MEASURING THE EMPLOYMENT EFFECT OF SECTORS BY USING EMPLOYMENT MULTIPLIER

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Abstract

In this study, input-output method has been chosen since this method is capable of measuring total impact of changes in final demand on employment. Among many measurement methods, researchers prefer to use the input-output model to measure the employment effects. The input-output technology is capable of measuring the interdependence among industries in national economic system comprehensively and systematically. This study aims to determine strategically important sub-sectors of the Turkish economy according to employment. Using the 1998 and 2002 input-output tables of Turkey, employment multipliers of the sectors have been calculated and the results are evaluated.

Keywords: Employment Elasticity; IO Analysis; Foreign Trade

JEL: J21, R15

1. Introduction

The importance of a sector with respect to economic growth and development can be measured by determining the employment effects of that sector. The employment effect of changes in final demand has always attracted the attention of researchers. The employment effects of changes in final demand have always been important to solve unemployment issues in global era.

The Turkish economy is examined in two periods in terms of the industrialization strategies. The first period covers the years before 1980 which import substitution strategy was applied, and the second period includes after 1980 which export-oriented industrialization strategy was

followed (Seyidoğlu, 2003: 591-595). Therefore, 1980 is the year that socio-economical transformations have been experienced for Turkey. In the second period, some sophisticated mechanisms for protecting the domestic production from imports' were repealed and new mechanisms to promote exporting were put into effect in order to improve the domestic production. The primary objective of these policies is to overcome the problems about balance of payments through increasing exportation and eventually to provide the macroeconomic stability. It is possible for these policies to have impact on both domestic production and employment. On one hand reducing the total expenditure by force of these new policies has negative effects on public sector and on the other hand the incentives for the goods subjected to these policies promote the production and employment while decreasing the production and employment in the sectors of which non-tradable goods are produced. Also the loss in domestic production due to the ease in importation and the competition of external goods may have adverse effects on employment either (Günçavdı, 2002: 1-2).
In recent studies the employment effects arising from effective strategies in production are often taught. Accordingly, the quality of labor on the production discussed in addition to the amount of labor (Ritt, 2001:1)

The rest of the paper is organized as follows: The next section describes the data, methodology and the results from empirical analysis are presented in third section. Section four presents conclusion and policy implications of the paper.

2. Data

Based on this input-output model an empirical research has been done by using the 1998, 2002 input-output tables in Turkey.

3. Methodology and Results

In order to succeed economic development, determinations of relationships between sectors are important to support the dynamic and important sectors. The strong related sectors are multi-dimensional and have complicated structure. Therefore, models are needed to analyze these relations. The input-output analysis is a powerful approach to investigate these complicated relations among sectors (Phillips, 1955: 138).

The input-output methodology investigates economic cases as base of general equilibrium approach. It considers only production dimension and deems consumption as a result of

production. The assumptions of the model are; a commodity is produced only one production, factor, there is no substitution among goods and production and technology is constant. There are *n* producers with different production functions. The product of any of these sectors is demanded as an intermediate input or final consumption by other sectors. Total inputs which comprise basic and intermediate inputs are equal to total demand which comprises intermediate input demand by other sectors and final demand by consumers and this equality is kept sector by sector.

Relations between sectors in input-output models are shown by tables. Each sector is placed twice in a table. While columns in a table show basic and intermediate inputs used in production of each sector, rows in a table show the distribution of a product of a sector to other sectors as an intermediate input and final demand by consumers. The A^T matrix below shows relationships among sectors

$$A^t = \left[z_{ij} \right]$$

z_{ij} coefficients show sector i (I=1,2,…,n) outputs produced using the sector j (j=1,2,….,n) products as inputs. The equation below can be written for a production produced by basic (w) and intermediate inputs[1]:

$$\sum_{j=1}^{n} x_j = \sum_{i=1}^{n} z_{ij} + w_i \qquad (1)$$

The technical coefficients matrix (A), which shows intermediate input usage per product, is obtained by dividing total intermediate inputs used by sector j produced in other sectors to sector j's total production.

$$a_{ij} = z_{ij} / x_j \qquad (2)$$

where $a_{ij} < 1$; (j=1,2,…n).

The demand for input depends on the production of the sector. An increase in the product of a sector increases basic and intermediate input demand of that sector and in turn raises the products of other sectors. This first step effects are partial and direct effects. Chenery and

[1] w shows labor, capital and natural resourced used in a production and they are excluded from the analyses.

Watanabe (1958) argue that the sum of column elements of the matrix *A* shows the intermediate input amount needed to produce one unit of a product. Rasmussen states that indirect effects can be calculated using Leontief matrix. However, a change in sector's demand leads a chain of indirect effects in subsequent steps in whole related sectors. The Leontief matrix is used to determine the size of whole effects (Dietzenbacher and Los, 2002: 410).

$$L = (I - A)^{-1} X \qquad (3)$$

The l_{ij} elements of the *L* matrix show that how many more output has to be produced in the sector *i* to meet the increase in the demand of the sector *j* (Mercado, 2006: 60). The sum of columns in the Leontief matrix shows the total production effects in economy in response to increase in the demand of the related sector.

Employment effects can be calculated from input output table.

$$e = L/X \qquad (4)$$

In equation 4 e shows labor coefficient for each sector. In this sense total employment effects can be measured by multiplying e and Leontief inverse matrix.

$$\Delta E = W / X * (I - A)^{-1} \qquad (5)$$

Four input output methods have been chosen and applied to the case of the Turkish Economy. Based on Chenery-Watanabe, Rasmussen-Ghosh, Dietzenbacher and Laumas input-output methods.

In Turkey, due to the unstable positive developments in production, the unemployment and employment rates could not fall but raise. In the period of 2002-2007 the unemployment rates were average 10%, but increased to 11.6% in 2007. The calculation of unemployment criteria in Turkey as given, the rates are even more raise and the economic and social costs of problem are even more higher. Developments in production and employment in the manufacturing industry in recent years to assess the variation between employees and the production index shown in the Table 1 for period 2000-2006.

Table 1: Average Annual Indexes in Manufacturing Industry							
	2000	2001	2002	2003	2004	2005	2006
Employees index	89,1	81,7	82,2	83,7	85,4	84,8	84,2
Production Index	102,1	92,4	102,5	112	123,7	129,6	136,8
Source: Bedriye Saraçoğlu…							

Changes in employees index and production index as seen in Table 1, although raises in production, the employment could not be raised in parallel. Employee index was 89.1 in 2000, but fell down 81.7 in 2001. After 2001, although the upward trend was observed, raise 84.2 in 2006 but never catch the level of 2000. In this process, the production index was raised 102.1 to 136.8. Index employee has increased from time to time, generally showed a downward trend during this period.

Direct and total employment coefficients of sectors are determined to show the importance of the Turkish manufacturing industry sub-sectors in terms of employment. Just as stated in back and forward links, coefficients calculated based on employed calculation in CW method has give the direct effects. Therefore, an analysis based on employment growth which will emerge in entire economy, would have performed a more healthy results about employment creation of sectors, employment effects (marginal employment coefficients) were determined according to the method of Rasmussen and Ghosh.

Employment coefficients are projected in the Table 2 as calculated as well as the unweighted and weighted with the CW, Leontief and Rasmussen method, like calculation for production in input-output method.

Table 2: Unweighted					
		CW Method		**Rasmussen and Ghosh Method**	
	L/Q	Employment Effects of Back Links	Employment Effects of Forward Links	Employment Effects of Back Links	Employment Effects of Forward Links

Food-Beverage and Tobacco Products	0,076	0,016	0,013	0,098	0,095
Textile and Leather Products	0,107	0,056	0,055	0,212	0,207
Wood, Mushroom and Paper Products	0,121	0,051	0,072	0,206	0,230
Printing and Publishing	0,110	0,042	0,006	0,180	0,117
Chemical Substances and oil products	0,097	0,028	**0,109**	0,139	**0,305**
Plastic and Rubber Products	0,104	0,051	0,040	0,185	0,164
Non-metallic mineral products	0,137	0,038	0,031	0,194	0,189
Basic Metal Industry	0,090	0,045	**0,146**	0,175	**0,400**
Metal Goods Industry	0,120	0,061	0,028	0,235	0,161
Machine Goods Industry	0,133	**0,063**	0,046	**0,250**	0,208
Manufacture of Transport Vehicles	0,149	**0,081**	0,033	**0,304**	0,192
Manufacture of Furniture	0,092	0,051	0,003	0,187	0,096

Sectors are evaluated according to the factor intensity in production the highest labor concentrations are in manufacture of transport vehicles with 0.149. In transport vehicles sector, 0.149 unit of a unit production cost consist payment made to labor. In second place, non-metallic mineral products are coming with 0.137. One by one, food-beverage, base metal industry, manufacture of furniture are the least labor intensity sectors.

In unweighted CW method according to back links, the sector which creates more employment capable is the manufacture of transport vehicles with 0.081 directly employed coefficient.

While machine goods sector is at the second row with the coefficient 0,063, food-beverage sector remains at the end of the sequence. It is seen that the sector having the highest capacity to generate employment by inducing forward linkages is basic metal industy with the

coefficient 0,146. This sector is followed by chemical substances and oil products at the second row referring to generation of employment based on forward linkages.

Total employment impacts have been found to be parallel to direct employment impacts. The sector that affects total employment in the direction of backward linkages at the most is once again transport and communication vehicles with a marginal employment coefficient of 0,304 while machine goods industry maintains its place at the second row with a marginal employment coefficient of 0,250.The same sectors are also put forward in terms of their total employment effect at the forward linkages. The coefficient of basic metal industry at the first row reveals as basic metal industry while chemical substances and oil products at the second row have a coefficient of 0,305.

According to Table 3, there emerges four groups of sectors in terms of their production and employment effects. The sectors that are higher than total production and employment effects are at the first group; the sectors whose production effects are high and employment effects are low are at the second group; the sectors whose employment effects are low and production effects are high are at the third group and the sectors with low production and employment effects are at the fourth group. The condition of sub sectors of manufacturing industry according to their production and employment effects is given at the Table 3.

Table 3: Categorization of Sectors as their effects on Total Production and Total Employment

		Employment Effects	
		High	Low
Production Effects	High	Textile and Shoes Machine Goods Transportation-Communication	Wood Products Basic Metal
	Low	Plastic and Rubber	Food-Beverage and Tobacco

Textile and shoe, machine goods and transport vehicles are located in the first group such as total production and employment generating capacity. In the second group sectors which have high production effects and low employment effects are wood products and basic metal industry. Plastic and rubber sector is in the third group with low production effects and high employment effects. Food-beverage and tobacco sector which has low production and employment effects is lined according to size of these effects after determining total effects of sectors about average situation.

Back links, forward links and total employment effects of sectors are given in Table 4.

Table 4: Sectors Positions to Total Production, Intermediate Input Demand and Employment Effects

Back Link Effects		Forward Link Effects			
Line	Sectors	Line	Sectors		
1	**Transportation-Communication**	**1**	**Basic Metal**		
2	Textile and Shoes	2	Plastic and Rubber		
3	Basic Metal	3	Textile and Shoes		
4	Machine Goods	4	Machine Goods		
5	Wood Products	5	Wood Products		
6	Plastic and Rubber	6	Transportation-Communication		
7	Food-Beverage and Tobacco	*7*	Food-Beverage and Tobacco		

Source: Calculated from 2002 I-O table which was prepared by TUIK.

The transport and communication sector is the highest back links effects. Development of the transport and communication sector provides development of many sector that provide input

itself when inputs are met from local markets. The second sector which has strong back links is the textile and shoe and the third one is the base metal industry. The sector which has the lowest back links is the food-beverage and tobacco sector. Basic metal industry is in the first order as the effect of forward linkage. Development of basic metal industry contributes the sectors which are using its cheaper and more qualified inputs. In terms of forward links plastic and rubber is the second, and textile and shoe is the third. Transport sector effected many sectors in term of back links but for forward links it is the last sector. The lowest forward links are seen in Food-Beverage and Tobacco sector.

According to effects of total employment, textile and shoe sector is the first. When production is increased a unit, the employment will increase more in textile sector. According to effects of total employment, transportation and communication sector is the second. An the lowest effects of employment are in food-beverage and tobacco sector.

4. Conclusion

In respect of the results, the sectors has been varies with regard to employment effects from method to method. According to emprical results; Textile Industry Garments, Shoes, Hats, Leather, and Related Products, electrical machinery and equipment manufacturing industry, plastic and rubbery and transport equipment have got huge employment capability, while food and Tobacco Products, basic metal industry, Wood processing and furniture manufacturing have low employment capability in all of four methods.

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