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## A Sectoral Approach to the Surging Imports in Turkey

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**A Sectoral Approach to the Surging Imports in Turkey**

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**Working Paper # 10/05**

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## **A Sectoral Approach to the Surging Imports in Turkey**

### **Abstract**

The dramatic surge in imports of goods and services without a concomitant surge in exports in Turkey deserves a sound explanation. The studies on the issue addressed increasing import dependency of the manufacturing sector in Turkey. This paper has attempted to scrutinize the reasons behind this phenomenon by looking not only at the manufacturing sector as the past studies did, but also at the other sectors of the economy. Using 1998 and 2002 Input -Output Tables, import requirement ratios have been calculated for 12 aggregate sectors. The results demonstrate that the contribution of the “wholesale and retail trade; repair of motor vehicles and household goods” sector to the increasing import dependency, hence to significantly rising imports, is greater than that of the manufacturing sector.

*Keywords: Input-Output Model, import requirement ratio, sector analysis, Turkey.*

*Jel Codes: C67, F14*

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## Introduction

Turkish citizens used to celebrate a certain day called ‘Domestic Goods Day’ in which domestically made local goods were brought to public spaces such as schools and were shared among the participants. The ritual was constructed to induce the appreciation of the domestic production and the demand for domestic goods and services. That day is a history now. Imports rule the day.

Since the implementation of the outward oriented development and the export-led growth strategy in 1980, Turkey’s foreign trade developed very rapidly. The share of imported goods and services in GDP increased dramatically from 12 percent in 1980 to 28 percent in 2008. Similarly, 1980’s exports’ share of 5 percent in GDP reached 23 percent in 2008.

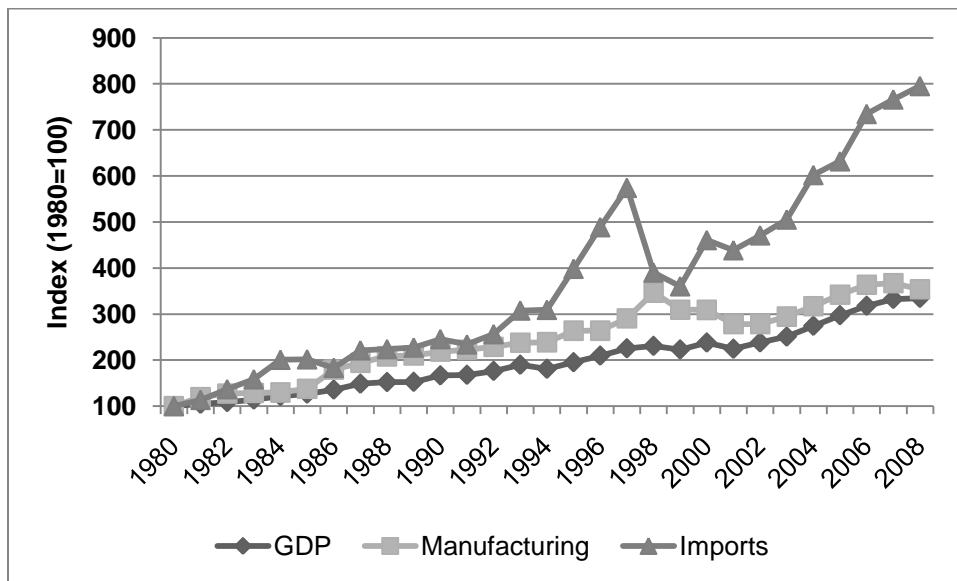
The rise in imports can be attributed to the increase in exports given that the demand for imports could be derived either from domestic expenditure, or from external demand, namely exports. In fact, the change in the nature of international trade addresses the import dependence of exports all around the world. There is a widespread literature documenting the fact that countries use imported intermediate inputs to produce final goods to be later exported -the so-called vertical specialization-, which leads to an increasing interconnectedness of production processes in a vertical trading chain (Dixit and Grossman 1982; Krugman 1995; Feenstra and Hanson 1996, 1997; Feenstra, 1998; Hummels et. al 2001; Yi; 2003). Thus intra- industry and intra-firm trade dominate the dynamics of exports and imports. The consequence is obviously higher import dependence of exports.

The phenomenon of the rising import dependence of exports in Turkey has been put forward by many studies (See for instance Aydın et al. 2007; Yükseler and Türkan 2008; Eşiyok 2008 among others). These studies mainly focus on the import dependence of the manufacturing sector to explain the upsurge in imports. This attempt makes sense considering that 95 percent of exports are generated by the manufacturing sector, the value added of which is 18 percent of GDP in 2008. However, a glance at Figure 1 reveals that increasing import dependence of the manufacturing sector is not sufficient to explain the surging imports.

The growth rate of GDP is 234 percent between 1980 and 2008, while the value added of the manufacturing sector grew by 253 percent within the same period. Imports, on the other hand, increased almost by sevenfold. Hence, neither the growth of the manufacturing sector nor the increasing import dependency in the manufacturing sector can explain the overall growth of imports.

The idea of this paper is that import dependence of some sectors other than the manufacturing sector could be the reason for the increasing trend in imports. To this aim, we first reclassify the sectors according to the OECD National Accounts Standards involving 12 main economic activities by employing Input-Output (I-O) Tables for 1998 and 2002 (the latest data available) and calculate the ‘import-requirement-ratio’ (IRR) of each sector. Thereafter, we weight the IRRs by the sectoral valued added shares and calculate each sector’s contribution to the rising imports between 1998 and 2002. Lastly, we carry out an analysis by extrapolating the IRRs for the years following the year 2002 in which the last I-O Table for the Turkish Economy was published.

**Figure 1: Trends in GDP, the Value Added of the Manufacturing Sector, and Imports**



Source: World Development Indicators

The results show that the rise in imports should be related more to the “wholesale and retail trade; repair of motor vehicles and household goods” (trade) sector than the manufacturing sector. Real estate, renting and business activities (real estate) sector is the other sector that causes a considerable increase in imports as the final demand increases between 1998 and 2002.

Among the studies that use I-O analysis to measure IRRs (Şenesen and Şenesen 2003; Yentürk, 2004; Şenesen, 2005; Aydın et al., 2007; Yükseler and Türkan, 2008; Eşiyok, 2008) only Aydın et al. (2007) calculated ratios by using 2002 I-O Tables. Nevertheless, this study aggregates the sectors to 5 main sectors and emphasizes the import dependence of the manufacturing sector analyzing its each subsector. To the best of our knowledge, our paper is the first study to focus on other sectors than the manufacturing sector by using both 1998 and 2002 I-O Tables.

The remainder of this paper is structured as follows. Section 2 describes the methodology and the data. Section 3 discusses the results. Section 4 concludes.

## Methodology and Data

### Input-Output (I-O) Analysis

In this paper Leontief’s I-O model is employed to calculate the IRRs. The I-O model is centered on the idea of inter-industry transactions in the economy, this meaning that industries use the products of other industries to produce their own products, while outputs from one industry become inputs to another. I-O models assume that each industry has a single, homogeneous production function and each industry produces one product. Moreover, it assumes that a linear relationship exists between increasing demand for inputs and outputs.

The equivalence between final demand and gross output is given by the following equation

$$X = Z + Y \quad (1)$$

where  $X$  is gross output,  $Z$  is total demand for intermediate inputs, and  $Y$  is the final demand. The variable  $Y$  represents the final demand by the expenditure approach and is given by the following equation

$$Y = C + I + E - M \quad (2)$$

where  $C$  denotes consumption expenditures,  $I$  denotes investment expenditures,  $E$  is exports, and  $M$  stands for imports.

The values in I-O matrix, the so-called Leontief coefficients, represent the total direct and indirect ("induced") requirements of any industry  $j$  supplied by other industries ( $i$ ) in order for industry  $j$  to be able to deliver 1 unit of output to final demand.

Sectoral production function can be represented by the following equation

$$X_{ij} = a_{ij} X_i \quad (3)$$

where  $a_{ij}$  is the ratio of inputs from domestic industry  $i$  used in the output of industry  $j$ .

Input-output model can be expressed as in the following formula in matrix notation

$$X = A^* X + Y \quad (4)$$

where  $A$  is an  $n \times n$  matrix describing the relationships among industries,  $X$  is an  $n \times 1$  vector of gross output, and  $Y$  is an  $n \times 1$  vector of final demand for domestically produced goods and services, including exports. Equation (4) can be rewritten as follows

$$X - A^d X = A^m X + C^d + I^d + C^m + I^m + E - (A^m X + C^m + I^m) \quad (5)$$

where  $A^d$  is an  $n \times n$  matrix describing the relationships among domestic inputs and the sector outputs,  $A^m$  is an  $n \times n$  matrix describing the links among imported inputs and the sector outputs,  $C^d$  is domestic consumption,  $I^d$  is domestic investment,  $C^m$  is imports of consumption, and  $I^m$  is imports of investment.

Arranging the terms in equation (5) yields

$$X = (I - A^d)^{-1} (C^d + I^d + E) \quad (6)$$

Multiplying both sides of equation (6) by  $A^m$  yields

$$A^m X = A^m (I - A^d)^{-1} (C^d + I^d + E). \quad (7)$$

Hence, inverse import matrix is the following

$$R = A^m (I - A^d)^{-1} . \quad (8)$$

The sum of each column in inverse matrix  $R$  yields IRR for the corresponding sector, which represents the total direct and indirect import requirements induced by a unit increase in final demand deriving from domestic consumption, domestic investment and/or exports of the corresponding industry.<sup>1</sup>

## Data and Methods

The primary sources of data are I-O Tables for 1998 and 2002 extracted from Turkish Statistical Institute. Since OECD publishes the most detailed data regarding the value added at the sectoral level for the years following 2002 in which the last I-O Table was published, we choose to use OECD National Accounts Standards involving 12 main economic activities to aggregate the sectors.<sup>2</sup> The key for the aggregation of the sectors is displayed in Table 1. Firstly, we calculate the IRR of each sector for both 1998 and 2002. Secondly, by using OECD National Accounts in constant prices we calculate the relative shares of the sectors in total value added and weight the IRRs by each sector's value added share. Lastly, we carry out a further analysis and extrapolate the IRRs for the years after 2002. We assume that the growth trend observed in each sector's the import dependency between 1998 and 2002 would continue for the years following 2002.

## Results and Discussion

Table 2 displays findings regarding IRRs in 1998 and 2002. The first two columns in Table 2 demonstrate the calculated IRRs for the years 1998 and 2002, respectively. The third column shows the percentage change in IRRs between 1998 and 2002. For instance, IRR was found to be equal to 0.21 for the manufacturing sector in 1998. Therefore, 1 TL increase in final demand inducing a one unit increase in output will cause the manufacturing sector to use 0.21 TL worth of imports via its direct input requirements as well as its indirect import requirements. Notice that the manufacturing sector requires input flows from the manufacturing sector itself as well as from the other sectors. Similarly, other sectors require inputs from the manufacturing sector. The IRR for the manufacturing sector increased to 0.25 in 2002. This increase implies an extra 0.04 TL worth of imports in 2002 compared to 1998. The relative increase is then 19 percent.

The calculated IRRs show that the manufacturing sector is the most import dependent sector in 1998 with the IRR of 0.21.” Electricity, gas and water supply” (electricity) and construction

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<sup>1</sup> See Chenery ve Clark (1965); Weisskoff ve Wolff (1975); Sarma ve Ram (1989); Yükseler (1980) for a detailed analysis of IRR.

<sup>2</sup> Data are obtained from OECD National Accounts Database under the heading of “Value Added and Its Components by Economic Activities” at [http://stats.oecd.org/BrandedView.aspx?oeed\\_by\\_id=na-data-en&doi=na-dna-data-en](http://stats.oecd.org/BrandedView.aspx?oeed_by_id=na-data-en&doi=na-dna-data-en).

sectors follow the manufacturing sector with the IRRs of 0.16 and 0.14, respectively. In 2002, IRR of the electricity sector is observed to increase to 0.27. Therefore, the electricity sector becomes the most import dependent sector in 2002, followed by manufacturing and construction sectors. Looking at the percentage changes in IRRs between 1998 and 2002, on the other hand, reveals that the trade sector demonstrates the highest increase in import dependency with 160 percent.

The analysis should also take into account the relative shares of each sector in total value added because one unit of extra final demand would induce import flows in each sector according to the sector share in total value added. It is logical to assume that the final demand is distributed along the sectors according to the sectoral shares in total value added. Take a 100 TL worth of final demand expansion; since the share of the electricity sector in total value added is only 2.07 percent in 1998, only 2.07 TL will be allocated to this sector. In 1998, the required increase in imports (directly or indirectly) would be 16 percent of this 2.07 TL, which is 0.32 TL. In 2002, the same rise in final demand would require 0.57 TL worth of imports. The similar reasoning for the manufacturing sector implies that a 100 TL worth of final demand expansion leads to a requirement of 4.66 TL worth of imports in 1998 and 5.16 TL worth of imports in 2002. This exercise shows that each sector should be weighted by its share of value added to have a true picture of the relative import requirement of the sectors. Although the electricity sector is the most import dependent sector in terms of IRR in 2002, its contribution to the upsurge in imports is very little. We, therefore, weighted the IRRs of both 1998 and 2002 by each sector's valued added share in the corresponding year. The results of this exercise are displayed in the fourth and fifth columns of Table 2.<sup>3</sup> In 1998, a 100 TL worth of final demand increase leads to import requirements of 4.66 TL, 1.14 TL and 0.79 TL in the manufacturing, "transport, storage and communication" (transport), and construction sectors, respectively. Thus, these three sectors were observed to make the greatest contribution to the surge in imports in 1998. The situation is similar for the manufacturing and the transport sectors in 2002 with import requirements of 5.16 TL and 1.24 TL for a 100 TL worth of final demand increase, respectively. Yet, the trade sector turned out to play a considerable role in import expansion with its 1.19 TL worth of import requirement. Real estate, renting and business activities (real estate) sector is also worth mentioning with a contribution of 0.92 TL.

The sum of the fourth and fifth columns in Table 2 give total import requirements in Turkey for a 100 TL worth of final demand increase in 1998 and 2002, respectively. Rising by 20 percent, total import requirements went up from 10.21 TL in 1998 to 12.25 TL in 2002. The last column of Table 2 displays the contribution of each sector to this rise in total imports.

The biggest contribution to total import requirements was found to come from the trade sector with almost 32 percent, which was followed by the manufacturing and the real estate sectors with contributions of 25 percent and 21 percent, respectively. These results

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<sup>3</sup> Notice that these columns illustrate IRRs for a 100 TL increase in final demand. In other words, we chose to multiply the original weighted IRRs with 100 to overcome the difficulty of dealing with four decimal numbers.



demonstrated that 6.72 percent of the 20 percent increase in imports between 1998 and 2002 resulted from the trade sector alone.

Therefore, our preliminary findings suggest that the surge in imports should be related more to the trade sector than the manufacturing sector. Real estate sector is another sector that is worth mentioning with regard to its contribution to the rise in imports.

In fact, the increasing trend in trade sector's import dependency is very striking. Taking into account its 13 percent share in total value added, it is not unrealistic to predict that this trend would bring about a higher rise in imports in the years following 2002. Thus, as a final step we carried out another analysis and extrapolated the IRRs for the years after 2002. We assume that the growth trend observed in each sector's IRR between 1998 and 2002 would continue for the years after 2002 in which we have the last I-O table for the Turkish Economy. The results are reported in Table 3.

The first column of Table 3 displays 2002 IRRs and the second column shows the extrapolated IRRs for the year 2007. The percentage changes in IRRs between the years 2002 and 2007 are reported in the third column. As we did in the previous exercise, results of which were displayed in Table 2, we weighted the extrapolated IRRs of 2007 by each sector's value added share. Fourth and fifth columns in Table 3 illustrate these weighted IRRs.<sup>4</sup> This analysis demonstrated that the trade sector would have a slightly higher IRR than that of the manufacturing sector in 2007 and its contribution to the rise in imports would be very considerable, if the trend observed in each sector's import dependency would continue for the years following 2002. Due to a 100 TL additional final demand, 1.19 TL worth of imports would be required by the trade sector in 2002, while the same level of induced demand would lead to a requirement of 4.37 TL worth of imports in the same sector in 2007. The percentage increase in import requirement of this sector is then 268 percent in this period.

The sum of the fourth and fifth columns in Table 3 give total import requirements in Turkey for a 100 TL worth of final demand increase in 2002 and 2007, respectively. According to our calculations, total imports increased by 44 percent between 2002 and 2007. The last column of Table 3 where the contribution of each sector to this rise in total import requirements is illustrated reveals the dominance of the trade sector in surging imports. Almost 60 percent of the growth in imports would be originated from the trade sector, whereas the manufacturing sector would contribute only by 32.7 percent. Electricity is the third sector after these two sectors in terms of contribution to the import increase with an import requirement of 11.8 percent. Yet, the real estate sector was observed to contribute only by 4.45 percent to the rise in imports.

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<sup>4</sup> Notice that these columns demonstrate import requirements for a 100 TL increase in final demand as also those of Table 2 display.

Construction; and health and social work sectors were also found to require more imports in 2007 compared to 2002. Since their total value added shares are small, their net contribution to the surge in imports is limited.

Hence, the further assessment made in the last exercise confirmed our preliminary finding that the surge in imports should be related more to the trade sector than the manufacturing sector.

## **Conclusions**

The phenomenon of the surging imports in Turkey without a concomitant rise in exports raises more than an eyebrow. This study was conducted to explore the reasons of this fact by using an I-O analysis. Aggregating the sectors in 1998 and 2002 I-O Tables to have 12 main sectors and calculating the IRRs of each sector yielded total direct and indirect import requirements of each sector. The IRR of the manufacturing sector was found to be the highest one in 1998 and the second highest one after that of the electricity sector in 2002. However, weighting the IRRs of 1998 and 2002 by each sector's value added share in the corresponding year and calculating each sector's role in the expansion of total imports between these two years revealed that the greatest contribution to the upsurge in imports was made by the trade sector. The contribution of the real estate sector to the change in imports also turned out to be considerable, although less considerable than that of the manufacturing sector between 1998 and 2002.

A further analysis was carried out by extrapolating the IRRs for the years after 2002 in which the last I-O Table was published. This analysis demonstrated that the trade sector would have a slightly higher IRR than that of the manufacturing sector in 2007 and it would make the greatest contribution to the rise in imports in the same year, if the growth trend observed in each sector's import dependency between 1998 and 2002 would continue for the years following 2002.

One general conclusion from the results discussed in this study is that the rise in imports is related more to the trade sector than the manufacturing sector. Future research will hopefully take into account the effect of not only the manufacturing sector on imports, but also other sectors, especially the trade sector.

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### **Abbreviations**

Import requirement ratio: IRR

Electricity, gas and water supply: electricity

Wholesale and retail trade; repair of motor vehicles and household goods: trade

Transport, storage and communication: transport

Real estate, renting and business activities: real estate

**Table 1: The key for Classification of the Sectors**

OECD National Standards	Number of the Products in I-O Tables	
	1998	2002
A: Agriculture, hunting and forestry	1-6	1,2
B: Fishing	7	3
C: Mining and quarrying	8-12	4-8
D: Manufacturing	13-68	9-30
E: Electricity, gas and water supply	69-71	31-33, 55
F: Construction	72	34
G: Wholesale and retail trade; repair of motor vehicles and household goods	73-75	35-37
H: Hotels and restaurants	76-77	38
I: Transport, storage and communication	78-83	39-43
J: Financial intermediation	84-85	44-46
K: Real estate, renting and business activities	86-90, 97	47-51
L: Public administration and defense; compulsory social security	96	52
M: Education	91	53
N: Health and social work	92	54
O: Other community, social and personal service activities	94-95	57, 58
P: Private households with employed persons	-	59
Q: Extra-territorial organizations and bodies	93	56

Source: OECD, TUIK 1998 and 2002 I-O Tables.

**Table 2: IRRs in 1998 and 2002**

	<b>IRR 1998</b>	<b>IRR 2002</b>	<b>Change in IRR 1998-2002 (%)</b>	<b>Weighted IRR *100 1998</b>	<b>Weighted IRR*100 2002</b>	<b>Contribution to the rise in imports 1998-2002 (%)</b>
A: Agriculture, hunting and forestry	0,07	0,06	-11,18	0,74	0,64	-4,75
B: Fishing	0,04	0,07	76,41	0,01	0,01	0,22
C: Mining and quarrying	0,05	0,10	100,44	0,06	0,10	1,91
D: Manufacturing	0,21	0,25	19,35	4,66	5,16	24,75
E: Electricity, gas and water supply	0,16	0,27	73,94	0,32	0,57	11,91
F: Construction	0,14	0,16	12,09	0,79	0,81	1,19
G: Wholesale and retail trade; repair of motor vehicles and household goods	0,04	0,10	160,46	0,54	1,19	31,77
H: Hotels and restaurants	0,10	0,10	6,94	0,27	0,29	0,72
I: Transport, storage and communication	0,10	0,09	-9,17	1,14	1,24	4,90
J: Financial intermediation	0,07	0,05	-31,61	0,47	0,37	-4,78
K: Real estate, renting and business activities	0,06	0,07	25,26	0,66	0,92	12,68
L: Public administration and defense; compulsory social security	0,00	0,08	0,00	0,00	0,42	20,82
M: Education	0,06	0,05	-26,89	0,17	0,13	-1,85
N: Health and social work	0,07	0,11	62,00	0,10	0,17	3,75
O: Other community, social and personal service activities	0,17	0,11	-30,59	0,28	0,22	-3,22
P: Private households with employed persons	0,00	0,00	0,00	0,00	0,00	0,00
Q: Extra-territorial organizations and bodies	0,07	0,06	-15,25	0,00	0,00	0,00

Source: OECD, TUIK 1998 and 2002 I-O Tables, and Authors' own calculations.

**Table 3: Extrapolated IRRs in 2007 and Weighted IRRs in 2002 and 2007**

	IRR 2002	IRR 2007	Change in IRR 2002-2007 (%)	Weighted IRR *100 2002	Weighted IRR *100 2007	Contribution to the rise in imports 2002-2007 (%)
A: Agriculture, hunting and forestry	0,06	0,05	-13,77	0,64	0,40	-4,57
B: Fishing	0,07	0,14	103,31	0,01	0,04	0,41
C: Mining and quarrying	0,10	0,25	138,49	0,10	0,22	2,14
D: Manufacturing	0,25	0,32	24,75	5,16	6,91	32,70
E: Electricity, gas and water supply	0,27	0,54	99,75	0,57	1,20	11,80
F: Construction	0,16	0,19	15,33	0,81	1,12	5,78
G: Wholesale and retail trade; repair of motor vehicles and household goods	0,10	0,32	230,88	1,19	4,37	59,61
H: Hotels and restaurants	0,10	0,11	8,75	0,29	0,24	-0,91
I: Transport, storage and communication	0,09	0,08	-11,33	1,24	1,21	-0,56
J: Financial intermediation	0,05	0,03	-37,81	0,37	0,25	-2,20
K: Real estate, renting and business activities	0,07	0,09	32,51	0,92	1,16	4,45
L: Public administration and defense; compulsory social security	0,08	0,00	-100,00	0,42	0,00	-7,92
M: Education	0,05	0,03	-32,39	0,13	0,07	-1,08
N: Health and social work	0,11	0,20	82,76	0,17	0,29	2,11
O: Other community, social and personal service activities	0,11	0,07	-36,64	0,22	0,12	-1,75
P: Private households with employed persons	0,00	0,00	0,00	0,00	0,00	0,00
Q: Extra-territorial organizations and bodies	0,06	0,05	-18,68	0,00	0,00	0,00

Source: OECD, TUIK 1998 and 2002 I-O Tables, and Authors' own calculations.