Productivity and Growth in Turkish Manufacturing Industry: 1980–2001

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The Journal of Developing Areas, Volume 43, Number 2, Spring 2010, pp. 187-219 (Article)

Published by Tennessee State University College of Business
DOI: *https://doi.org/10.1353/jda.0.0053*

PRODUCTIVITY AND GROWTH IN TURKISH MANUFACTURING INDUSTRY: 1980-2001

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ABSTRACT

The objective of this study is to analyze and explain the factors influencing the value added growth in Turkish public and private manufacturing sectors during 1980- 2001. With this aim in view, a Two-Deflator Growth Accounting (TDA) method is applied in the study. It is revealed that industries as a whole have positive value added growth with no negative contribution of capital. Although human capital's contribution to the industrial sector's growth as a whole and especially to public sector industries is not very significant, its contribution to the private sector industries remains significantly high. The overall contribution of raw labor is able to explain most of the contribution of labor to value-added growth in Turkish manufacturing industry during the period 1980-2001.

JEL Classification: O41
Keywords: Growth, TFP Growth, Manufacturing Industry
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INTRODUCTION

Scarcity of resources is one of the main reasons to produce under efficient and productive production processes to get the highest possible volume of output. Researchers often find that productive production process is the result of the growth of Total Factor Productivity (TFP), and the two-way causality between TFP growth and output growth has also proved by several times, especially by Harberger, and Robles among others (Robles, 2000, Harberger, 1998). It is a general feature that when TFP increases, the growth rate of Gross Domestic Product (GDP) follows an upward trend; while lower TFP growth is correlated with decreases in GDP growth rates. Thus, it is possible to understand growth in GDP by explaining the elements affecting positively the changes in TFP. This is likely to be the rationale behind almost all studies aiming at explaining the process of output growth through the analysis of TFP growth (Robles, 2000).

Obtaining a stable and sustainable economic growth is one of the main macroeconomic challenges of ruling agents in every typical economy. Therefore, the

sources and the outcomes of economic growth are being studied and analyzed by economists. According to several authors who analyzed sources of output growth, the difference between the sum of the contributions of labor and capital to output growth can be explained by the residual or Total Factor Productivity (TFP) (Cho, 2000). TFP growth enables firms to create competitive capability which is a special advantage. As stated by Harberger, the growth of TFP and cost reduction in the production process occur at the same time (Harberger, 1997). Hence, real cost reduction in the production process leads to a strong competitive advantage (Kim, 2001). A primer study which aimed to investigate the sources of economic growth was initiated by Tinbergen in 1942 (Tinbergen, 1959). Today, his method in analyzing the sources of growth is called the traditional growth accounting method. He initially explained the difference between the growth of inputs and output growth as a residual which is commonly defined as TFP. Empirical studies have brought home the fact that growth in output can be attributed to growth in TFP. In many studies, output growth is tried to be explained by analyzing the behavior of its components (Robles, 1997). In the literature, the sources of output growth are categorized under three main headings: the Traditional Approach (TA), Extended Traditional Approach (ETA) and the Two-Deflator Approach (TDA).

Since in every economy one of the main objectives of the government is to achieve a stable and sustainable economic growth rate, the study of the sources of growth becomes a critical issue. There are indeed various sources of economic growth such as innovative technology use, economic policy changes, technological advances and so on (Harberger, 1998, Notaro, 2003). Turkey started to carry out the neo-liberal economic policies since January, 1980. To this end, industrialization and import substitution formed the main economic policy of the government in subsequent years. However, these policies could not be sustainable because of high inflation rates and balance of payments problems. After each crisis, currency devaluation took place in order to increase exports. The government decreased relative prices and real wage rates in sectors that are export oriented to give them a comparative advantage. Precautionary measures were taken for the labor-intensive industries in the manufacturing and energy sectors. However, despite lower wages, export volumes did not increase as targeted. Throughout the studied period, the initial results of neo-liberal economic policies taken a decade ago started to be effective, but economic and financial crises of 1994, 2000 and 2001 brought about a reduction in out in every sector of the economy.

Like other countries, it is necessary for Turkey to produce under efficient and productive production processes to get the highest possible volume of output especially in the manufacturing industry. Sources of economic growth in Turkish manufacturing industry have been analyzed, among others, by the State Planning Organization (SPO, 2004) and Krueger and Tuncer (Krueger and Tuncer, 1982). Taymaz and Saatçi (Taymaz and Saatci, 1997) analyzed stochastic production frontiers for Turkish textile, cement, and motor vehicles industries in a panel data technique. Saygili, et al. (Saygili et al., 2005) also deal with this issue. Önder and Lenger (Önder and Lenger, 2000) define TFP as improvement in technical efficiency and use the translog stochastic frontier production function in their analysis. Ismihan and Metin-Ozcan (Ismihan and Metin-Ozcan, 2005) applied co-integration technique in order to analyze the determinants of total factor productivity (TFP). Cecen, et al. (Cecen et al., 1994) analyze the causes of development during the pre-liberalization (1960-80) and post-liberalization (1980-88) periods

consecutively. Karadağ, Önder, and Deliktaş (Karadağ, 1989) applied panel data analysis to measure total factor productivity changes in privately-owned Turkish manufacturing industries for the period of 1980-2000. But, these studies provide little information relating to productivity at industrial branches. Besides, they do not analyze the contribution labor to output growth in a disaggregated form.

Furthermore, these studies use Traditional Approaches (TA). Therefore, they fail to ascertain the contributions of different qualities of human factor to Total Factor Productivity. It is our contention that the traditional approach to study the sources of growth in Turkish manufacturing sector suffers from many limitations, and therefore, a better analytical approach is called for. Our study tries to fill-up the knowledge gap and aims at investigating the sources of growth in Turkish manufacturing industry for the period 1980-2001 with the help of a better method – the two-deflator approach. In sympathy with the conventional wisdom, we acknowledge that labor, capital and TFP can broadly explain the major economic sources of growth. In the present study, the contributions of these factors to growth will be examined separately for public and private manufacturing sectors, enabling thereby a comparison of production efficiencies in these manufacturing sectors in Turkey. The paper is organized in the following way. In the next section, a literature review on the two-deflator approach is presented. The third section records the empirical findings of the study, and the last section incorporates the main conclusions of the study.

LITERATURE REVIEW

As it is stated earlier in this paper, there are mainly three approaches in the growth accounting literature. The traditional approach (TA) was initiated by J. Tinbergen (Tinbergen, 1959) and based on the theory of production; it is further extended by Solow and Kendrick (Kendrick, 1956, Solow, 1956). Tinbergen's approach deals only with the changes in input quantities. However, Solow explains the changes through residual, which is a portion that remains after subtracting the total sum of contributions of inputs from the output growth. Then extended traditional approach (ETA) is developed by Jorgenson (Jorgenson and Griliches, 1967b). This method is also based on the theory of production. However, it requires detailed data in order to analyze the contributions of inputs to output growth. Therefore, inputs are disaggregated by several hundred classes in the ETA. Although Jorgenson's approach is much elaborate, it fails to consider all the changes in human capital. Hence, it does not make a great difference from the traditional method.

TFP measures gain importance in most of the contemporary studies on the analysis of economic growth. The TFP and its growth rate has been become increasingly prominent since the publication of the studies by Krugman (Krugman, 1994) and Young (Young, 1994). They studied the sources of output growth by measuring the effects of changes in TFP growth in East Asian developing countries. According to their conclusions, changes in TFP growth does not play a more significant role than the role of other inputs on the level of output growth as in the case of Singapore. This discrepancy is newly explained by Hsieh (Hsieh, 2002) and he defines the TFP growth through changes in factor prices. Hsieh (Hsieh, 2002) also finds a large discrepancy for Singapore the results given by the TA and the ETA. According to him, the reason for the large

discrepancy for Singapore is the use of a constant rate of return to capital, despite a high rate of capital accumulation. Hsieh's method does not take into consideration the productivity of human capital to measure its effect on the level of output growth.

In the literature there are several studies that aimed to discriminate the separate effects of changes in the quality of human capital on changes in the level of output. Coen and Hickman (Coen and Hickman, 2006) identify the factors contributing to the growth of output as productivity and labor supply. Park (Park, 2006) analyzes the sources of human capital investment and concludes that education policy plays a crucial role for human capital investment and that it promotes growth if it is properly implemented by the government. Due to similar motivations, Harberger (Harberger, 1991) put forward a Two-Deflator Approach (TDA) which permits a more complete assessment of the contribution of human capital quality to growth. Unlike the TA and ETA, the TDA method is based on the theory of capital and provides highly disaggregated analysis of the contributions of human quality changes to output growth. Harberger (Harberger, 1998) defines TFP growth as real cost reduction due to duality of the measures of optimal output growth (Cepeda, 2000).

Except the ones, which apply method of Jorgenson, other traditional growth accounting methodologies use highly aggregated data to examine the sources of growth. Of course measuring productivity at aggregated level is important, but measuring productivity at disaggregated level across firms and/or industries provides more reliable results compared with the measurement of productivity at the aggregate level. In his dissertation study, Cho (Cho, 2000) explains that the act of aggregation introduces many complications. A Two-Deflator Approach (TDA) is used in our study as it requires less data and gives similar results as the TA and the ETA (Miyajima, 2004). Moreover, it allows for better assessment of the contribution of human capital quality to growth than the method of Jorgenson (Jorgenson and Griliches, 1967a). Since TDA is based on the theory of capital, there is no need for distinguishing capital into quality and quantity forms. The only need is to measure initial physical capital stock. Hence, the inventory method is applied first. We first provide a background for measuring capital stock, and afterwards, the Two-Deflator Approach is elaborated.

Measuring Capital Stock

$$K_i(t) = (1 - \delta_i)K_i(t-1) + \qquad (1)$$

where

δ^* : Depreciation rate of i'th sector.

So, the value of real capital stock at the end of each period equals the initial capital stock (depreciated value) plus adding to physical capital in every year. Here, measuring initial capital stock is a crucial issue. In some studies, it is measured by dividing the average value of the last four to five years' investments by the sum of average growth rate of GDP and real rate of return at the corresponding years (Robles,

1997). So this methodology is used to measure the initial physical capital stock in this study. It can be obtained by the following formula:

Once all the variables are expressed in real terms by dividing all with GDP deflator or CPI, capital stocks can be estimated by using the perpetual inventory method (PIM). Capital stock's contribution to output growth is proportional to capital stock itself. For making the estimate, the annual nominal sectoral physical capital investments for every type of physical capital are obtained from State Institute of Statistics (SIS, 2001). Then, by applying the PIM real values of physical capital stock at the end of any given year the necessary calculations can be made by using the following formula:

$$K_i 1980 = I_{avg}/(g + d_i) \quad (2)$$

where

i = Machinery and equipment, buildings, land and site amelioration, transport equipment, office furniture, land and site

g = Growth rate of GDP (average 5% for Turkey,) d_i = Depreciation rate of the type of capital

$\mathbf{I_{avg}}$ = Average of the Ith component of investment (1979-1981)

One can also find out the initial capital stock on the basis of the assumption that in the past, the capital stock grew at the same rate as the real sectoral GDP (g_i). In this respect, the following formula can be used:

$$\frac{K_i(t)}{K_i(t-1)} = g_i, \forall t \leq 0 \quad (3)$$

Two-Deflator Approach (TDA)

As stated earlier, the TDA approach is based on the theory of capital. There is no need to construct a production function explicitly. Rather, as it is given in the study of Cho (Cho, 2000) the analysis of production is viewed as "a social project post-evaluation".

In the TDA method, all the nominal data are transformed into aggregated real values by either the Consumer Price Index or the GDP Deflator. Harberger (Harberger, 1991) analyzed production under capital theory in his TDA methodology, in this way, as there is no need for dividing capital into quantity and quality contributions as required under the ETA. Here, capital is regarded as the amount of savings that remains after meeting expenditures on consumption and production. One of the main distinguishing factors of the TDA from other traditional methods is the analysis of the disaggregated

human capital contributions to output growth. In spite of this, labor is analyzed in the TDA by taking into account the wage bill of an industrial sector as crude input. Data for the wage bill in Turkish aggregate manufacturing sectors for the period of 1980-2001 are obtained from the State Institute of Statistics (SIS). In our formulation, the total wage equals the summation of the wage paid to all classes of labor multiplied by the number of labor hours used in the sector. As it is clearly defined earlier in this paper, one of the most distinguishing characteristics of the TDA is that there is no longer the need for formulating a production function. Its roots are linked to capital theory. Therefore, the contribution of capital to the growth of value added is calculated by the help of the following formula:

$$\frac{\Delta K_{it}^{*}}{Y_{it}^{*}} = \left(\frac{(r^{*}+\delta)K_{it}^{*}}{Y_{it}^{*}}\right) \times \left(\frac{\Delta K_{it}^{*}}{K_{it}^{*}}\right) \quad (4)$$

In the TDA, before measuring residual, the value of output is expressed in real terms by using a GDP deflator. Since there is no longer the need for constructing production function, as is depicted in traditional approaches, the real value of GDP can be divided into two components: labor income (the wage bill) and capital (property) income. Besides, income from capital stock can be obtained by multiplying the value of depreciated capital stock with the rate of return.

$$Y^{*} = W^{*}L^{*} + (r^{*} + \delta^{*})K^{*} \quad (5)$$

where;

Y^{*} : Deflated Value Added

W*: Basic Wage (2/3 of Real GDP per Capita)

r^{*} : Rate of Return to Capital Net of Depreciation

δ^{*} : Depreciation Rate

K^{*} : Capital (Deflated)

Here, Y^{*} is the real value of output rather than the quantum (Q), and is equal to the value of the output at the national level. Under the ETA, Q is measured by applying different indices corresponding to different types of inputs. Hence, at the firm or industry level, Y^{*} is different than Q because it is calculated by a GDP deflator. K^{*}, r^{*} and δ^{*} are the capital stock, the rate of return and the depreciation rate of the capital stock series respectively. By a little manipulation of the Equation 5, the growth of output can be obtained by the following formula:

$$\Delta Y = W^{*}\Delta L^{*} + (r^{*} + \delta^{*})\Delta K \quad (6)$$

where

R^* : Real Cost Reduction (RCR)

Therefore, the residual as a percentage of output under the TDA is obtained by the following formula (Harberger, 1998):

$$\frac{R_i^*}{Y_i} = \frac{\Delta Y_i}{Y_i} - W^* \frac{\Delta L_i^*}{Y_i} - (r_i^* + \delta_i^*) \frac{\Delta K_i^*}{Y_i} \quad (7)$$

or

$$\frac{R_i^*}{Y_i} = \frac{\Delta Y_i}{Y_i} - \left(\frac{W^* L_i^*}{Y_i}\right) \frac{\Delta L_i^*}{L_i} - \left[(r_i^* + \delta_i^*) \frac{K_i^*}{Y_i}\right] \frac{\Delta K_i^*}{K_i} \quad (8)$$

Every class of labor is clearly specified under the TDA. There are two main differences between the traditional approaches and the TDA. First, human capital quality effect on labor's contribution to growth is clearly defined in the TDA. Second, an analysis of the relative price effect is feasible under TDA, because all the quantities are expressed in real terms by aggregate price indices as opposed to quantum in traditional approaches. Hence, the residual in the TDA is also expressed in real terms rather than in quantum. The only difference between the two equations seems to be the measures of human quality effects on labor's contributions to output growth (Robles, 2000). Unlike in other traditional approaches, there are two deflators that are used in the TDA: value added (Y) and Net Capital Stock (K) are deflated by a GDP Deflator and labor income is deflated by a wage deflator which is taken as 2/3 of RGDP per capita. In order to deflate the output and capital, the following procedure is followed:

$$Y_{i,t}^* = \frac{Y_{i,t}^*}{P_t^*} \text{ and } K_{i,t}^* = \frac{\sum K_{i,k,t}}{P_t^*} \quad (9)$$

where

i : Different Manufacturing Branches

k : Different Types of Capital

P : GDP Deflator

In the TDA method, the total wage bill in sector i, is at the same time equal to the basic wage (W^*) which is multiplied by the number of basic labor units (L^*).

$$\sum_{j=1}^{m} W_{ij} L_{ij} = W^* L_i^* \qquad (i = 1,2, \ldots n)\ (j = 1,2, \quad (10)$$

where

$W_{ij}L_{ij}$: Wage Bill at Each Industry

W^* : Basic Wage

L_i^*: Number of Basic Labor Units at Each Industry

Lij: Number of Labor at Each Industry

i : Industry

j : Labor Classes

Here, is a measure expressed in basic units of labor such that a worker who is represented as is attributed with a specified level of human capital skills. For example, the basic labor units of a doorkeeper at a firm or industrial sector is attributed as ten, while it is fifteen for a blue color production worker, twenty for a white color labor, and fifty for an engineer. W* (basic wage) is the payment made to this basic unit of labor and it is considered as the second deflator, which is taken as two-thirds of Real GDP per capita in this study. After defining the basic wage rate W* basic labor units can be measured with the help of following formula:

$$L_i^* = \frac{\sum_{j=1}^{m} W_{ij}L_{ij}}{W^*} \quad (i = 1,2,\dots n)\ (j = 1,2,\dots m) \tag{11}$$

For Equation 11 notations are the same as Equation 10.

Since disaggregated data are not required for the application of the TDA, the wage bill here is the aggregated number. Total wage bill for each industrial sector can be divided into two main segments as the compensation to raw (basic) labor and the compensation to human capital.

$$\sum_{j=1}^{m} W_{ij}L_{ij} = W^*L_i + W^*(L_i^* - L_i) = W^*L^* \tag{12}$$

where

W^*L_i : is the compensation paid for the raw (basic) labor component of the labor force

$W^*(L_i^* - L_i)$: is the compensation paid to the human capital component of the labor force

Change in raw labor would change the total wage bill as shown in the following formula.

$$w_t^*\Delta L_{it}^* = w_t^*\Delta L_{it} + w_t^*(\Delta L_{it}^* - \Delta L_{it}) \tag{13}$$

Total wage bill changes due to either change in raw labor or human capital. Human capital can be divided into two parts as the maintenance component of human capital (that is, endowing new workers with the existing average human capital in the industry) and the change in the quality of human capital.

$$w_t^* \Delta L_{it}^* = RLC + HCC \tag{14}$$

where
RLC : Raw Labor Contribution
HCC : Human Capital Contribution

$$RLC = w_t^* \Delta L_{it} \tag{15}$$

$$HCC = HCM + HCQU \tag{16}$$

where
HCM : Human Capital Maintenance
HCQU: Human Capital Quality Upgrade

$$HCM = (w_{it} - w_t^*)\Delta L_{it} \tag{17}$$
$$HCQU = (w_t^* \Delta L_{it}^* - w_{it} \Delta L_{it}) \tag{18}$$

With the help of these equations, following equilibrium can be obtained:

$$w_t^* \Delta L_{it} = w_t^* \Delta L_{it} + (w_{it} - w_t^*)\Delta L_{it} + (w_t^* \Delta L_{it}^* - w_{it} \Delta L_{it}) \tag{19}$$

Traditional approaches to growth measures do not provide sufficient analysis of human capital quality changes as part of labor's contributions to growth. Any change in human capital quality is attributed to changes in residual in the TA. For instance, if human capital quality improves residual enlarges. On the other hand, a change in human capital quality is analyzed under several labor classes in the ETA. By equation 9, the compensations to different labor classes and their contributions to output growth can be analyzed. The TDA allows us to analyze the contributions of all types of labor either raw labor or human capital to output growth after determining the basic labor units L^*. Therefore, effects of human capital quality improvements can be subtracted from the residual. Labor's contribution to growth can be expressed as the following:

$$\frac{w_{it}^* \Delta L_{it}^*}{Y_{it}^*} = \frac{w_{it}^* \Delta L_{it}}{Y_{it}^*} + \frac{w_{it}^* (\Delta L_{it}^* - \Delta L_{it})}{Y_{it}^*} = \left(\frac{w_t^* L_{it}^*}{Y_{it}^*}\right) \times \left(\frac{\Delta L_{it}^*}{L_{it}^*}\right) \tag{20}$$

where

GLC : Growth of Total Labor Contribution
GRLC : Growth of Raw Labor Contribution
GHCC : Growth of Human Capital Contribution

and

$$GLC = \frac{W_{it}^{*}\Delta L_{it}^{*}}{Y_{it}^{*}} = \left(\frac{W^{*}L_{it}^{*}}{Y_{it}^{*}}\right) \times \left(\frac{\Delta L_{it}^{*}}{L_{it}^{*}}\right) \quad (21)$$

$$GRLC = \frac{W_{it}^{*}\Delta L_{it}}{Y_{it}^{*}} = \left(\frac{W^{*}L_{it}}{Y_{it}^{*}}\right) \times \left(\frac{\Delta L_{it}}{L_{it}}\right) \quad (22)$$

$$GHCC = \frac{W_{it}^{*}(\Delta L_{it}^{*} - \Delta L_{it})}{Y_{it}^{*}} \quad (23)$$

The Human Capital Contribution to Growth (GHCC) can be divided into two sub components. These are formulized as follows.

$$GHCM = \frac{(w_{it} - w_{it}^{*})\Delta L_{it}}{Y_{it}^{*}} = \frac{(W_t - W_t^{*})L_{it}}{Y_{it}^{*}} \times \frac{\Delta L_{it}}{L_{it}} \quad (24)$$

$$GHCQU = \frac{(w_{it}^{*}\Delta L_{it}^{*} - w_{it}\Delta L_{it})}{Y_{it}^{*}} = \frac{w_t^{*}\ L_{it}^{*}}{Y_{it}^{*}} \times \frac{\Delta L_{it}^{*}}{L_{it}^{*}} - \frac{w_t L_{it}}{Y_{it}^{*}} \times \frac{\Delta L_{it}}{L_{it}} \quad (25)$$

where
GHCM : Growth of Human Capital Maintenance
GHCQU : Growth of Human Capital Quality Upgrade

That is, the contribution of Human Capital to the growth of value added is:

$$\frac{(w_{it}^{*}(\Delta L_{it}^{*} - \Delta L_{it}))}{Y_{it}^{*}} = \frac{(w_{it} - w_{it}^{*})\Delta L_{it}}{Y_{it}^{*}} + \frac{(w_{it}^{*}\Delta L_{it} - w_{it}\Delta L_{it})}{Y_{it}^{*}} =$$

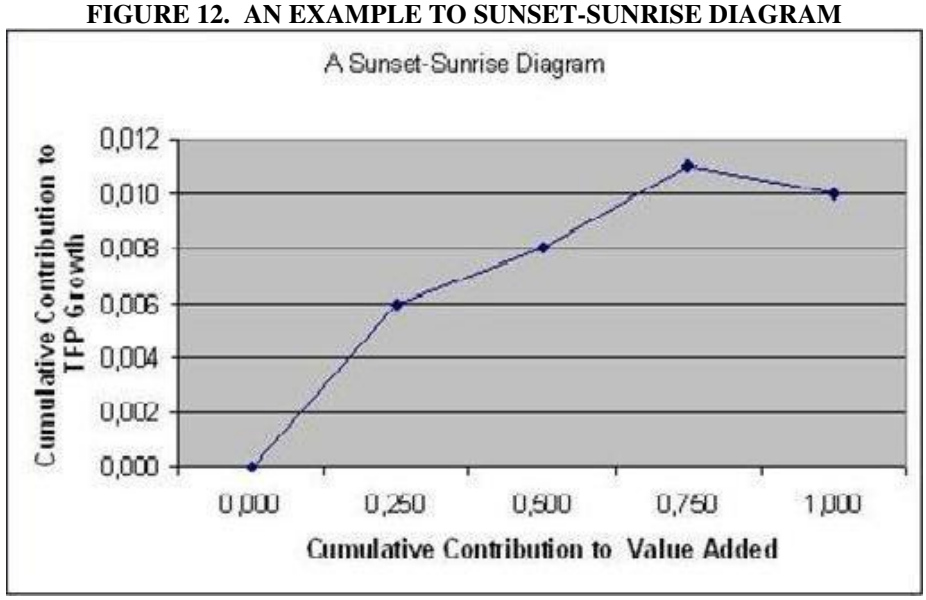
$$\frac{(W_{it} - W_{it}^{*})L_{it}}{Y_{it}^{*}} \times \frac{\Delta L_{it}}{L_{it}} + \frac{w_t^{*}L_{it}^{*}}{Y_{it}^{*}} \times \frac{\Delta L_{it}^{*}}{L_{it}^{*}} - \frac{W_t L_{it}}{Y_{it}^{*}} \times \frac{\Delta L_{it}}{L_{it}} \quad (26)$$

As Harberger (Harberger, 1998) mentions in his study on the growth process, growth is not a homogenous phenomenon. That is, the TFP growth is not occurring at every manufacturing branch at the same time. Most of the time, it is concentrating in some manufacturing branches taking positive numbers which are called by Harberger as the “winners” and the rest are “losers”. This statement contradicts the view of Solow who states that technological progress which is an attribute to growth, is evenly distributed in all sectors of the industry (Solow, 1957). Solow assumes that the change in technological progress shifts the production function $Y = A(t)f(K,L)$, $A(t)$ to an upper level.

Thus, the cumulative effect of technical change occurs evenly in every sector of the industry, which is in contradiction with the ob the TFP growth can occur in any sector at any time (Harberger, 1998).

In this context, his study develops the sunset-sunrise diagrams. Since the TFP is concentrated in some sectors, by forming a situation like the sunset-sunrise diagram, the sectors which are positively or negatively contributing to growth can be clearly visible. The rising slope part of the diagram is shaped by the positive TFP growth industries' cumulative contributions to the growth of value added, and the decreasing slope part of the diagram is because of the negative TFP growth industries' cumulative contribution to the growth of value added. In order to construct a sunset-sunrise diagram, first, TFP of each manufacturing sector is sorted in a descending order. The contribution of each manufacturing branch to value added growth can be calculated by the multiplication of their TFP by the value added (VA) of each of them. Then, the contribution to VA growth of each branch is cumulated and the percentile of them is calculated. However, the value added is cumulated in a different column. Finally, cumulative contribution to the TFP growth constitutes the vertical axis; cumulative contribution to VA constitutes the horizontal axis. An example of the diagram is shown below in Figure 1.

FIGURE 12. AN EXAMPLE TO SUNSET-SUNRISE DIAGRAM



Source: Calculated from State Institute of Statistics ‹http://www.tuik.gov.tr›

In the diagram, 50 percent of the manufacturing branches with respect to their contributions to value added indicate that they are responsible for a cumulative TFP growth of 0,8 percent. The peak point of the TFP growth is accounted for by 75 percent of the manufacturing branches with the TFP growth of 1,1 percent. Henceforth, the slope of the diagram starts to take negative values, that is, the concentrations of the TFP growth of manufacturing branches are less than 1,1 percent. For instance, 95 percent of the manufacturing branches account for the TFP growth of 1,0 percent.

EMPIRICAL FINDINGS

General Findings

Empirical application of the TDA is examined and the corresponding explanations of the results are provided in this section of the study. The raw data on the variables (value added, capital, and labor data) used in the study were obtained from the State Institute of Statistics. Data on capital are classified in six categories, such as machinery and equipments; transportation vehicles; building construction; land reclamation and the construction of non-buildings; land; and office furniture and equipments. The corresponding depreciation rates for each type of capital in each sector are available in the webpage of Turkey's Ministry of Finance. There is a lack of appropriate data on aforementioned types of capital, particularly for the manufacturing industry in Turkey. For this reason capital stock is calculated by applying perpetual inventory method (PIM).

The international standards of industrial codes (ISIC) were used to depict each manufacturing industry; a separate table including the explanations of those codes is provided in the appendix of this study. There are two main types of labor in Turkish manufacturing industry as production workers, and managerial and administrative workers. The average sources of value-added growth in the total manufacturing industry of Turkey between 1980 and 2001 are shown in Table 1.

According to Table 1, during the studied period, except in the manufacture of miscellaneous products of petroleum and coal (354) and other manufacturing industries (390) with -0,3% and -1,4% respectively, the average growth rates of almost all industries are positive figures. An average of the top figures is around 16% and is achieved by petroleum refineries (353) and manufacture of professional and scientific and measuring and controlling equipments (385). Nevertheless, more than half of all manufacturing industries acquire positive TFP growth rates. However, although labor's contribution to growth is -18,2%, the highest rate of TFP growth with 24,7% is accounted for by the manufacture of leather and products of leather (323). All sectors of the industry have positive contributions of capital to value added growth and the manufacture of wearing (322) acquired the highest rate as 17,9%. Unlike capital, labor's contribution was found to be negative in some industries. Those are manufactures of leather and products of leather (323) (-18,2%), manufacture of wood and wood cork (331), (-0,6%) manufacture of rubber products (355) (-2%), non-ferrous metal basic industries (372) (-0,3%) and other manufacturing industries (390) (6,5%) However, the value added growth in the Manufacturing Industry as a whole is positive in the analyzed period. In this context, it is necessary to point out that Turkey experienced three economic and financial crises successively in 1994, 1999 and 2001. Every crises did bring output decline and currency depreciation. Since Turkish industry is mostly based on imported

TABLE 1. AVERAGE SOURCES OF GROWTH AT TOTAL MANUFACTURING INDUSTRIES BETWEEN 1980-2001

Total (1980-2001)	VA Growth Rate (1)=(2)+(3)+(4)	TFP Growth Rate (2)	Capital's Contribution to Growth (3)	Labor's Contribution to Growth (4)
3	6.2%	1.3%	4.6%	0.3%
311	7.5%	3.6%	3.7%	0.2%
312	4.0%	-2.5%	6.1%	0.4%
313	6.0%	-2.8%	8.6%	0.1%
314	12.4%	-3.6%	15.5%	0.4%
321	5.5%	0.3%	4.7%	0.6%
322	15.1%	-5.2%	17.9%	2.5%
323	9.2%	24.7%	2.7%	-18.2%
324	5.4%	-6.1%	9.0%	2.5%
331	4.3%	-0.4%	5.3%	-0.6%
332	15.1%	3.8%	8.9%	2.4%
341	5.9%	1.1%	4.6%	0.2%
342	11.6%	1.2%	9.7%	0.7%
351	5.9%	2.8%	2.8%	0.3%
352	8.8%	0.6%	7.4%	0.8%
353	16.8%	12.4%	4.3%	0.1%
354	-0.3%	-9.3%	8.0%	1.0%
355	5.5%	1.6%	6.0%	-2.0%
356	7.6%	-2.6%	9.1%	1.0%
361	3.5%	-5.1%	8.0%	0.7%
362	8.5%	4.4%	3.4%	0.6%
369	7.6%	1.3%	6.1%	0.2%
371	6.8%	3.8%	2.6%	0.4%
372	3.9%	2.9%	1.4%	-0.3%
381	4.8%	-1.7%	5.8%	0.6%
382	5.5%	3.6%	1.9%	0.1%
383	7.3%	3.5%	3.0%	0.9%
384	7.1%	-0.5%	6.8%	0.8%
385	16.4%	0.1%	14.1%	2.1%
390	-1.4%	-0.1%	5.2%	-6.5%

Source: Calculated from State Institute of Statistics ‹http://www.tuik.gov.tr›

TABLE 2. AVERAGE SOURCES OF GROWTH AT PUBLIC MANUFACTURING INDUSTRIES BETWEEN 1980-2001

Public (1980-2001)	VA Growth Rate (1)=(2)+(3)+(4)	TFP Growth Rate (2)	Capital's Contribution to Growth (3)	Labor's Contribution to Growth (4)
3	5.0%	3.8%	1.4%	-0.2%
311	2.2%	2.4%	-1.0%	0.8%
312	4.6%	2.8%	2.1%	-0.2%
313	-7.4%	-7.4%	-0.1%	0.2%
314	3.8%	-4.2%	8.1%	-0.1%
321	-7.9%	-9.0%	2.0%	-0.8%
322	-9.1%	-15.2%	6.0%	0.1%
323	-35.4%	-8.7%	-1.1%	-25.6%
324	-8.5%	-19.4%	1.9%	8.9%
331	-20.4%	-17.9%	3.1%	-5.6%
332	-42.8%	-39.2%	1.1%	-4.8%
341	3.4%	4.1%	0.0%	-0.8%
342	4.7%	-12.4%	11.0%	6.0%
351	7.6%	3.7%	2.8%	1.1%
352	6.5%	2.3%	4.2%	0.1%
353	14.2%	21.9%	-7.7%	0.0%
354	-15.4%	-14.7%	-1.2%	0.6%
355	-20.5%	1.2%	3.1%	-24.7%
356	-18.9%	-14.3%	-4.3%	-0.3%
361	-7.4%	-3.2%	-0.6%	-3.6%
362	-22.8%	-23.3%	6.5%	-6.0%
369	-1.5%	-7.6%	8.3%	-2.2%
371	8.6%	9.6%	-2.4%	1.4%
372	5.3%	6.0%	0.6%	-1.3%
381	8.2%	-0.5%	3.4%	5.3%
382	-0.3%	4.1%	-2.3%	-2.1%
383	4.7%	0.4%	2.1%	2.2%
384	-0.4%	1.9%	-1.7%	-0.6%
385	-8.5%	-2.3%	-1.0%	-5.8%
390	-8.9%	-10.6%	0.0%	1.6%

Source: Calculated from State Institute of Statistics ‹http://www.tuik.gov.tr›

raw materials, the depreciation of TL against the US Dollar during the crises period caused a rise in the cost of production. Hence high inflation rate persisted for a long period of time.

Table 2 shows the average sources of growth that occurred in the public manufacturing branches during the same period. According to this table, almost half of the manufacturing industries have shown negative value added growth. While manufactures of leather and products of leather (323) and manufactures of furniture and fixtures (332) have the highest negative figures -35,4% and -42,8% respectively; petroleum refineries (353) have the highest positive value added growth 14,2 % .Unlike the total manufacturing industry, capital's contribution to value added growth in some public manufacturing branches took negative values. It would not be wrong to say that unsatisfactory public sector management failed to carry out programs to implement the free market rules of the globalization game. As an offshoot of inefficient public sector management, the public sector industries generated negative growth rates. The TFP growth rates have also negative values in almost half o all the publicly-owned industries. The highest negative TFP growth is seen in the manufacture of furniture and fixtures (332) (-39,2%). which at the same time shows the highest negative value added growth(-42,8%) .

As seen in Table 3, contrary to the shameful performance of the public sector, the value added growth is found to be positive in almost all privately-owned manufacturing industries except petroleum refineries (353) and manufacture of miscellaneous products of petroleum and coal (354) with -2% and -7,6% respectively. However, the TFP growth rates are not as remarkable as the value added. Nearly half of the industries on average have shown negative productivities. The contribution of capital to value added growth is positive except in the manufacture of pottery, china and earthenware (361) (-2%) and manufacture of glass and glass products (362) (-12,1%). Labor seems to be the most important source of the value added growth in private industries with its positive contributions except in the manufacture of wood and wood cork (331) (-0,3%). Yet, throughout the whole period, private manufacturing industries have made remarkable contributions to the value added growth.

Contributions of Labor to Growth

As explained earlier, the TDA is more useful in decomposing human capital's contribution to growth than traditional methods. Table 4 represents the decomposition of the contribution of labor to total manufacturing industry's value added growth. Throughout the period, except a few stray years, labor's contribution was negative to the value added growth. But, raw labor's contribution shows very few negative figures; most of the negative contribution is found in human capital quality upgrading. During this period, the highest rate at total labor's contribution to growth occurred in the manufactures of footwear (324) (2,5%) and of furniture and fixtures (332) (2,4%).

TABLE 3. AVERAGE SOURCES OF GROWTH AT PRIVATE MANUFACTURING INDUSTRIES BETWEEN 1980-2001

VA Growth Rate (1)=(2)+(3)+(4)	TFP Growth Rate (2)	Capital's Contribution to Growth (3)	Labor's Contribution to Growth (4)
6.6%	0.6%	5.4%	0.6%
7.4%	1.4%	5.7%	0.3%
5.9%	-2.7%	7.8%	0.8%
7.9%	-1.3%	8.9%	0.3%
35.5%	14.6%	19.7%	1.2%
5.8%	-0.1%	5.2%	0.7%
14.3%	1.6%	10.2%	2.5%
8.7%	-0.6%	8.7%	0.6%
10.0%	5.3%	3.4%	1.3%
6.5%	-4.6%	11.5%	-0.3%
2.4%	-6.0%	5.8%	2.7%
-8.3%	-44.4%	51.4%	1.3%
5.4%	-1.4%	6.2%	0.6%
7.0%	3.8%	3.1%	0.1%
8.6%	2.5%	5.3%	0.8%
-2.0%	-30.0%	27.6%	0.4%
-7.6%	-17.8%	8.9%	1.2%
5.6%	2.4%	0.1%	3.1%
7.1%	-0.1%	6.1%	1.0%
4.2%	4.9%	-2.0%	1.3%
7.0%	17.7%	-12.1%	1.3%
8.6%	1.8%	6.4%	0.4%
3.8%	-2.1%	5.6%	0.3%
5.5%	3.1%	1.8%	0.6%
4.5%	-2.4%	6.2%	0.7%
6.1%	3.5%	2.1%	0.6%
6.8%	3.1%	2.8%	0.9%
8.1%	-0.5%	7.4%	1.2%
16.7%	-1.6%	15.3%	2.9%
11.3%	7.5%	3.4%	0.4%

Source: Calculated from State Institute of Statistics ‹http://www.tuik.gov.tr›

TABLE 4. THE COMPONENTS OF TOTAL LABOR'S CONTRIBUTION TO GROWTH

Total (1980-2001)	Total Labor's Contribution to Growth (TLCG) (1)=(2)+(3)+(4)	Raw Labor's Contribution to Growth (TRLCG) (2)	Human Capital Maintenance Contribution to Growth (THCMCG) (3)	Human Capital Quality Upgrade Contribution to Growth (THCQUCG) (4)
3	0.3%	0.1%	0.2%	0.0%
311	0.2%	0.1%	0.2%	-0.2%
312	0.4%	0.0%	-0.2%	0.6%
313	0.1%	0.0%	-0.1%	0.2%
314	0.4%	-0.2%	-0.7%	1.4%
321	0.6%	0.3%	0.3%	-0.1%
322	2.5%	1.7%	0.9%	-0.1%
323	-18.2%	0.1%	2.4%	-20.6%
324	2.5%	0.6%	1.0%	0.9%
331	-0.6%	0.0%	0.0%	-0.6%
332	2.4%	0.9%	0.5%	1.0%
341	0.2%	0.1%	0.3%	-0.1%
342	0.7%	0.2%	0.4%	0.1%
351	0.3%	0.0%	-0.1%	0.3%
352	0.8%	0.1%	0.4%	0.3%
353	0.1%	0.0%	0.0%	0.1%
354	1.0%	0.1%	0.3%	0.6%
355	-2.0%	0.1%	0.1%	-2.2%
356	1.0%	0.4%	0.6%	0.1%
361	0.7%	0.1%	0.2%	0.3%
362	0.6%	0.1%	0.3%	0.2%
369	0.2%	0.1%	0.1%	0.0%
371	0.4%	-0.1%	-0.5%	1.0%
372	-0.3%	-0.1%	-0.6%	0.3%
381	0.6%	0.3%	0.4%	0.0%
382	0.1%	0.1%	0.2%	-0.3%
383	0.9%	0.2%	0.5%	0.2%
384	0.8%	0.1%	0.3%	0.4%
385	2.1%	1.1%	1.9%	-0.9%
390	-6.5%	0.5%	5.2%	-12.2%

Source: Calculated from State Institute of Statistics ‹http://www.tuik.gov.tr›

TABLE 5. THE COMPONENTS OF PUBLIC LABOR'S CONTRIBUTION TO GROWTH

Public (1980-2001)	Public Labor's Contribution to Growth (PLCG) (1)=(2)+(3)+(4)	Raw Labor's Contribution to Growth (PRLCG) (2)	Human Capital Maintenance Contribution to Growth (PHCMCG) (3)	Human Capital Quality Upgrade Contribution to Growth (PHCQUCG) (4)
3	-0.2%	-0.2%	-0.7%	0.6%
311	0.8%	-0.1%	-0.5%	1.5%
312	-0.2%	-0.5%	-1.6%	1.9%
313	0.2%	0.0%	-0.1%	0.3%
314	-0.1%	-0.4%	-1.2%	1.5%
321	-0.8%	-1.0%	-4.0%	4.2%
322	0.1%	1.0%	-5.8%	4.8%
323	-25.6%	-1.8%	4.9%	-28.7%
324	8.9%	1.6%	-2.1%	9.5%
331	-5.6%	-1.7%	-11.6%	7.7%
332	-4.8%	-2.4%	-0.8%	-1.6%
341	-0.8%	-0.3%	-2.8%	2.4%
342	6.0%	1.3%	1.6%	3.1%
351	1.1%	0.0%	-0.3%	1.4%
352	0.1%	-0.1%	-0.7%	0.8%
353	0.0%	0.0%	0.0%	0.0%
354	0.6%	-0.1%	-0.4%	1.1%
355	-24.7%	0.2%	0.6%	-25.5%
356	-0.3%	1.5%	1.8%	-3.5%
361	-3.6%	-0.9%	-5.0%	2.3%
362	-6.0%	-0.1%	-0.6%	-5.3%
369	-2.2%	-0.7%	-3.1%	1.6%
371	1.4%	-0.3%	-2.1%	3.7%
372	-1.3%	-0.4%	-2.5%	1.6%
381	5.3%	1.0%	2.5%	1.8%
382	-2.1%	-0.2%	-2.4%	0.5%
383	2.2%	-0.3%	-0.8%	3.3%
384	-0.6%	-0.6%	-3.1%	3.2%
385	-5.8%	-0.5%	-3.0%	-2.4%
390	1.6%	0.9%	0.7%	0.0%

Source: Calculated from State Institute of Statistics ‹http://www.tuik.gov.tr›

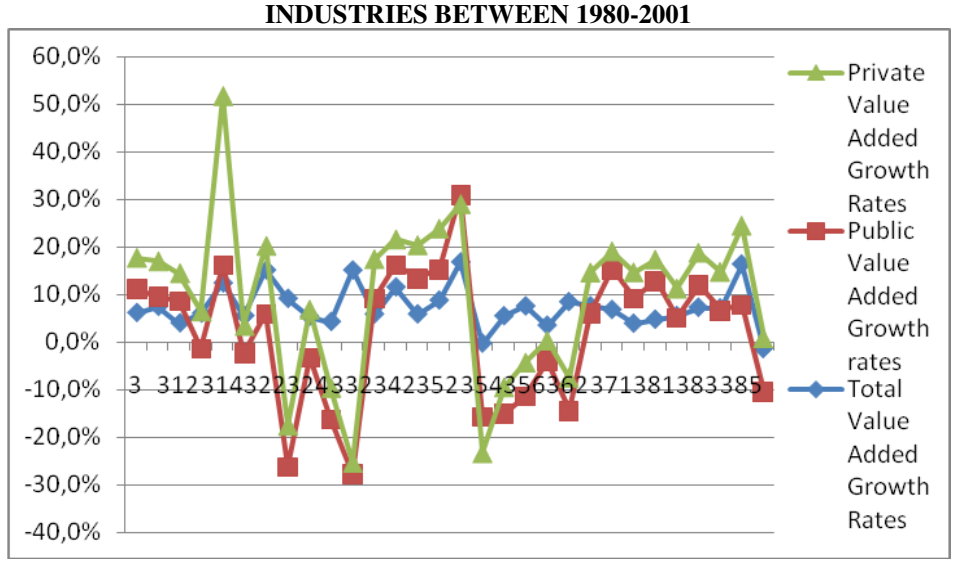
TABLE 6. COMPONTS. OF PRIV. LABOR'S CONTRN. TO GROWTH

Private (1980-2001)	Private Labor's Contribution to Growth (PLCG) (1)=(2)+(3)+(4)	Raw Labor's Contribution to Growth (PRLCG) (2)	Human Capital Maintenance Contribution to Growth (PHCMCG) (3)	Human Capital Quality Upgrade Contribution to Growth (PHCQUCG) (4)
3	1.0%	0.7%	0.4%	-0.1%
311	0.6%	0.6%	0.3%	-0.3%
312	1.1%	0.6%	0.3%	0.2%
313	0.3%	0.1%	0.0%	0.2%
314	1.3%	0.4%	0.1%	0.8%
321	1.2%	0.8%	0.4%	-0.1%
322	3.3%	2.6%	0.9%	-0.1%
323	1.0%	0.8%	0.4%	-0.3%
324	2.0%	1.6%	0.7%	-0.3%
331	0.0%	0.6%	0.3%	-1.0%
332	3.3%	1.6%	0.6%	1.0%
341	2.0%	1.0%	0.7%	0.3%
342	1.1%	0.7%	0.5%	-0.1%
351	0.1%	0.1%	0.0%	0.0%
352	1.3%	0.5%	0.4%	0.3%
353	0.7%	0.1%	0.1%	0.5%
354	1.7%	0.6%	0.5%	0.7%
355	3.0%	0.0%	-0.1%	3.0%
356	1.6%	0.9%	0.5%	0.1%
361	1.7%	0.7%	0.4%	0.6%
362	1.7%	0.5%	0.3%	0.8%
369	0.8%	0.7%	0.3%	-0.3%
371	0.4%	0.2%	0.1%	0.1%
372	0.8%	0.3%	0.2%	0.3%
381	1.1%	0.7%	0.4%	0.0%
382	1.0%	0.5%	0.4%	0.1%
383	1.4%	0.7%	0.5%	0.2%
384	2.0%	1.0%	0.7%	0.2%
385	3.9%	1.8%	1.0%	1.1%
390	0.4%	1.0%	0.3%	-0.9%

Source: Calculated from State Institute of Statistics ‹http://www.tuik.gov.tr›

Tables 5 and 6 summarize, in order, the components of public and private labor's contributions to the value added growth. Not surprisingly, labor's contributions to value added growth in publicly-owned industries show mostly negative figures especially for raw labor and human capital maintenance. Although nearly all private industries show positive contributions in raw labor and human capital maintenance, the contribution of human capital quality improvement has the most negative figures, although their contributions are mostly positive in public industries. The trend is opposite in the private sector. In the public sector, most of the positive contribution to the value added growth is accounted for by the improvement of human capital quality.

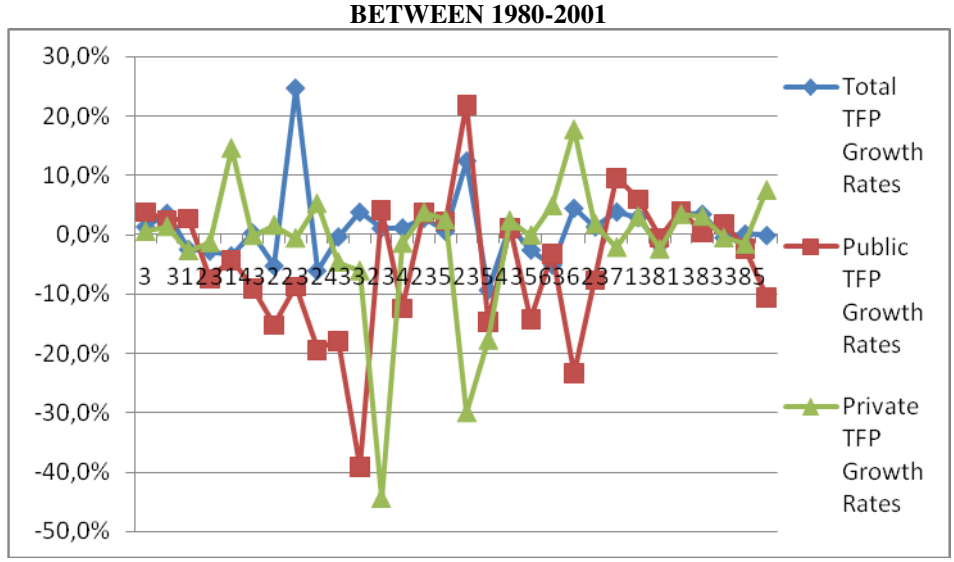
FIGURE 2. VALUE ADDED GROWTH RATES OF MANUFACTURING INDUSTRIES BETWEEN 1980-2001



Source: Calculated from State Institute of Statistics ‹http://www.tuik.gov.tr›

Figures 2 and 3 show the value added growth and TFP growth in public and private manufacturing industries, and the relative performance can be gauged from these figures. It is clear that private manufacturing industries' value added growth can satisfactorily explain the total growth at the industry level.

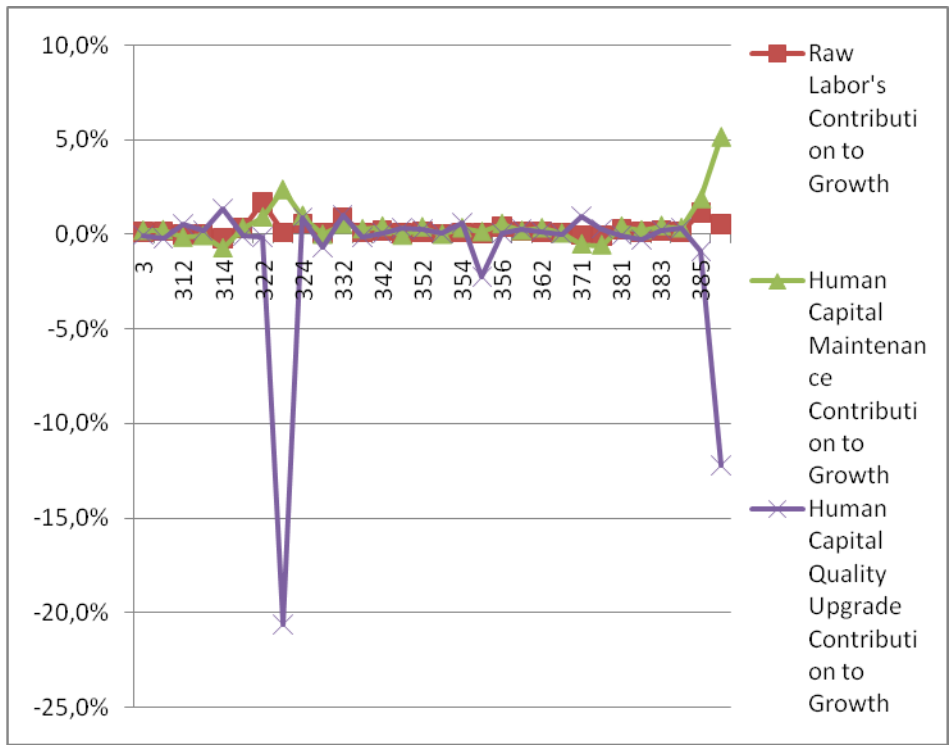
FIGURE 3. TFP GROWTH RATES OF MANUFACTURING INDUSTRIES BETWEEN 1980-2001



Source: Calculated from State Institute of Statistics ‹http://www.tuik.gov.tr›

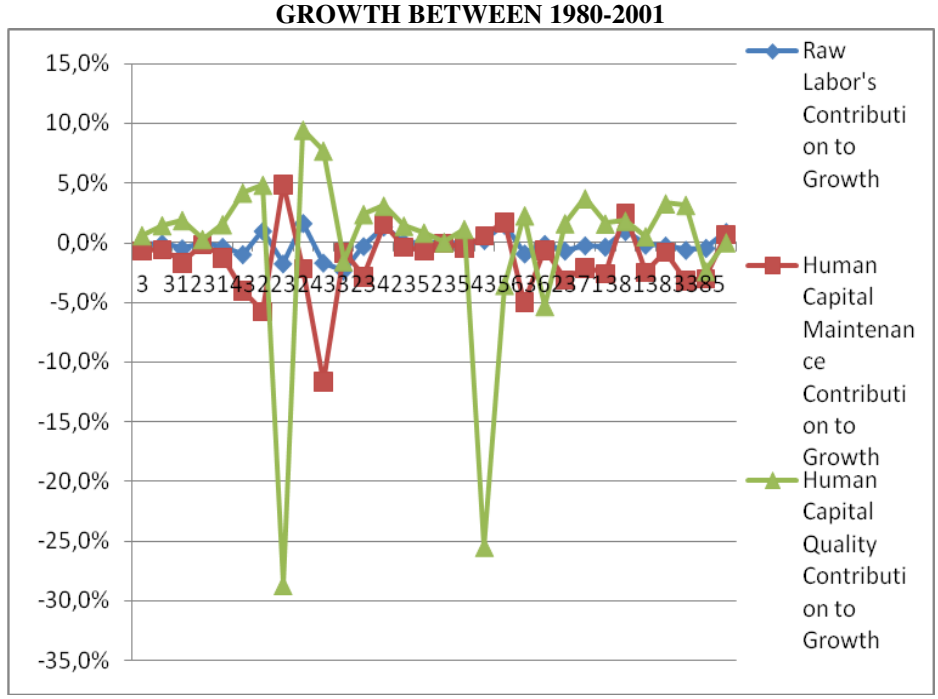
Figures 4, 5 and 6 below make the comparison of the contributions of different components of labor very clear.

FIGURE 4. THE COMPONENTS OF TOTAL LABOR CONTRIBUTION TO GROWTH BETWEEN 1980-2001



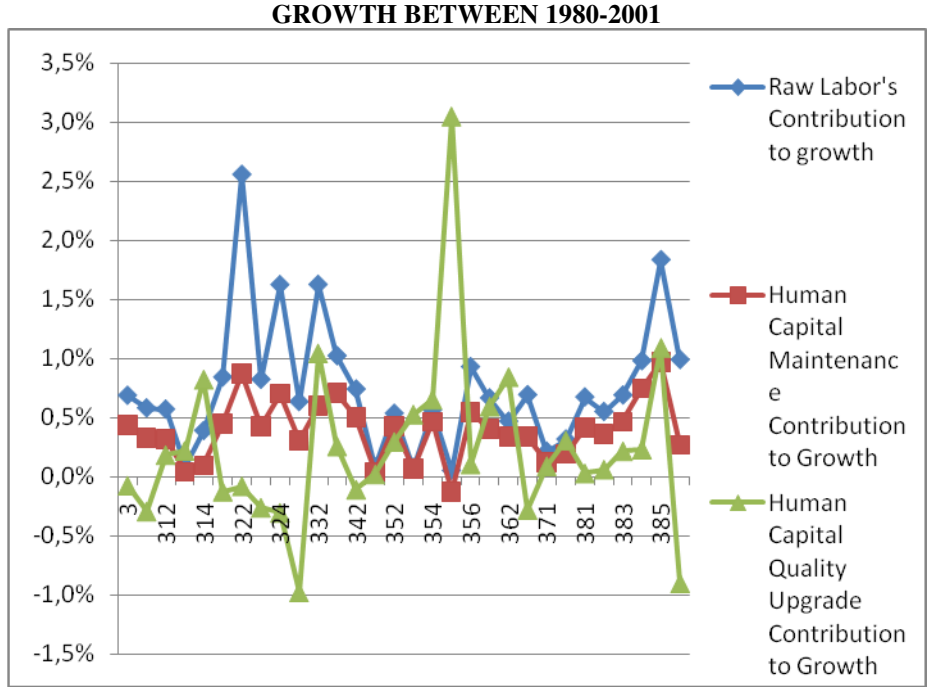
Source: Calculated from State Institute of Statistics ‹http://www.tuik.gov.tr›

FIGURE 5. THE COMPONENTS OF PUBLIC LABOR CONTRIBUTION TO GROWTH BETWEEN 1980-2001



Source: Calculated from State Institute of Statistics ‹http://www.tuik.gov.tr›

FIGURE 6. THE COMPONENTS OF PRIVATE LABOR CONTRIBUTION TO GROWTH BETWEEN 1980-2001



Source: Calculated from State Institute of Statistics ‹http://www.tuik.gov.tr›

The Concentration of TFP Growth among Manufacturing Branches

According to Harberger (Harberger, 1991), growth is not a homogenous phenomenon. Growth of TFP can occur in any industry at any time. Sometimes it is observed that industries which have insignificant contributions to value added growth have the highest level of TFP growth. Following Harberger (Harberger, 1991), positive values of TFP concentrated in some manufacturing industries are referred to as the "winners," while the rest are "losers." This view is different from the view entertained by the protagonists of traditional approaches. For instance, Robert Solow (Solow, 1956) attributes the TFP growth mainly to technological progress, and he observes that it is evenly distributed over all the sectors of the economy.

In this context, Tables 7, 8 and 9 summarize the concentration of cumulative TFP growth among manufacturing industries for the period 1980-2001. As Table 7 shows, manufactures of leather and leather products (323) industries are contributing only 1.5% to the cumulative value added growth (1760665546/ 1,1728E+11) and contribute 17,5 percent to the cumulative TFP growth. These tables help to appreciate the ranks of the manufacturing branches from the highest to the lowest TFP rates. For example, manufactures of leather and leather products (323) (as a whole), petroleum refineries (353) (in the public sector) and manufactures of glass and glass products (362) achieve the highest TFP growth throughout the studied period.

TABLE 7. THE CONCENTRATION OF TFP AMONG TOTAL MANUFACTURING INDUSTRIES BETWEEN 1980-2001

Total (1980-2001)	TFP Growth	Absolute Contribution of TFP Growth	Cumulative Sum	VA	Cumulative Sum
323	24.7%	434010778.5	434010779	1.8E+09	1760665546
353	12.4%	966935054.4	1400945833	7.8E+09	9557499093
362	4.4%	41016256.35	1441962089	9.3E+08	10484045332
371	3.8%	132406824.9	1574368914	3.5E+09	13950391185
332	3.8%	9319835.676	1583688750	2.5E+08	14197195309
382	3.6%	92760910.98	1676449661	2.6E+09	16762152108
311	3.6%	167116055.3	1843565716	4.6E+09	21406221235
383	3.5%	103779991.1	1947345707	3E+09	24412326253
372	2.9%	23861715.78	1971207423	8.2E+08	25235841232
351	2.8%	71334654.04	2042542077	2.6E+09	27792982146
355	1.6%	15276965.48	2057819043	9.8E+08	28776609383
3	1.3%	769805168	2827624211	5.8E+10	86770686460
369	1.3%	33689146.72	2861313357	2.6E+09	89323616552
342	1.2%	9899665.551	2871213023	8.6E+08	90178790330
341	1.1%	10114030.47	2881327053	9.6E+08	91135707740
352	0.6%	18306930.97	2899633984	3.2E+09	94326759037
321	0.3%	19629949.42	2919263934	7E+09	1.01286E+11
385	0.1%	290100.0224	2919554034	2.4E+08	1.01524E+11
390	-0.1%	-276328.5477	2919277705	2.2E+08	1.01745E+11
331	-0.4%	-1472082.547	2917805623	4E+08	1.02147E+11
384	-0.5%	-18423729.87	2899381893	3.7E+09	1.05818E+11
381	-1.7%	-34084153.8	2865297739	2E+09	1.07795E+11
312	-2.5%	-27875385.77	2837422353	1.1E+09	1.08922E+11
356	-2.6%	-22513777.71	2814908575	8.7E+08	1.09797E+11
313	-2.8%	-43836994.09	2771071581	1.6E+09	1.11389E+11
314	-3.6%	-87403219.73	2683668362	2.5E+09	1.13846E+11
361	-5.1%	-31531611.91	2652136750	6.2E+08	1.14461E+11
322	-5.2%	-98127284.76	2554009465	1.9E+09	1.16336E+11
324	-6.1%	-9999036.816	2544010428	1.6E+08	1.16501E+11
354	-9.3%	-72628894.11	2471381534	7.8E+08	1.1728E+11

Source: Calculated from State Institute of Statistics ‹http://www.tuik.gov.tr›

TABLE 8. THE CONCENTRATION OF TFP AMONG PUBLIC MANUFACTURING INDUSTRIES BETWEEN 1980-2001

Public (1980-2001)	TFP Growth	Absolute Contribution of TFP Growth	Cumulative Sum	VA	Cumulative Sum
353	21.9%	1680336561	1680336561	8E+09	7657449766
371	9.6%	137282994.8	1817619556	1E+09	9091449091
372	6.0%	16805535.14	1834425091	3E+08	9371404512
341	4.1%	11387803.36	1845812895	3E+08	9648891236
382	4.1%	10537893.96	1856350789	3E+08	9906311328
3	3.8%	620127026.4	2476477815	2E+10	2.6181E+10
351	3.7%	38095364.92	2514573180	1E+09	2.7202E+10
312	2.8%	9082264.686	2523655445	3E+08	2.7527E+10
311	2.4%	20544461.25	2544199906	9E+08	2.8394E+10
352	2.3%	1823737.818	2546023644	8E+07	2.8474E+10
384	1.9%	5045450.279	2551069094	3E+08	2.874E+10
355	1.2%	780195.5385	2551849290	7E+07	2.8808E+10
383	0.4%	373984.9158	2552223274	9E+07	2.8897E+10
381	-0.5%	-492951.893	2551730323	1E+08	2.9003E+10
385	-2.3%	-367780.082	2551362543	2E+07	2.9019E+10
361	-3.2%	-1292671.341	2550069871	4E+07	2.9059E+10
314	-4.2%	-75567357.51	2474502514	2E+09	3.0847E+10
313	-7.4%	-58642866.56	2415859647	8E+08	3.1635E+10
369	-7.6%	-20427370.31	2395432277	3E+08	3.1904E+10
323	-8.7%	-204679126.9	2190753150	2E+09	3.4245E+10
321	-9.0%	-37269682.57	2153483467	4E+08	3.4657E+10
390	-10.6%	-2495568.664	2150987899	2E+07	3.4681E+10
342	-12.4%	-8163863.544	2142824035	7E+07	3.4747E+10
356	-14.3%	-2133921.501	2140690114	1E+07	3.4762E+10
354	-14.7%	-6559062.422	2134131051	4E+07	3.4806E+10
322	-15.2%	-3520826.514	2130610225	2E+07	3.483E+10
331	-17.9%	-16128095.79	2114482129	9E+07	3.492E+10
324	-19.4%	-7634310.559	2106847818	4E+07	3.4959E+10
362	-23.3%	-8386927.885	2098460890	4E+07	3.4995E+10
332	-39.2%	-5940295.774	2092520595	2E+07	3.501E+10

Source: Calculated from State Institute of Statistics ‹http://www.tuik.gov.tr›

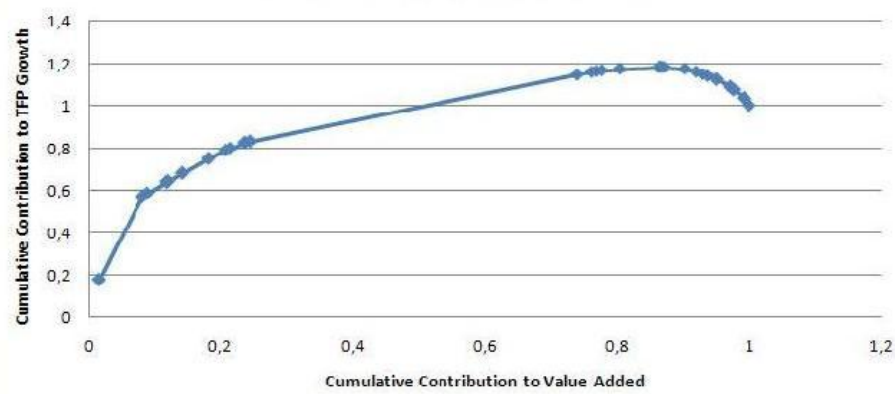
TABLE 9. THE CONCENTRATION OF TFP AMONG PRIVATE MANUFACTURING INDUSTRIES BETWEEN 1980-2001

Private (1980-2001)	TFP Growth	Absolute Contribution of TFP Growth	Cumulative Sum	VA	Cumulative Sum
362	22.9%	200533889.4	200533889	9E+08	874366815
314	14.6%	89505542.32	290039432	6E+08	1487911983
324	7.9%	9569625.602	299609057	1E+08	1609724075
390	6.5%	12801141.06	312410198	2E+08	1806783204
361	4.7%	26456003.35	338866202	6E+08	2365180898
355	4.5%	40955971.17	379822173	9E+08	3277330377
351	3.8%	55838203.86	435660377	1E+09	4766055282
382	3.5%	77699150.12	513359527	2E+09	7015907299
383	3.1%	88374483.39	601734010	3E+09	9854730348
372	3.1%	16371333.87	618105344	5E+08	1.0389E+10
322	2.9%	51914703.46	670020048	2E+09	1.217E+10
352	2.8%	86090523.62	756110571	3E+09	1.5191E+10
369	1.8%	40282231.85	796392803	2E+09	1.7402E+10
311	1.4%	51423156.87	847815960	4E+09	2.1044E+10
3	0.6%	235748213.6	1083564174	4E+10	6.1303E+10
321	-0.1%	-6440570.319	1077123603	6E+09	6.7723E+10
342	-0.2%	-1330679.883	1075792923	8E+08	6.8485E+10
384	-0.5%	-16205693.2	1059587230	3E+09	7.1792E+10
323	-0.6%	-903547.543	1058683683	2E+08	7.1955E+10
313	-1.3%	-10258775.58	1048424907	8E+08	7.273E+10
356	-1.4%	-12129649.34	1036295258	8E+08	7.357E+10
385	-1.6%	-3349947.419	1032945310	2E+08	7.3784E+10
371	-2.1%	-41397502.08	991547808	2E+09	7.5752E+10
381	-2.4%	-44300592.41	947247216	2E+09	7.759E+10
312	-2.7%	-20996812.29	926250403	8E+08	7.8375E+10
331	-4.6%	-14277626.67	911972777	3E+08	7.8684E+10
332	-6.5%	-14691238.66	897281538	2E+08	7.891E+10
341	-10.1%	-66246805.98	831034732	7E+08	7.9568E+10
354	-17.8%	-127223043.5	703811689	7E+08	8.0285E+10
353	-24.3%	-18594393.03	685217296	8E+07	8.0361E+10

Source: Calculated from State Institute of Statistics ‹http://www.tuik.gov.tr›

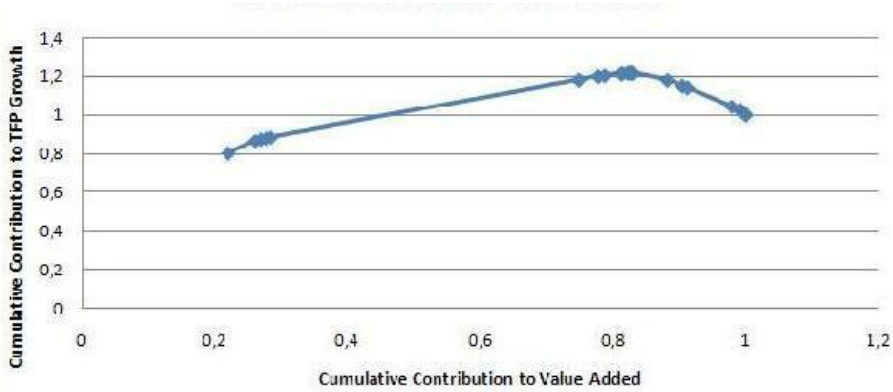
The following sunrise-sunset diagrams are constructed to show more clearly the concentration of TFP growth among the manufacturing branches. As Figure 7 reveals, total manufacturing branches which are cumulatively contributing to the value added by 30 percent generate 80 percent of cumulative TFP growth.

FIGURE 7. THE CONCENTRATION OF TFP AMONG TOTAL MANUFACTURING INDUSTRIES BETWEEN 1980-2001



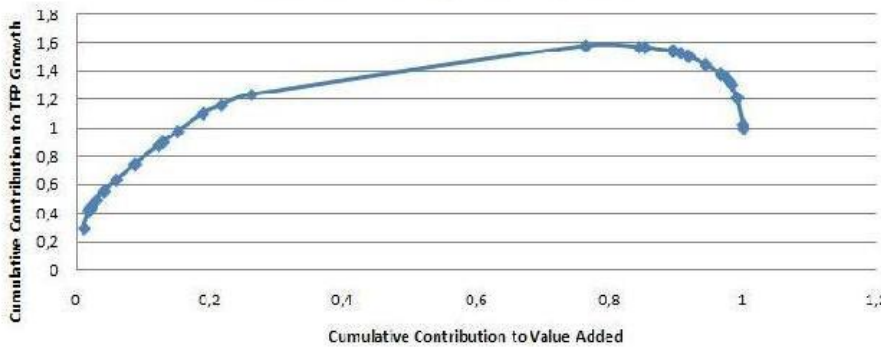
Source: Calculated from State Institute of Statistics ‹http://www.tuik.gov.tr›

FIGURE 8. THE CONCENTRATION OF TFP AMONG PUBLIC MANUFACTURING INDUSTRIES BETWEEN 1980-2001



Source: Calculated from State Institute of Statistics ‹http://www.tuik.gov.tr›

FIGURE 9. THE CONCENTRATION OF TFP AMONG PRIVATE MANUFACTURING INDUSTRIES BETWEEN 1980-2001



Source: Calculated from State Institute of Statistics ‹http://www.tuik.gov.tr›

As shown in Table 8, petroleum refineries (353) contribute 21,9 percent (765744976/ 35010202205) to the cumulative value added growth and their contribution to the TFP growth is 80,3 percent (1680336561/ 2092520595).

CONCLUSION

The sources of growth in Turkish Manufacturing Industry have been examined in this paper by considering twenty nine main sub-branches of the manufacturing industry under public and private sectors. The sources of growth vary across these manufacturing branches. Earlier empirical studies applying traditional methods to analyze the sources of growth at the aggregate level were unable to explain the dynamics of growth at the sectoral or firm level where growth really takes place.

Our empirical study reveals that as a whole, industries have positive value added growth with no negative contribution of capital. However, capital's contribution to output growth in the public sector is negative in some branches. Raw labor's contribution to growth plays the most significant role both at the aggregate industry level and also in private sector industries. One of the main differences between the previous empirical studies applying traditional methods and the TDA is that the latter method is able to decompose human capital's contribution to growth and analyze sectoral details. The TDA method can capture the fact human's capital's contribution to the growth of private sector industries, as in our study, may be significantly positive, although its contribution is not significant at the industry level , and particularly to the public sector.

The present study reveals that TFP growth rates across public and private sectors vary considerably. During the studied period, almost half of the public and private sectors showed positive rates of TFP growth. However, the distributions of TFP growth rates across public and private sectors represented by the Sunrise-Sunset diagrams vary across sectors and over time. Our empirical study finds that public manufacturing sectors are less efficient than the private ones. In order to let them operate efficiently and productively, it will be necessary to subsidize some of these industries and introduce market principles to make them more competitive. If the tax rate on imported raw

materials is reduced, the cost of production can be considerably minimized and the firms can be more competitive. One of the main revenue sources of the government budget is the Value Added Tax (VAT) especially in a developing country like Turkey. Although the VAT is an important income source of revenue, it is often mismanaged in Turkey. Therefore, in order to increase government revenues, a sensible restructuring of the VAT collection should be implemented. A suitable debt management policy is also necessary for Turkey. Economy in tax collection and a suitably phased debt management policy should be able to release some resources that may be utilized for subsidies. As a matter of fact, a liberalized open economy like Turkey should gradually reduce import and export tariffs. A comprehensive export policy can give more incentives and cost reduction to make the sector more contestable and competitive. Cheaper import cost of raw materials for export industries can go a long way to enhance their competitiveness in the international market. For better macroeconomic performance at the industrial level, not only inputs costs but also transport costs and agency-based costs need to be reduced. All these along with human capital investment, better technology and infrastructure can contribute significantly to the industrial development of Turkey.

APPENDIX: INTERNATIONAL STANDARDS OF INDUSTRIAL CODES

ABBREVIATIONS	SECTOR CODE	SECTOR DESCRIPTION
	3	MANUFACTURING INDUSTRY
FOD	**311**	Food manufacturing
FOD	**312**	Manufacture of food products not elsewhere classified
BEV	**313**	Beverage industries
TOB	**314**	Tobacco manufactures
TEX	**321**	Manufacture of textiles
APP	**322**	Manufacture of wearing apparel, except footwear
LEA	**323**	Manufacture of leather and products of leather, leather substitutes and fur, except footwear and wearing apparel
FOT	**324**	Manufacture of footwear, except vulcanize or moulded rubber of plastic footwear
WOD	**331**	Manufacture of wood and wood cork products, except furniture
FUR	**332**	Manufacture of furniture and fixtures, except primarily of metal
PAP	**341**	Manufacture of paper and paper products
PRT	**342**	Printing, publishing and allied industries
ICH	**351**	Manufacture of industrial chemicals
CHE	**352**	Manufacture of other chemical products
PET	**353**	Petroleum refineries
COL	**354**	Manufacture of miscellaneous products of petroleum and coal
RUB	**355**	Manufacture of rubber products
PLA	**356**	Manufacture of plastic products not elsewhere classified
POT	**361**	Manufacture of pottery, china and earthenware
GLS	**362**	Manufacture of glass and glass products
NMM	**369**	Manufacture of other non-metallic mineral products
STL	**371**	Iron and steel basic industries
NFM	**372**	Non-ferrous metal basic industries
FMP	**381**	Manufacture of fabricated metal products, except machinery and equipment
MCH	**382**	Manufacture of machinery except electrical
EMC	**383**	Manufacture of electrical machinery, apparatus, appliances and supplies
TRN	**384**	Manufacture of transport equipment
SCI	**385**	Manufacture of professional and scientific, and measuring and controlling equipment not elsewhere classified, and of photographic and optical goods
MOT	**390**	Other manufacturing industries

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