AN INPUT-OUTPUT ANALYSIS OF RISING IMPORTS IN TURKEY

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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 Classification: *C67, F14.*

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Türkiye Ekonomisinde İthalat artışı: Bir Girdi-Çıktı Analizi

Özet

Bu çalışma ihracatta aynı hızda bir artış olmadan ithalatta gözlemlenen dikkate değer artışı daha önceki çalışmalardan farklı olarak imalat sektörü haricindeki sektörleri de dikkate alarak açıklamayı amaçlamaktadır. 1998 ve 2002 Girdi-Çıktı tabloları kullanılarak, 12 sektör için ithalat bağımlılık oranları hesaplanmış ve "toptan ve parekende ticaret; motorlu taşıtların ve ev eşyalarının tamiri" sektörünün artan ithalat bağımlılığına ve dolayısıyla artan ithalata katkısının imalat sektörünün katkısından daha büyük olduğu saptanmıştır.

Anahtar Kelimeler: *Girdi-çıktı modeli, ithalat bağımlılık oranı, sektör analizi, Türkiye.*

JEL Sınıflaması: *C67, F1.*

Introduction

Turkish citizens used to celebrate a certain week called 'The Week of Domestic Goods' within the scope of which domestically produced local goods were brought to public spaces such as schools to be distributed among the participants as well as to be consumed in public. The ritual was constructed to induce the appreciation of domestic production and demand for domestic goods and services. That day has gone nowadays. Imports dominate the day.

Since the implementation of the outward oriented development policy 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, the share of exports in GDP rose from 5 percent in 1980 to 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; 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.

Figure 1: Trends in GDP, the Value Added of the Manufacturing Sector, and Imports
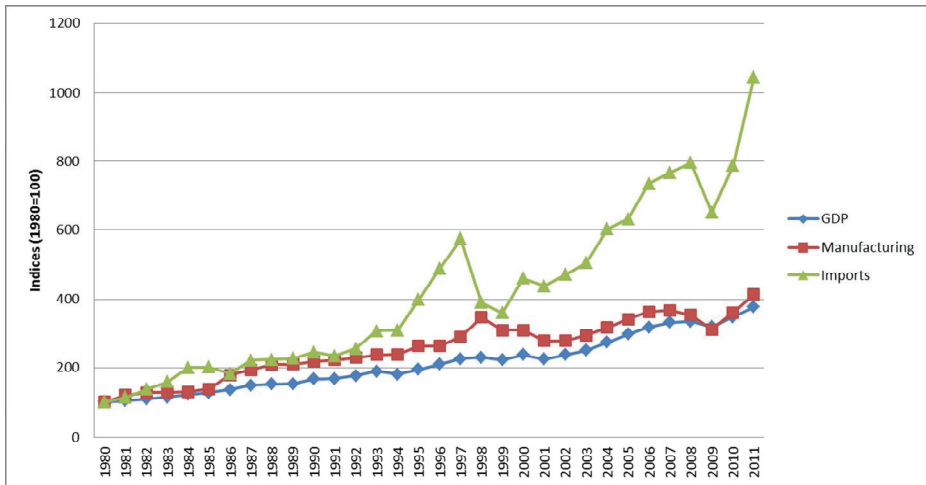
The idea of this paper is that import dependence of some sectors other than the manufacturing sector could be the reason for the increasing trend in imports. To this aim, we first reclassify the sectors according to the OECD National Accounts Standards involving 12 main economic activities by employing 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.

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 leads to a considerable increase in imports 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) calculate ratios by using 2002 I-O Tables. Yet, they aggregate the sectors to only five main sectors and focus on the import dependence of the manufacturing sector by analyzing its subsectors. 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

$$X = Z + Y \tag{1}$$

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

$$Y = C + I + E - M \tag{2}$$

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

$$X_{ij} = a_{ij} X_i \tag{3}$$

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

$$X = A * X + Y \tag{4}$$

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

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

where A^d is an $n*n$ matrix describing the relationships among domestic inputs and the sector outputs, A^m is an n*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

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

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

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

Hence, inverse import matrix is the following

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

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.[1]

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.[2] 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 is 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

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[1]See Chenery ve Clark (1965);Weisskoff ve Wolff (1975); Sarma ve Ram (1989); Yükseler (1980) for a detailed analysis of IRR.
[2]Data are obtained fromOECD National Accounts Database under the heading of "Value Added and Its Components by Economic Activities" at http://stats.oecd.org/BrandedView.aspx?oecd_bv_id=na-data-en&doi=na-dna-data-en.

manufacturing sector. The IRR for the manufacturing sector increases 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 an IRR of 0.21." Electricity, gas and water supply" (electricity) and construction sectors follow the manufacturing sector with IRRs of 0.16 and 0.14, respectively. In 2002, IRR of the electricity sector increases to 0.27. Therefore, the electricity sector becomes the most import dependent sector in 2002, followed by manufacturing and construction sectors. On the other hand, trade sector's import dependency increases by 160 percent between 1998 and 2002.

The analysis should also take into account the relative shares of each sector in total value added because an extra final demand would induce import flows in each sector according to each sector's share in total value added. It can be assumed that the final demand is distributed among the sectors according to the sectoral shares in total value added. For instance, a 100 TL worth of final demand expansion would lead to a 2.07 TL increase in demand for the electricity sector as the share of the electricity sector in total value added is 2.07 percent in 1998. The required increase in imports in the electricity sector (directly or indirectly) would be 16 percent of 2.07 TL, which is 0.32 TL. In 2002, the same rise in final demand would require 0.57 TL worth of imports in the electricity sector. 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 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. In contrast, the contribution of the manufacturing sector to the increase in imports is very high because of its relatively big sectoral share in value added. Hence, each sector should be weighted by its share of value added to see its contribution to the rise in imports. Therefore, we have also calculated the weighted IRRs for both 1998 and 2002 by multiplying each sector's valued added share by that sector's IRR in the corresponding year. Table 4 displays the share of sectors in total value added in 1998 and 2002. Fourth and fifth columns in Table 2 and 3 demonstrate weighted IRR in each sector, which is the sector share multiplied by the corresponding sector's IRR.[3] 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,

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[3] Notice that these columns illustrate IRRs for a 100 TL increase in final demand. In other words, we have chosen to multiply the original weighted IRRs with 100 to overcome the difficulty of dealing with four decimal numbers.

respectively. Thus, these three sectors make the greatest contribution to the surge in imports in 1998. Similarly, a 100 TL worth of extra final demand triggers 5.16 TL worth of imports in the manufacturing sector and 1.24 TL worth of imports in the transport sector in 2002. Yet, the trade sector plays 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 rise 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 comes from the trade sector with almost 32 percent, which is followed by the manufacturing and the real estate sectors with contributions of 25 percent and 21 percent, respectively. These findings demonstrate that 6.72 percent of the 20 percent increase in imports between 1998 and 2002 results 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 have carried out another analysis and extrapolated the IRRs for the years after 2002. We have assumed 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. Similar to the previous exercise, we have weighted the extrapolated IRRs of 2007 by each sector's value added share. Fourth and fifth columns in Table 3 illustrate these weighted IRRs.[4] This analysis demonstrates that the trade sector would have a slightly higher IRR

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[4] Notice that these columns demonstrate import requirements for a 100 TL increase in final demand.

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 increase 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 contributes by 4.45 percent to the rise in imports.

Hence, the last exercise confirms 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 deserves a sound explanation. This study has been conducted to explore the reasons behind this phenomenon 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 yield total direct and indirect import requirements of each sector. The IRR of the manufacturing sector is 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 reveals that the greatest contribution to the upsurge in imports is made by the trade sector. The contribution of the real estate sector to the change in imports also turns out to be considerable, although less considerable than that of the manufacturing sector between 1998 and 2002.

A further analysis has been carried out by extrapolating the IRRs for the years after 2002 in which the last I-O Table was published. This analysis demonstrates

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 of 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

	IRR 1998	IRR 2002	Change in IRR 1998-2002 (%)	Weighted IRR *100 1998	Weighted IRR*100 2002	Contribution to the rise in imports 1998-2002 (%)
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.

Table 4: Share of Sectors in Total Value Added (%)

Sectors	1998	2002
A: Agriculture, hunting and forestry	10,75	10,52
B: Fishing	0,27	0,22
C: Mining and quarrying	1,18	0,96
D: Manufacturing	21,84	20,28
E: Electricity, gas and water supply	2,07	2,08
F: Construction	5,48	5,04
G: Wholesale and retail trade; repair of motor vehicles and household goods	14,33	12,08
H: Hotels and restaurants	2,80	2,76
I: Transport, storage and communication	11,67	13,97
J: Financial intermediation	6,97	8,09
K: Real estate, renting and business activities	11,83	13,13
L: Public administration and defense; compulsory social security	4,68	5,02
M: Education	2,65	2,81
N: Health and social work	1,43	1,56
O: Other community, social and personal service activities	1,71	1,89
P: Private households with employed persons	1,13	0,14
Q: Extra-territorial organizations and bodies	-	-

Source: TUIK 1998 and 2002 I-O Tables