AN EXAMINATION OF SOURCES OF THE SECTORAL ECONOMIC GROWTH IN THE TURKISH ECONOMY

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The study examines the main components of Turkey's economic growth from 1998 to 2002. Economists have developed various approaches defining and meausiring the sources of economic growth. Most of the studies decomposed the growth rate of aggregate output into two main components. One of the component is factor growth and the other component is the residual. Residual is defined as total factor productivity growth. On the basis of input-output model, this paper uses input-output tables of Turkey to analyze main sources of sectoral growth in Turkish economy. The paper measures growth of factor and growth of factor productivity in the main sector in Turkey.

Results show that, sources of the growth are changing according to sectors. For example capital growth play an important role in growth of the agriculture sector. In the agricultural sector; a small increase has been found in total factor productivity while a decrease has been occured in employment. The biggest total factor productivity rate belongs to the mining sector. The increase in service sector has been resulted from capital usage.

Keywords:Total productivity change, sectoral growth, input output model

INTRODUCTION

The investigation of sources of the economic growth is the most important matter in economic sciences. The first theoretic research on sources of the economic growth belongs to Solow (1956). In the Solow's formulation the sources of the economic growth are growth of factors (labor and capital) and increase in total factor productivity. Input output models provide comprehensive framework to analysis of sectoral growth by using input–output tables Leontief (1941 and 1951). In the study the model of sources of the economic growth and input output models are used to determine sources of the sectoral growth in Turkey.

THE MODEL OF THE SOURCES OF THE ECONOMIC GROWTH

According to this model there has been two components of the economic growth. The economic growth can be result of either increase in factor quantitiy or increase in productivity or both. The rate of total factor productitiv for each sector can be defined as difference between the growth rate of gross output and the weighted average growth rate of the inputs of the sector. The production function is used to analyse economic growth. Growth model can be written as follows:

$$Y = BK^{\alpha}L^{1-\alpha} \qquad 0 > \alpha > 1 \qquad (1)$$

$$B = A^{1-\alpha}$$

$$g_y = g_{TFP} + \alpha\, g_{k} + (1-\alpha)g_L \qquad (2)$$

The input growth rate must be some weighted average of the labor growth and capital growth rates in which both are considered as value shares in national income (Ten Raa 2004). In this model in the form of decomposition techniques, decomposes the changes in the volume of

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outputs. The input growth rate must be some weighted average of the labor growth and capital growth rates.

INPUT OUTPUT MODEL

The analysis of structural change using input output table goes back to Leontiefs early work on US data (1941). In order to capture both direct and indirect repercussions of growth factors and productivity, Input Output model may be used to derive estimates of productivity factor growth. In accordance with concept of the input – output method output function of the sector I can be presented as follow:

$$Xi = \sum_{j=1}^{n} x_{ij} + F_i \quad (3)$$

(Xi) is the value of total output, (xij) is sum of intermediate demand and Fi is final demand. With regard to input output relations, the input coefficients referring the quantity of inputs required from each sector to produce one unit worth of a given sectors output provides valuable information. The input coefficients can be presented as follows:

$$a_{ij} = x_{ij} / X_j \quad (4)$$

Input coefficients (aij) are calculated by dividing the value of intermediate input demanded from sector i (xij) to value of the total input for sector j (Xj). By replacing (xij) in equation (4) by aij in equation (3) we can obtain the following equation.

$$Xi = \sum_{j=1}^{n} aijX_j + F_i \quad (5)$$

This equation can be represented as matrix form as follows:

$$X = AX + F \quad (6)$$ This equation can be rewritten as $$X = (I - A)^{-1} X + F \quad (7)$$

X; is a column vector of output, A; is an nxn matrixs of input coefficient I; is the nxn identify matrix and $(I - A)^{-1}$ is called Leontief reverse matrix giving direct and indirect input requirements per unit of final output of sector.

$$G_x = \Delta \overline{X} . \overline{X}^{-1} \quad (8)$$

While $\Delta \overline{X}$ is the column vector of change in output and $\overline{X}^{-1}$ is the diagonal matrix of initial output Gx gives the growth of output.

Employment is an important source of the economic growth and labor requirement for each sector may be calculated as follows:

$$\hat{N} = n (I\text{-}A)^{-1} F \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (9)$$

n is a diagonal matrix of labor coefficients by sector. The growth rate of the employment Gn can be measured as written below.

$$G_n = \quad N/\ N_{t-1} \qquad\qquad (10)$$

N is the row vector of change in employment and **is** the diagonal matrix of initial employment levels and Gn is growth of employment. Measuring sectoral capital growth, computation is the same for labor. If we denote as total capital use in the t period and as a diagonal matrix of capital coefficients by sector, the growth rates of capital may be calculated as follows:

$$C = k\ (I-A)^{-1} \qquad\qquad (11)$$

C is capital usage of sectors and k is a diagonal matrix of capital coefficients by sector.

$$G_c = \quad C/\ C_{t-1} \qquad\qquad (12)$$

C is the row vector of change in capital usage and C_{t-1} is the diagonal matrix of initial capital levels.

EMPIRICAL RESULTS

In this paper sources of the economic growth have been examined by using input-output productivity model. The model explaned above applied on the basis of Input Output Tables of Turkish economy for 1998 and 2002 the latest available table. The most advantage of input-output model is to be able to calculate not only labor and capital changes but also intermediate inputs changes. Two national input-output tables for the years of 1998 and 2002 have been used to analyze sources of the economic growth in main sectors in Turkish economy. Calculations are considered for 1998 and 2002 years. All of the tables are constructed by Turkish statistical Institue. Input output tables are reduced to 4 main sectors. 4 sector level of aggregation has been applied in all computations. Sectors are as follows: Agriculture, mining, industry and services. Analyses have been made with 1998 and 2002 years datas and results analyses are shown separately. The overall as well as sectoral rates of growth of employment are shown in Table 1.

Table 1: Employment In The Sectors Years of 1998 and 2002		
Sectors	1998	2002
Agriculture	9.039	7.458
Mine	147	120
Industry	3.463	3.731
Service	9.129	10.045
Total	21.778	21.354
Source: Turkish National Statistical Institue.		

Table 1 shows the sectoral growth rates for a five-year period 1998-2002. In the composite period of five years, the employment datas Show that there have been a decrease in total employment from 21.778 to 21.354 in 2002. The changes in employment are differing according to the sectors. Agriculture and mine industries are the sectors which of employment

decreased between 1998-2002 process. There has been increase in employment of industry and service sectors. The sectoral growth rates of capital usage are shown in Table 2.

Table 2: Capital Usage In The Sectors Years of 1998 and 2002		
Sectors	1998	2002
Agriculture	230.693	526.035
Mine	127.223	93.268
Industry	1.102.660	1.853.006
Service	2.087.836	3.463.600
Total	3.548.412	5.935.908
Source: Turkish National Statistical Institue, 1998 And 2002 National nput Output Tables And Author's Calculations		

Table 2 presents the results for the capital usage in 1998 and 2002 years by sectors. In the five years, there have been an important increase in capital usage in total from 3.548.412 to 5.935.908 in 2002 and changes in capital usage are differing according to the sectors. Mine industries are the only sectors which of capital usage decreased between 1998-2002 process. There has been an important increase in capital usage of agriculture, industry and service sectors. The sectoral growth rates of components are shown in Table 3.

Table 3: Growth Components of Turken Between 1998-2002						
Sectors	**Gy**	**Gn**	**Gc**	**TFP**		
Agriculture	0,23	-0,17	1,28	0,11	0,04	0,10
Mine	0,70	-0,18	-0,27	0,78	0,07	0,27
Industry	0,74	0,08	0,68	0,66	0,04	0,10
Service	0,72	0,10	0,66	0,60	0,04	0,17
Source: Author's Calculations						

Gy	GL	Gk	TFP		
0,23	-0,17	1,28	0,11	0,04	0,10
0,70	-0,18	-0,27	0,78	0,07	0,27
0,74	0,08	0,68	0,66	0,04	0,10
0,72	0,10	0,66	0,60	0,04	0,17
0,67	-0,02	0,67	0,58	0,04	0,14

Turkey has been experienced relatively well growth in production per capita during last two decades according to Turkey Statistical Institute reports. The amprical results are shown in the Table 3. The growth rates between 1998-2002 inferred from the I-O tables. Table 3 shows output growth rates and source of the economic growth by sectors. In this period sectoral output growths are very different for the sectors. Annual growth of sectors are changing from 0,23 to 0,74. In this process the fastest growing sector is industry with 0,74 annual growth rate and the highest output growth rate belongs to industry. As the amprical results analysed it can be seen that, the second fastest growing sector is the service sectors in the Turkish economy. Also mining sectors are fastly growing sectors in 1998-2002. There has been limited growth in agriculture when compare to the other sectors of the economy.

Also the sources of the growth are changing according to sectors. Gn shows increase in labor usage in sectors as explained before. The biggest increase in labor usage has been occured in servic sector with annual %10 per sent. The second sector whic has benefited labor usage increase is industry with % 8 per cent. According to amprical results labor usage in agriculture and mine industry decreased.

Gc shows increase in capital usage in sectors. The biggest growth of capital usage belongs to agricultural sector. There has been a decrease in mine sector while both industry and service sector has benefited from increase in capital usage.

The results exhibit thetotal factor productivity has made some progress in all sectors. Mine industry has the highest factor productivity growth rate while the agriculture has the lowest productivity growth rate.

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