Dependency of Exports on Imports: The Turkish Case

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Abstract
In this study, Turkey's dependency on imports in terms of main sectors is analyzed. Particularly, in order to measure the dependency of export-oriented manufacturing sectors, the input-output tables and due to calculating forward and backward links of the production it becomes considerably easier to measure the dependency of sectors on foreign input. Besides, in order to measure the dependency of imports on exports of these sectors, it is important to calculate considering exports/total production ratio with exports/total supply ratio. For this reason, during the dependency analysis of the sectors, it is important to evaluate the difference between these two rates together. As a result of the calculations, it is seen that in Turkey, the first five sectors that are dependent on imports take part in manufacturing industry. These sectors are considered as industry and energy sectors that require high-technology and highly dependent on foreign input.

Keywords: Turkish export and import, trade dependency, export oriented sectors.
JEL Classification Codes: D57, F10, F14, F19

1. Introduction
Both increase in national income and increase in the share of the industry sector in national income are very important for the economic growth of the countries. However, the regularity of the speed-up also depends on dependency on imports (Ersungur and Kızıltan, 2005:1). Therefore, the relations between the sectors should be analyzed in order to produce the production structure of the national economy and to develop prudential economic plan and programs.

Interdependencies arising from exchanging of goods and services between the sectors play an important role in shaping the production structure. Each sector needs inputs of the other sectors in order to produce output. What important thing is the amount of net output of the economy; in other words, the aim should be to increase the difference between input and output. Since there is a mutual dependency among the sectors, each sector must use both its own and other sectors’ intermediate input in order to achieve the production. Thus, this situation may generate the backward link impact of the sector on economy. Nonetheless, the output of each sector is used as an intermediate input by other sectors.
sectors. This generates the forward link impact of that sector. Hirschman, (1958:9) suggests that the backward and forward link impacts of the sectors between the others should be observed carefully in the process of taking investment decisions. In order to evaluate the impacts of the backward and forward link between the sectors, the sectoral mutual relations are formulated with certain models. The resulting models are useful for both taking the investment decisions and provide information about the level of dependency in production structure. For this purpose, input-output tables are prepared that show cross-sectoral flow of goods and services in a framework and with these input-output models, both the input use structure of the economy is analysed and the effects of the sectors on the other ones whose production structures will change is determined.

To examine the relationship between the sectors in detail, models are needed that represent these relationships (Philips, 1955:138). In order to meet the demand, the input-output tables and analysis that establishes the functional connection between the entire economy and industries and identified as one of the most useful planning tools was developed by W.W Leontief in 1930's (Dernburg and Dernburg, 1969:141). Input-output models are simple mathematical general equilibrium that evaluates the mutual dependency between production and consumption units that establish the economic structure (Aydogus, 2010:3). In Leontief's (1966:134) input-output table, there are flow of goods taken or given each other by the sectors that form the economy and flow of goods that meet the final demand. These tables form an important data source that can show structural changes emerge in the entire economy at a macroeconomic level (Bulmer-Thomas, 1982:14). (Leontief (1966:134). As a result of his input-output analyses, there is a mutual interaction between the sectors and they are interdependent due to the outputs of various economic sectors and their demand for inputs to achieve production. Moreover, Leontief, with some studies and input-output analyses, tried to answer the question that how much input should be used to provide a particular output. As a result of this function, input-output tables are used as an important planning tool in both developed and developing countries (Dernburg and Dernburg, 1969:141). Also, through these tables, many indicators can be reached in order to measure the performance of a national economy (Schaffer, 2007:23). In Leontief's (1966:134) input-output table, there are flow of goods taken or given each other by the sectors that form the economy and flow of goods that meet the final demand. These tables form an important data source that can show structural changes emerge in the entire economy at a macroeconomic level (Bulmer-Thomas, 1982:14). As a result of his input-output analyses, there is a mutual interaction between the sectors and they are interdependent due to the outputs of various economic sectors and their demand for inputs to achieve production. Moreover, Leontief, with some studies and input-output analyses, tried to answer the question that how much input should be used to provide a particular output. As a result of this function, input-output tables are used as an important planning tool in both developed and developing countries (Dernburg and Dernburg, 1969:141). Also, through these tables, many indicators can be reached in order to measure the performance of a national economy (Schaffer, 2007:23). In addition to the input-output analysis, developed by Leontief, forms a basis to make a prediction on long-term economic structure and demography (Glickman, 1977:54). Compared to other methods, one other positive function of input-output analysis is its flexibility. In other words, in input-output method, specialists with research can use the model in the pose of their own purposes (Fletcher, 1989:516).

The input-output tables and the backward and forward links inputs or procurements of intermediate goods of export oriented sectors with the foreign companies affect foreign dependency. On the other hand, in order to evaluate the dependency of these sectors properly, exports/total production rate and exports/total demand rates are crucial.

In this study, the dependency of Turkey’s imports on its exports will be evaluated in terms of main sectors. Also, in order to reduce the dependency of these sectors, some analyses are made in order to determine what sort of measures should be taken.

2. Methodology

One of the main reasons of the increase in imports is to increase exports because of foreign dependency and increase in exports is claimed to enhance imports due to sectoral dependency. For this reason, evaluating the high amounts alone in exports/production rate may not give true results. In that case, it is significant to analyse exports/total production rate along with exports/total supply rates in order to assess dependency properly (Yükseler and Türkan, 2008:31). Here, the supply rate is the sum of the values of sector’s production and imports. Exports/supply ratio can be expressed as the sector’s exports ratio to production and the sum of imports ratio. Thus, while making the dependency analysis, evaluating the difference between these two ratios together is important. In the method which is used to express the dependency of exports on imports proportionally;

\[ TDPREXx = \text{Share of Exports in Total Domestic Production} \]
The share of exports in total supply;
\[ TSREX_x = \frac{EXV_x}{TPV_x} \]

Besides, in order to reach the dependency of exports on imports in sectoral basis, the above operating rates should be removed from each other. In other words, the difference between the two rates that are obtained by the above formulas reveals the dependency in the analyzed sector and it.

\[ EXD_{IMR_x} = TDPREX_x - TSREX_x \]

This expresses,

\[ EXD_{IMR_x} = \text{Dependency Ratio of Exports on Imports} \]
\[ TDPREX_x = \text{Share of Exports in Total Domestic Production} \]
\[ TSREX_x = \text{The Share of Exports in Total Supply} \]

3. Dependency of Turkey’s Exports on its Imports in Terms of Main Sectors in 2003 – 2010 Periods

Manufacturing industries which are dependent sectors will be analyzed for Turkey in the period of 2003 – 2010. Calculations, regarding dependency, are centered in active sectors due to the fact that the manufacturing industry production has an important share in GNP.

It is possible to measure the dependency on the basis of active manufacturing sectors with the input-output table of Turkish Statistical Institute (here in after referred to as TSI). However, the most recent table was prepared in 2002. In order to measure the dependency on sectoral basis in 2003-2010 period, a new method, which is developed by Yükseler and Türkan (2008:27-31) and used by Aydin and etc. (2007:26), makes an empirical analysis of the structural changes in Turkish exports. They used the input-output table which is constituted in 2002. In the method, 70 coded export values (Fob) in the vertical axis, 72 coded import values (Cif) in the horizontal axis and 71 coded total production (with base prices) values again in the horizontal axis in the input-output table are separately determined for each active manufacturing sectors and these values accepted as the base values. At this stage, to extend the values accepted as 2002=100 basis to the years of 2003 – 2010 period, industrial production indices, export quantity indices and and import quantity indices are needed. As a result of the fact that the indices published by TSI are on 1994=100 and 2003=100 basis and in order to reach each active manufacturing sectors’ 2002= 100 basis industrial production indices, export quantity indices and import quantity indices, it is necessary to convert 1994=100 and 2003=100 basis indices to 2002=100 indices. The indices that accept different years as 100 basis are organized and 2002=100 basis industrial production indices, export quantity indices and import quantity indices are reached. In the next step, the obtained 2002=100 basis index values and input-output table basic prices production values, export values and import values are multiplied. Total production values of each sector active in manufacturing industry in 2003 – 2010 periods, export and import values are reached and dependency of exports on imports on sectoral basis is calculated by comparing some values to each other. As a
result of the calculations related to the period after 2002, the dependency rates of each sector active in manufacturing industry are on Table 1.

Table 1: Dependency Ratios in Manufacturing Industry Sectors (Import/Production) - (Export/Supply)

<table>
<thead>
<tr>
<th>Dependency Level</th>
<th>2002</th>
<th>2003</th>
<th>2004</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
<th>O.I</th>
</tr>
</thead>
<tbody>
<tr>
<td>Food products and beverage</td>
<td>100</td>
<td>0.32</td>
<td>0.35</td>
<td>0.44</td>
<td>0.48</td>
<td>0.42</td>
<td>0.43</td>
<td>0.44</td>
<td>0.45</td>
<td></td>
</tr>
<tr>
<td>Tobacco Products</td>
<td>0.18</td>
<td>0.24</td>
<td>0.29</td>
<td>0.35</td>
<td>0.29</td>
<td>0.29</td>
<td>0.42</td>
<td>0.37</td>
<td>0.50</td>
<td></td>
</tr>
<tr>
<td>Textile Products</td>
<td>2.63</td>
<td>3.16</td>
<td>4.23</td>
<td>4.40</td>
<td>5.42</td>
<td>6.11</td>
<td>6.07</td>
<td>6.22</td>
<td></td>
<td>9</td>
</tr>
<tr>
<td>Tanned leather, luggage, handbags, saddlery and footwear</td>
<td>1.84</td>
<td>1.77</td>
<td>2.94</td>
<td>3.06</td>
<td>4.04</td>
<td>4.55</td>
<td>4.06</td>
<td>4.44</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wood and cork products (except furniture) Mesh and so on. Weaving prod.</td>
<td>1.35</td>
<td>1.91</td>
<td>2.11</td>
<td>1.79</td>
<td>2.00</td>
<td>1.67</td>
<td>1.59</td>
<td>1.66</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Paper and paper products</td>
<td>1.79</td>
<td>2.25</td>
<td>2.59</td>
<td>2.64</td>
<td>3.17</td>
<td>3.40</td>
<td>3.49</td>
<td>3.93</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Coke, refined petroleum products and nuclear fuels</td>
<td>6.45</td>
<td>7.11</td>
<td>11.90</td>
<td>14.09</td>
<td>19.15</td>
<td>22.37</td>
<td>29.86</td>
<td>24.12</td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>Chemicals and chemical products</td>
<td>5.18</td>
<td>5.32</td>
<td>5.38</td>
<td>5.69</td>
<td>5.69</td>
<td>6.08</td>
<td>5.70</td>
<td>6.88</td>
<td></td>
<td>8</td>
</tr>
<tr>
<td>Rubber and plastic products</td>
<td>3.40</td>
<td>4.04</td>
<td>3.47</td>
<td>4.04</td>
<td>4.45</td>
<td>5.11</td>
<td>4.75</td>
<td>5.08</td>
<td></td>
<td>10</td>
</tr>
<tr>
<td>Other non-metallic mineral products</td>
<td>1.32</td>
<td>1.57</td>
<td>1.83</td>
<td>1.94</td>
<td>2.05</td>
<td>2.27</td>
<td>2.31</td>
<td>2.55</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Metal products (except machinery and equipment)</td>
<td>4.76</td>
<td>5.99</td>
<td>4.43</td>
<td>4.68</td>
<td>4.79</td>
<td>6.72</td>
<td>7.41</td>
<td>7.11</td>
<td></td>
<td>7</td>
</tr>
<tr>
<td>NEC machinery and equipment</td>
<td>11.76</td>
<td>9.64</td>
<td>12.33</td>
<td>13.06</td>
<td>14.94</td>
<td>17.12</td>
<td>16.00</td>
<td>15.03</td>
<td></td>
<td>5</td>
</tr>
<tr>
<td>NEC electrical machinery and apparatus</td>
<td>9.06</td>
<td>13.90</td>
<td>14.64</td>
<td>15.77</td>
<td>17.66</td>
<td>20.22</td>
<td>20.64</td>
<td>17.65</td>
<td></td>
<td>4</td>
</tr>
<tr>
<td>Radio, television, communication equipment and apparatus</td>
<td>23.21</td>
<td>26.05</td>
<td>33.74</td>
<td>55.65</td>
<td>73.68</td>
<td>79.61</td>
<td>86.15</td>
<td>77.59</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Motor vehicles and trailers</td>
<td>15.37</td>
<td>15.65</td>
<td>15.90</td>
<td>16.69</td>
<td>18.42</td>
<td>17.29</td>
<td>17.47</td>
<td>17.88</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>Furniture and NEC other products</td>
<td>7.91</td>
<td>11.05</td>
<td>7.02</td>
<td>5.89</td>
<td>4.16</td>
<td>3.46</td>
<td>2.45</td>
<td>2.41</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source:

Note: Total production values which are in the 2002 input-output table define total products with basic prices.
O.I: Order of Importance

The graphs which is constituted using the Table 1, it is determined that the most dependent first five sectors in Turkey are respectively radio, television, and communication equipment and apparatus sector, coke, refined petroleum products and nuclear fuels sector, motor vehicles and trailers, NEC electrical machinery and apparatus sector and NEC machinery and equipment sectors. It should be specified that the assessments which are intended to dependency increase or decrease in sectoral basis are made due to differentiation between Export/Total Production and Export/Total Supply Rates.

3.1. Radio, Television and Communication Tools Industry

The electronics industry, which contains radio, television, communication equipment and apparatus, is a locomotive sector which develops and affects all sectors positively. The recent increasing importance of the sector has played a key role in the increase of the consumption demand of the consumers especially in the domestic markets. Although some sector-specific investments made for the increase in demand, the current output cannot satisfy domestic demand and imported intermediate goods are usually used after processing or are exported. This situation increasingly brings along dependency by years. In addition, the product prices are highly affected by the economic developments and exchange rate volatilities. Under these circumstances, other sectors are affected negatively as they use the products of the sector as input. The 2003-2010 period dependency of radio, television, communication tools and apparatus sector, which is observed to be significant for national economy and is a sub-sector of the electronics industry, can be analyzed by the figure 1.
Between 2003–2010 period, dependency is increased in radio, television, communication tools and apparatus sector. This increase is more rapid since 2006. The reason is the process of rapid development of information and communication technologies in recent years. In Turkey, the increase in demand for radio, television, communication tools and apparatus sector is satisfied by imported products. Beside the intermediate goods used in the production of the sector are highly imported ones and this situation made the sector increasingly dependent by years.

### 3.2. Coke, Refined Petroleum Products and Nuclear Fuels Sector

The second most dependent sector is coke, refined petroleum products, and nuclear fuels in our country. This is the most important sub-sector in the energy sector. Therefore, an energy sector oriented analysis will be beneficial to obtain a comprehensive perspective. The energy sector is one of the leading sectors which affect the future of countries. The increase in demand depending upon technological developments and in order to satisfy this demand the mandatory R&D works with the high costs of investments, requires political, social and economic balances to be considered in decision making process. The tendency to migrate from villages to towns, the transformation process to consumer society, demand for technology, the steady and rapid increase of young population, economic growth and other elements such as the speed of industrialization has made Turkey one of the fastest growing energy markets and exposed rapidly increasing demand for energy. However, despite this rapid increase in energy demand, limited energy sources of the country brings about dependence on imported energy sources firstly in petrol and natural gas. The dependency developments in the coke, refined petroleum products and nuclear fuels sector, which is very important for the economy of the country, is analyzed in figure 2.
Energy dependency is observed to increase rapidly after 2003 period in Turkey. In this period, the political instability in the Middle Eastern countries and power cut (natural gas) of the countries for political purposes that have various energy sources cause power supply and accordingly the energy prices to become very volatile. Our country, which is dependent on a variety of energy sources, especially oil, directly and deeply affected by this variation of energy prices. This situation increases the importance of investments in the sector.

3.3. Motor Vehicles, Trailers and Semi-Trailers Manufacturing Sector

Motor vehicles, trailers and semi-trailers manufacturing industry also require high technology content and absence of these technological elements in a country cause import need direct and indirect ways and this makes the sector one of the leading sectors that is foreign dependent.

Motor vehicles industry is considered as an important growth sector in the middle-developed and middle income countries. This is also true for Turkey. The sector has shown a rapid growth since the mid 1990’s and in terms of production, employment and exports got a significant position in Turkish economy. It is possible to analyse the developments in dependency after 2003 in figure 3.
The most important event affecting dependency since 2003 is the reduction in purchasing power of Turkish citizens after 2001 crisis and the development of sector exports and imports due to the devaluation. In this process, the engine, electric components, and transmission parts of the motor vehicles are imported and it is seen that some other parts and components were met from the domestic market and the rest from abroad. Besides, new companies that do not have a strong sub-industry, played an important role increasing dependence of the sector.

However, it can be said that the global economic crisis in 2008 downgraded the motor land vehicles sector exports and correspondingly downgraded the demand for imported products (raw material and intermediate goods) used in the process of production to increase exports. It is possible to say that the stimulus for consumption aiming for increasing the demand for new automobiles is effective in the increase of sector dependency in 2009 and 2010. Thus, the vitality emerged in the sector caused an increase of dependency on imports in 2009 and 2010.

3.4. Not Elsewhere Classified (NEC) Electrical Machinery and Apparatus Production

The sub-sector of electrical machinery consists of production, transmission and distribution function of the electrical power and electric power machines and transport units of electrical energy and units to help them. Insulated wire and cable (3/1) and sub-sectors of electrical equipment have the largest share in sector production.

One third of domestic market demand is met by imports. Therefore, the sector is opened to international competition in the domestic market. However, in the NEC electrical machinery and devices sector more than 2/3 of the production is directed to exports. The electrical machinery and equipment industry has been largely opened to foreign countries since 2001. The insulated wire and cable and electrical household appliances are of very high concern groups in export sectors. It is possible to analyse the developments in dependency by the help of figure 4.

![Figure 4: NEC Electrical Machinery and Apparatus Production](image)

In the NEC electrical machinery and apparatus sectors of Turkey, the dependence of exports on imports are increased between 2003 and 2009 years. The reasons for this increase are conditions of intense foreign competition in electrical household industry as a result of Customs Union Treaty of Turkey with E.U countries in 1996. The increased competition caused improving product quality and variety and increase in exports. These positive developments in exports of the sector caused increases
in imports for raw materials. Although, the sector consists of advanced technology or closely follows the technological developments, the lack of competitiveness of Turkish industrial sector in the needs of these qualities play a key role in the increase of dependency on imports. In addition, uncertainty in the demand for output of the other sectors that supply products and decreases in profit margins as a result of public procurement and accordingly weakening of investment opportunities create difficulty in planning and investment. At this stage, the sector becomes dependent. The decrease of dependence in 2010 is a result of tailing the fields of technical developments in the form of interaction by foreign-capitalized large international companies with domestic-capitalized and midsize companies working with license. In line with these developments, the timely done R&D investments and expenditures within the framework of financial possibilities are effective.

3.5. Not Elsewhere Classified (NEC) Machinery and Equipment Production

In the Not Elsewhere Classified (NEC) Machinery and Equipment Manufacturing industry, which consists of manufacturing machines of many sectors composing the production of Turkish manufacturing industry, agricultural machinery and white goods production that is a major exports sub-sector, two thirds belong to private sector production of NEC household appliances (white goods). The defense-related manufacturing industries also take place under this sector.

As a result of the fact that Europe white goods sector shifted high-tech products and developed the production technology, export from Turkey has increased in the last decade in order to meet the need of the middle income section. In this decade, the white goods sector managed to reach a certain level of quality in Turkey and increased its share in European market. Therefore, while the production of white goods have foreign trade surplus in terms of foreign trade, the remaining part of the sector is a net importer. It is possible to analyse the developments in dependency by the help of figure 5.

Figure 5: NEC Machinery and Equipment

When the graph analyzed, it is seen that the dependency has been in a tendency to increase since 2005. In the analyzed period, this tendency is correlated with the technology variation of the industry branches except from white goods production according to the size of firms, lower technologies used by small and medium sized firms, lack of developed side-sector in machine manufacturing sub-sector, high of average wages in the sector and shortage of skilled labour. As a result of these analyses it is determined that, the NEC machine and equipment manufacturing sector is
one of the leading strategic sectors that plays an important role in the growth of national economy and supplies investment and service input.

4. Conclusion
Recently, one of the main reasons of the increase in imports is the increase of dependency of exports. In other words, the increase in exports increases imports, too as it is dependent on imported inputs. In terms of cross industry approach, the reason of a country’s imports is due to weak cross sectoral backward and forward link impact in national economy. If the national industries, which provide intermediate input in order to produce an output unit for any of the industries, are insufficient, the backward links of the national economy will move to overseas related industries. The extensity of these backward and forward links and numerical quantity increase the foreign dependency of the country.

The cross sectoral dependencies, arising from exchange of goods and services between sectors, play a key role in shaping the production structure. In this context, the mutual relations between the sectors are formulated in certain models and the findings of the analyses made by the help of the resulting models can advise both for investment decisions and the dependence level of the production structure. Besides, owing to determination of interdependence, planning for the future of the production structure and which sectors should be given priority in terms of industrialization is shaped. The Input-Output tables, establishing a functional relation between industries, are generated in order to understand the relationships comprehensively among the sectors. In the input-output tables, there are flows of goods that are taken and given from basic sectors to each other and they are formed to meet the final demand.

However, in the period after 2002, the input-output tables are not prepared in Turkey. This situation makes it difficult to determine the dependency of exports. But, it is possible to determine the sectoral dependency by using Exports/Total Production and Exports/Total Supply method. As a result of the analysis made for determining the development of sectoral dependency after 2002 period, it is determined that the most dependent first five sectors in our country are respectively Radio, television and communication equipment and apparatus sector, Coke, refined petroleum products and nuclear fuels sector, Motor vehicles and trailers, NEC electrical machinery and apparatus sector and NEC machinery and equipment sectors.

In consequence of the investigation, the measures and regulations gains importance and become compulsory to reduce the level of dependence on manufacturing sector as the manufacturing sectors are the first five dependent sectors. This situation involves both keeping a large portion of the revenue of the domestic production and taking this dependency to the lowest possible levels by increasing the percentage of local content of products. For this reason, the raw material potential of the country should be evaluated in terms of sectors. Prime strategic planning and policies are needed to enhance competitiveness. In line with these strategic objectives, it is important to increase the share for R&D activities. While making R&D expenditures, the competition with the foreign operating companies should not be forgotten. The priority should be given to the use of technologically new and improved production models. It is necessary to increase and diversify the exports of high value added products. It is also necessary to improve the investment climate in order to reach a more competitive level in world markets.

On the other hand, the effective use of energy, giving importance to policies that will reduce dependence on foreign energy and turning to renewable energy sources are very important. In this context, investments on the sectors operating in the manufacturing sector should be increased and using the advanced technologies is crucial to reduce the dependence on imports in Turkey. In addition, the necessary raw material and intermediate goods and especially the high value added products should be produced in our country in the production process. By this way, the dependency of the sectors can be reduced and the country will gain competitiveness.
References