Journal of Economic Cooperation **27**, 1 (2006) 71-88

PATTERNS OF INDUSTRIALISATION, STRUCTURAL CHANGES AND PRODUCTIVITY IN TURKISH MANUFACTURING (1970-2000)

K. Ali Akkemik*

This paper analyses the impact of structural changes in Turkish manufacturing employment on manufacturing productivity by decomposing aggregate manufacturing productivity growth for the period 1970-2000 into the contributions of individual industries and of labour reallocation among industries. The analysis is conducted for 19 manufacturing industries. The results show that before 1980, the government could effectively realise gains in aggregate productivity to some extent through the reallocations of manufacturing labour across industries in an import-substitution industrialisation policy. The export-oriented strategy (after 1980) which was accompanied by structural adjustment reforms that included a large-scale liberalisation first of the trade regime and later of the capital flows did not bring about the desired shifts of labour towards industries with higher labour productivity growth rates. The impact of the induced shifts of labour on aggregate labour productivity in the post-1980 period is negative.

1. INTRODUCTION

Long-run economic growth can be sustained by increases in productivity. The impact of the shifts of resources across industries on economic growth and productivity has recently attracted the attention of many researchers. Now, there is a large literature on the impact of changes in labour composition on productivity for developing as well as developed economies (e.g. Salter, 1960; Syrquin, 1984 and 1986; Fagerberg, 2000; Timmer and Szirmai, 2000; Jalava *et al*. 2002 and Van Ark and Timmer, 2003). These studies focus on the shift of labour and capital from primary sectors (e.g. agriculture) to manufacturing and services sectors. They specifically point to the positive contribution of resource reallocation

* Ph.D. Candidate, Nagoya University, Graduate School of International Development, Japan.

from low-productivity industries such as agriculture and traditional manufacturing industries (e.g. food and textile manufactures) to those with higher productivity such as heavy and chemical industries. It is found, however, that the shifts of resources for most developing countries are not conducive to productivity growth.

It is important to investigate how the shifts of resources impact on productivity, the long-run determinant of growth. This issue is of great importance for policymakers because a slow adjustment of productivity bears a cost in the long-run as foregone growth. Two previous studies investigate the relation between the structure and performance of Turkish manufacturing industries. The first of these, Voyvoda and Yeldan (1999), decomposes the productivity growth of manufacturing into the contributions of individual industries to aggregate productivity growth (net productivity effect) and the sectoral labour reallocation effect after 1970. They find little structural change in the industrial composition and almost no contribution of this change to productivity advances under the post-1980 structural adjustment reforms. They further investigate the distributional consequences and find that the gains in productivity during the post-1980 structural adjustment reforms did not bring about gains in real wages. Finally, they argue that post-1980 structural adjustment reforms, designed to enhance the outward orientation of the economy, cannot be a viable strategy of "export-oriented industrialisation" as those practiced in the East Asian economies.

The second study by Kiliçaslan and Taymaz (2004) decomposes the productivity growth in manufacturing into intra-industry productivity growth and the reallocation effect (i.e. the contribution of the reallocations of labour to aggregate labour productivity) using the conventional shift-share analysis. Their analysis is conducted for a sample of Middle East and North African economies and Asian economies for the period 1965-1999. However, they do not present the contribution rates of industries and confine their analysis to the aggregate manufacturing sector. Their finding for Turkey suggests a negligible contribution of structural change in manufacturing labour composition to manufacturing productivity.

This paper builds upon the findings of those two studies and takes their analyses one step further by employing a thorough methodology and

a detailed analysis that incorporates the number of industries. The purpose of this paper is to analyse the impact of the structural changes in the composition of employment on manufacturing productivity in Turkey. To this end, the gains in aggregate manufacturing productivity are decomposed into the contributions of individual industries and the contributions of the shifts of labour across industries. The contributions of each industry to each source of productivity gains are presented in detail. The hypothesis that shifts of resources have a positive effect on aggregate productivity growth as supposed by Syrquin (1995) is tested. The study covers all manufacturing activities in Turkey, classified into nineteen manufacturing industries, and the analysis covers the period 1970-2000. The analysis allows for a rough evaluation of the development path the Turkish manufacturing is following.

This paper is organised as follows: Section 2 summarises the macroeconomic characteristics of the periods of analysis with emphasis on productivity, labour composition and output growth. Section 3 lays out the methodology and presents the empirical results. Finally, Section 4 concludes with some remarks.

2. MACROECONOMIC STRATEGIES AND TRENDS IN MANUFACTURING OUTPUT, EMPLOYMENT AND LABOUR PRODUCTIVITY

In line with the explanations in Voyvoda and Yeldan (1999), the development of the manufacturing industry is considered in this study under four distinct periods: 1970-79, 1980-88, 1989-94, and 1995-2000. In the first period (1970-79), the government adopted an import substitution strategy for industrialisation by large public investments and establishing various incentives for private investors in heavy manufacturing and chemical industries (Kepenek and Yentürk, 2000, p. 360-363). The shares of these industries in total manufacturing value-added increased remarkably in this period (see Table A. 1 in the annex). International trade was highly restricted with strong barriers to trade implemented by the government to nurture the import substitute industries. The last three years of this period were characterised by balance of payments crises due to deliberate overvaluation of the fixed exchange rate in an attempt to enable the purchases of imported intermediate and capital goods necessary for the domestic production of consumer manufactures and the consequent foreign exchange

insufficiency. As a result, the import substitution strategy became an unviable policy option.

The second period covers the years from 1980 to 1988 under the strong control of the newly established military regime and is characterised by structural adjustment reforms. From 1980 onwards, international trade was liberalised, the exchange rate was largely devaluated, and an export-oriented development strategy was adopted by the government. The aim of such a policy change was to ensure the earnings of foreign exchange necessary for the purchases of capital goods imports. For this purpose, a number of subsidies and incentive schemes were established for the export industries. On the other hand, organised labour was taken under control and real wages were suppressed. This aimed at lowering production costs for domestic producers and enhancing exports by way of improved competitiveness (Voyvoda and Yeldan, 1999; Kepenek and Yentürk, 2000, p. 200). Kepenek and Yentürk (2000, p. 364) add that exports of the main export industries increased in this period due to the effective use of the productive capacity which was installed in the pre-1980 era rather than the increase in the productive capacity. In other words, export expansion in this period was not realised by cost reductions that result from scale economies but by artificial reductions in production costs by way of government subsidies on pricing of exportables.

The third period (1989-1994) starts with the liberalisation of the capital account of the balance of payments that effectively made Turkey an open economy. This move allowed Turkey to attract foreign capital, but mainly short-term capital flows in nature (Voyvoda and Yeldan, 1999). The direct impact of such a policy change was on the interest rates, which are deterministic in investment decisions of domestic producers. Direct inflows of foreign capital were incorporated with real appreciation of the exchange rate and consequent rises in interest rates in the domestic capital market (Kepenek and Yentürk, 2000, p. 211). Continuous real appreciation of the currency along with an increasing trade deficit gave way to a currency crisis in 1994.

The fourth period (1995-2000) is a period of instability with ups and downs in economic performance. The 1994 currency crisis was followed later by a short-living normalisation of economic performance. However, the adverse effects of the global financial distress in 1997-98 and the destructive earthquake in 1999 came as big shocks to the economy.

Labour productivity growth rates by industry are presented in Table A. 2 in the annex. Labour productivity is defined in this paper as real industrial value-added per employee in 1987 prices. The data on nominal value-added and employment are obtained from annual issues of the *UNIDO Yearbook of Industrial Statistics* and OECD data sources. Nominal value-added data are deflated by the wholesale price indices obtained from the Central Bank Electronic Data Delivery System and the statistical yearbook of the national statistics office. Noticing the inferior productivity growth rates by industries during the import substitution period, it is obvious that the import substitution strategy did not encourage productivity improvements by protecting domestic producers from foreign competition.

During the export orientation and structural adjustment period (1980-88), there was a tendency for the productivity growth rates of almost all industries to increase, especially for the major export industries (i.e. textiles, clothing, chemicals, basic metals, and non-electrical machinery). However, it is important to recall the warning by Kepenek and Yentürk (2000, p. 364) that the increases in exports were stimulated by various subsidies and incentives but not by the exploitation of scale economies. This, in turn, led to the expansion of output in export industries which resulted in increased productivity growth rates. In the 1989-94 period, major export industries (textiles, clothing, chemicals, and basic metals) maintained their high productivity growth rates and were joined by the upper-end heavy industries (machinery and equipment), which experienced an increase in their export shares in total. In the crisis period (1995-2000), all industries exhibited very low productivity growth rates.

3. STRUCTURAL CHANGE AND PRODUCTIVITY GROWTH IN MANUFACTURING

3.1. Methodology

In order to investigate the contribution of labour shifts across industries to aggregate productivity growth in manufacturing, the static shift-share method as described in Timmer and Szirmai (2000) is employed. Aggregate labour productivity growth is decomposed into components measuring productivity growth resulting from productivity growth within individual industries and from labour shifts across industries.

We start by defining labour productivity as follows:

$$LP_t = \frac{Q_t}{L_t} = \sum_i \frac{Q_{i,t}}{L_{i,t}} \cdot \frac{L_{i,t}}{L_t} \tag{1}$$

where *LP* stands for aggregate labour productivity, *L* for number of employees, *Q* for real value-added, and the subscripts *i* and *t* for individual manufacturing industries and time, respectively. The terms without the subscript *i* are manufacturing aggregates. The term $L_{i,t}/L_t$ in equation (1) refers to labour share of the industry *i* in total labour and the term $Q_{i,t}/L_{i,t}$ refers to labour productivity for the same industry. Renaming the former as sl_i and the latter as $LP_{i,,}$ equation (1) can be rewritten as follows:

$$LP = \sum_i LP_i \cdot sl_i \tag{2}$$

Equation (2) implies that the aggregate labour productivity level is the weighted sum of individual industries. The weights are the respective shares of industries in total labour.

Changes in labour productivity are defined for a specific time period *[0,1]*, where *0* and *1* stand for the beginning and the end years of the period, respectively. The change in labour productivity level can be written simply by subtracting the level of labour productivity at the end of period (*1*) from that of the beginning of period (*0*):

$$LP_1 - LP_0 = \sum_i LP_{i,1} \cdot sl_{i,1} - \sum_i LP_{i,0} \cdot sl_{i,0} \tag{3}$$

Rearranging with some algebraic manipulations and dividing each side by LP_0 to rearrange (3) in growth terms, the above decomposition finally takes the following shape:

$$\frac{LP_1 - LP_0}{LP_0} = \frac{1}{LP_0}\sum_i (LP_{i,1} - LP_{i,0}) \cdot sl_{i,o} + \frac{1}{LP_0}\sum_i (sl_{i,1} - sl_{i,0}) \cdot LP_{i,o} + \frac{1}{LP_0}\sum_i (sl_{i,1} - sl_{i,0}) \cdot (LP_{i,1} - LP_{i,0}) \tag{4}$$

The first term on the right-hand side of equation (4), i.e. the sum of labour productivity changes by industries weighted by employment shares industries in the initial year of a period, is the contribution of internal productivity growth within individual industries to aggregate productivity growth and is named "intra-industry productivity effect." The intra-industry effect measures the change in aggregate labour productivity growth if the labour shares remain constant over time.

The second term (summation of the changes in labour shares multiplied by the labour productivity level of the initial year) measures labour shift based on the labour productivity level at the beginning of the period. In other words, this effect measures the changes in aggregate labour productivity resulting from the movements of labour across industries with differing productivity levels had the labour productivity levels of individual industries remained constant over time. When the employment shares of industries with high productivity levels rise, this means a reallocation of labour towards industries whose productivity is growing rapidly. Timmer and Szirmai (2000) name this term the "static shift effect."

The third term, that measures the cross-effects of the changes in both labour productivity and labour shares, is the most difficult to interpret. When the industries whose productivity levels grow rapidly also increase their share of employment, this means a reallocation of labour towards industries with rapid growth in productivity. Since it takes into account both labour productivity and labour share changes in the selected period, Timmer and Szirmai (2000) name this term the "dynamic shift effect."[1] The size of this component is generally found to be small in empirical studies.

The sum of the two shift effects measures the impact of structural change on aggregate labour productivity. One can measure the impact of inter-industry shifts of labour on aggregate productivity level in alternative ways (Syrquin, 1986). The method adopted here is capable enough to summarise the impacts of labour reallocation on aggregate productivity.

[1] Using the same methodology for an analysis of the productivity slowdown in the US, Beebe and Haltmaier (1980) name the intra-industry and shift effects as "rate" and "level" effects, respectively.

Note that the increases in labour quality reflect not only the improvement in the quality of labour due to in-house training by companies or restructuring within firms, but also the changes in available capital per labour. Higher capital-labour ratio leads to higher labour productivity level. It is important to note that the shift effects are related to average productivity, not the marginal product of labour. It is assumed here, for simplicity, that all workers in the same industry have the same productivity, i.e. average productivity remains unchanged by inter-industry employment shifts. In addition, labour is assumed to be homogenous.[2] Under these assumptions, the focus here is on average productivity.

3.2. Empirical Results

Table 1 presents the results of the shift-share analysis for the manufacturing sector. For the overall period (1970-2000), the results show that shifts of labour across industries did not impact positively on aggregate labour productivity. The contribution of the static shift effect to aggregate labour productivity was significant only during the import substitution era (1970-79), accounting for about one fourth of aggregate labour productivity growth. During the export-orientation (1980-88) and liberalisation (1989-94) periods, the static shifts effect contributed negatively to aggregate labour productivity (-5.7 percent for 1980-88 period and -7.0 percent for 1989-94 period). During the instability years (1995-2000), the contribution of static shifts to aggregate labour productivity was largely negative (-29.7 percent). The magnitude of the dynamic shift effect is very small as expected for all periods. Its contribution to aggregate labour productivity is negligibly small (between -0.1 percent and -1.3 percent). In consequence, the total shift effect, which is defined as the sum of static and dynamic shift effects, arises as composed almost entirely of the static shift effect.

[2] Timmer and Szirmai (2000) report some shortcomings of the shift-share analysis. For example, the shift of low-productivity and low-skilled agricultural labour into industry leads to an increase in the average productivity in agriculture. In the shift-share analysis, this increase in agricultural labour productivity is included in the intra-industry productivity growth effect, but in fact was caused by labour shift. This may lead to an underestimation of shift effects. Productivity levels may be dependent also on the quality of labour. If labour shifts towards industries with higher productivity due to higher labour skills, shift effects include improved labour quality which results in the overestimation of shift effects.

The results of the decomposition by industries are presented in Table 3 in the annex. The dynamic shift effect at the manufacturing sector level was found to be negligible. Therefore, dynamic effects arising from individual industries are not important and are not presented in the table. Rather, the sum of the static and dynamic shift effects is presented as total shift effects for each industry. Panel A in Table 3 in the annex presents the results as raw figures by industries and Panel B presents the percentage contributions of each industry to intra-industry productivity and total shift effects.

Table 1: Sources of Labour Productivity in Manufacturing (Average annual percentage changes)

	1970-1979	**1980-1988**	**1989-1994**	**1995-2000**	**1970-2000**
Aggregate labour productivity growth rate	1.63	5.46	7.16	2.69	4.09
of which;					
Intra-industry productivity growth	1.15 (70.6 %)	5.78 (105.9 %)	7.67 (107.1 %)	3.51 (130.5 %)	4.63 (113.2 %)
Static shift effect	0.50 (30.7 %)	-0.31 (-5.7 %)	-0.50 (-7.0 %)	-0.80 (-29.7 %)	-0.48 (-11.7 %)
Dynamic shift effect	-0.02 (-1.3 %)	-0.01 (-0.2 %)	-0.01 (-0.1 %)	-0.02 (-0.8 %)	-0.06 (-1.5 %)

Source: Author's calculations.
Note: The numbers in brackets refer to percentages of aggregate labour productivity growth rate.

The sign and magnitude of the intra-industry productivity growth and total shift effects by each industry presented in Table 3 in the annex have important implications for industrialisation strategies. Under different industrialisation strategies in different periods, certain key industries were promoted. The effectiveness of each strategy in stimulating the transfer of labour from less productive to highly productive industries is crucially important in industrial development. It is important to investigate the contribution of those key industries to intra-industry productivity growth and the total shift effect in the manufacturing sector in each period. For the import substitution period (1970-79), those key industries are the capital-goods-producing industries which the government protected and nurtured, namely chemicals, rubber and plastics, non-metallic minerals, basic metals (i.e. iron and steel), metal products, non-electrical and electrical machinery, and transport equipment industries. In the export-orientation and liberalisation periods (i.e. 1980-88 and 1989-94), the key industries are the main export industries which were subject to the government's extensive direct export

price subsidies such as food, textiles, clothing, chemicals, refined oil products, basic metals, and non-electrical machinery industries. The shifts of labour to and from the key industries during the relevant periods are important in understanding the direction of the industrialisation path in Turkey.

Intra-industry productivity growth may be interpreted as an indicator for characterising the industries as leaders and followers in labour productivity growth. A leading industry may be thought of as one with large intra-industry productivity growth. Similarly, a following industry may be one with very low or negative intra-industry productivity growth. During the import-substitution era (1970-79), much of the intra-industry productivity growth resulted from key import-substitute industries except the basic metals industry. Textiles, chemicals and transport equipment industries stand out as major leaders in labour productivity. During both the first stage (1980-88) and the second stage of export orientation (1989-94), key export industries contributed largely to the intra-industry productivity growth. It is also worth noting that the contributions of the heavy industries (metals, machinery and equipment industries) to the intra-industry productivity growth increased largely from the first period of export orientation (1980-88) to the second period (1989-94). During the instability period (1995-2000), a major leading industry appears to be textiles, electrical machinery, and transport equipment industry with their relatively larger contributions to the intra-industry productivity growth.

Total shift effects by industry are also presented in Table 3 in the annex. In the period 1970-79, textiles, non-metallic minerals, basic metals, and electrical machinery industries (all of which are key industries in this period) have significantly large and positive contributions to total shift effects. In this period, the sum of total shift effects accounts for about 30 percent of aggregate labour productivity growth, i.e. the shifts of labour across industries led to a higher aggregate labour productivity growth rate than could be obtained by individual industries without such shifts. It is evident from Table 3 in the annex that much of the total shift effects result from import-substitute industries. The negative total shift effects of some import substitute industries (rubber and plastics, metal products and non-electrical machinery) are remarkable.

In the period 1980-88, all industries have negligibly small contributions to total shift effects. In the period 1989-94, on the other

hand, food, non-metallic minerals and basic metals industries had significantly large contributions to total shift effects. The contributions of the key export industries in the period 1989-94 are various. Note that the sum of total shift effects amounts to minus 5.9 percent and minus 7.1 percent of aggregate labour productivity in the 1980-88 and 1989-94 periods, respectively (see Table 1 above). It is evident from the figures in Table 3 in the annex that the negative impacts of labour reallocations involving textiles and heavy industries suppressed the positive shift effects in both periods. In this sense, the contributions of individual industries to total shift effects should not be deemed as significant to aggregate labour productivity.

Significant contributions to total shift effects came from food, clothing and printing industries in the 1995-2000 period. However, the negative shift effects from textiles and heavy industries excluding the basic metals industry (i.e. iron and steel manufactures) sum up to a highly negative figure bringing down the sum of total shift effects to a negative figure.

The negative figures for total shift effects in the post-1980 era in Table 1 above suggest that throughout the process of restructuring and structural adjustment that aimed at liberalisation and the enhancement of outward orientation, a shift of labour from the less productive industries to more productive ones did not take place in the Turkish manufacturing sector.[3] This implies the bidding of labour away from productive industries to other industries in the manufacturing sector or to the other segments of the economy. It is obvious from Tables A. 2 and A. 4 in the annex that the employment shares of the heavy and chemical industries where the growth rate of labour productivity was higher than others did not increase in this era. Traditional manufacturing industries such as food, textiles and clothing succeeded in maintaining their shares in manufacturing employment over the restructuring process. While these primary industries established themselves as main export industries in the post-1980 era, their relatively low productivity growth rates (compared to

[3] Voyvoda and Yeldan (2000) argue that during the export-orientation era, real investment levels of the manufacturing industries (including that of export industries) declined and the growth rate of real investment in manufacturing sector was only 2.1 percent between 1983 and 1987. This, they argue, is one of the main reasons for the failure of export-oriented strategy which was not accompanied by the required resource accumulation.

heavy and chemical industries) at the same time suggest that exposure to competition by way of increasing openness did not stimulate improvements in labour skills quality. Improving labour quality is important for enhancing international competitiveness. This finding supports the argument by Kepenek and Yentürk (2000, p. 364) that export expansion in this period was based on artificial cost reductions through the extensive use of government subsidies on export prices. Under such circumstances, an export-oriented development strategy cannot be expected to be successful.

In case there are shifts of labour from industries with low productivity growth rates to those with high ones, an extra source for aggregate productivity growth will be created ("bonus" as named by Timmer and Szirmai, 2000), i.e. apart from the productivity growth rates within each industry, aggregate labour productivity will increase by an interaction of industries by means of labour shifts. In this case, one can expect more job creation and wage rises in the industries with high productivity growth. However, it is found here that such a shift did not happen in Turkey. One possible reason is the lack of labour skills required by those industries whose productivity growth rates are high. In this regard, training of labour and improving the general quality of the labour force (e.g. by an improved education system) gain much importance.

4. CONCLUDING REMARKS

This paper quantifies the impacts of the shifts of labour across manufacturing industries on aggregate labour productivity in manufacturing under different industrialisation strategies of the Turkish government in different periods after 1970. This has been done by employing the conventional shift-share method. The impact of the shifts of labour on aggregate manufacturing labour productivity is found to be positive during the import-substitution era (until 1980) and negative in the post-1980 structural adjustment and export orientation era.

Previous research in development economics literature has emphasised the positive role of the shifts of labour from less productive to more productive areas as a positive factor for productivity. This study shows that prior to 1980, the government's import-substitution type of industrialisation strategy realised such a gain to some extent. The replacement of this policy with an export-oriented one after 1980,

accompanied by large-scale liberalisation and structural adjustment reforms, did not bring about the desired shifts of resources towards high-productivity activities. Moreover, the shifts of labour across manufacturing industries acted as a negative factor for aggregate labour productivity.

A full assessment of industrialisation strategies of the Turkish government in the past is beyond the scope of this study, but an important conclusion can be drawn. The reallocations of labour across manufacturing industries during the course of liberalisation first in international trade in the early 1980s and later in capital flows from the late 1980s onwards were not incorporated with shifts of labour towards industries that used labour more efficiently. In this sense, there is a need to improve labour quality, e.g. by formal education and training of labour in order not only to meet the demands for such labour by those industries with faster productivity growth (typically the industries operating with upper-end technologies such as heavy and chemical industries), but also to stimulate the shifts of labour towards such industries. Then, induced allocations of labour are expected to enhance aggregate labour productivity growth so that greater benefits can be reaped from industrial development.

REFERENCES

Beebe, Jack and Jane Haltmaier (1980). "An Intersectoral Analysis of the Secular Productivity Slowdown," *Federal Reserve Bank of San Francisco Economic Review*, Fall 1980, pp. 7-28.

Fagerberg, Jan (2000). "Technological Progress, Structural Change and Productivity Growth: A Comparative Study," *Structural Change and Economic Dynamics* vol. 11, pp. 393-411.

Jalava, Jukka, S. Heikkinen, and R. Hjerppe (2002). "Technology and Structural Change: Productivity in the Finnish Manufacturing Industries, 1925-2000", paper presented at *XIII Economic History Congress*, Buenos Aires, 28 June 2002.

Kepenek, Yakup and Nurhan Yentürk (2000). *Türkiye Ekonomisi* [Turkish Economy], Remzi Kitabevi (in Turkish).

Kılıçaslan, Yılmaz and Erol Taymaz (2004). "Structural Change, Productivity and Competitiveness in MENA Countries," paper presented at the *ERF 11th Annual Conference*, Beirut, Lebanon, December 14-16, 2005.

Salter, W. E. G. (1960). *Productivity and Technical Change*, University of Cambridge Department of Applied Economics Monographs, Cambridge University Press.

Syrquin, Moshe (1984). "Resource Reallocation and Productivity Growth," in Moshe Syrquin, Lance Taylor, and Larry E. Westphal (eds.), *Economic Structure and Performance – Essays in Honor of Hollis B. Chenery*. Orlando, Florida: Academic Press, pp. 75-101.

Syrquin, Moshe (1986). "Productivity Growth and Factor Reallocation," in Hollis Chenery, Sherman Robinson, and Moshe Syrquin (eds.), *Industrialization and Growth: A Comparative Study*, Oxford University Press (for the World Bank), pp. 229-262.

Syrquin, Moshe (1995). "Patterns of Structural Change," in H. Chenery and T.N. Srinivasan, (eds.), *Handbook of Development Economics, Volume 1*. Elsevier, pp. 203-273.

Timmer, Marcel P. and A. Szirmai (2000). "Productivity Growth in Asian Manufacturing: The Structural Bonus Hypothesis Examined," *Structural Change and Economic Dynamics* vol. 11, pp. 371-392.

Van Ark, Bart and M. Timmer (2003). "Asia's Productivity Performance and Potential: The Contribution of Sectors and Structural Change," paper presented at the conference *Leading East Asia in the 21st Century*, Tokyo, 30 May 2003.

Voyvoda, Ebru and A. Erinç Yeldan (1999). "Patterns of Productivity Growth and the Wage Cycle in Turkish Manufacturing," paper presented at *METU Economic Research Conference III*, Ankara, September 1999.

ANNEX

Table A.1: Composition of Value-Added in Manufacturing
(Percent of total)

	1970	1975	1980	1983	1985	1988	1990	1994	1997	2000
Food	12.7	10.5	10.9	8.5	9.3	8.4	8.8	10.0	9.3	9.7
Beverages	3.7	3.1	3.1	2.8	3.2	2.7	3.1	2.6	1.8	1.9
Tobacco	9.8	7.9	4.3	7.8	8.4	5.3	4.0	2.2	1.4	1.5
Textiles	13.8	12.9	14.2	12.3	12.3	11.5	11.2	12.5	12.2	11.6
Clothing	0.7	1.4	1.1	2.0	2.0	3.3	3.7	4.8	5.6	6.0
Wood	0.9	1.2	1.1	0.9	0.6	0.7	0.6	0.5	0.6	0.7
Furniture	0.1	0.2	0.1	0.2	0.5	0.3	0.3	0.4	0.7	1.1
Paper	2.6	2.3	1.9	1.9	2.3	1.8	1.9	1.9	1.3	1.1
Printing	1.9	1.4	0.9	1.4	1.3	1.2	1.5	2.0	1.8	2.0
Chemicals	6.5	9.2	10.2	7.2	8.1	13.0	9.9	11.0	10.0	11.1
Petroleum	15.2	15.9	14.5	20.5	15.9	13.0	17.3	12.5	15.3	13.1
Rubber and plastics	2.8	2.3	3.0	2.3	2.2	2.7	2.7	3.4	3.7	4.2
Non-metallic minerals	5.2	5.0	6.8	6.1	6.7	7.7	8.2	7.6	6.9	7.5
Basic metals	10.7	9.0	9.9	8.3	8.8	10.5	6.9	9.3	6.7	6.9
Metal products	4.5	3.5	3.6	3.0	3.3	3.1	3.1	2.9	3.6	3.1
Non-electrical machinery	4.0	4.7	4.7	4.2	4.4	4.4	4.9	4.8	4.5	5.1
Electrical machinery	1.4	3.4	4.3	4.2	5.1	4.7	5.1	5.0	4.8	5.8
Transport equipment	2.8	5.8	5.0	5.9	5.1	5.3	6.0	6.1	8.9	6.6
Others	0.5	0.4	0.3	0.4	0.6	0.4	0.6	0.6	1.0	1.2

Source: *UNIDO Yearbook of Industrial Statistics*, various issues.

Table A.2: Labour productivity growth rates by industry
(Average annual percentage changes)

	1970-1979	1980-1988	1989-1994	1995-2000	1970-2000
Food	-1.8	5.6	5.3	0.0	2.7
Beverages	-2.3	6.3	5.1	-0.1	2.7
Tobacco	-6.3	16.2	-1.2	0.0	1.7
Textiles	2.6	2.9	10.9	1.8	3.5
Clothing	-0.6	5.0	8.5	-0.9	1.8
Wood	0.6	0.0	2.9	2.8	3.2
Furniture	3.6	9.2	7.1	2.3	4.5
Paper	-6.2	2.4	5.0	-0.3	-1.0
Printing	-4.1	4.8	13.0	1.3	2.6
Chemicals	5.4	9.8	8.3	0.9	5.4
Petroleum	-17.6	10.1	3.0	0.4	-0.8
Rubber and plastics	0.4	6.5	8.3	0.8	2.8
Non-metallic minerals	0.7	6.0	9.7	0.7	4.8
Basic metals	-4.4	7.5	11.5	1.0	2.4
Metal products	2.1	5.3	7.6	1.0	3.8
Non-electrical machinery	-2.7	6.9	16.8	0.7	3.8
Electrical machinery	3.2	6.3	16.4	1.8	6.9
Transport equipment	5.3	7.2	15.0	1.4	7.1
Others	-5.2	4.4	9.2	2.1	3.4

Source: Author's own calculations using the data whose the sources are explained in the text.

Table A.3: Industrial Contributions to Components of Aggregate Labour Productivity Growth

	Intra-industry productivity				Total shift effects			
	1970-1979	1980-1988	1989-1994	1995-2000	1970-1979	1980-1988	1989-1994	1995-2000
A. Sources of intra-industry productivity growth and total shift effects by industry								
Food	-0.28	1.13	0.81	0.01	0.45	0.47	3.69	2.06
Beverages	0.05	0.14	0.06	-0.01	-0.43	-0.03	0.02	0.34
Tobacco	-0.02	0.64	0.10	0.00	-5.23	0.00	0.85	0.69
Textiles	0.37	0.66	1.51	1.38	2.29	-0.06	-1.05	-3.72
Clothing	0.02	0.17	0.36	-0.33	0.60	0.12	-1.07	1.12
Wood	0.04	-0.03	0.11	0.12	-0.83	0.04	0.57	0.00
Furniture	0.02	0.02	0.04	0.11	-0.10	-0.02	-0.51	-0.86
Paper	-0.11	0.01	0.08	-0.01	0.09	-0.07	0.23	0.49
Printing	-0.04	0.03	0.07	0.07	-0.33	0.05	-0.17	2.47
Chemicals	0.41	0.39	0.54	0.23	0.24	-0.15	1.16	0.53
Petroleum	-0.09	0.09	0.06	0.03	0.17	-0.15	0.01	0.66
Rubber and plastics	0.06	0.11	0.23	0.12	-1.58	0.15	-0.89	-1.09
Non-metallic minerals	0.38	0.60	0.58	0.22	3.00	-0.04	3.44	-0.13
Basic metals	-0.46	0.43	0.72	0.26	5.92	-0.15	1.01	2.74
Metal products	0.22	0.26	0.33	0.18	-3.41	-0.05	-1.37	-1.42
Non-electrical machinery	-0.06	0.40	0.58	0.16	-1.87	-0.07	-0.59	-2.05
Electrical machinery	0.21	0.32	0.53	0.41	2.18	-0.02	-0.16	-0.80
Transport equipment	0.47	0.40	0.82	0.45	-0.44	-0.29	-5.10	-1.28
Others	-0.03	0.04	0.12	0.11	-0.22	-0.06	-0.58	-0.57
TOTAL	1.15	5.78	7.67	3.51	0.48	-0.33	-0.51	-0.82
B. Percentage contributions by industry (percent of total)								
	1970-1979	1980-1988	1989-1994	1995-2000	1970-1979	1980-1988	1989-1994	1995-2000
Food	-24.3	19.6	10.6	0.3	93.8	-142.4	-723.5	-251.2
Beverages	4.3	2.4	0.8	-0.3	-89.6	9.1	-3.9	-41.5
Tobacco	-1.7	11.1	1.3	0.0	-1089.6	0.0	-166.7	-84.1
Textiles	32.2	11.4	19.7	39.3	477.1	18.2	205.9	453.7
Clothing	1.7	2.9	4.7	-9.4	125.0	-36.4	209.8	-136.6
Wood	3.5	-0.5	1.4	3.4	-172.9	-12.1	-111.8	0.0
Furniture	1.7	0.3	0.5	3.1	-20.8	6.1	100.0	104.9
Paper	-9.6	0.2	1.0	-0.3	18.8	21.2	-45.1	-59.8
Printing	-3.5	0.5	0.9	2.0	-68.8	-15.2	33.3	-301.2
Chemicals	35.7	6.7	7.0	6.6	50.0	45.5	-227.5	-64.6
Petroleum	-7.8	1.6	0.8	0.9	35.4	45.5	-2.0	-80.5
Rubber and plastics	5.2	1.9	3.0	3.4	-329.2	-45.5	174.5	132.9
Non-metallic minerals	33.0	10.4	7.6	6.3	625.0	12.1	-674.5	15.9
Basic metals	-40.0	7.4	9.4	7.4	1233.3	45.5	-198.0	-334.1
Metal products	19.1	4.5	4.3	5.1	-710.4	15.2	268.6	173.2
Non-electrical machinery	-5.2	6.9	7.6	4.6	-389.6	21.2	115.7	250.0
Electrical machinery	18.3	5.5	6.9	11.7	454.2	6.1	31.4	97.6
Transport equipment	40.9	6.9	10.7	12.8	-91.7	87.9	1000.0	156.1
Others	-2.6	0.7	1.6	3.1	-45.8	18.2	113.7	69.5
TOTAL	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source: Author's calculations.

Table A.4: Composition of Employment in Manufacturing
(Percent of total)

	1970	1975	1980	1983	1985	1988	1990	1994	1997	2000
Food	15.5	14.2	15.6	13.9	14.1	13.5	13.4	14.1	12.8	12.7
Beverages	2.0	1.7	1.5	1.5	1.4	1.4	1.4	1.2	1.0	1.1
Tobacco	6.9	5.5	6.7	5.9	5.1	3.6	3.3	2.9	2.0	1.4
Textiles	25.9	21.7	21.0	21.8	20.9	20.4	20.5	20.1	23.0	20.1
Clothing	1.6	2.7	2.5	3.8	4.7	7.5	8.9	11.1	12.8	15.0
Wood	1.8	1.8	1.7	1.6	1.6	1.5	1.4	1.5	1.2	1.0
Furniture	0.3	0.6	0.4	0.4	0.5	0.5	0.5	0.8	1.2	2.0
Paper	2.4	2.3	2.3	2.4	2.5	2.2	2.2	2.1	1.8	2.0
Printing	1.9	1.4	1.3	1.3	1.3	1.5	1.4	1.5	1.2	1.1
Chemicals	6.0	5.8	5.5	5.8	6.3	6.0	6.1	5.4	5.1	5.2
Petroleum	0.4	0.7	1.3	1.4	1.0	0.9	1.0	1.1	0.9	0.6
Rubber and plastics	2.9	3.1	2.8	2.4	2.3	2.8	2.9	3.2	3.7	3.8
Non-metallic minerals	7.3	7.2	7.5	7.3	8.0	8.3	7.7	7.0	6.6	6.5
Basic metals	6.2	9.2	9.4	9.3	9.2	9.0	8.5	6.8	5.1	5.6
Metal products	7.0	5.0	4.6	4.7	4.4	4.3	4.2	4.4	5.1	4.7
Non-electrical machinery	4.1	6.0	6.0	6.1	5.8	5.7	5.3	5.2	5.0	6.5
Electrical machinery	2.0	3.7	3.9	4.2	4.4	4.5	4.8	4.3	4.6	4.8
Transport equipment	5.9	7.4	6.0	6.3	6.6	6.3	6.5	7.1	7.0	5.9
Others	0.5	0.8	0.6	0.8	0.8	0.9	1.0	1.1	1.3	1.2

Source: *OECD Industrial Structure Database.*