluate dependency of the economy and detailed assessment of import dependency requires that total import effects are taken into account. Total import effects of sectors composed of direct and indirect import effects. Indirect import of sectors express distributed import impacts on the economy via industrial input output relations. When tracing indirect imports, all past imports are included in the supply chain from all the industries engaged in the production process. This provides a broader picture of a sector's total dependency on imports.

Total import effects composed of direct and indirect effects accounted for Import Inverse Matrix (IIM) coefficients and the method of the calculation is presented in equations 9 (Bravo and Alvarez 2012; Knuuttila et al. 2014; Şenesen 2001).

$$IIM_t = m_{ij} * (I - d_{ij})^{-1} \tag{9}$$

Import Inverse Matrix coefficients which are measuring dependency of the economy on imported input obtained by multiplying import coefficients with inverse matrix of domestic input. Sum of the column values of Import Inverse Matrix coefficients indicate dependency of sectors on imported input and termed as total import effects. Total import effects of sectors exhibit if final demand of the mentioned sector increase one unit, how much quantity import would be required both directly and indirectly to respond it.

 Total import effects of sectors refer the capacity to affect the dependency of the whole economy. İn this sense while direct import effects are associated with only dependency of the sector, total import effects of the sectors are related to whole economy and they are impacted by share of sectors in total output and inter sectorial relations besides import content of the output. Import Inverse Matrix coefficients were valid if the economy would have been consisted of only one sector and share of sectors would have been 100% in total output. However, the real economy is comprised of many sectors having different share in output and Import Inverse Matrix coefficients ignore the weight of sectors in output. Import Multipliers (IM) coefficients takes share of sectors in total output into account and indicate absolute gross import effects. Therefore, it is possible to obtinate Import Multipliers by multiplying Import Inverse Matrix of sectors with their shares in output (Bocutoğlu 1990; Chenery and Clark 1965; Ersungur 2007; Şenesen 2005).

$$IM_t = IIM * {Q_i}/{Q_t} \tag{10}$$

A higher share of the import intensive sectors in the economy evokes more import effects while other things are equal. To assessment relative import dependency of the sectors with regard to average, also Normalized Import (NI) Coefficients are calculated in the study as follow.

$$NI = n*IM_j / \sum IM_j \tag{11}$$

In the equity 11; Normalized Import coefficients indicates normalized values of import coefficient, n, indicates number of sectors, IM_j indicates import multiplier coefficient of sectors and $\sum IM_j$ exhibits sum of import multiplier coefficients of all sectors. Normalized Import coefficients change between 0-1 and values show total import effects of the sector with regard to national average. Higher values of Normalized Import coefficient than 1 means import dependency of the sector is over average while smaller than 1 refer under average. (Atan 2011).

3. ANALYSIS AND DISCUSSION

Change of intermediate input structure and import dependency of Turkish Economy during 1995-2011 period has been analyzed in accordance with the input output model which explained in section 2. Although calculations include all of sectors, emphasis is put on the top ten sectors having the greatest import impacts in 2011 seeing that the study focused on macro wide import dependency of the economy in recent years

3.1. The Input Structure of Turkish Economy (1995-2011)

Due to Turkey's GDP growth has depended more on imported input than domestic input increases in some strategic sectors, dependency of Turkish Economy on import is a growing concern in the literature. After 1980's outward-oriented and export-based growth strategy has been started to implement in Turkish Economy. Past developments such as custom union entering into force in 1996, trade liberalizations, falling transport costs and efforts of low-cost countries to integrate with the world economy caused to major changes in production structure of Turkish Economy. Increase in imported input intensity of output is important reflections of these changes.

Output value is composed of value added and intermediate input. Intermediate inputs are sourced from foreign or domestic markets. The decomposition of the output into components helps to understand the characteristics of the production structure. For this reason, total output decomposed into its main components such as value added, domestic intermediate input and imported intermediate input in order to understand how the production

structure of Turkish Economy changed between 1995 and 2011. Decomposition results were presented in Figure 1.
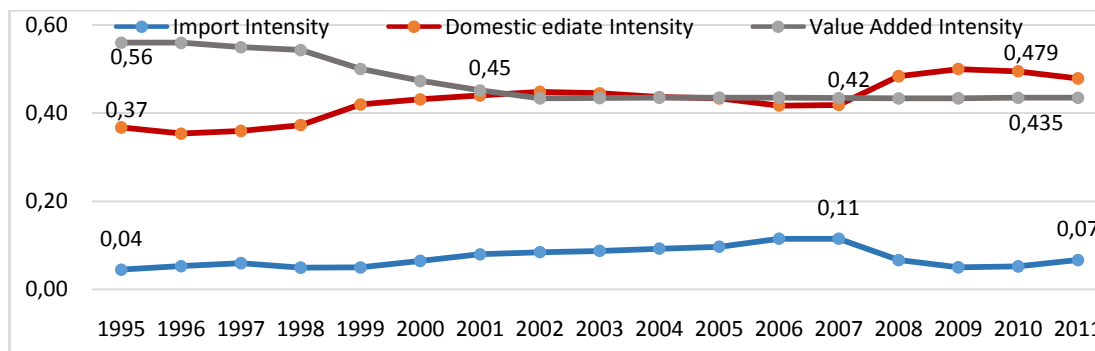

Figure 1. Factor Content of Output in Turkish Economy Between 1995 and 2011.

Value added and domestic input weighted production structure have been observed in Turkish Economy within the research period. By the input factors, there has been some changes in content of the output between 1995 and 2011. Value added and domestic input intensities of production were accounted for %56 and %37 while this percentage decreased to %0,04 for import intensity in 1995. Domestic intermediate input and imported input intensity of the output increased while value added content diminished in this period.

Import intensity increased from 0.04% to 0.7% between 1995 and 2011. Value of the import intensity is reached the highest peak in 2006 and 2007 with 0.11% in corresponded period. Upward trend in import content of output attended steadily to 2007 and began to decline after 2007. Although import intensity dropped to 0.7% in 2011, it is significantly higher than value of in 1995. If this period is evaluated as a whole; it is possible to say that, imported input intensity of Turkish Economy almost doubled its value within the period of 1995-2011.

Intermediate input supply and demand capacity of the economy is strongly associated with backward and forward linkages of the sectors. The high share of intermediate input intensive sectors which has strong backward linkage increase import dependency by enhancing intermediate input demand of the economy while the high share of sectors which having strong forward linkage supports input adequacy. In the study, intermediate input demand and intermediate input supply structures of the economy has been researched in the framework of forward and backward linkages with regard to input output model. Forward linkages exhibit the relative importance of the sector as supplier to the other industries in the economy while the backward linkages show importance of the sector as intermediate input demander.

To anticipate intermediate input demand capacity of Turkish Economy in the period of 1995-2011, average Direct Backward Linkage Coefficients (DBLC) of sectors exhibiting intermediate input intensity (intermediate input demand) were calculated and results presented in Figure 2.
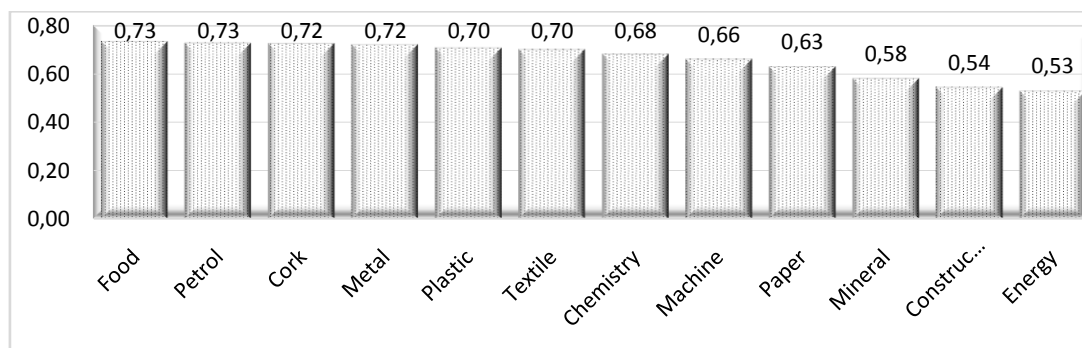

Figure 2. Average Direct Backward Linkages Coefficients between 1995 and 2011.

The graphical illustrations and analysis of DBLC show imported input dependency of Turkish Economy and allows insights at sectorial level. DBLC of sectors sign that, output of the many sectors are heavily on intermediate input usage and most of sectors (12 of 21) have high intermediate input intensity.

By the sectors, the biggest Intermediate input content were found in food, petrol, cork, metal, plastic and textile according to average of 1995- 2011 values. Intermediate input requirement was accounted for %70 and over for mentioned sectors above in this period. Both food and petrol used 0.73 unit intermediate input from other sectors to produce extra one unit product. Intermediate input requirements found 0.72 for metal and cork sectors, 0.70 for plastic and textile sectors. Average intermediate input requirement of an additional one unit output in energy sector was 0.53 in this period. Figure 2 also assigns that most of the intermediate input intensive sector is industrial sectors.

Intermediate input supply is also significant for import dependency of the economy. To analyze intermediate input supply characteristics of sectors, average of Direct Forward Linkage Coefficients (DFLC) reflecting capacity to produce intermediate input were calculated for the period of 1995-2011 and ranked with respect to their average DFLC in Figure 3.
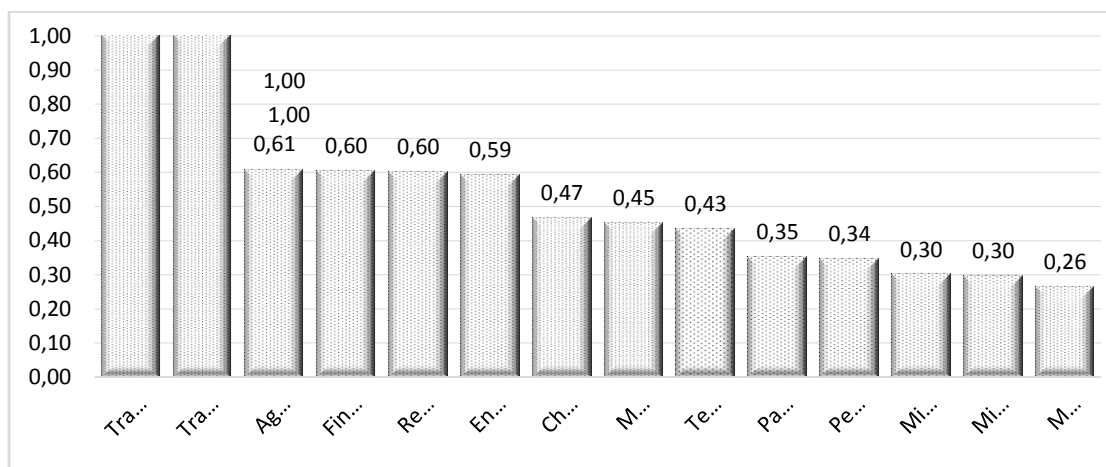

Figure 3. Average Direct Forward Linkage Coefficients between 1995 and 2011.

Figure 3 shows the range of sectors in terms of DFLC. More than 50% of outputs of 6 sectors were demanded as intermediate input in Turkish Economy in this period. Trade and transport sectors are the most significant suppliers of intermediate input and nearly whole of outputs of these sectors were demanded as intermediate input by the others. Also agriculture, finance, real estate and energy sectors found as the most significant input suppliers in this period. According to Figure 3 it is possible to say that most of the intermediate input suppliers was in service industry except agriculture.

These results express that intermediate input demand was greater than intermediate input supply in this period in Turkish Economy. Results also showed that service sectors were important intermediate input supplier while industry sectors were important intermediate input demander. In this sense Intermediate input requirement of industrialization needs transition from input demand weighted production structure to input supply weighted production structure in Turkish Economy.

3.2. Total Import Effects of Sectors: Import Multipliers

Import intensity coefficient of sectors indicating import content of sectorial output were defined as direct import effects while import multiplier coefficient exhibits total import effects if one unit final demand of sectors increased. Import Multiplier Coefficients were calculated as explained in section 2 and results for the most 10 import dependent sectors in the period of 1995-2011 presented in Figure 4.
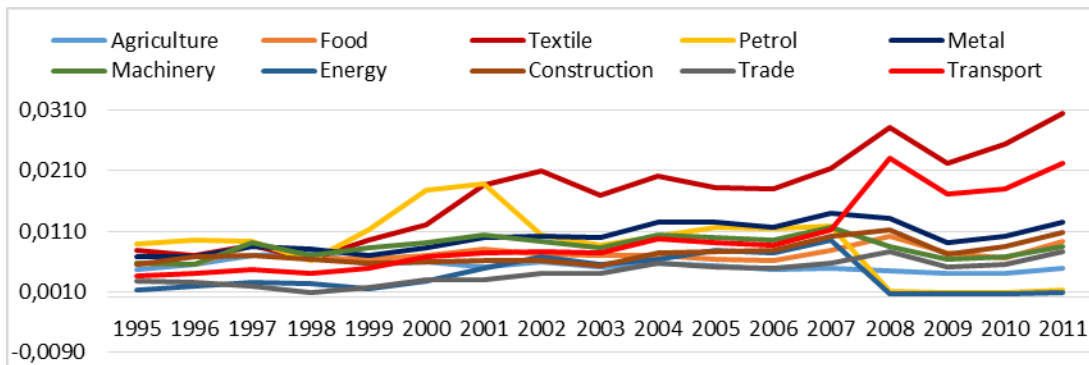
Figure 4. Import Multipliers for Some Sectors between 1995 and 2011.

Import multiplier of sectors between 1995 and 2011 has been seen clearly from the figure 4. The import multipliers of sectors seem to have changed in narrow band and closer to each other in period of 1995-1998 While it has been observed an expansion of import multipliers band and an increase in differences among sectors after 1998. As seen in Figure 4, the sector having the biggest total import effects was petrol in 1995. A rise in final demand of petrol led to 0.0088 unit increase in import in 1995. Reaching maximum values of import effects in 2000 (0.0177) and 2001 (0.0198), import multipliers of petrol decreased dramatically after 2002 (lower than 0.0100). Import multiplier of the petrol dropped to 0.0012 at the end of the period. Total import requirement of one unit final demand of petrol declined from 0.0088 in 1995 to 0.0012 in 2011. Shortly import effects of energy and petrol sectors decreased considerably after 2008 compared to 1995 in this period. The opposite situation has been observed for transportation. Import effects of transportation has increased significant rates after 2007.

Textile also one of the more import dependent sectors in this period. Opposite to petrol and energy, import multiplier of textile sector growth on a constant and steady rates since 1998. Total import requirement of one more unit final demand of textile rose from 0.0079 to 0.0305 unit in 1995-2011 period. To meet an additional one unit final textile demand required 0.0305 unit extra import in 2011. Import impacts of other sectors in 2011 were found as follows: 0.0222-unit for transport, 0.0124-unit for metal and 0.0108-unit for construction.

In order to determine sectors having the biggest import impact in 2011 and to evaluate changes in import dependency of sectors in this period, import multiplier coefficients in 1995 and 2011 years calculated and results were given in Figure 5.
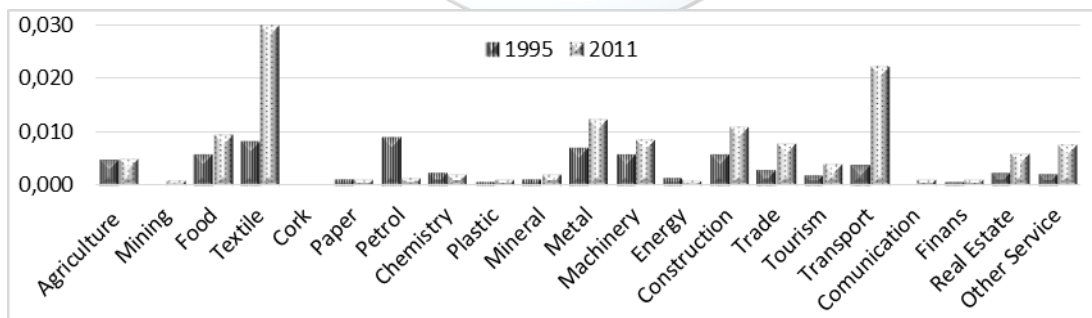

Figure 5. Import Multipliers of Sectors.

Import multipliers of sectors both in 1995 and 2011 are presented in Figure 5. We found that the top 3 sectors having the biggest import effects were ranked as petrol, textile and metal in 1995 while ranked as textile, transport and metal in 2011. Figure 5 also showed that food, textile, metal, machinery, and construction sectors had higher import multipliers in both 1995 and 2011.

To understand % changes in import effects of sectors between 1995 and 2011, growth rate of import multipliers in this period calculated and results presented in Figure 6.
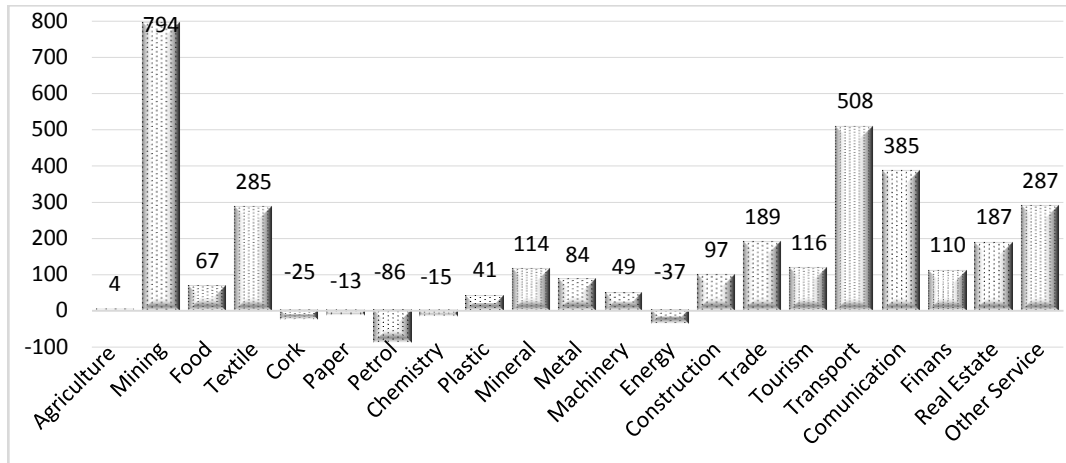
Figure 6. Change in Import Multipliers between 1995 and 2011 (in %).

Figure 6 indicates that, import multipliers of only 5 sectors diminished within the period of 1995-2011. The most decline observed in petrol. Import multiplier of sector considerably decreased in 2011 (86%). Other sectors having decrease in total import impacts are energy (37%), wood and cork (25%). Import multipliers of the others increased with different rates. The top 5 sectors having the most increase in import effects are mining, transport, construction, textile and trade. Even though mining had ignorable total import effects both in 1995 and 2011, the biggest increase observed in mining sector (794%) in this period in Turkish Economy. Import multipliers grew 508% for transport, 385% for communication and 285% for textile between 1995 and 2011.

For a detailed analysis of current import dependency, import multipliers of all of sectors in this year were calculated and sectors were ranked associate with their total import effects in 2011 in Figure 7.
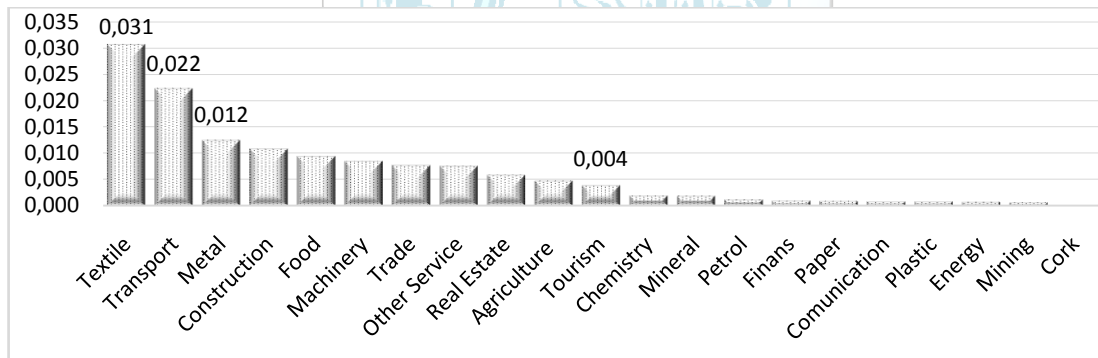

Figure 7. Import Multipliers of Sectors in 2011.

Import multipliers are changing between 0.031 and 0.001 in 2011. Textile sector found as the most import dependent sector in 2011 and import effect of the sector calculated as 0.031. To produce additional one unit textile output in Turkish Economy in 2011, evoked to 0.0031 unit increase in import. Total import requirement of additional one unit output calculated 0.022 for transport, 0.012 for metal and 0.011 for construction while import requirement for the rest of sectors are lower than 0.010 unit.

Status of import dependency of sectors with regard to average is essential from the point of sectorial incentive policies. In order to understand relative import dependency of sectors, normal import multipliers exhibiting relative positions of each sector for the period of 1995-2011 were calculated and calculations were given in Table 1.

Table 1. Normal Values of Import Multiplier in 2011.

Sectors	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Agriculture	1,08	1,31	1,61	1,72	1,30	1,37	1,19	1,38	1,20	1,33	1,24	1,06	1,14	1,04	0,97	0,93	1,12
Mining	0,29	0,27	0,29	0,29	0,52	0,88	0,95	1,06	1,06	1,43	1,67	1,59	2,08	2,18	1,89	1,99	2,56
Food	0,97	0,93	1,49	1,12	1,10	1,18	1,37	1,24	1,17	1,20	1,07	1,05	1,34	1,75	1,27	1,12	1,61
Textile	0,57	0,50	0,63	0,45	0,68	0,87	1,34	1,50	1,21	1,45	1,31	1,29	1,54	2,02	1,60	1,83	2,19
Cork	1,19	1,05	1,07	0,89	1,33	1,49	1,43	1,37	1,21	1,49	1,71	1,65	2,06	0,82	0,63	0,72	0,89
Paper	0,94	0,93	1,15	1,17	1,23	1,48	1,47	1,63	1,39	1,67	1,66	1,61	1,75	0,74	0,64	0,71	0,82
Petrol	1,24	1,35	1,31	0,86	1,57	2,48	2,65	1,46	1,20	1,42	1,62	1,61	1,66	0,15	0,11	0,13	0,18
Chemistry	1,17	1,09	1,53	1,21	1,14	1,25	1,45	1,41	1,19	1,51	1,50	1,45	1,73	0,92	0,69	0,76	0,99
Plastic	0,87	0,80	1,09	1,03	1,10	1,25	1,45	1,43	1,26	1,60	1,58	1,52	1,81	1,13	0,87	0,97	1,23
Mineral	0,84	0,92	1,07	1,00	0,82	1,03	1,06	1,26	1,04	1,29	1,42	1,37	1,63	1,68	1,30	1,47	1,79
Metal	0,83	0,83	1,05	1,00	0,85	1,01	1,22	1,25	1,23	1,53	1,52	1,44	1,73	1,62	1,13	1,24	1,53
Machinery	0,84	0,80	1,33	1,02	1,19	1,30	1,49	1,35	1,22	1,52	1,45	1,39	1,69	1,24	0,93	0,99	1,24
Energy	0,41	0,68	0,86	0,79	0,50	0,89	1,58	2,27	1,81	2,09	2,60	2,46	3,14	0,24	0,21	0,22	0,26
Construction	0,92	1,11	1,18	1,06	0,95	0,99	1,03	1,02	0,89	1,25	1,28	1,30	1,69	1,88	1,23	1,42	1,81
Trade	0,79	0,75	0,54	0,26	0,49	0,88	0,90	1,17	1,19	1,68	1,48	1,45	1,68	2,29	1,47	1,67	2,29
Tourism	0,96	1,11	1,14	0,89	0,81	1,06	1,20	1,18	0,98	1,17	1,04	1,03	1,20	2,04	1,78	1,36	2,07
Transport	0,45	0,51	0,59	0,51	0,59	0,83	0,92	0,95	0,91	1,21	1,11	1,07	1,38	2,86	2,13	2,22	2,75
Comunicat,	0,37	0,42	0,37	0,13	0,50	0,93	1,32	1,73	1,49	1,86	1,70	1,65	2,03	1,86	1,42	1,42	1,78
Finance	0,64	0,88	1,65	2,31	2,46	1,58	1,54	0,87	0,67	0,87	0,70	0,69	0,94	1,32	1,33	1,22	1,33
Real Estate	0,65	0,77	0,46	0,34	0,88	1,16	1,23	1,06	0,92	1,26	1,38	1,41	2,13	1,85	1,88	1,78	1,85
Other Serv,	0,51	0,59	0,48	0,36	0,79	1,01	1,45	1,52	1,23	1,63	1,37	1,33	1,79	1,68	1,68	1,63	1,97
Normal values of 1 refers on the average while bigger than 1 over the average and smaller than 1 below the average.																	

Table 1 assigns that import dependency is changing both by years and sectors. In comparison with average, only import multiplier of four sectors (petrol; 1.24, cork; 1.19, chemistry; 1.17, and agriculture; 1.08) found above the average while the rest of the others were far below average in 1995. Petrol having the biggest value, were 1.24 times more import dependent than of average of the economy in 1995. Cork (1.19), chemistry (1.17) and agriculture (1.08) were also more import dependent sectors than national average in this period.

Vital change has been observed in relative import dependency of sectors in this period. For example, output of the mining sector having the smallest normal import multiplier in 1995 found more import dependent in 2011 and value of normal import multiplier of sector rose from 0.029 in 1995 to 2.56 in 2011 while position of petrol changed opposite direction. Normal import multipliers of petrol diminished from 1.24 to 0.18 in this period. While total import effects of the petrol were 1.24 times more than average in 1995, this value dropped in 0.18 in 2011.

Normal values of textile assign that total import effects of corresponded sector are 2.19 times more than average in 2011. Approximately same explanation can be made for metal sector. Metal sector has been more import dependent since 2000 and total import effects of the sector is bigger 1.53 times more than average in 2011 year. The most import depended sectors compare to national average in recent years are food, textile, metal, construction, trade and transport sectors.

According to Table 1, if taken both the whole economy and entire period into account, it is concluded that the most import dependency observed between 2001 and 2007 years during research period. Both number of import dependent sector and size of the import multipliers of the particular sectors increased in this period. It is clear that, import dependency deepened and expanded in this period except a few service sector. Even though both number of import dependent sectors over the average and import deepening of sectors decreased between 2008 and 2011, import dependency of many sectors found greater than their values of between 1995 and 2007.

3.3. Determinants of Total Import Effects of the Sectors

This section provides an overview total import dependency drivers of entire economy. Total import effects of the sectors have been examined associate with three elements widely used in the input output literature. Main elements of macro wide import dependency according to input output approach are imported input intensity, output share of sectors and sectorial input output linkages.

3.3.1. Imported input intensity of sectors

mport intensity is highly significant for both individual import dependencies of sectors and macro wide import effects of them. Methodologically we measured import intensity of sectors by means of the import coefficients. To examine dependency of each sector and to understand the role of them in import dependency of the entire economy, import coefficients of sectors having the biggest total import effects in 2011 were calculated and results presented in Figure 8.
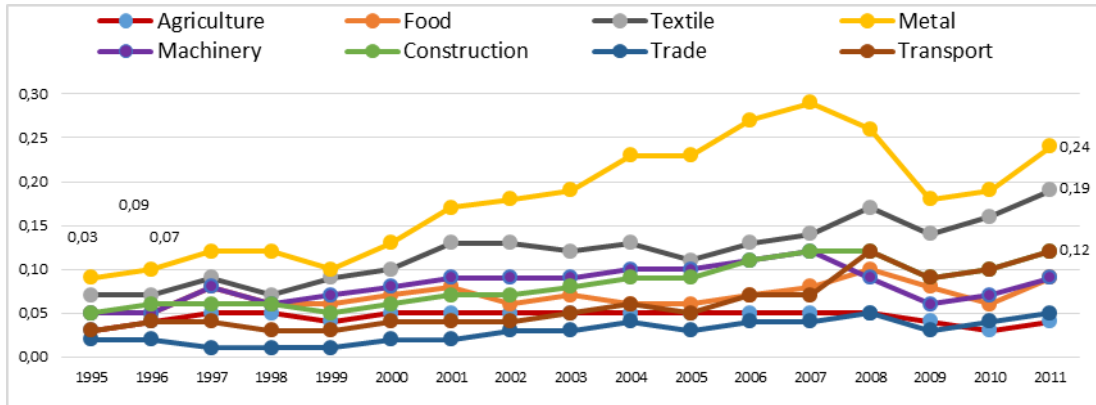
Figure 8. Import Intensity of Some Sectors between 1995 and 2011

Figure 8 exhibits that there was a considerable heterogeneity in intensity of imported inputs among sectors. Analysis of the data in input output tables revealed that, metal production depended mainly on imported inputs and had higher import intensity than the others in the period of 1995-2011.

It is clearly seen that imported input intensity of the metal and textile sectors found both high and tend to rise. Import multiplier of the metal sector having the biggest import intensity increased from 0.09 to 0.24 while import multiplier of the textile which was the second import intensive sector rose from 0.07 in 1995 to 0.19 in 2011.

Sectors having the lowest imported input intensity are agriculture and trade in this period. İmported input intensity of these sectors were calculated less than 0.05 during this period. As a result, it is possible to conclude that, imports coefficients in most of the sector indicates a growing trend in import intensity in Turkish Economy between 1995 and 2011.

Besides the level of imported input intensity of sectors, its rate of the change is also an important issue for import dependency. Change in imported input coefficients within the period of 1995-2011 were calculated and results presented in Figure 9.
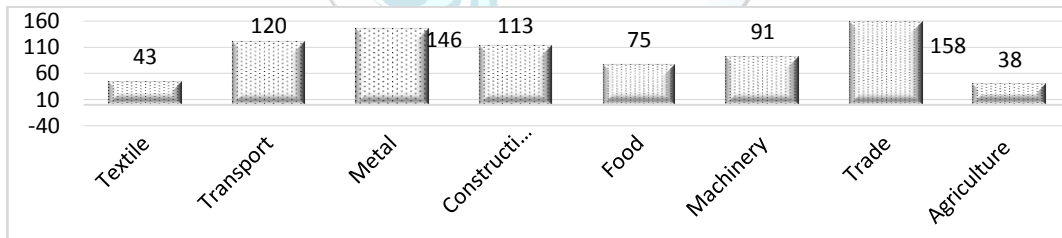

Figure 9. Change in Import Intensity between 1995 and 2011 (in %).

Figure 9 shows the change in imported input intensity of sectors which are having the biggest increase in import intensity between 1995 and 2011. Some sectors such as trade, metal, transport and construction exhibited significantly increase in their import requirements between 1995 and 2011. Trade is the sector which experienced the maximum increase with respect to change in import intensity in this period. İmported input intensity of the corresponded sector increased in 158% in this period. İncrease in imported input intensity found 146% for metal, 120% for transport and 113% for construction while this value was lower than 100% for the other sectors. Import intensity of textile which has the greatest import effect in 2011, grew only 3% in this period. This is good sign of import dependency of Turkish Economy.

3.3.2. Output Share of Sectors

Import intensity is not strong indicator of the total import effects of sectors. The second element impacting economy wide import dependency is the relative significance of each sector in terms of its weight in total output. To see size of sectors in economy, output share of sectors were calculated and results presented in Figure 10.
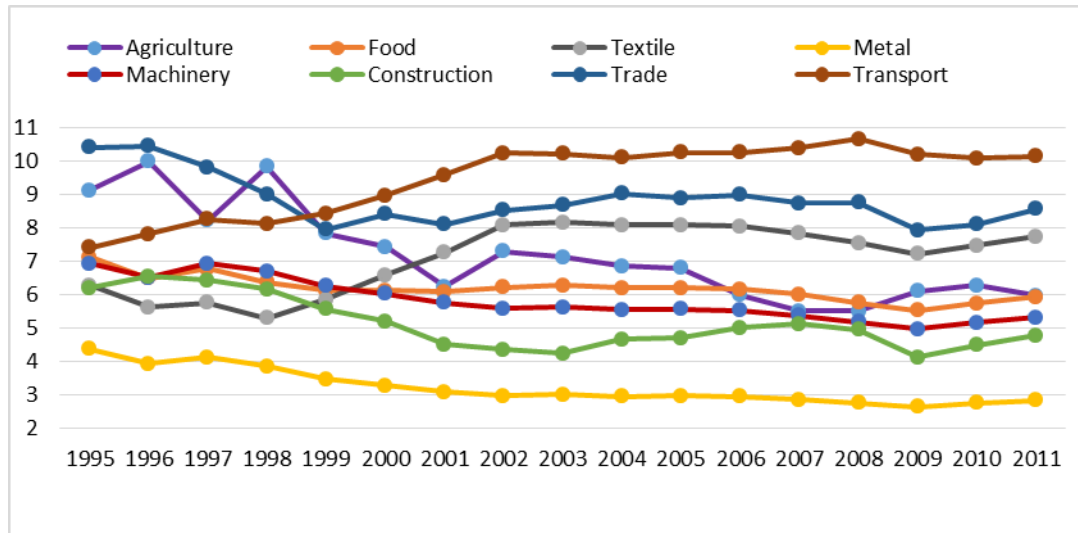

Figure 10. Share of Sectors in Output between 1995 and 2011

Figure 10 shows that, trade agriculture and transport sectors were 3 major sectors of Turkish Economy in 1995 according to output share. While trade and transport sectors sustained relatively high share in production, share of agriculture in economy dropped considerably in 2011. The share of the transport increased from 7.4% in 1995 to 10.15% in 2011 while share of trade and agriculture diminished in this period. Although share of trade diminished, trade sector was still the second sector in 2011. Share of textile sector showed considerable development since 1998. Transport, trade and textile sectors were in absolute terms top-3 weighted sectors since 2001 with respect to output share.

Metal sector having the highest import intensity during this period, had the lowest share in total output and tended to decrease in this period. Share of metal in output dropped from 4.36% in 1995 to 2.82 % in 2011. Construction and machinery sectors also has small share in total output between 1995 and 2011.

Besides output share of sectors, change of their rates are also important. Percent change of sectorial output share within 1995-2011 period were calculated in order to predict import dependency of the economy in the future and results presented in Figure 11.

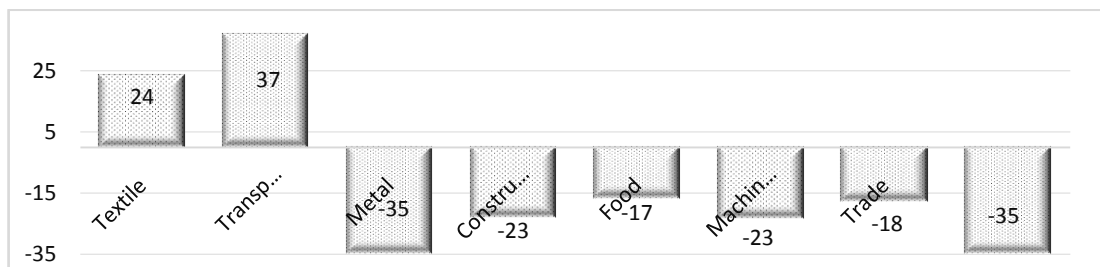Figure 11. Change in Share of Output for Some Sectors Between 1995 and 2011 (in %).

Transport and textile sectors are only 2 of the 8 sectors have increasing trend in terms of output share among sectors which having the biggest total import effects in 2011. Having 37% growth rate textile found most rapidly growing sector in this period while second growing sector was transport with 24% growth rate.

As seen from figure 11, share of the output of some sectors which having high import multipliers tended to decrease in this period. Fall of the output share varied to some extent between sectors. The greatest fall in output share observed both metal and agriculture sectors (35%). Other sectors losing weight in output were construction (23%), machinery (23%), trade (18%) and food (17%) during this period.

Also growth rate of sectors having high import impact is essential from the point of future-oriented improvement of import dependency. Rapid growth of sectors having high import effects leads to a further increase in import dependency of the economy in the future. Growth rates of sectors between 1995 and 2011 were calculated and results presented in Figure 12.
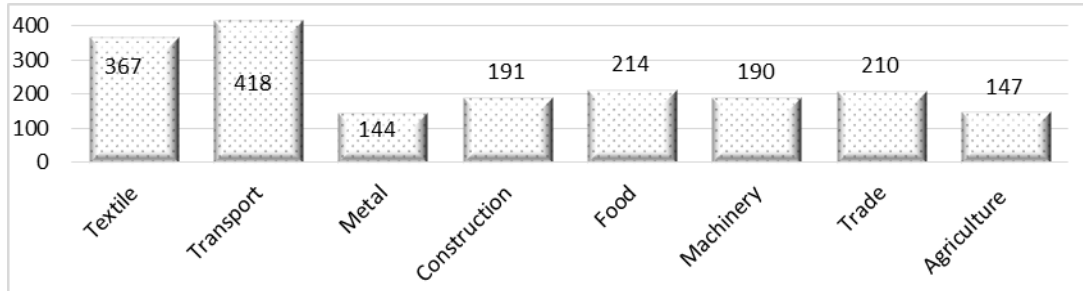

Figure 12. Output Growth of Some Sectors between 1995 and 2011 (in %).

Figure 12 indicates that all of the chosen sectors grew positively between 1995 and 2011. Transportation sector is the fastest growing sector with 418% growth rate while as a second growing sector textile has 367% growth rate. Both 418% and 367% are rather high rate of output growth among sectors. If taken significant import effects of textile and transport sectors into account, it can be concluded that Turkish Economy maintenance to grow imported input base next years. Food and trade sectors grew by 214%, and 210%, while metal had the lowest growth rate with 144% in this period.

3.3.3. Inter-Sectorial Input Output Linkages

After imported input intensity and share of sectors in output, the third element impacting import dependency of the economy is inter-sectorial input output linkages. Methodologically we measured sectorial linkages by means of the total backward coefficients since these coefficients present requirement of total intermediate input needs if final demand of the sector increased one unit. Total Backward Coefficients of sectors were exhibited in Figure 13.
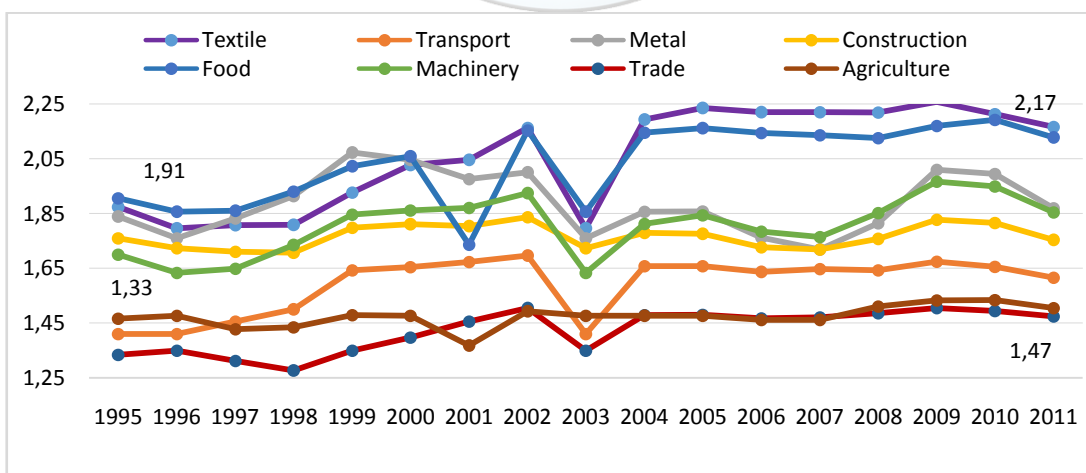
Figure 13. Total Backward Linkage Coefficient of Sectors between 1995 and 2011

Figure 13 shows that total backward linkage coefficients of sectors changed between 1.33 and 1.91 in 1995. Food sector has the highest total backward linkage coefficient in 1995. When the final demand increases one-unit in this sector, an additional 1.91-unit intermediate input demand emerged throughout the economy. It is seen that; total backward linkage coefficients rose up to 1.47-2.17 band in 2011. Textile, food and metal

sectors has high backward linkage coefficients while trade, transportation and agriculture sectors has low total backward linkage coefficients in this period.

Besides total backward linkages of sectors, rate of the change in coefficients is also important. Change of the total backward linkages between 1995 and 2011 were calculated in order to predict change in capacity of impact to import dependency of sectors and results presented in Figure 14.

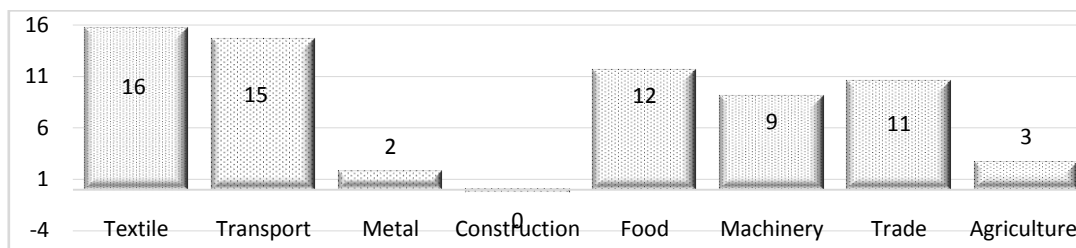Figure 14. Change In the Total Backward Linkage Coefficients of Sectors between 1995 and 2011 (in %).

Figure 14 presents that total backward linkages of the most import dependent sectors changed positively. This change exhibits that, capacity of the chosen sectors to impact entire economy expanded in this period. The maximum change in backward linkages observed in textile (16%). The rates of increase in backward linkages were 15% for transport, 12% for food, 11% for trade and lower than 10% for the other sectors between 1995 and 2011.

4. CONCLUSION

Since production and trade structure has been changing in globalization economic area, even if production and exports increases, economic impacts of their change cannot be always positive. This is also valid for Turkish economy. Despite growing output and exports volumes, maintaining problems such as unemployment, foreign trade and current account deficits shows that Turkish economy hasn't been taken advantage of foreign trade benefits. One of the basic reason of this situation is to substitute imported inputs for domestic inputs caused multiplier mechanism to diminish. In this study, 17 input-output tables published by WIOD for Turkish Economy (from 1995 to 2011) were used. Empirical evidences found in the study summarized as below. One conclusion which emerges from the results of the study is that, the production structure of Turkish Economy changed between 1995 and 2011. While both imported and domestic input intensity of the output increased, value added intensity of production diminished in this period. An economic structure that heavily intermediate input demanding and inadequate intermediate input supplying dominated in Turkish economy. This structure increased the dependency of Turkish Economy on imported inputs. Therefore, it is essential to stimulate sectors producing intermediate input particularly in manufacturing sector and also encourage to use of domestic intermediate input in Turkish Economy. Total import effects investigated on sectorial basis. Textile sector found as the most import dependent sector in 2011. When researched sources of the import dependency of the sector, it is found that both the imported input intensity and share of the sector's in output are relatively high. Consequently, both textile's own import dependency and capability of stimulate national import demand increased within this period. Similar issues are also true for the transportation sector. Since these sectors being also the fastest growing sectors of Turkish Economy, it seems import dependency of Turkish Economy will continue to increase in the future.

Metal has been found as third sector according to total import effects in 2011. İmported input intensity which indicates import dependency of sector found high and in upward trend. However, due to decreasing output share and unchanged backward linkages, total import effects of metal diminished in this period. Construction sector was also another sector who's of total import effects decreased although import intensity increased between 1995 and 2011.

Diminishing the imported input usage in economy would have some beneficial results such as increase in employment, increase in domestic input and decrease in current and foreign trade deficits. If Turkey aims to be a developed country, production structure must change from the unsustainable and imported input base model to high domestic input growth model in the near future.

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Appendix 1. Import Multipliers Coefficients (1995-2011)

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Agriculture	0,0046	0,0056	0,0069	0,0074	0,0056	0,0059	0,0051	0,0059	0,0051	0,0057	0,0053	0,0046	0,0049	0,0045	0,0041	0,0040	0,0048
Mining	0,0001	0,0001	0,0001	0,0001	0,0001	0,0002	0,0003	0,0003	0,0003	0,0004	0,0005	0,0004	0,0006	0,0006	0,0005	0,0006	0,0007
Food	0,0057	0,0055	0,0087	0,0066	0,0064	0,0069	0,0080	0,0073	0,0069	0,0070	0,0063	0,0061	0,0078	0,0102	0,0075	0,0066	0,0094
Textile	0,0079	0,0070	0,0087	0,0063	0,0095	0,0121	0,0187	0,0209	0,0169	0,0202	0,0183	0,0179	0,0214	0,0282	0,0223	0,0255	0,0305
Cork	0,0002	0,0001	0,0001	0,0001	0,0002	0,0002	0,0002	0,0002	0,0002	0,0002	0,0002	0,0002	0,0003	0,0001	0,0001	0,0001	0,0001
Paper	0,0011	0,0011	0,0013	0,0014	0,0014	0,0017	0,0017	0,0019	0,0016	0,0019	0,0019	0,0019	0,0020	0,0009	0,0007	0,0008	0,0010
Petrol	0,0088	0,0096	0,0093	0,0062	0,0112	0,0177	0,0189	0,0104	0,0086	0,0101	0,0116	0,0115	0,0119	0,0010	0,0008	0,0009	0,0012
Chemistry	0,0023	0,0022	0,0031	0,0024	0,0023	0,0025	0,0029	0,0028	0,0024	0,0030	0,0030	0,0029	0,0034	0,0018	0,0014	0,0015	0,0020
Plastic	0,0006	0,0006	0,0008	0,0008	0,0008	0,0009	0,0011	0,0010	0,0009	0,0012	0,0012	0,0011	0,0013	0,0008	0,0006	0,0007	0,0009
Mineral	0,0009	0,0010	0,0011	0,0011	0,0009	0,0011	0,0011	0,0014	0,0011	0,0014	0,0015	0,0015	0,0017	0,0018	0,0014	0,0016	0,0019
Metal	0,0068	0,0068	0,0085	0,0081	0,0069	0,0082	0,0099	0,0102	0,0100	0,0124	0,0124	0,0117	0,0140	0,0131	0,0091	0,0101	0,0124
Machinery	0,0057	0,0055	0,0092	0,0070	0,0082	0,0090	0,0103	0,0093	0,0083	0,0104	0,0100	0,0095	0,0116	0,0085	0,0064	0,0068	0,0085
Energy	0,0012	0,0020	0,0026	0,0024	0,0015	0,0027	0,0048	0,0068	0,0055	0,0063	0,0078	0,0074	0,0095	0,0007	0,0006	0,0007	0,0008
Construction	0,0055	0,0067	0,0070	0,0063	0,0057	0,0059	0,0061	0,0061	0,0053	0,0075	0,0076	0,0078	0,0101	0,0112	0,0073	0,0085	0,0108
Trade	0,0027	0,0025	0,0018	0,0009	0,0017	0,0030	0,0030	0,0040	0,0040	0,0057	0,0050	0,0049	0,0057	0,0077	0,0050	0,0056	0,0077
Tourism	0,0018	0,0021	0,0022	0,0017	0,0016	0,0020	0,0023	0,0023	0,0019	0,0022	0,0020	0,0020	0,0023	0,0039	0,0034	0,0026	0,0040
Transport	0,0037	0,0041	0,0047	0,0041	0,0048	0,0067	0,0074	0,0077	0,0074	0,0098	0,0090	0,0086	0,0112	0,0231	0,0172	0,0179	0,0222
Communication	0,0002	0,0002	0,0002	0,0001	0,0003	0,0005	0,0007	0,0009	0,0008	0,0010	0,0009	0,0008	0,0010	0,0009	0,0007	0,0007	0,0009
Finance	0,0005	0,0007	0,0012	0,0017	0,0019	0,0012	0,0012	0,0007	0,0005	0,0007	0,0005	0,0005	0,0007	0,0010	0,0010	0,0009	0,0010
Real Estate	0,0021	0,0024	0,0015	0,0011	0,0028	0,0037	0,0039	0,0034	0,0029	0,0040	0,0044	0,0045	0,0067	0,0059	0,0060	0,0056	0,0059
Other Service	0,0020	0,0023	0,0019	0,0014	0,0031	0,0039	0,0056	0,0059	0,0048	0,0063	0,0053	0,0051	0,0069	0,0065	0,0065	0,0063	0,0076