Efficiency Differences between Turkish and German Companies Operating in Germany

Prof. Dr. Nurhan Aydın
Anadolu University,
Yunusemre Campus, Faculty of Economics and Administrative Sciences,
26470 Eskisehir, Turkey.

Assist. Prof. Dr. Metin Coskun
Anadolu University,
Yunusemre Campus, Faculty of Economics and Administrative Sciences,
26470 Eskisehir, Turkey.

Dr. Arda Surmeli
Research Assist., Anadolu University,
Yunusemre Campus, Faculty of Economics and Administrative Sciences,
26470 Eskisehir, Turkey.

Gulsah Kulalı
Research Assist., Anadolu University,
Yunusemre Campus, Faculty of Economics and Administrative Sciences,
26470 Eskisehir, Turkey.

ABSTRACT

Considering efficiency as a key factor for competitive advantage in domestic and foreign markets, it is important to constitute the current efficiency of firms and to determine needed steps to take forward for enhancement. This study executes it for non-financial German and Turkish firms in Germany for 2007. 2007 was chosen as the year, which contains the most data and represents a normal period without any financial or economic crisis. Results of Data Envelopment Analysis infer that the efficiency ratios of Turkish enterprises in service sector calculated by constant returns to scale approach are lower than that of German enterprises but ratios calculated by variable return to scale approach catch those of German enterprises, suggesting that Turkish enterprises cannot benefit from economies of scale. On the other hand, Turkish enterprises have superior efficiency results over German enterprises in manufacturing sector.

Keywords: Efficiency, Data Envelopment Analysis, Foreign Firms
JEL Classification: D24, R15, F23

1. Introduction

Efficiency is one of the key issues on which firms mostly focus on since it is a fundamental in realization of company targets and providing sustainable growth. The factors affecting efficiency, as well as degree of these effects, can reveal significant differences according to countries, sectors, partnership structure, cultural properties etc. Moreover, entrepreneurs with different background characteristics in capabilities, value systems etc. have effects on the operating efficiency of firms.

The purpose of this study is to determine and calculate the relative efficiency of Turkish and German firms active in the service and manufacturing sectors operating in Germany, to compare the results and to expose necessary changes need to be done in inputs and outputs in order inefficient firms to become efficient.

There is an important indication about the organization of the paper that readers should consider that *Technical Efficiency Scores and Scale Efficiency Scores* as well as *Efficiency Distributions and Descriptive Statistics* of German and Turkish firms operating in service and manufacturing industry could have a place in tables, whereas *Reference Set and Reference Intensity Coefficients, Target Input Amounts and Enhancement Rates as well as Target Output Amounts and Enhancement Rates* could have a place in 'Appendix' part. The significant results of these tables are explained in the main text. Whole tables can be achieved by Appendix part of the journal. Furthermore, the corresponding author if required can provide the firm list by e-mail.

2. Literature

It is not possible for firms to increase their profit and realize value maximization unless efficiency and productivity are achieved. In this context, as parallel to efficiency and performance analysis, a number of studies have been performed to determine which factors affect efficiency and performance and how they affect them. In addition to different results found in different countries, it is seen that sectorial, administrative, geographical, cultural differences as well as differences in capital structure affect company efficiency and performance in different ways, even in the same country. The results of studies on the efficiency of local and foreign firms in Germany and different countries are given below.

2.1. Studies Performed in Germany

Jungnickel and Keller (2003) determined that foreign firms in Germany have an advantage over local firms in productivity, but they do not have the same advantage over foreign-owned and Germany-based multinational firms active in Germany. Furthermore, they reported that foreign owned firms active in Germany are in need of a skilled work force more than that of German firms.

Lehman, Warning and Weigand (2004) stated that profitability differences among firms can be explained by company efficiency. It is observed that this result is valid even after sectorial differences and unobservable systematic effects are checked.

Arnold and Hussinger (2006) listed firms according to the factor productivity and concluded that the exporting German firms were more productive than firms active in the local market. On the other hand, multinational German firms were more productive than both exporting German firms and firms which are active in the local market.

Temouri, Driffield and Higon (2008) found that national German firms were less productive than foreign-owned firms whereas there was no productivity difference between international German firms and foreign firms. The main emphasis here is on productivity difference playing an important role in whether firms are national or international rather than local or foreign. Other important conclusions of their study were that there is a significant relationship between productivity and the region where firms are located; firms located in the East were less productive than those located in West.

In their study, Fryges and Wagner (2008) reported that the profitability of exporting manufacturing firms was higher than non-exporting ones. They found that the causality was not from profitability towards export but from export towards profitability.

2.2. Studies Performed in Other Countries

In their studies, Pfaffermayr and Bellak (2000) found that there are performance differences among local firms (which are not multinational) and foreign firms. However, there are only marginal performance differences among multinational local firms and foreign firms. Moreover, they concluded that German firms had no significant differences to other foreign firms.

Bechetti and Santoro (2001) found that variables, which largely explain the decision of small and medium-sized enterprises on opening a sales office outside the base country, are: size of the enterprise, firm age and commitment to consortium. Furthermore, a significant and strong positive correlation was found between the decision to open a sales office abroad and productivity. The last important conclusion of the study was towards ownership structure of the firms and their productivity. On one hand they concluded that productivity increases as ownership intensity increases, on the other hand the productivity of small and medium-sized enterprises is limited since less investment is made on activities having high risks as ownership intensity increases.

Dimelis and Louri (2004) stated that the firms in Greece in which foreign investors have more shares were doing more productive than other firms. This effect was valid only for large firms having a foreign capital of 51% or more. They determined that the firms benefitted from spillover effect and positive externalities were largely achieved by local small-sized enterprises. Furthermore, they concluded that the firms performing technology transfer and providing more positive externalities were foreign-owned local small-sized enterprises.

Beccali (2004) who aimed to compare cost efficiency of British and İtalian investment firms between 1995 and 1998 reported that British firms were more efficient in terms of abroad business capabilities, and British firms were more efficient than Italian firms even in Italy.

In their study concerning 1.272 Italian firms Bottaso and Sembenelli (2004) determined that foreign-owned multinational partnerships were more efficient than the reference group whereas publicly owned partnerships were found to be less efficient. However, no significant difference was found among private-owned independent local firms and private-owned underlying firms.

Zheka (2005), who investigated the effects of ownership structures and quality levels of institutional governance on Farrell efficiency, determined that the most efficient Ukrainian firms were locally owned ones. The researcher observed that foreign-owned firms were relatively inefficient, but being foreign-owned had a positive significant effect on institutional governance quality. In addition, the researcher thought that ownership intensity develops efficiency and this reflects country specific factors. Finally, the researcher determined that institutional governance quality has a significant positive effect on the efficiency of locally owned firms.

Banfratello and Sembenelli (2005) found that foreign firms in Italy were more efficient than local ones and this was not causal. In other words, the reason foreign firms were more efficient than local ones is not because they are foreign firms but it might be due to reasons such as they are operating in a technology-intensive sector or they are new firms. It was observed that only US-based multinational firms were more efficient than other foreign firms in Italy. It was stated that European and non-Europe firms were less efficient in competition and asset transfer.

Demirbag, Tatoglu, Glaister and Zaim (2010) concluded that Turkish firms operating in Turkey were more efficient than British firms in strategic decision-making. While Turkish firms provide efficiency by focusing on the management of environmental factors, British firms provide it by focusing on organizational structure. Similarly, different factors were pronounced as inefficiency reasons for firms of both countries.

3. Data and Methodology

3.1. Data

According to Deutsche Bank 2007 data, there are total of 3.036.600 active firms in Germany of which 2.997.800 are micro and small-sized, 30.000 are medium-sized and 8.800 are large-sized enterprises. According to Turkey Research Centre Foundation data, there are 70.300 Turkish enterprises active in Germany. It is estimated that almost 92% of Turkish enterprises are micro and small-sized. In this study, a total of 112 enterprises were investigated; 13 micro-sized enterprises - 6 Turkish, 7 German; 52 small-sized enterprises – 29 Turkish, 23 German; 27 medium-sized enterprises – 12 Turkish and 15 German; 20 large-sized enterprises – 9 Turkish and 11 German. The selection of 112 enterprises is explained in detail in Data Envelopment Analysis – Selection of Decision Making Units (DMUs) subsection.

Financial data in the study were obtained from Dafne database of Bureau Van Dijk Electronic Publishing. Dafne Data base is a reliable database containing comparative financial and non-financial data belonging to almost 950.000 private and public enterprises operating in Germany. As a result of studies performed in the database 2007 was chosen as the year, which contains the most data and represents a normal period without any financial or economic crisis.

3.2. Methodology

In this study, Data Envelopment Analysis (DEA) is utilized in the determination of company efficiency. Since financial accounts needed to calculate efficiency ratios concerning the use of company assets could not be definitively obtained, company efficiency was measured by DEA, and since all 112 enterprises within the sample of the study is not included in stock exchange, the ratios used in measuring the market performance of firms were not included in the study.

Data Envelopment Analysis is a non-parametric measurement technique used to measure the relative productive efficiency of decision making units in cases where there exist many input and output and where these inputs and outputs are not transformed into an aggregate total input or output. In this study, a variable yield, output-oriented DEA model was preferred in which multi stage linear programming was utilized.

Necessary Steps for DEA

The four steps necessary for the application of DEA are: selection of DMUs, selection of input and output sets to be used in DAE, relative efficiency measurement by DEA, detailed analysis of each DMU and interpretation of results, respectively.

1st step: Selection of DMUs

In this study, DMUs were determined as: firms with German capital and either enterprises with Turkish capital or Turkish originated companies actively operating in Germany. First, enterprises with Turkish origin, which can be included in the study, were determined. Following this step, German enterprises resembling firms with Turkish origin in terms of sectorial classification, geographical

location and size of assets were determined. As a result, comparable homogeneous two groups could be achieved.

2nd step: Selection of Input and Output Sets to be used in DEA

It was aimed to select inputs and outputs to be used in the analysis in a way that they are causally dependent on production process and can represent the process best, and it was decided that it would be suitable to use financial statements in the analysis. The financial statements of 112 DMUs concerning the year 2007 obtained from Bureau Van Dijk Dafne Database were used to form the financial ratios to be used in input and output sets. Six inputs were determined which will provide information on use and distribution of assets and sources in the input set. These six inputs are: "Current Assets/Total Assets", "Fixed Assets/Total Assets", "Foreign Assets/Total Assets", "Shareholder's Equity/Total Assets", "Personnel Cost/Total Assets" and "Material Cost/Total Assets".

The four outputs selected to provide information on revenue-generation strength of DMUs, profitability, interest and depreciation policies. They are "Total Revenue/Total Assets", "Net Profit/Net Sales", "EBIDTA/Net Sales" and "EBIDTA/Shareholder's Equity", respectively.

4. Analysis Results

In order to significantly measure the efficiency of DMUs resembling each other in terms of products or services they produced, 112 DMUs in the sample were divided into two sub-groups as 87 DMUs in the service sector and 25 DMUs in the manufacturing sector, and DEA was applied to these groups separately.

3rd step:

4.1. Relative Efficiency Measurements of DMUs Operating in Service Sector

Technical efficiency scores and scale efficiency scores of 87 DMUs in the Service sector are given in **Table 1** and efficiency distributions and descriptive statistics of DMUs in service sector under different approaches are given in **Table 2.**

Relative Technical Efficiency Measurement under CRS Approach:

As the technical scores of 87 DMUs active in the service sector are examined, it can be deduced that 35 DMUs are operated as fully efficient under constant returns to scale approach, whereas 52 DMUs are not. Seventeen of the fully efficient 35 DMUs have Turkish origin while the rest are German. Twenty-seven out of 52 DMUs, which are not efficient, have Turkish origin whereas the remaining 25 have German origin.

Average relative efficiency score of DMUs having Turkish origin active in this sector was calculated as 91.70%, whereas the least relative efficiency score and standard deviation were calculated as 52.00% and 11.62%, respectively. Average relative efficiency score of DMUs having German origin; the least relative efficiency score and standard deviation were calculated as 92.59%, 67.70% and 9.04%, respectively.

Technical Efficiency Measurement under VRS Approach:

As the relative technical efficiency scores of 87 DMUs in the service sector were calculated under the variable return to scale approach, it can be said that 43 DMUs are fully efficient while the other 44 DMUs are not. Twenty-one of fully efficient 43 DMUs have Turkish origin while the rest are German. Twenty-three out of 44 DMUs, which are not efficient, have Turkish origin whereas the remaining 21 have German origin.

Average relative efficiency score of DMUs having Turkish origin active in the service sector was calculated as 94.76%, whereas the least relative efficiency score and standard deviation were calculated as 75.20% and 7.00%, respectively. Average relative efficiency scores of DMUs having German origin, the least relative efficiency score and standard deviation were calculated as 93.86%, 73.10% and 8.11%, respectively.

Relative Scale Efficiency Measurement:

Two different components of technical efficiency scores obtained by the CRS approach in DEA are scale efficiency and DMU-specific technical efficiency. If there is a difference between technical efficiency scores obtained under the CRS and VRS approaches, this result shows that DMU has scale inefficiency. In order to calculate the scale efficiency of a DMU, its VRS efficiency score divides the CRS efficiency score of that specific DMU.

When relative scale efficiency scores of 87 DMUs active in the service sector are examined, it can be seen that 44 DMUs are fully efficient while the other 43 DMUs are not. Twenty-two of fully efficient 44 DMUs have Turkish origin while the rest are German. Twenty-two out of 43 DMUs that are not efficient have Turkish origin whereas the remaining 21 have German origin.

The average relative scale efficiency score of DMUs having Turkish origin active in service sector was calculated as 96.69%, whereas the least relative scale efficiency score and standard deviation were calculated as 55.50% and 8.90%, respectively. Average relative scale efficiency scores of DMUs having German origin; the least relative scale efficiency score and standard deviation of the series were calculated as 98.57%, 89.20% and 2.86%, relatively.

German DMUs have superiority over Turkish DMUs in terms of both descriptive statistics concerning relative efficiency scores, and the number of DMUs that are fully efficient, which are not fully efficient and the number of DMUs in the last quartile. However, in the VRS approach, which shows lean technical efficiency of a DMU, Turkish DMUs caught up with German DMUs in terms of the number of DMUs which are fully efficient, which are not fully efficient and the number of DMUs in the last quartile, and they revealed a higher performance than German DMUs in terms of descriptive statistics concerning efficiency scores.

When assessed in terms of scale efficiency, which is found by dividing the CRS efficiency score by the VRS efficiency score, Turkish DMUs and German DMUs are very close to each other in terms of the number of DMUs which are fully efficient, which are not fully efficient and the number of DMUs in the last quarter. However, in terms of statistics concerning efficiency scores, German DMUs have higher performances than Turkish DMUs.

When 87 DMUs are examined, though Turkish DMUs have superiorities over German DMUs in terms of lean efficiency, Turkish DMUs incur losses since they cannot benefit from economies of scale as German DMUs do, and accordingly the scale inefficiencies of Turkish DMUs are higher than those of German DMUs. It is considered that Turkish DMUs must certainly increase the economies of scale to catch German DMUs as it is observed from the average efficiency scores.

4.2. Relative Efficiency Measurements of DMUs Operating in Manufacturing Sector

Relative technical efficiency and scale efficiency scores of DMUs in the manufacturing sector are presented in **Table 3** and efficiency distributions and descriptive statistics of DMUs in manufacturing sector under different approaches are presented in **Table 4.**

Relative Efficiency Measurement under CRS Approach:

As the technical scores of 25 DMUs active in the manufacturing sector are examined, it can be seen that 18 DMUs are operated as fully efficient under constant returns to scale approach, whereas 7 DMUs are inefficient.

Ten of the fully efficient 18 DMUs have Turkish origin while the rest are German. Two out of 7 DMUs that are not efficient have Turkish origin whereas five have German origin.

The average relative efficiency score of DMUs having Turkish origin active in this sector was calculated as 97.12%, whereas the least relative efficiency score and standard deviation were calculated as 73.20% and 7.76%, respectively. Average relative efficiency scores of DMUs having German origin; the least relative efficiency score and standard deviation were calculated as 94.28%, 68.80% and 10.00%, relatively.

It is assumed that the whole of the calculated average inefficiency ratio (4.36%) for DMUs in the manufacturing sector, under constant returns to scale approach, are the technical inefficiency of DMUs.

Technical Efficiency Measurement under VRS Approach:

When the relative technical efficiency scores of 25 DMUs in the manufacturing sector calculated under a variable return to the scale approach, it can be said that 20 DMUs are fully efficient while the other five DMUs are not.

Eleven of the fully efficient 20 DMUs have Turkish origin while the remaining nine have German origin. One out of 5 DMUs, which are not efficient, had Turkish origin whereas the remaining four have German origin.

The average relative efficiency score of DMUs having Turkish origin active in the manufacturing sector was calculated as 97.77%, whereas the least relative efficiency score and standard deviation were calculated as 73.20% and 7.74%, respectively. The average relative efficiency score of DMUs having German origin, the least relative efficiency score and standard deviation were calculated as 97.00%, 69.70% and 8.35%, relatively.

The whole of the average inefficiency ratio (2.32%), which is cleared of scale efficiency and assumed as the lean technical efficiency score of DMU, refers to technical inefficiencies independent from the scales of DMUs.

Relative Scale Efficiency Measurement:

When the relative scale efficiency scores of 25 DMUs active in manufacturing sector are examined, it can be seen that 20 DMUs are fully efficient while the other five DMUs are not. Although the results here are equal to the number of DMUs in the VRS approach which are fully efficient and not fully efficient, as the DMUs are examined in detail it can be said that two DMUs (T10m and A42m) which

were efficient in the VRS approach had no scale efficiency whereas two inefficient DMUs (T31m and A6m) under the VRS approach had scale efficiency.

Eleven of fully efficient 20 DMUs have Turkish origin while nine are German. One out of five DMUs, which are not efficient, are of Turkish origin whereas the remaining four are of German origin.

The average relative scale efficiency score of DMUs having Turkish origin active in the manufacturing sector was calculated as 99.35%, whereas the least relative scale efficiency score and standard deviation were calculated as 92.20% and 2.25%, respectively. The average relative scale efficiency score of DMUs having German origin, the least relative scale efficiency score and standard deviation of the series were calculated as 96.82%, 82.40% and 6.40%, relatively.

As the revenues of the DMUs that are not operated on an optimal economic scale are examined according to scale it was found that these DMUs have increasing returns to scale (IRS) similar to the case in the service sector. While these DMUs active in the manufacturing sector the increase in their outputs will be higher than that in their inputs in case they provide an increase in their inputs.

As 25 DMUs active in the manufacturing sector are examined, it is possible to say that Turkish and German DMUs benefit from a scale economy in similar size since there are not big differences in the CRS, VRS and Scale efficiency scores of DMUs.

4th step:

4.3. Detailed analysis of DMUs and Evaluation of Results

In this section, reference sets and reference intensity coefficients of DMUs which are not fully efficient in the service and manufacturing sectors were calculated under the VRS approach and accordingly, the target amount of inputs and outputs of DMUs were determined. It should be noted that target amounts of input and outputs are calculated by using DMU-specific efficiency values. In other words, it is free from economies of scale.

Detailed Analysis of DMUs in Service Sector and Evaluation of Results

The reference sets and reference intensity coefficients of DMUs, which are active in the service sector and are not fully efficient, are given in **Table 5** and **Table 6** in the Appendix for Turkish and German DMUs, respectively. The target amounts of input and output of a DMU which is not fully-efficient, is the linear combination of current input and output amounts of fully efficient DMUs in reference set and the intensity values of these DMUs. This linear combination can be formulated for the "A1h" coded DMU as:

$$A1h(I_{T1}:I_{T6}) = \lambda_{T34h}T34h(I_1:I_6) + \lambda_{A24h}A24h(I_1:I_6) + \lambda_{A48h}A48h(I_1:I_6) + \lambda_{A15h}A15h(I_1:I_6) + \lambda_{A27h}A27h(I_1:I_6) + \lambda_{A22h}A22h(I_1:I_6) + \lambda_{T41h}T41h(I_1:I_6)$$

$$A1h(O_{T1}:O_{T6}) = \lambda_{T34h}T34h(O_1:O_6) + \lambda_{A24h}A24h(O_1:O_6) + \lambda_{A48h}A48h(O_1:O_6) + \lambda_{A15h}A15h(O_1:O_6) + \lambda_{A27h}A27h(O_1:O_6) + \lambda_{A22h}A22h(O_1:O_6) + \lambda_{T41h}T41h(O_1:O_6)$$

Where; I=input, O=output, A=German company, T=Turkish company and h=service industry.

From this linear equation, target input and output amounts calculated for DMUs which are not fully efficient, and corresponding enhancement rates which is needed to be realized in inputs and outputs of DMUs which are not fully efficient to become fully efficient are given in **Table 7** to **Table 10** in the Appendix.

The general suggestions for the Turkish and German DMUs which are in the service sector and not fully efficient can be summarized as follows: in order to become fully efficient, Turkish DMUs should decrease input number 3 (Foreign Assets/Total Assets) by 6%, whereas they should increase output number 1 (Total Revenue/Total Assets) by 12.2%, output number 2 (Net Profit/Net Sales) by 237%, output number 3 (EBIDTA/Sales) by 176%, and output number 4 (EBIDTA/Shareholder's Equity) by 148%.

In order to become fully efficient, German DMUs should decrease input number 3 (Foreign Assets/Total Assets) by 4%, and input number 5 (Personnel Cost/Total Assets) by 2% whereas they should increase output number 1 (Total Revenue/Total Assets) by 15.2%, output number 2 (Net Profit/Net Sales) by 246.3%, output number 3 (EBIDTA/Sales) by 417%, and output number 4 (EBIDTA/Shareholder's Equity) by 148%.

Detailed Analysis of DMUs in Manufacturing Sector and Evaluation of Results

Under the VRS approach, the reference sets, reference intensity coefficients, target inputs and outputs of DMUs, which are active in the service sector are given in **Table 11** to **Table 16** in the Appendix. When these tables are examined, it can be seen that as in the service sector under the VRS approach, the amounts of target input and current input amount as well as target output and current output amounts are same for fully efficient DMUs in manufacturing sector. For example, in order to make the efficiency score of 73%, "T31ü" coded Turkish DMU should increase; output number 1 (Total Revenue/Total Assets) by 37.3%, output number 3 (EBIDTA/Net Sales) by 37 and output number 4 (EBIDTA/Shareholder's Equity) by approximately 45%.

General suggestions for German DMUs can be summarized as follows: in order to become fully-efficient German DMUs which are not fully-efficient should decrease input number 5 (Personnel Cost/Total Assets) by almost 3% and input number 6 (Material Cost/Total Assets) by 11% whereas they should increase output number 1 (Total Revenue/Total Assets) by 12%, output number 2 (Net Profit/Net Sales) by 162%, output number 3 (EBIDTA/Sales) almost 2.5 times and output number 4 (EBIDTA/Shareholder's Equity) by almost 9.5 times.

5. Conclusion and Recommendations

Small and medium-sized enterprises (SMEs) shape the German economy as they do in the whole world. Although SMEs face more problems than large enterprises it has been observed that they can cope up with these problems and grow rapidly even in increasing competitive environment. German SMEs are usually run by their owners, chasing cost decreasing measures, trying to develop innovative and creative products, following newly growing markets and they largely contribute to country's economy especially in employment, tax and trading volume. On the other hand, the population is becoming older as in other European countries. While 25% of German population is over 60 years old, it is only 5% for Turkish people living in Germany. This brings the problem of a decrease in youth population which will steer business world. Concerning the overcoming of this strategically important problem, politicians have been attempting to attract new investments, as well as developing new policies towards migrants having high birth rate and high entrepreneurship capabilities, are open to taking risks, young, and dynamic.

The biggest migrant group is comprised of Turkish people in Germany, which is one of the countries in Europe accommodating the highest number of migrants. The contributions of Turkish migrants, who celebrate the 50th year of their migration this year, to the German economy both as consumer and

investor are at levels which cannot be ignored. Today, although most of the firms founded by Turkish entrepreneurs whose number is about 70.000 they have been being successful not only in Germany but also in other European countries. Moreover, Turkish enterprises in Turkey have also run business in Germany via subsidiary firms or branches.

While efficiencies of the firms are assessed by this study, it is also attempted to present how firms could increase their efficiencies. It is considered that the study will be useful for both the current firms and for the potential entrepreneurs.

As a result of efficiency analysis, as the efficiency ratios of Turkish enterprises in service sector calculated by constant returns to scale assumption are lower than that of German enterprises, the efficiency ratios of Turkish enterprises calculated by variable return to scale approach catch those of German enterprises and thus suggest that Turkish enterprises in the service sector cannot benefit from economies of scale. Efficiency of Turkish enterprises will increase as they move towards expanding their market. It is observed that Turkish enterprises have superior efficiency results over German enterprises in manufacturing sector. Eleven (55.00%) of the 20 fully efficient enterprises have Turkish origin whereas nine (%45) are of German origin. One (%20) out of five enterprises, which are not fully efficient, has Turkish origin while four (%80) have German origin. In comparison to German enterprises, processing a more efficient activity in the manufacturing sector is an important achievement for Turkish enterprises as migrant entrepreneurs.

The amount of return per unit risk and output amount against their inputs by Turkish enterprises in the service sector is low. In order to provide a balance between risk and return, and to attain an efficient level, the main requirement for Turkish enterprises in the service sector is to increase their revenues. This can be achieved not only by addressing the ethnic market but also the entire market. It can be expected that the profitability of these enterprises will increase, thus efficiency and the balance between risk and return is achieved in case these enterprises are able to increase their revenues. Further study may be conducted to find out ways to access the entire foreign markets and to gain a competitive advantage in these markets.

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Appendix: Table 1 to Table 16

Table 1. Technical Efficiency Scores and Scale Efficiency Scores of DMUs in Service Sector

Firm Code	Techical. Efficiency (CRS)	Technical Efficiency (VRS)	Scale Efficiency	Return to Scale	Firm Code	Technical Efficiency (CRS)	Technical Efficiency (VRS)	Scale Efficiency	Return to Scale
T16s	52.00%	77.30%	67.30%	IRS	T29s	96.30%	96.60%	99.70%	IRS
T17s	55.50%	**100.00%**	55.50%	IRS	G35s	96.80%	96.80%	**100.00%**	-
G16s	67.70%	75.30%	89.90%	IRS	T52s	97.20%	97.30%	99.90%	IRS
G43s	69.50%	73.10%	95.00%	IRS	T55s	97.20%	**100.00%**	97.20%	IRS
T4s	72.20%	81.40%	88.70%	IRS	G51s	97.30%	**100.00%**	97.30%	IRS
T9s	74.40%	75.20%	99.00%	IRS	G18s	97.70%	97.80%	99.90%	IRS
T43s	76.10%	76.80%	99.00%	IRS	G41s	98.70%	99.10%	99.60%	IRS
T15s	76.70%	**100.00%**	76.70%	IRS	T22s	99.70%	99.90%	99.80%	IRS
G53s	76.80%	85.00%	90.40%	IRS	G12s	**100.00%**	**100.00%**	**100.00%**	-
G14s	77.80%	78.10%	99.60%	IRS	G15s	**100.00%**	**100.00%**	**100.00%**	-
G20s	79.00%	80.30%	98.40%	IRS	G17s	**100.00%**	**100.00%**	**100.00%**	-
G10s	80.30%	80.30%	**100.00%**	-	G22s	**100.00%**	**100.00%**	**100.00%**	-
T27s	80.70%	80.80%	**100.00%**	-	G23s	**100.00%**	**100.00%**	**100.00%**	-
T20s	81.50%	81.50%	**100.00%**	-	G24s	**100.00%**	**100.00%**	**100.00%**	-
G19s	81.70%	82.90%	98.50%	IRS	G27s	**100.00%**	**100.00%**	**100.00%**	-
T3s	81.90%	83.30%	98.40%	IRS	G29s	**100.00%**	**100.00%**	**100.00%**	-
G36s	82.80%	83.10%	99.60%	IRS	G31s	**100.00%**	**100.00%**	**100.00%**	-
G46s	86.10%	89.60%	96.10%	IRS	G34s	**100.00%**	**100.00%**	**100.00%**	-
G44s	87.20%	87.20%	**100.00%**	-	G37s	**100.00%**	**100.00%**	**100.00%**	-
T2s	87.60%	87.60%	**100.00%**	-	G38s	**100.00%**	**100.00%**	**100.00%**	-
G13s	87.70%	87.90%	99.80%	IRS	G39s	**100.00%**	**100.00%**	**100.00%**	-
T26s	87.70%	87.90%	99.80%	IRS	G4s	**100.00%**	**100.00%**	**100.00%**	-
G28s	88.20%	89.20%	98.90%	IRS	G45s	**100.00%**	**100.00%**	**100.00%**	-
G3s	88.50%	89.10%	99.30%	IRS	G48s	**100.00%**	**100.00%**	**100.00%**	-
T46s	88.50%	90.80%	97.50%	IRS	G50s	**100.00%**	**100.00%**	**100.00%**	-
G54s	89.20%	**100.00%**	89.20%	IRS	G55s	**100.00%**	**100.00%**	**100.00%**	-
T28s	89.60%	94.40%	94.90%	IRS	T19s	**100.00%**	**100.00%**	**100.00%**	-
G52s	89.70%	90.70%	98.90%	IRS	T21s	**100.00%**	**100.00%**	**100.00%**	-
T8s	89.70%	**100.00%**	89.70%	IRS	T23s	**100.00%**	**100.00%**	**100.00%**	-
G40s	89.80%	89.80%	**100.00%**	-	T24s	**100.00%**	**100.00%**	**100.00%**	-
G25s	92.50%	92.50%	99.90%	IRS	T32s	**100.00%**	**100.00%**	**100.00%**	-
G2s	92.70%	93.20%	99.50%	IRS	T33s	**100.00%**	**100.00%**	**100.00%**	-
T18s	92.70%	94.10%	98.60%	IRS	T34s	**100.00%**	**100.00%**	**100.00%**	-
T25s	93.10%	94.00%	99.00%	IRS	T36s	**100.00%**	**100.00%**	**100.00%**	-
T38s	93.30%	93.50%	99.80%	IRS	T37s	**100.00%**	**100.00%**	**100.00%**	-
T39s	93.80%	93.90%	**100.00%**	-	T41s	**100.00%**	**100.00%**	**100.00%**	-
T45s	93.90%	93.90%	**100.00%**	-	T44s	**100.00%**	**100.00%**	**100.00%**	-
G11s	93.90%	**100.00%**	93.90%	IRS	T48s	**100.00%**	**100.00%**	**100.00%**	-

G33s	94.70%	**100.00%**	94.70%	IRS	T49s	**100.00%**	**100.00%**	**100.00%**	-
G1s	95.00%	95.00%	99.90%	IRS	T5s	**100.00%**	**100.00%**	**100.00%**	-
T53s	95.20%	97.40%	97.70%	IRS	T56s	**100.00%**	**100.00%**	**100.00%**	-
T50s	96.10%	98.30%	97.70%	IRS	T6s	**100.00%**	**100.00%**	**100.00%**	-
T51s	96.20%	96.60%	99.60%	IRS	T7s	**100.00%**	**100.00%**	**100.00%**	-
T35s	96.20%	97.10%	99.00%	IRS	**AVERAGE**	**92.14%**	**94.32%**	**97.62%**	

Table 2. Efficiency Distributions and Descriptive Statistics of DMUs in the Service Sector under Different Approaches

	Number of Fully Efficient DMUs		**Number of DMUs Not Fully Efficient**		**Number of DMUs in Last Quartile**	
	Turkish DMUs	German DMUs	Turkish DMUs	German DMUs	Turkish DMUs	German DMUs
Technical Efficiency (CRS)	17	18	27	25	11	11
Technical Efficiency (VRS)	21	22	23	21	9	13
Scale Efficiency	22	22	22	21	10	12
	Mean Value		**Minimum Value**		**Standard Deviation**	
	Turkish DMUs	German DMUs	Turkish DMUs	German DMUs	Turkish DMUs	German DMUs
Technical Efficiency (CRS)	91.70%	92.59%	52.00%	67.70%	11.62%	9.04%
Technical Efficiency (VRS)	94.76%	93.86%	75.20%	73.10%	7.00%	8.11%
Scale Efficiency	96.69%	98.57%	55.50%	89.20%	8.90%	2.86%

Table 3. Technical Efficiency Scores and Scale Efficiency Scores of DMUs in Manufacturing Sector

Firm Code	Technical Efficiency(CRS)	Technical Efficiency(VRS)	Scale Efficiency	Return to Scale
G56m	68.80%	69.70%	98.70%	IRS
T31m	73.20%	73.20%	**100.00%**	-
G42m	82.40%	100.00%	82.40%	IRS
G7m	82.60%	99.00%	83.30%	IRS
T10m	92.20%	100.00%	92.20%	IRS
G9m	94.20%	99.90%	94.30%	IRS
G6m	97.60%	97.60%	**100.00%**	-
G21m	**100.00%**	**100.00%**	**100.00%**	-
G26m	**100.00%**	**100.00%**	**100.00%**	-
G30m	**100.00%**	**100.00%**	**100.00%**	-
G32m	**100.00%**	**100.00%**	**100.00%**	-
G47m	**100.00%**	**100.00%**	**100.00%**	-
G49m	**100.00%**	**100.00%**	**100.00%**	-
G5m	**100.00%**	**100.00%**	**100.00%**	-
G8m	**100.00%**	**100.00%**	**100.00%**	-
T11m	**100.00%**	**100.00%**	**100.00%**	-
T12m	**100.00%**	**100.00%**	**100.00%**	-
T13m	**100.00%**	**100.00%**	**100.00%**	-
T14m	**100.00%**	**100.00%**	**100.00%**	-
T1m	**100.00%**	**100.00%**	**100.00%**	-
T30m	**100.00%**	**100.00%**	**100.00%**	-
T40m	**100.00%**	**100.00%**	**100.00%**	-
T42m	**100.00%**	**100.00%**	**100.00%**	-
T47m	**100.00%**	**100.00%**	**100.00%**	-
T54m	**100.00%**	**100.00%**	**100.00%**	-
AVERAGE	95.64%	97.58%	98.04%	

Table 4. Efficiency Distributions and Descriptive Statistics of DMUs in Manufacturing Sector under Different Approaches

	Number of Fully Efficient DMUs		**Number of DMUs Not Fully Efficient**		**Number of DMUs in Last Quartile**	
	Turkish DMUs	German DMUs	Turkish DMUs	German DMUs	Turkish DMUs	German DMUs
Technical Efficiency (CRS)	10	8	2	5	-	-
Technical Efficiency (VRS)	11	9	1	4	-	-
Scale Efficiency	11	9	1	4	-	-
	Mean Value		**Minimum Value**		**Standard Deviation**	
	Turkish DMUs	German DMUs	Turkish DMUs	German DMUs	Turkish DMUs	German DMUs
Technical Efficiency (CRS)	97.12%	94.28%	73.20%	68.80%	7.86%	10.00%
Technical Efficiency (VRS)	97.77%	97.40%	73.20%	69.70%	7.74%	8.35%
Scale Efficiency	99.35%	96.82%	92.20%	82.40%	2.25%	6.40%

Table 5. Reference Set and Reference Intensity Coefficients of Turkish DMUs in Service Sector

DMU	Reference set and Intensity Coefficients							DMU	Reference set and Intensity Coefficients						
T16s	T36s 0.1750	T41s 0.1330	T6s 0.2590	G34s 0.3210	T37s 0.1120			T38s	G17s 0.2000	G50s 0.3040	T5s 0.0990	G15s 0.1600	T33s 0.2370		
T17s	T17s **1.0000**							T39s	T41s 0.0250	G22s 0.0190	G27s 0.3380	G15s 0.1300	G48s 0.2010	G24s 0.0070	T34s 0.2800
T18s	T34s 0.2780	G48s 0.0010	T36s 0.4620	T7s 0.2070	G15s 0.0520			T4s	G54s 0.1850	G31s 0.3250	G23s 0.1170	T41s 0.2200	G12s 0.1530		
T19s	T19s **1.0000**							T41s	T41s **1.0000**						
T2s	G50s 0.1820	G37s 0.0090	G12s 0.1060	T49s 0.2240	G15s 0.4790			T43s	G15s 0.2360	G22s 0.0020	T41s 0.0310	T7s 0.2770	G23s 0.4530		
T20s	G45s 0.0400	G15s 0.2420	G38s 0.0260	G48s 0.0260	T49s 0.3940	G22s 0.0980	G4s 0.1740	T44s	T44s **1.0000**						
T21s	T21s **1.0000**							T45s	T48s 0.2070	G15s 0.3950	G27s 0.0010	T24s 0.1560	G17s 0.2420		
T22s	G23s 0.0800	G22s 0.0300	T7s 0.4140	G12s 0.2190	G48s 0.2570			T46s	T48s 0.2070	G15s 0.3950	G27s 0.0010	T24s 0.1560	G17s 0.2420		
T23s	T23s **1.0000**							T48s	T48s **1.0000**						
T24s	T24s **1.0000**							T49s	T49s **1.0000**						
T25s	T24s 0.0670	G55s 0.2560	G27s 0.1350	G48s 0.3910	G22s 0.1510			T5s	T5s **1.0000**						
T26s	T7s 0.2310	T6s 0.0230	G27s 0.2860	G15s 0.4030	G17s 0.0380	T41s 0.0210		T50s	T5s 0.4370	T41s 0.0000	T44s 0.0440	T55s 0.2230	T7s 0.0560	T36s 0.1130	T34s 0.1260
T27s	T19s 0.0250	G17s 0.0330	G15s 0.8370	T41s 0.0250	T33s 0.0020	G22s 0.0770		T51s	G23s 0.0390	G15s 0.1020	T48s 0.0430	G48s 0.5770	T7s 0.2390		
T28s	T6s 0.2950	G55s 0.0620	T48s 0.1060	G15s 0.0490	T37s 0.0710	G48s 0.4160		T52s	G15s 0.1040	G17s 0.3470	T5s 0.2700	T7s 0.1160	T34s 0.1080	G27s 0.0550	
T29s	T36s 0.0150	T7s 0.1070	T55s 0.2000	G27s 0.4470	G48s 0.2310			T53s	G15s 0.1040	G17s 0.3470	T5s 0.2700	T7s 0.1160	T34s 0.1080	G27s 0.0550	
T3s	G15s 0.1140	T5s 0.2460	T7s 0.1180	T33s 0.5110	G17s 0.0100			T55s	T55s **1.0000**						
T32s	T32s **1.0000**							T56s	T56s **1.0000**						
T33s	T33s **1.000**							T6s	T6s **1.00**						

	0						**00**						
T34s	T34s **1.000** **0**					T7s	T7s **1.00** **00**						
T35s	T33s 0.208 0	G15s 0.29 60	T5s 0.18 10	G17s 0.06 50	T7s 0.25 00	T8s	T8s **1.00** **00**						
T36s	T36s **1.000** **0**					T9s	T7s 0.66 50	T41s 0.00 70	T6s 0.00 30	T44s 0.14 80	T55s 0.16 10	T34s 0.01 60
T37s	T37s **1.000** **0**												

G_s : German service sector firm, T_s : Turkish service sector firm

Table 6. Reference Set and Reference Intensity Coefficients of German DMUs in Service Sector

DMU	Reference set and Intensity Coefficients							DMU	Reference set and Intensity Coefficients					
G1s	T34s	G24s	G48s	G15s	G27s	G22s	T41s	G33s	G33s					
	0.2950	0.0160	0.4540	0.0290	0.0190	0.1490	0.0390		**1.0000**					
G10s	G45s	T49s	G4s	G48s	G15s			G34s	G34s					
	0.2120	0.3910	0.0790	0.1110	0.2080				**1.0000**					
G11s	G11s							G35s	G17s	T19s	G15s	T32s	T48s	
	1.0000								0.264	0.2340	0.1450	0.1940	0.1620	
G12s	G12s							G36s	T48s	G27s	G48s	G15s	T24s	
	1.0000								0.2580	0.0850	0.1340	0.5050	0.0190	
G13s	T7s	T6s	G27s	G15s	G17s	T41s		G37s	G37s					
	0.2310	0.0230	0.2860	0.4030	0.0380	0.0210			**1.0000**					
G14s	G22s	G48s	T7s	G23s	G15s			G38s	G38s					
	0.0490	0.2240	0.4340	0.1540	0.1390				**1.0000**					
G15s	G15s							G39s	G39s					
	1.0000								**1.0000**					
G16s	T6s	G15s	T41s	T15s	T56s			G4s	G4s					
	0.4310	0.0050	0.3050	0.0940	0.1650				**1.0000**					
G17s	G17s							G40s	G27s	T48s	G15s	G22s	G17s	
	1.0000								0.0680	0.2380	0.4880	0.0180	0.1890	
G18s	T7s	G15s	T5s	G27s	T34s	G17s		G41s	G50s	T5s	G15s	G39s	G12s	
	0.0710	0.0530	0.1720	0.5660	0.0430	0.0950			0.3980	0.2730	0.0350	0.2360	0.0580	
G19s	T7s	G51s	T36s	G15s	T41s	G48s		G43s	G50s	T5s	G15s	G39s	G12s	
	0.2930	0.2350	0.2840	0.1550	0.0120	0.0220			0.3980	0.2730	0.0350	0.2360	0.0580	
G2s	G17s	G15s	T7s	T5s	T41s	T34s		G44s	T41s	G48s	G15s	G22s	G27s	G23s
	0.1190	0.3310	0.0340	0.3070	0.1020	0.1080			0.0070	0.2220	0.3100	0.2900	0.1420	0.0290
G20s	T7s	T36s	G23s	G12s	G48s			G45s	G45s					
	0.2120	0.0940	0.3210	0.1370	0.2360				**1.0000**					
G22s	G22s							G46s	G48s	G15s	G23s	T48s	T7s	
	1.0000								0.1030	0.0360	0.6340	0.2100	0.0180	
G23s	G23s							G48s	G48s					
	1.0000								**1.0000**					
G24s	G24s							G50s	G50s					
	1.0000								**1.0000**					
G25s	T41s	G23s	G22s	G12s	G29s			G51s	G51s					
	0.1170	0.2320	0.4810	0.0170	0.1530				**1.0000**					

G27s	G27s							G52s	G24s	T41s	T36s	G15s	G12s	G48s
	1.0000								0.3950	0.0420	0.3030	0.1130	0.1420	0.0050
G28s	G31s	T56s	T15s	G15s				G53s	T36s	G23s	T41s	T6s	G17s	
	0.0740	0.1010	0.1890	0.6370					0.1500	0.4880	0.3410	0.0180	0.0040	
G29s	G29s							G54s	G54s					
	1.0000								**1.0000**					
G3s	G15s	T48s	G48s	G27s	T24s			G55s	G55s					
	0.1280	0.3500	0.4770	0.0210	0.0240				**1.0000**					
G31s	G31s							T15s	T15s					
	1.0000								**1.0000**					

G_s : German service sector firm, T_s : Turkish service sector firm

Table 7. Target Input Amounts and Enhancement Rates of Turkish DMUs in Service Sector

DMU	TE (VRS)	Target Input Amount						Current Input Amount						Enhancement Rate					
		Input 1	Input 2	Input 3	Input 4	Input 5	Input 6	Input 1	Input 2	Input 3	Input 4	Input 5	Input 6	Input 1	Input 2	Input 3	Input 4	Input 5	Input 6
T15s	**100.00%**	0.103	0.897	0.134	0.866	0.071	0.334	0.103	0.897	0.134	0.866	0.071	0.334						
T16s	77.30%	0.403	0.598	0.689	0.311	0.090	0.428	0.403	0.598	0.689	0.311	0.090	0.428	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
T17s	**100.00%**	0.370	0.630	1.079	0.280	0.024	0.169	0.370	0.630	1.079	0.280	0.023	0.169						
T18s	94.10%	0.919	0.081	0.908	0.091	0.142	2.350	0.919	0.081	0.908	0.091	0.142	2.350	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
T19s	**100.00%**	0.934	0.066	0.646	0.354	1.173	7.000	0.935	0.066	0.646	0.354	1.173	7.000						
T2s	87.60%	0.975	0.025	0.812	0.280	0.367	3.696	0.975	0.025	1.498	0.280	0.367	3.696	0.00%	0.00%	-45.81%	0.00%	0.00%	0.00%
T20s	81.50%	0.843	0.157	1.023	0.280	0.468	2.300	0.843	0.157	1.126	0.280	0.468	2.300	0.00%	0.00%	-9.18%	0.00%	0.00%	0.00%
T21s	**100.00%**	0.984	0.016	1.020	0.280	0.165	2.922	0.984	0.016	1.019	0.280	0.165	2.922						
T22s	99.90%	0.839	0.161	0.855	0.145	0.470	1.751	0.839	0.161	0.855	0.145	0.470	1.751	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
T23s	**100.00%**	0.996	0.004	1.263	0.280	0.135	4.821	0.996	0.004	1.263	0.280	0.135	4.821						
T24s	**100.00%**	0.441	0.559	0.855	0.145	0.267	5.983	0.441	0.559	0.855	0.145	0.267	5.983						
T25s	94.00%	0.774	0.226	0.949	0.051	0.545	3.800	0.774	0.226	0.949	0.051	0.545	3.800	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
T26s	87.90%	0.859	0.141	0.738	0.262	0.259	5.974	0.859	0.141	0.738	0.262	0.259	5.974	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
T27s	80.80%	0.946	0.054	0.621	0.379	0.429	6.058	0.946	0.054	0.621	0.379	0.429	6.058	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
T28s	94.40%	0.598	0.402	0.868	0.132	0.351	2.357	0.598	0.402	0.868	0.132	0.351	2.357	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
T29s	96.60%	0.871	0.129	0.939	0.062	0.296	5.392	0.871	0.129	0.939	0.062	0.296	5.392	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
T3s	83.30%	0.953	0.047	0.720	0.280	0.095	3.075	0.953	0.047	1.163	0.280	0.095	3.075	0.00%	0.00%	-38.12%	0.00%	0.00%	0.00%
T32s	**100.00%**	0.924	0.076	0.617	0.383	0.630	14.870	0.924	0.076	0.617	0.383	0.630	14.870						
T33s	**100.00%**	0.984	0.016	0.619	0.381	0.036	2.096	0.984	0.016	0.619	0.381	0.037	2.097						
T34s	**100.00%**	0.945	0.055	0.957	0.043	0.205	5.252	0.945	0.055	0.958	0.043	0.205	5.252						
T35s	97.10%	0.913	0.087	0.720	0.280	0.158	4.445	0.913	0.087	1.345	0.280	0.158	4.445	0.00%	0.00%	-46.48%	0.00%	0.00%	0.00%
T36s	**100.0**	0.9	0.0	0.9	0.0	0.1	0.6	0.9	0.0	0.9	0.0	0.1	0.6						

	0%	78	22	98	03	09	38	78	22	98	03	09	38						
T37s	**100.00%**	0.438	0.563	0.839	0.161	0.305	0.037	0.438	0.563	0.839	0.161	0.305	0.037						
T38s	93.50%	0.975	0.025	0.799	0.201	0.144	6.415	0.975	0.025	0.799	0.201	0.144	6.415	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
T39s	93.90%	0.911	0.089	0.898	0.102	0.340	6.088	0.911	0.089	0.898	0.102	0.340	6.088	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
T4s	81.40%	0.852	0.148	0.594	0.406	0.428	0.758	0.852	0.148	0.594	0.406	0.428	0.758	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
T41s	**100.00%**	0.783	0.217	0.462	0.538	0.069	0.992	0.783	0.217	0.462	0.538	0.069	0.992						
T43s	76.80%	0.728	0.272	0.712	0.288	0.360	1.865	0.728	0.272	0.712	0.288	0.360	1.865	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
T44s	**100.00%**	0.542	0.458	0.886	0.114	0.043	6.156	0.542	0.458	0.886	0.114	0.043	6.156						
T45s	93.90%	0.789	0.211	0.743	0.257	0.400	8.402	0.789	0.211	0.743	0.257	0.400	8.402	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
T46s	90.80%	0.879	0.121	0.919	0.081	0.160	1.455	0.879	0.121	0.919	0.081	0.160	1.455	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
T48s	**100.00%**	0.560	0.440	0.763	0.237	0.857	3.353	0.560	0.440	0.763	0.237	0.857	3.353						
T49s	**100.00%**	0.986	0.014	1.111	0.280	0.362	0.673	0.986	0.014	1.111	0.280	0.362	0.674						
T5s	**100.00%**	0.990	0.009	0.983	0.017	0.113	3.987	0.991	0.010	0.983	0.017	0.113	3.987						
T50s	98.30%	0.925	0.075	0.960	0.040	0.123	3.313	0.925	0.075	0.960	0.040	0.123	3.313	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
T51s	96.60%	0.855	0.145	0.857	0.143	0.364	3.095	0.855	0.145	0.857	0.143	0.364	3.095	0.00%	0.00%	0.00%	0.00%	0.00%	**0.00%**
T52s	97.30%	0.928	0.072	0.882	0.118	0.199	9.274	0.928	0.072	0.882	0.118	0.199	9.274	0.00%	0.00%	0.00%	0.00%	0.00%	**0.00%**
T53s	97.40%	0.994	0.006	0.900	0.100	0.177	2.679	0.994	0.006	0.900	0.100	0.177	2.679	0.00%	0.00%	0.00%	0.00%	0.00%	**0.00%**
T55s	**100.00%**	0.881	0.119	0.972	0.028	0.131	2.176	0.881	0.119	0.972	0.028	0.131	2.176						
T56s	**100.00%**	0.218	0.782	0.424	0.576	0.873	0.659	0.218	0.782	0.424	0.576	0.873	0.659						
T6s	**100.00%**	0.154	0.846	0.796	0.204	0.093	0.659	0.154	0.846	0.796	0.204	0.093	0.659						
T7s	**100.00%**	0.742	0.258	0.724	0.276	0.088	1.369	0.742	0.258	0.724	0.276	0.088	1.369						
T8s	**100.00%**	0.398	0.602	0.450	0.550	0.512	0.383	0.398	0.602	0.450	0.550	0.512	0.383						
T9s	75.20%	0.737	0.263	0.790	0.210	0.090	2.267	0.737	0.263	0.790	0.210	0.090	2.267	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
										Turkish DMUs, Average				**0.00%**	**0.00%**	**-6.07%**	**0.00%**	**0.00%**	**0.00%**
										General, Average				**0.00%**	**0.00%**	**-5.14%**	**0.00%**	**-1.13%**	**0.00%**

T_s : Turkish service sector firm, TE: Technical Efficiency, VRS: Variable return to Scale

Table 8. Target Input Amounts and Enhancement Rates of German DMUs in Service Sector

DMU	TE (VRS)	Target Input Amount						Current Input Amount						Enhancement Rate					
		Input 1	Input 2	Input 3	Input 4	Input 5	Input 6	Input 1	Input 2	Input 3	Input 4	Input 5	Input 6	Input 1	Input 2	Input 3	Input 4	Input 5	Input 6
G1s	95.00%	0.923	0.077	0.927	0.073	0.532	4.155	0.923	0.077	0.927	0.073	0.532	4.155	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
G10s	80.30%	0.875	0.125	1.369	0.280	0.316	1.910	0.875	0.125	1.461	0.280	0.316	1.910	0.00%	0.00%	-6.31%	0.00%	0.00%	0.00%
G11s	**100.00%**	0.976	0.024	1.232	0.280	0.054	2.006	0.976	0.023	1.232	0.280	0.054	2.006						
G12s	**100.00%**	1.000	0.000	0.984	0.016	1.029	0.726	1.000	0.000	0.984	0.016	1.029	0.726						
G13s	87.90%	0.859	0.141	0.738	0.262	0.259	5.974	0.859	0.141	0.738	0.262	0.259	5.974	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
G14s	78.10%	0.798	0.202	0.779	0.221	0.349	2.408	0.798	0.202	0.779	0.221	0.349	2.408	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
G15s	**100.00%**	0.955	0.045	0.586	0.414	0.310	5.904	1.000	0.000	0.984	0.016	1.029	0.726						
G16s	75.30%	0.355	0.645	0.569	0.431	0.214	0.754	0.355	0.645	0.569	0.431	0.214	0.754	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
G17s	**100.00%**	0.938	0.062	0.909	0.091	0.243	18.366	1.000	0.000	0.984	0.016	1.029	0.726						
G18s	97.80%	0.895	0.105	0.920	0.080	0.273	8.125	0.895	0.105	0.920	0.080	0.273	8.125	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
G19s	82.90%	0.901	0.099	0.840	0.160	0.180	1.869	0.901	0.099	0.840	0.160	0.180	1.869	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
G2s	93.20%	0.938	0.062	0.778	0.222	0.198	6.075	0.938	0.062	0.778	0.222	0.198	6.075	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
G20s	80.30%	0.796	0.204	0.864	0.137	0.454	1.313	0.796	0.204	0.864	0.137	0.454	1.313	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
G22s	**100.00%**	0.914	0.086	0.921	0.079	1.678	3.889	0.915	0.086	0.921	0.079	1.678	3.889						
G23s	**100.00%**	0.597	0.403	0.786	0.214	0.564	0.117	0.597	0.403	0.786	0.214	0.564	0.117						
G24s	**100.00%**	0.978	0.022	0.887	0.113	0.244	4.017	0.978	0.022	0.887	0.113	0.244	4.017						
G25s	92.50%	0.821	0.179	0.831	0.170	1.163	2.249	0.821	0.179	0.831	0.170	1.163	2.249	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
G27s	**100.00%**	0.868	0.132	0.956	0.044	0.352	8.939	0.868	0.132	0.956	0.044	0.352	8.939						
G28s	89.20%	0.713	0.287	0.458	0.542	0.319	3.964	0.713	0.287	0.458	0.542	0.637	3.964	0.00%	0.00%	0.00%	0.00%	-49.93%	0.00%
G29s	**100.00%**	0.878	0.122	0.880	0.120	1.303	1.450	0.878	0.122	0.880	0.120	1.303	1.450						
G3s	89.10%	0.787	0.213	0.846	0.154	0.562	3.930	0.787	0.213	0.846	0.154	0.562	3.930	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
G31s	**100.00%**	0.866	0.134	0.218	0.782	0.269	0.998	0.866	0.134	0.218	0.782	0.269	0.998						
G33s	**100.00%**	0.802	0.198	0.950	0.050	0.917	2.843	0.802	0.198	0.950	0.050	0.917	2.843						
G34s	**100.00%**	0.120	0.880	0.476	0.524	0.013	0.031	0.120	0.880	0.476	0.524	0.013	0.031						
G35s	96.80%	0.876	0.124	0.720	0.280	0.645	10.784	0.876	0.124	1.097	0.280	0.645	10.784	0.00%	0.00%	-34.38%	0.00%	0.00%	0.00%
G36s	83.10%	0.832	0.169	0.720	0.280	0.471	5.181	0.832	0.169	0.720	0.280	0.471	5.181	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
G37s	**100.00%**	1.000	0.000	1.204	0.280	1.445	10.687	1.000	0.000	1.204	0.280	1.445	10.687						

G38s	**100.00 %**	0.915	0.085	0.963	0.037	0.397	2.473	0.915	0.085	0.963	0.037	0.397	2.473						
G39s	**100.00 %**	1.000	0.000	0.598	0.402	0.202	9.263	1.000	0.000	0.598	0.402	0.202	9.263						
G4s	**100.00 %**	0.315	0.685	1.059	0.280	0.332	0.404	0.315	0.685	1.059	0.280	0.332	0.404						
G40s	89.80%	0.851	0.149	0.720	0.280	0.455	7.819	0.851	0.149	1.334	0.280	0.455	7.819	0.00%	0.00%	-46.04%	0.00%	0.00%	0.00%
G41s	99.10%	0.996	0.004	0.853	0.147	0.183	4.710	0.996	0.004	0.853	0.147	0.183	4.710	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
G43s	73.10%	0.625	0.375	0.769	0.231	0.295	1.296	0.625	0.375	0.769	0.231	0.295	1.296	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
G44s	87.20%	0.912	0.088	0.826	0.174	0.747	5.008	0.912	0.088	0.826	0.174	0.747	5.008	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
G45s	**100.00 %**	0.775	0.225	2.934	0.280	0.168	0.024	0.775	0.225	2.934	0.280	0.168	0.024						
G46s	89.60%	0.638	0.362	0.792	0.208	0.595	1.372	0.638	0.362	0.792	0.208	0.595	1.372	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
G48s	**100.00 %**	0.923	0.077	0.971	0.029	0.438	3.496	0.923	0.077	0.971	0.029	0.439	3.496						
G50s	**100.00 %**	0.999	0.001	0.919	0.081	0.086	2.987	0.999	0.001	0.919	0.081	0.086	2.987						
G51s	**100.00 %**	0.974	0.026	0.969	0.031	0.277	1.215	0.974	0.026	0.969	0.031	0.276	1.215						
G52s	90.70%	0.970	0.030	0.883	0.117	0.316	2.607	0.970	0.030	0.883	0.117	0.316	2.607	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
G53s	85.00%	0.711	0.289	0.708	0.292	0.318	0.580	0.711	0.289	0.708	0.292	0.318	0.580	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
G54s	**100.00 %**	0.951	0.050	0.966	0.034	0.549	0.493	0.951	0.050	0.966	0.034	0.549	0.493						
G55s	**100.00 %**	0.504	0.496	0.952	0.048	0.214	0.938	0.504	0.496	0.952	0.048	0.214	0.938						
										German DMUs, Average				**0.00%**	**0.00%**	**-4.13%**	**0.00%**	**-2.38%**	**0.00%**
										General, Average				**0.00%**	**0.00%**	**-5.14%**	**0.00%**	**-1.13%**	**0.00%**

G_s : German service sector firm, TE: Technical Efficiency, VRS: Variable return to Scale

Table 9. Target Output Amounts and Enhancement Rates of Turkish DMUs in Service Sector

DMU	TE (VRS)	Target Output Amount				Current Output Amount				Enhancement Rate			
		Output 1	Output 2	Output 3	Output 4	Output 1	Output 2	Output 3	Output 4	Output 1	Output 2	Output 3	Output 4
T15s	**100.00%**	0.522	0.000	0.000	0.000	0.522	0.000	0.000	0.000				
T16s	77.30%	0.940	0.089	0.201	1.122	0.727	0.014	0.090	0.197	29.30%	519.02%	122.11%	470.70%
T17s	**100.00%**	0.294	0.000	0.120	0.090	0.294	0.000	0.120	0.090				
T18s	94.10%	3.040	0.007	0.039	2.594	2.860	0.002	0.031	0.974	6.29%	262.82%	25.81%	166.32%
T19s	**100.00%**	9.481	0.017	0.025	0.670	9.481	0.017	0.025	0.670				
T2s	87.60%	5.344	0.000	0.000	0.000	4.682	0.000	0.000	0.000	14.14%			
T20s	81.50%	4.051	0.020	0.111	0.494	3.300	0.016	0.037	0.402	22.76%	25.00%	199.21%	22.89%
T21s	**100.00%**	3.825	0.059	0.061	0.818	3.825	0.059	0.061	0.818				
T22s	99.90%	3.065	0.015	0.055	1.026	3.065	0.010	0.046	0.944	0.00%	52.77%	19.57%	8.69%
T23s	**100.00%**	5.375	0.010	0.010	0.194	5.375	0.010	0.010	0.194				
T24s	**100.00%**	6.995	0.022	0.055	2.583	6.995	0.022	0.055	2.583				
T25s	94.00%	5.070	0.003	0.034	1.836	4.765	0.003	0.016	1.440	6.40%	0.00%	118.10%	27.50%
T26s	87.90%	7.644	0.010	0.032	1.066	6.717	0.006	0.028	0.727	13.80%	66.67%	14.29%	46.62%
T27s	80.80%	8.387	0.010	0.016	0.304	6.774	0.006	0.013	0.236	23.81%	66.67%	23.08%	28.81%
T28s	94.40%	3.471	0.032	0.097	1.169	3.278	0.009	0.045	1.104	5.89%	275.54%	114.74%	5.89%
T29s	96.60%	6.455	0.000	0.017	1.799	6.237	0.000	0.006	0.555	3.50%		208.79%	224.11%
T3s	83.30%	3.953	0.000	0.000	0.000	3.293	0.000	0.000	0.000	20.04%			
T32s	**100.00%**	16.144	0.012	0.020	0.862	16.144	0.012	0.020	0.862				
T33s	**100.00%**	2.835	0.085	0.140	1.044	2.835	0.085	0.140	1.044				
T34s	**100.00%**	5.991	0.023	0.034	4.721	5.991	0.023	0.034	4.721				
T35s	97.10%	5.705	0.018	0.046	0.462	5.542	0.003	0.011	0.217	2.94%	595.48%	313.00%	112.70%
T36s	**100.00%**	0.849	0.001	0.038	2.508	0.849	0.001	0.038	2.508				
T37s	**100.00%**	0.919	0.038	0.188	0.872	0.919	0.038	0.188	0.872				
T38s	93.50	7.165	0.023	0.039	0.618	6.697	0.002	0.006	0.204	6.99	1154.	534.9	202.6

	%									%	59%	2%	6%
T39s	93.90 %	7.379	0.016	0.025	2.516	6.926	0.015	0.023	1.565	6.54 %	6.67%	8.70 %	60.78 %
T4s	81.40 %	1.902	0.000	0.190	1.269	1.547	0.000	0.019	0.069	22.95 %		890.6 8%	1740. 34%
T41s	**100.0 0%**	2.670	0.293	0.369	1.814	2.670	0.293	0.369	1.814				
T43s	76.80 %	3.450	0.093	0.184	1.286	2.651	0.012	0.043	0.402	30.14 %	672.1 1%	325.7 7%	219.6 1%
T44s	**100.0 0%**	6.378	0.004	0.012	0.653	6.378	0.004	0.012	0.653				
T45s	93.90 %	10.02 2	0.011	0.028	1.070	9.409	0.006	0.013	0.488	6.52 %	98.58 %	109.2 9%	119.1 3%
T46s	90.80 %	2.130	0.000	0.000	0.000	1.935	0.000	0.000	0.000	10.08 %			
T48s	**100.0 0%**	5.352	0.028	0.077	1.710	5.352	0.028	0.077	1.710				
T49s	**100.0 0%**	2.006	0.000	0.000	0.000	2.006	0.000	0.000	0.000				
T5s	**100.0 0%**	4.284	0.000	0.000	0.000	4.284	0.000	0.000	0.000				
T50s	98.30 %	3.729	0.004	0.016	1.249	3.666	0.004	0.013	1.228	1.72 %	0.00%	23.08 %	1.71%
T51s	96.60 %	4.525	0.009	0.034	0.804	4.369	0.003	0.023	0.693	3.57 %	200.0 0%	47.83 %	16.02 %
T52s	97.30 %	10.04 0	0.004	0.014	1.121	9.767	0.004	0.011	0.795	2.80 %	0.00%	27.27 %	41.01 %
T53s	97.40 %	3.156	0.000	0.000	0.000	3.074	0.000	0.000	0.000	2.67 %			
T55s	**100.0 0%**	2.569	0.003	0.016	1.388	2.569	0.003	0.016	1.388				
T56s	**100.0 0%**	2.332	0.113	0.190	0.765	2.332	0.113	0.190	0.765				
T6s	**100.0 0%**	1.166	0.088	0.229	1.289	1.166	0.088	0.229	1.289				
T7s	**100.0 0%**	2.632	0.000	0.059	0.554	2.632	0.000	0.059	0.554				
T8s	**100.0 0%**	1.430	0.086	0.193	0.461	1.430	0.086	0.193	0.461				
T9s	75.20 %	3.228	0.004	0.048	0.781	2.426	0.003	0.015	0.174	33.06 %	33.33 %	217.7 5%	348.5 7%
								Turkish	**DMUs,**	**12.00 %**	**237.0 1%**	**176.0 0%**	**203.3 7%**
								Average					
								General, Average		**13.49 %**	**241.8 1%**	**296.9 2%**	**176.0 0%**

T_s : Turkish service sector firm, TE: Technical Efficiency, VRS: Variable return to Scale

Table 10. Target Output Amounts and Enhancement Rates of German DMUs in Service Sector

DMU	TE (VRS)	Target Output Amount				Current Output Amount				Enhancement Rate			
		Output 1	Output 2	Output 3	Output 4	Output 1	Output 2	Output 3	Output 4	Output 1	Output 2	Output 3	Output 4
G1s	95.00%	5.517	0.019	0.030	2.136	5.243	0.018	0.028	2.030	5.23%	5.56%	7.14%	5.22%
G10s	80.30%	3.452	0.000	0.454	0.224	2.772	0.000	0.009	0.081	24.53%		5229.27%	174.90%
G11s	**100.00%**	2.298	0.070	0.074	0.629	2.298	0.070	0.074	0.629				
G12s	**100.00%**	1.995	0.000	0.007	1.597	1.995	0.000	0.007	1.597				
G13s	87.90%	7.644	0.010	0.032	1.066	6.717	0.006	0.028	0.727	13.80%	66.67%	14.29%	46.62%
G14s	78.10%	3.913	0.029	0.081	0.872	3.057	0.009	0.026	0.357	28.00%	237.04%	213.69%	144.24%
G15s	**100.00%**	8.303	0.002	0.006	0.113	8.303	0.002	0.006	0.113				
G16s	75.30%	1.790	0.146	0.243	1.236	1.347	0.048	0.093	0.281	32.89%	205.52%	161.29%	339.81%
G17s	**100.00%**	18.776	0.003	0.005	1.109	18.776	0.003	0.005	1.109				
G18s	97.80%	9.157	0.000	0.013	1.908	8.954	0.000	0.013	1.459	2.27%		0.00%	30.81%
G19s	82.90%	2.856	0.004	0.034	0.956	2.369	0.004	0.013	0.192	20.56%	13.44%	160.44%	399.00%
G2s	93.20%	7.302	0.033	0.046	0.883	6.802	0.013	0.027	0.823	7.35%	153.85%	70.37%	7.29%
G20s	80.30%	2.511	0.060	0.128	1.515	2.016	0.022	0.069	0.712	24.55%	178.04%	85.51%	112.78%
G22s	**100.00%**	6.475	0.002	0.017	1.404	6.475	0.002	0.017	1.404				
G23s	**100.00%**	1.463	0.185	0.341	2.308	1.463	0.185	0.341	2.308				
G24s	**100.00%**	5.040	0.005	0.025	1.094	5.040	0.005	0.025	1.094				
G25s	92.50%	4.311	0.078	0.138	1.645	3.988	0.003	0.011	0.252	8.10%	2451.08%	1183.31%	553.49%
G27s	**100.00%**	10.166	0.005	0.012	2.744	10.166	0.005	0.012	2.744				
G28s	89.20%	5.765	0.020	0.036	0.182	5.141	0.008	0.017	0.158	12.14%	159.89%	114.42%	15.41%
G29s	**100.00%**	3.329	0.000	0.047	1.278	3.329	0.000	0.047	1.278				
G3s	89.10%	5.602	0.011	0.032	1.143	4.989	0.006	0.021	0.669	12.29%	83.33%	54.50%	70.92%
G31s	**100.00%**	1.925	0.106	0.184	0.446	1.925	0.106	0.184	0.446				
G33s	**100.00%**	4.158	0.010	0.040	2.313	4.158	0.010	0.040	2.313				
G34s	**100.0**	0.099	0.072	0.203	0.034	0.099	0.072	0.203	0.034				

	0%												
G35s	96.80 %	12.393	0.012	0.025	0.911	11.993	0.005	0.012	0.501	3.34 %	146.78%	113.89%	81.71 %
G36s	83.10 %	7.203	0.009	0.025	0.894	5.989	0.005	0.015	0.322	20.27 %	80.00 %	64.98 %	177.64%
G37s	**100.00%**	12.734	0.002	0.007	0.302	12.734	0.002	0.007	0.302				
G38s	**100.00%**	3.438	0.025	0.058	5.316	3.438	0.025	0.058	5.316				
G39s	**100.00%**	9.913	0.034	0.036	0.880	9.913	0.034	0.036	0.880				
G4s	**100.00%**	2.059	0.036	0.128	0.922	2.059	0.036	0.128	0.922				
G40s	89.80 %	9.672	0.000	0.000	0.000	8.685	0.000	0.000	0.000	11.36 %			
G41s	99.10 %	5.158	0.010	0.014	0.475	5.158	0.005	0.010	0.338	0.00 %	117.10%	45.01 %	40.49 %
G43s	73.10 %	2.572	0.000	0.000	0.000	1.881	0.000	0.000	0.000	36.74 %			
G44s	87.20 %	7.014	0.010	0.022	1.103	6.118	0.009	0.019	0.616	14.65 %	11.11 %	15.79 %	78.98 %
G45s	**100.00%**	1.186	0.295	2.086	0.155	1.186	0.295	2.086	0.155				
G46s	89.60 %	2.885	0.123	0.234	1.924	2.584	0.036	0.071	0.864	11.65 %	242.03%	228.92%	122.69%
G48s	**100.00%**	4.786	0.001	0.005	0.860	4.786	0.001	0.005	0.860				
G50s	**100.00%**	3.248	0.005	0.011	0.429	3.248	0.005	0.011	0.429				
G51s	**100.00%**	1.804	0.000	0.003	0.101	1.804	0.000	0.003	0.101				
G52s	90.70 %	3.604	0.015	0.039	1.513	3.267	0.013	0.015	0.419	10.32 %	15.38 %	158.54%	260.68%
G53s	85.00 %	1.851	0.192	0.302	2.147	1.573	0.153	0.256	0.821	17.67 %	25.49 %	17.81 %	161.38%
G54s	**100.00%**	1.148	0.009	0.045	1.140	1.148	0.009	0.045	1.140				
G55s	**100.00%**	1.490	0.000	0.093	2.907	1.490	0.000	0.093	2.907				
					German DMUs, Average					**15.13 %**	**246.61%**	**417.85%**	**148.63%**
					General, Average					**13.49 %**	**241.81%**	**296.92%**	**176.00%**

G_s : German service sector firm, TE: Technical Efficiency, VRS: Variable return to Scale

Table 11. Reference Set and Reference Intensity Coefficients of Turkish DMUs in Manufacturing Sector

DMU	Reference set and Intensity Coefficients					
T1m	T1m					
	1.0000					
T10m	T10m					
	1.0000					
T11m	T11m					
	1.0000					
T12m	T12m					
	1.0000					
T13m	T13m					
	1.0000					
T14m	T14m					
	1.0000					
T30m	T30m					
	1.0000					
T31m	T42m	G5m	T12m	G30m	T1m	T40m
	0.1450	0.0570	0.2490	0.0670	0.4540	0.0270
T40m	T40m					
	1.0000					
T42m	T42m					
	1.0000					
T47m	T47m					
	1.0000					
T54m	T54m					
	1.0000					

G_m : German manufacturing sector firm, T_m : Turkish manufacturing sector firm

Table 12. Reference Set and Reference Intensity Coefficients of German DMUs in Manufacturing Sector

DMU	Reference set and Intensity Coefficients					
G21m	G21m **1.0000**					
G26m	G26m **1.0000**					
G30m	G30m **1.0000**					
G32m	G32m **1.0000**					
G42m	G42m **1.0000**					
G47m	G47m **1.0000**					
G49m	G49m **1.0000**					
G5m	G5m **1.0000**					
G56m	T12m 0.1290	G32m 0.3340	G30m 0.0450	T1m 0.4320	T10m 0.0430	G5m 0.0160
G6m	G32m 0.3910	G26m 0.1380	T1m 0.0130	T54m 0.1360	T12m 0.3220	
G7m	T14m 0.4440	G32m 0.3480	T13m 0.0500	G5m 0.0680	G30m 0.0900	
G8m	G8m **1.0000**					
G9m	G8m 0.1240	T42m 0.4930	T1m 0.0280	T13m 0.3200	T14m 0.0360	

G_m : German manufacturing sector firm, T_m : Turkish manufacturing sector firm

Tables 13 - 14. Target Input Amounts and Enhancement Rates of Turkish and German DMUs in Manufacturing Sector

DMU	TE (VRS)	Target Input Amount						Current Input Amount						Enhancement Rate					
		Input 1	Input 2	Input 3	Input 4	Input 5	Input 6	Input 1	Input 2	Input 3	Input 4	Input 5	Input 6	Input 1	Input 2	Input 3	Input 4	Input 5	Input 6
T1m	100.0	0.8	0.1	0.6	0.3	0.2	0.0	0.8	0.1	0.6	0.3	0.2	0.0						
	0%	31	69	41	59	17	02	31	69	41	59	17	02						
T10	100.0	0.9	0.0	0.6	0.3	0.1	2.1	0.9	0.0	0.6	0.3	0.1	2.1						
m	0%	71	29	37	63	67	03	71	29	37	63	67	03						
T11	100.0	0.9	0.0	1.0	0.2	0.0	3.4	0.9	0.0	1.0	0.2	0.0	3.4						
m	0%	99	01	05	80	54	63	99	01	05	80	54	63						
T12	100.0	0.9	0.0	0.9	0.0	0.4	2.3	0.9	0.0	0.9	0.0	0.4	2.3						
m	0%	81	18	97	03	36	74	81	18	97	03	36	74						
T13	100.0	0.4	0.5	0.5	0.4	0.6	0.8	0.4	0.5	0.5	0.4	0.6	0.8						
m	0%	45	55	51	49	52	58	45	55	51	49	52	58						
T14	100.0	0.4	0.5	0.6	0.3	0.1	0.7	0.4	0.5	0.6	0.3	0.1	0.7						
m	0%	26	74	05	95	67	68	26	74	05	95	67	68						
T30	100.0	0.1	0.8	1.0	0.2	0.3	2.5	0.1	0.8	1.0	0.2	0.3	2.5						
m	0%	72	28	01	80	50	36	72	28	01	80	50	36						
T31	73.20	0.7	0.2	0.7	0.2	0.3	1.8	0.7	0.2	0.7	0.2	0.3	1.8						
m	%	64	36	81	19	56	06	64	36	81	19	56	06						
T40	100.0	0.7	0.2	0.9	0.0	0.8	4.7	0.7	0.2	0.9	0.0	0.8	4.7						
m	0%	88	12	74	26	92	94	88	12	74	26	92	94						
T42	100.0	0.4	0.6	0.7	0.2	0.6	3.1	0.4	0.6	0.7	0.2	0.6	3.1						
m	0%	00	00	57	43	25	21	00	00	57	43	25	21						
T47	100.0	0.9	0.0	0.5	0.4	1.0	2.3	0.9	0.0	0.5	0.4	1.0	2.3						
m	0%	98	02	03	97	62	59	98	02	03	97	62	59						
T54	100.0	0.9	0.0	0.8	0.1	0.4	0.8	0.9	0.0	0.8	0.1	0.4	0.8						
m	0%	62	38	07	93	15	30	62	38	07	93	15	30						
General, Average																		-3.36%	-10.80%

DMU	TE (VRS)	Target Input Amount						Current Input Amount						Enhancement Rate					
		Input 1	Input 2	Input 3	Input 4	Input 5	Input 6	Input 1	Input 2	Input 3	Input 4	Input 5	Input 6	Input 1	Input 2	Input 3	Input 4	Input 5	Input 6
G21	100.0	0.5	0.4	0.7	0.2	0.2	0.7	0.5	0.4	0.7	0.2	0.2	0.7						
m	0%	38	62	51	49	04	27	38	62	51	49	04	27						
G26	100.0	0.7	0.2	0.9	0.0	1.0	1.0	0.7	0.2	0.9	0.0	1.0	1.0						
m	0%	04	96	41	59	91	11	04	96	41	59	91	11						
G30	100.0	0.3	0.6	0.9	0.0	0.2	3.2	0.3	0.6	0.9	0.0	0.2	3.2						
m	0%	21	79	20	80	45	64	21	79	20	80	45	64						
G32	100.0	0.9	0.0	0.4	0.5	0.2	1.5	0.9	0.0	0.4	0.5	0.2	1.5						
m	0%	53	47	35	65	33	02	53	47	35	65	33	02						
G42	100.0	0.8	0.1	0.6	0.3	0.1	2.1	0.8	0.1	0.6	0.3	0.1	2.1						
m	0%	81	19	58	42	32	77	81	19	58	42	32	77						
G47	100.0	0.9	0.0	1.3	0.3	0.1	5.4	0.9	0.0	1.3	0.3	0.1	5.4						
m	0%	15	85	60	80	75	81	15	85	60	80	75	81						
G49	100.0	0.7	0.2	0.4	0.5	0.2	0.3	0.7	0.2	0.4	0.5	0.2	0.3						

m	**0%**	68	32	87	13	20	33	68	32	87	13	20	33		
G5m	**100.0**	0.7	0.2	0.7	0.2	0.3	7.1	0.7	0.2	0.7	0.2	0.3	7.1		
	0%	25	75	56	44	05	73	25	75	56	44	05	73		
G56	69.70	0.8	0.1	0.6	0.3	0.2	1.1	0.8	0.1	0.6	0.3	0.2	1.1		
m	%	72	28	32	68	51	64	72	28	32	68	51	64		
G6m	97.60	0.9	0.0	0.7	0.2	0.4	1.6	0.9	0.0	0.7	0.2	0.4	1.6	-3.36%	
	%	27	73	39	61	41	05	27	73	39	61	56	05		
G7m	99.00	0.6	0.3	0.5	0.4	0.2	1.6	0.6	0.3	0.5	0.4	0.2	1.8		-10.80%
	%	21	79	82	18	30	89	21	79	82	18	30	93		
G8m	**100.0**	0.8	0.1	0.3	0.6	0.3	1.0	0.8	0.1	0.3	0.6	0.3	1.0		
	0%	03	97	85	15	41	63	03	97	85	15	41	63		
G9m	99.90	0.4	0.5	0.6	0.3	0.5	1.9	0.4	0.5	0.6	0.3	0.5	1.9		
	%	77	23	36	63	71	73	77	23	36	63	71	73		
										German DMUs, Average				**-3.36%**	**-10.80%**
										General, Average				**-3.36%**	**-10.80%**

T_m : Turkish manufacturing sector firm, G_m : German manufacturing sector firm, TE: Technical Efficiency, VRS: Variable return to Scale

Table 15. Target Output Amounts and Enhancement Rates of Turkish DMUs in Manufacturing Sector

DMU	TE (VRS)	Target Output Amount				Current Output Amount				Enhancement Rate			
		Output 1	Output 2	Output 3	Output 4	Output 1	Output 2	Output 3	Output 4	Output 1	Output 2	Output 3	Output 4
T1m	**100.00%**	2.389	0.000	0.002	0.014	2.389	0.000	0.002	0.014				
T10m	**100.00%**	2.537	0.011	0.020	0.140	2.537	0.011	0.020	0.140				
T11m	**100.00%**	3.571	0.008	0.008	0.099	3.571	0.008	0.008	0.099				
T12m	**100.00%**	3.309	0.000	0.031	32.118	3.309	0.000	0.031	32.118				
T13m	**100.00%**	2.001	0.074	0.143	0.634	2.001	0.074	0.143	0.634				
T14m	**100.00%**	1.208	0.031	0.122	0.363	1.208	0.031	0.122	0.363				
T30m	**100.00%**	3.667	0.071	0.117	1.437	3.667	0.071	0.117	1.437				
T31m	73.20%	3.489	0.000	0.022	8.364	2.555	0.000	0.016	0.184	36.58%		37.12%	4452.67%
T40m	**100.00%**	5.935	0.000	0.001	0.216	5.935	0.000	0.001	0.216				
T42m	**100.00%**	4.801	0.018	0.070	1.393	4.801	0.018	0.070	1.393				
T47m	**100.00%**	4.373	0.006	0.007	0.061	4.373	0.006	0.007	0.061				
T54m	**100.00%**	2.025	0.018	0.039	0.407	2.025	0.018	0.039	0.407				
						Turkish DMUs, Average				**36.58%**		**37.12%**	**4452.67%**
						General, Average				**16.69%**	**162.16%**	**208.03%**	**1651.02%**

T_m : Turkish manufacturing sector firm, TE: Technical Efficiency, VRS: Variable return to Scale

Table 16. Target Output Amounts and Enhancement Rates of German DMUs in Manufacturing Sector

DMU	TE (VRS)	Target Output Amount				Current Output Amount				Enhancement Rate			
		Output 1	Output 2	Output 3	Output 4	Output 1	Output 2	Output 3	Output 4	Output 1	Output 2	Output 3	Output 4
G21m	**100.00%**	1.252	0.000	0.106	0.480	1.252	0.000	0.106	0.480				
G26m	**100.00%**	2.744	0.000	0.045	2.056	2.744	0.000	0.045	2.056				
G30m	**100.00%**	3.981	0.007	0.038	1.883	3.981	0.007	0.038	1.883				
G32m	**100.00%**	2.511	0.111	0.190	0.840	2.511	0.111	0.190	0.840				
G42m	**100.00%**	2.442	0.020	0.000	0.000	2.442	0.020	0.000	0.000				
G47m	**100.00%**	6.263	0.010	0.022	0.000	6.263	0.010	0.022	0.000				
G49m	**100.00%**	0.901	0.035	0.110	0.189	0.901	0.035	0.110	0.189				
G5m	**100.00%**	7.936	0.003	0.007	0.237	7.936	0.003	0.007	0.237				
G56m	69.70%	2.717	0.038	0.071	4.512	1.895	0.006	0.050	0.253	43.37%	513.99%	42.99%	1680.97%
G6m	97.60%	2.733	0.046	0.096	11.025	2.669	0.045	0.081	0.817	2.41%	2.90%	19.24%	1250.17%
G7m	99.00%	2.409	0.057	0.131	0.670	2.386	0.056	0.013	0.074	0.95%	1.30%	877.01%	802.97%
G8m	**100.00%**	1.913	0.000	0.153	0.476	1.913	0.000	0.153	0.476				
G9m	99.90%	3.354	0.034	0.103	0.962	3.350	0.015	0.063	0.571	0.11%	130.46%	63.80%	68.35%
						German DMUs, Average				**11.71%**	**162.16%**	**250.76%**	**950.61%**
						General, Average				**16.69%**	**162.16%**	**208.03%**	**1651.02%**

G_m : German manufacturing sector firm, TE: Technical Efficiency, VRS: Variable return to Scale