African Journal of Business Management Vol. 5(21), pp. 8567-8575, 23 September, 2011
Available online at http://www.academicjournals.org/AJBM
DOI: 10.5897/AJBM11.1027
ISSN 1993-8233 ©2011 Academic Journals

Full Length Research Paper

Analyzing the technical efficiency on the effects of foreign portfolio investment in the financing of small and medium-sized enterprises (SMEs) in turkey

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Accepted 25 July, 2011

This paper investigates the contribution of foreign portfolio investment (FPI) to firms' technical efficiency and total factor productivity by applying two empirical methodologies over a sample of firms. In the study, panel data is from 45 small businesses (small and medium-sized enterprises, SMEs) in Turkey were observed between 2006 and 2010 years. We will analyze the effects of foreign portfolio investment by using the data on businesses in the Istanbul Stock Exchange (ISE). To measure efficiencies of these units, data envelopment analysis (DEA) approach and Malmquist total factor productivity indexes (MTFP) are used.

Key words: Foreign portfolio investment, small and medium-sized enterprises (SMES) financial performance, data envelopment analysis (DAE), Malmquist total factor productivity indexes (MTFP).

INTRODUCTION

International capital flows are often thought to play a destabilizing role in developing economies, especially in the case of financial crises precipitated by sudden reversals of capital flows (Broto et al., 2008). At the same time, capital inflows provide much-needed capital that contributes to economic growth and development (Bernanke and Blinder, 1988). Thus, international capital flows are typically viewed through a dual lens of costs and benefits. Researchers have begun examining different types of capital flows in order to weigh these benefits and costs in a more comprehensive manner. A general empirical regularity arising from this research is that portfolio investment is related to business finance and financial performance.

Foreign investment has increased its importance on economy politics and finance especially since the 1980s because of economic liberalization and global liquidity (Beck et al., 2002). As a suitable source of economic growth and financial liquidity, foreign investment has affected home countries in terms of interest rates, currency, and economic stability (Beck et al., 2005). In the literature there are several studies of the effect of foreign investment on national economic structure (Beck et al., 2006). Unfortunately there has been scant research into the effects of foreign portfolio investment on business finance. The aim of this paper is to expose the effects of foreign portfolio investment on business finance in emerging economies. The purpose of this study is to examine the financial performance of small and medium-sized enterprises (SMEs) in terms of technical efficiency, change in technical efficiency, technological change and total factor productivity change depends on foreign investments (Candemir et al., 2011). In this study we will analyze the effects of foreign investments by using the data about the businesses in Istanbul Stock Exchange (IMKB). This data covers between 2006 and 2010 periods

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Abbreviations: FPI, Foreign portfolio investment; **IMKB,** Istanbul stock exchange; **DEA,** data envelopment analysis; **MTFP,** Malmquist total factor productivity indexes; **SMEs,** small and medium-sized enterprises; **TFP,** total factor productivity; **SFA,** stochastic frontier approach; **DMU,** decision making unit; **CCR,** Charnes Cooper Rhodes; **BCC,** Banker Charnes Cooper; **CRS,** constant-return-to-scale; **VRS,** variable-return-to-scale; **TFPC,** total factor productivity change.

annually (ISE, 2010).

LITERATURE REVIEW

Data envelopment analysis

The primary purpose of DEA is to compute the technical efficiency of organizational units. In measuring technical efficiency, the transformation of inputs such as employee services and raw materials into outputs is compared to best practice organizational units. Essentially, 100% technical efficiency is achieved when “no wastage of inputs” has occurred in generating the specific amount of output. For organizational units that are operating below the best practice levels, their level of efficiency is represented as a percentage of the best practice organizational units. One of the primary strengths of the DEA approach rests on its relative simplicity in requiring simply the output and input quantities to compute technical efficiency, without needing to include the prices. In addition, the DEA approach generates data that identify possible causes of inefficiency based on the computation of efficiency levels. Finally, the DEA approach pinpoints organizational units that have proven to be efficient in their utilization of inputs. Thus, inefficient units will have role models that can guide them in learning how they can improve the implementation of their operations (SCR, 1997).

Previous study: Application of data envelopment analysis (DAE) to foreign investment in the financing

In the literature, there are various methods related to measuring the technical efficiency and total factor productivity change of decision making units.

According to Prusa (2010) in the study, this paper analyses the efficiency of Czech small and medium enterprises. It use the data from 2002 - 2005 of thirty manufacturing industries, each divided into five subgroups according to the number of employees. The results reveal substantial variance in the efficiency scores, which is only partly removed by the robust DEA specification. They found that the majority of firms operate below full efficiency; with only a few companies (industries) belonging to top performers.

Xiangyu and Li (2007), using DEA methods to study the technical efficiency of the China from 2000 to 2005. And analyzes the DEA efficiency from regional perspective, includes Beijing, Guangdong, Shandong and Shanghai. The results find that the DEA efficiencies of foreign direct investment enterprises are low generally, and average scale efficiency appears the obvious decreasing trend, the changes of average pure technology not distinct. Therefore, this paper considers that the decreasing of average technology efficiency results from the decreasing of average scale efficiency. And this paper also finds that there are some differences of industrial DEA efficiency in regional perspective.

In the study by Pengfei and Bing (2009), they measured and applied DEA, the technical efficiency and the technical progress Malmquist productivity indexes in 30 provinces in China from 1978 - 2001; it has also testified empirically the relations between the human capital as well as the institution factor, the productivity and the technical progress together with the productivity growth. Its research values are that it has provided advanced analytical tools a research platform for Chinese economic researchers. Besides, it has also offered, for related sectors, the data processing base the policies basis which are near reality test standing.

Previous study: Foreign portfolio investment

The decision to invest abroad is typically a two-step process for investors. First, they decide in which country to invest. Second, they decide in which companies to invest. Studies find that disclosure at the firm level is an important determinant of firm choice for institutional investors (Aggarwal et al., 2005). Since information asymmetry appears to be worst for smaller firms, foreign investors often steer clear of these firms, even if they are listed. This implies that investors that are looking for international diversification choose to invest in only the largest listed firms. Indeed, Dahlquist and Robertssonb (2001), Kang and Stulz (1997), Edison and Warnock (2004) and Cai and Warnock (2004) all find that foreign owners prefer large firms. Leuz et al. (2008) find that information asymmetry and monitoring costs lead investors to choose firms with the least opaque earnings, also implying that foreign investment would go directly to large firms. As such, it is not immediately obvious whether small listed firms would benefit from foreign portfolio investment, defined by the International Monetary Fund as equity and debt issuances including country funds, depository receipts, and direct purchases by foreign investors of less than 10% control (IMF, 1993). This is especially the case in countries where property rights are less strictly enforced.

Although, the likelihood of small businesses accessing foreign capital directly is very small, FPI could have implications on capital allocation in the domestic market. Wurgler (2000) finds that, financial markets facilitate capital allocation. Since capital market liberalization allows for foreign investment and deepens financial markets one could argue that FPI could improve capital allocation (Henry, 2000). Thus, small public firms could see an improvement in their access to capital with an increase in the level of FPI (Kim and Singal, 2000).

Harrison et al. (2004) focus on the impact of foreign direct investment on the financial constraints of firms. They examine foreign direct investment cash flows as a

proportion of all foreign investment rather than the size of the market in question. Laeven (2003) examines the impact of liberalization (reform policies that open financial markets to foreign direct and portfolio investment) on financial constraints rather than the specific cash flows resulting from said reformation.

As mentioned, that there are many researches about foreign investment and their effects of macroeconomic factors such as interest rates, growth, unemployment and currency. However, this study has contributed to the literature by presenting the effects of foreign portfolio investment in the financing of SMEs.

RESEARCH METHODOLOGY

The empirical part of our study is based on DEA. The DEA model was introduced by (Charnes et al., 1978). It was the consequence of the development of the measurement of productive efficiency (Farrell, 1957), frontier production functions (Aigner and Chu, 1968), and numerical aspects of mathematical programming. Important contributions can also be found in (Fare et al., 1985). Numerous applications of the DEA method have appeared in economics and management journals, in studies of farming, air transportation, social insurance, and banking.

The frontier (either parametric or nonparametric) approach provides a better methodology for benchmarking economic performance because it shows both technical efficiency and technical progress. The appendix explains the nonparametric frontier approach, that is, the data envelopment approaches to estimate total factor productivity (TFP). There are two methods of estimating TFP in the frontier approach: DEA and the stochastic frontier approach (SFA). SFA is based on the parametric method; the DEA is not. Hence, SFA makes it possible to test the estimation results with statistical significance. However, while the SFA must assume some specific functional forms for estimating production (or cost) function, DEA does not. DEA's being completely free of specifications of functional forms is one of its attractive features (Farrell and Fieldhouse, 1962). The linear programming problem for DEA is described as follows:

$$Min\theta_{\theta\lambda}$$

$$st - y_{it} + Y_{\lambda} \geq 0,$$

$$\theta x_{it} - X_{\lambda} \geq 0,$$

$$\lambda \geq 0 \qquad (1)$$

Where X is K by 1 vector of inputs, Y is M by 1 vector of outputs; y_{it} is the output of i-th and t-period decision making unit (DMU). A θ is a scalar and λ is an N by 1 vector of constants. A θ must satisfy $\theta \leq 1$ and $\theta \leq 1$ indicates a point on the frontier and the DMU producing a good at a technically efficient level. A distance function $D(x, y)$ can be calculated from this linear programming.

The first term of the product on the right-hand side indicates the "efficiency change" and the second term (square bracket) is "technical change" between time *t* and time *t+1*. In the extreme case, for example, if there is no change in inputs and output between the periods, that is, $x_t = x_{t+1}$ and $y_t = y_{t+1}$, Malmquist index equals 1. In other words, if the Malmquist index is different from unity, productivity must have changed between the observed periods. If the index is greater than 1, the firm's productivity is regarded as having "increased" while if it is less than 1, the productivity has productivity has declined from time *t* to time *t+1* (Farrell and Fieldhouse, 1962). Hence, the Malmquist TFP index is the product of efficiency change and technical change,

$$TFP = TE * TC \qquad (2)$$

The first term "efficiency" can be broken into two components; "pure efficiency change" and "scale change." To derive "scale change," an additional restriction (convexity constraint) is placed on the linear programming of distance functions.

$$Min\theta_{\theta\lambda}$$

$$st - y_{it} + Y_{\lambda} \geq 0,$$

$$\theta x_{it} - X_{\lambda} \geq 0,$$

$$N'\lambda = 1,$$

$$\lambda \geq 0 \qquad (3)$$

N is an N by 1 vector of ones. The scale inefficiency can be calculated from the difference between the variable returns to scale technical efficiency and the constant returns to scale technical efficiency scores. The relationship among pure technical efficiency, scale efficiency and technical efficiency is as follows:

$$TE = PTE * SE \qquad (4)$$

Where *TE* stand for technical efficiency, *PTE* expresses pure technical efficiency and *SE* indicates scale efficiency. Combining this decomposition with the decomposition of TFP defined above, we arrive at the following decomposition formula:

$$TFP = TE * TC = PTE * SE * TC \qquad (5)$$

This is the decomposition formula used in this text. A *TE* expresses overall inefficiency caused by the technical inefficient operation (*PTE*) and at the same time by the disadvantageous scale condition (*SE*). More detailed discussion about scale (in) efficiency is found in (Cooper et al., 2006).

The two basic DEA models are the Charnes Cooper Rhodes (CCR) (Charnes et al., 1978) model and the Banker Charnes Cooper (BCC) (Banker et al., 1984) model. These models can be distinguished by the envelopment surface and the orientation. As shown in Figure 1, the envelopment surface can take the form of constant-return-to-scale (CRS) or variable-return-to-scale (VRS) as evaluated in the CCR model and the BCC model, respectively.

The CRS surface is presented by a straight line that starts at the origin and passes through the first DMU that it meets as it approaches the observed population. The models with CRS envelopment surface assume that an increase in inputs will resultin a proportional increase in outputs. However, markets rarely function in an ideal way. There will always be financial limitations or imperfect competitive markets where increased amounts of inputs do not proportionally increase the amount of outputs obtained. For example, in agriculture, when the water volume applied to crops is increased, we do not necessarily obtain a linearly proportional increase in agricultural production. In order to account for this effect, the DEA model for vari-able-returns-to-scale (BCC) was developed (Banker et al., 1984).

In the study, we used BCC model to measuring the technical efficiency on the effects of foreign portfolio investment in the financing of SMEs. DMU to measure the effectiveness of these units should be determined by the input and output variables. Constraints DEA:

$$I \text{ (input)} + O \text{ (output)} + 1 \leq DMU \qquad (6)$$

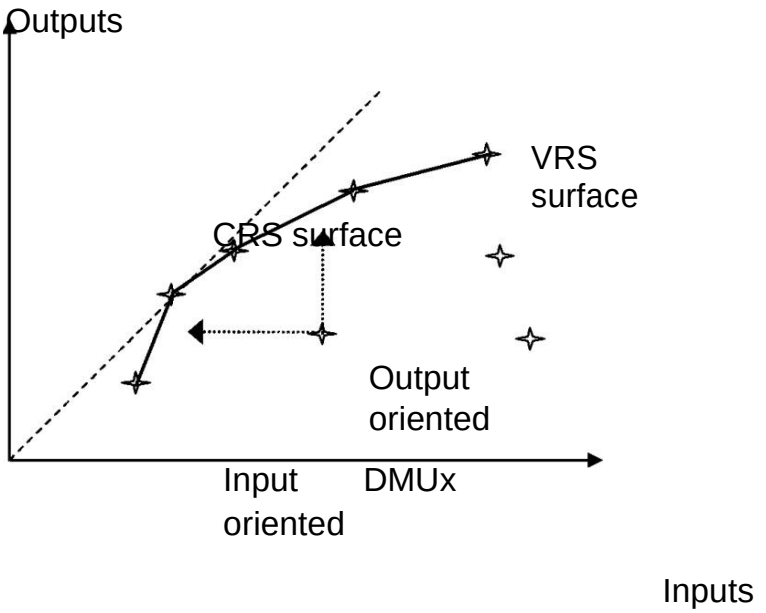

Figure 1. Envelopment surfaces and orientation

Table 1. Inputs and output of SMEs in Turkey, 2006-2010.

Input	Output
Direct investment (Input 1)	Total assets (Output 1)
Foreign portfolio investment (Input 2)	Equity (Output 2)
Other foreign investments (Input 3)	Long-term financial debts (Output 3)
	Short-term financial debts (Output 4)
	Net sales (Output 5)
	Gross profit margin (Output 6)
	Net profit (Output 7)

2.NoV(number of variables) ≤DMU (Boussofiane et al., 1991)

Technical efficiency and total factor productivity growth indices are obtained using the computer program DEAP 2.1 written by (Coelli, 1996).

APPLICATION RESULTS

Research design and data collection

The data used for this analysis were gathered from IMKB's annual reports and balance of payment reports of Central Bank of Turkey from 2006 and 2010 (CBTR, 2010). As shown in Table 1, the data used in this study is obtained from 2006-2010 accounting records of 45 businesses listed on the Istanbul stock exchange (ISE, 2010). The inputs used in DEA are direct investment, foreign portfolio investment and other foreign investments. The output includes the total assets, equity, long-term financial debts, short-term financial debts, net sales, gross profit margin and net profit.

Data envelopment analysis (DEA) approach for technical efficiency

This study focused on the output-oriented BCC model, both technical efficiency levels of 45 firms and annual average technical efficiency level of ten sectors including different numbers of firms are given in Table 2 over the of periods 2006 - 2010.

From these sectoral viewpoints, in the building sector Çimbeton is efficient in 2007 and 2009; in 2008 and 2010, no firm is fully efficient. In the chemistry, sector Boyasan is efficient in 2008 and 2010; CBS is efficient in 2007 and 2010. In this sector, interestingly, all firms are efficient in 2010. In the food sector Konfrut is efficient in 2006 and 2009; Merko is efficient in 2007and 2010; Şeker is efficient in 2008 and 2010. The year 2008 is very efficient in this sector. In the information technologies

Table 2. Technical efficiency levels of the SMEs in Turkey.

(IMKB) sector	Name of Firm	Period					
		2006	2007	2008	2009	2010	Mean
Building	Afyon Çim	0.843	0.898	0.825	0.814	0.929	0.862
	Cimbeton	0.917	1.000	0.952	1.000	0.952	0,964
	Haznedar Ref.	0.838	1.000	0.877	0.828	0.890	0,887
	Uşak Ser	1.000	0.688	0.808	0.793	0.930	0,844
Chemistry	Boyasan	0.889	0.892	1.000	0.885	1.000	0,933
	CBS Boya	0.969	1.000	0.907	0.876	1.000	0,950
	Hektaş	0.869	0.889	0.859	0.853	1.000	0,894
Electricity	Aksu En	0.781	0.977	1.000	0.836	0.933	0,925
Food	Dardanel	0.993	0.881	1.000	0.869	0.984	0,945
	Ersu Gıda	0.843	0.877	0.952	1.000	0.864	0,907
	Kerevitaş	0.928	0.889	1.000	0.951	0.892	0,932
	Konfrut	1.000	0.879	0.844	1.000	0.776	0,900
	Merko G	0.859	1.000	0.968	0.896	1.000	0,945
	Penguen G	0.994	0.890	1.000	0.898	0.843	0,925
	Şeker p	0.885	0.776	1.000	0.898	1.000	0,912
Information technologies	Escort B	0.856	1.000	0.899	0.947	0.986	0,938
	Link Bilg.	0.928	1.000	0.986	0.813	0.844	0,914
Machinery	Burçelik	0.941	1.000	0.993	0.898	1.000	0,966
	Burva	0.951	0.869	0.877	1.000	0.877	0,915
	Celha	0.864	0.869	1.000	0.881	0.965	0,916
	Erbosan	0.882	1.000	0.859	1.000	0.936	0,935
Metal products and machinery	Bosch Fren	0.924	1.000	0.864	0.776	0.896	0,892
	Ege End	0.972	1.000	0.864	0.892	1.000	0,946
	Emek Elekt	0.880	0.864	1.000	0.881	0.932	0,911
	Eminiş Amb	1.000	0.768	0.877	0.987	0.932	0,943
	Gerel Elekt	0.862	0.853	0.885	0.844	0.898	0,868
	Klimasan	0.977	0.843	1.000	0.811	0.717	0,870
	Makine Tak	0.877	0.896	0.987	0.940	0.986	0,937
Paper press	Bak Amb	0.884	0.896	0.898	1.000	0.914	0,918
	Kaplamin	0.853	1.000	0.876	0.889	0.952	0,914
	Kelebek Mob	1.000	0.924	0.881	0.941	0.890	0,927
	Viking Kağ	1.000	0.749	0.537	1.000	0.930	0,843
Stationery	Adel K	0.858	1.000	0.987	0.876	1.000	0,944
Textile	Aksu İp	1.000	0.879	0.905	0.869	0.876	0,918
	Berdan	0.994	1.000	0.890	0.892	0.879	0,931
	Bisaş	0.853	0.898	0.790	1.000	0.940	0,896
	Derimod	0.877	0.968	0.896	0.876	0.992	0,922
	Desa Deri	0.859	0.889	0.977	1.000	0.836	0,912
	Ege Ser Giy	0.832	0.879	0.917	0.876	0.917	0,884
	Esem S.	0.892	0.884	1.000	0.733	0.896	0,881
	Gediz İp	0.910	0.994	0.884	0.836	0.885	0,902
	İdaş	0.876	1.000	0.869	1.000	1.000	0,949
	Okan Teks	0.884	0.898	1.000	1.000	0.889	0,934
	Sonmez Fla	0.924	0.717	0.843	0.885	0.940	0,862
	Tumteks	0.898	0.696	1.000	0.890	0.885	0,874
General mean		0.909	0.906	0.916	0.903	0.924	0.913

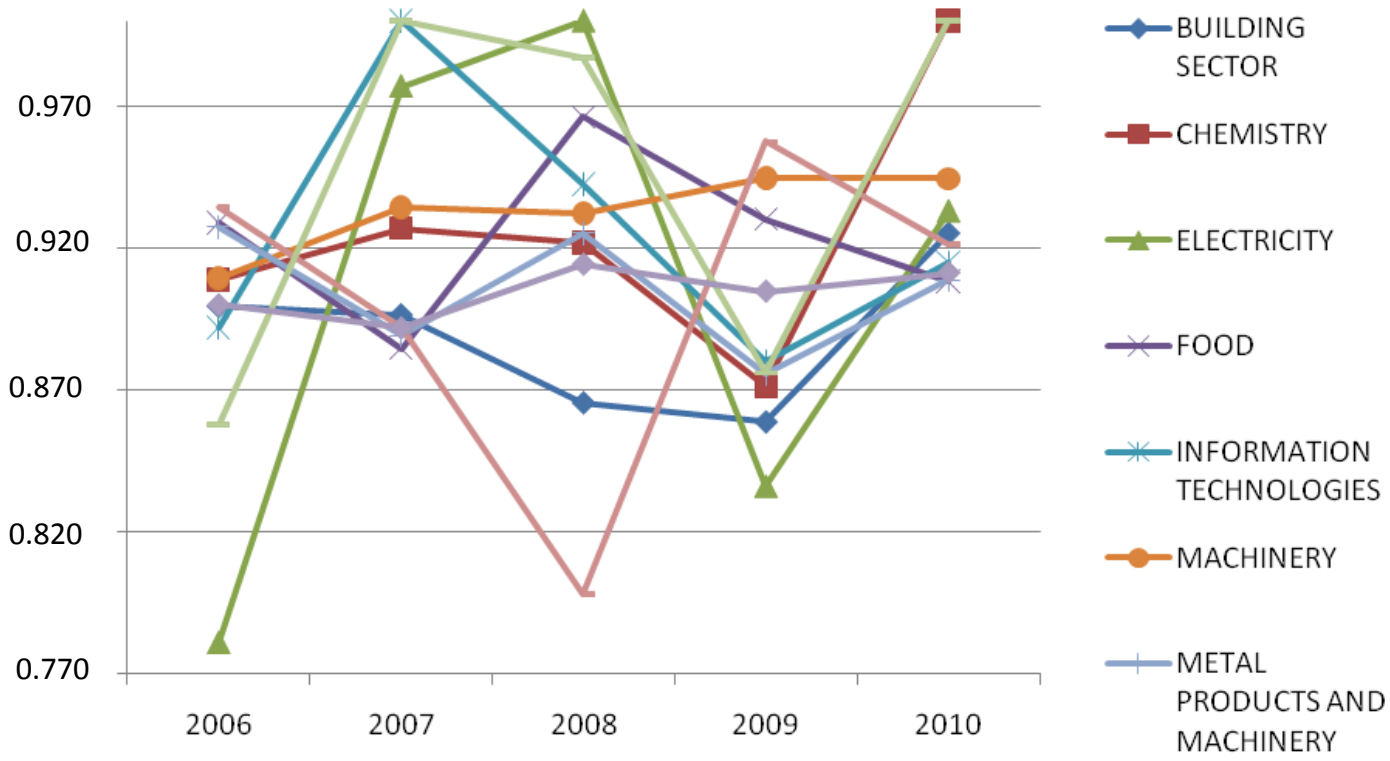

Figure 2. The sector average of technical efficiency levels.

sector, both firms are efficient in 2007. In the machinery sector, Burçelik is efficient in 2007 and 2010; Erbosan is the paper and press sector, Viking is efficient in 2006 and 2009. In the stationery business sector, Adel is efficient in 2007 and 2010. In the textile sector, Idaş is efficient in 2007, 2009 and 2010; Okan is efficient in 2008 and 2009. In this five-year period İdaş is the only firm in the sector that is efficient in all three of the years. In 2007, 14 firms are fully efficient.

The technical efficiency of SMEs in Turkey is shown in Figure 2. According to Table 2, the stationery business and machinery sectors are the most efficient. The electricity sector seems the most extraordinary sector in the sense of technical efficiency in the current years. The chemistry and the machinery sectors seem the most stable. While technical efficiency levels in all sectors increased until 2008; in 2009 all sectors, especially the building sector, declined suddenly because of the late effects of the global economic crisis.

Malmquist approach for total factor productivity index

All previous efficiency analyses were this study were performed for the 2006 - 2010. However, the change of efficiency by time is an important topic to be considered because it is difficult to assess whether increases or decreases in efficiency scores of each year are a result of increases or decreases in technical efficiency or technological change. In addition, Malmquist TFP growth index is decomposed into technical efficiency change and technical change indices. If technical efficiency change index is greater than 1, it means that there is an improvement in efficiency or catching-up effect the best practice frontier. On the other hand, if it is less than 1 it shows deterioration in production performance of the decision making unit.

The technical efficiency change is also decomposed into pure efficiency and change and scale efficiency changes. A scale efficiency change index that is greater than 1 indicates the success of cooperative to produce in optimal scale, while pure efficiency change index of greater than 1 indicates a learning process in the decision making unit (Nkamleu, 2004).

Therefore, the panel data that includes in the five years from 2006 - 2010. The values technical efficiency change, technical change, pure efficiency change, scale efficiency change and Malmquist TFP change of each firms are shown in Table 3.

The technical efficiency change index of 45 firms shows that the level of efficiency has increased 0.7% efficient in 2007 and 2009. In the metal products and machinery sector, Ege is efficient in 2007 and 2010. In

Table 3. Average total factor productivity for the SMEs in Turkey (2006 - 2010).

(IMKB) Sector	Name of business	Technical efficiency change	Technical change	Pure efficiency change	Scale efficiency change	Total factor productivity change
Building	Afyon Çim	0.978	1.063	1.076	0.909	1.040
	Cimbeton	1.022	1.005	0.978	1.045	1.027
	Haznedar Ref	1.005	1.043	1.089	0.923	1.048
	Uşak Ser	0.922	1.087	0.955	0.965	1.002
	Mean	0.982	1.050	1.025	0.961	1.029
Chemistry	Boyasan	1.037	0.940	1.045	0.992	0.974
	CBS Boya	1.058	1.048	0.976	1.084	1.109
	Hektaş	0.950	1.002	0.974	0.975	0.952
	Mean	1.006	1.010	1.005	1.003	1.016
Electricity	Aksu En	0.949	1.098	0.945	1.004	1.042
	Mean	0.991	1.039	0.975	1.016	1.030
Food	Dardanel	1.020	0.986	1.037	0.984	1.006
	Ersu Gıda	1.190	0.892	1.099	1.083	1.062
	Kerevitaş	0.980	1.046	0.993	0.987	1.025
	Konfrut	1.127	0.869	1.048	1.075	0.979
	Merko G	0.965	1.045	0.907	1.064	1.008
	Penguen G	0.881	0.945	1.000	0.881	0.833
	Şeker p	0.952	1.089	0.952	1.000	1.037
	Mean	1.016	0.982	1.005	1.011	0.993
Information technologies	Escort B	0.961	1.045	1.004	0.957	1.004
	Link Bilg	0.785	0.968	0.896	0.876	0.760
	Mean	0.873	1.007	0.950	0.917	0.882
Machinery	Burçelik	0.977	0.889	0.977	1.000	0.869
	Burva	1.073	1.048	1.087	0.987	1.124
	Celha	0.961	0.986	0.917	1.048	0.948
	Erbosan	1.075	0.864	1.089	0.987	0.929
	Mean	1.021	0.947	1.018	1.006	0.967
Metal products	Bosch Fren	0.866	0.917	0.877	0.987	0.794
And machinery	Ege End	0.974	1.089	0.987	0.987	1.061
	Emek Elekt	1.129	0.877	1.049	1.076	0.990
	Eminiş Amb	1.046	1.056	0.998	1.048	1.104
	Gerel Elekt	1.114	1.089	1.054	1.057	1.213
	Klimasan	0.974	0.994	0.987	0.987	0.968
	Makine Tak	1.071	0.853	1.067	1.004	0.914
	Mean	1.025	0.982	1.003	1.021	1.006
Paper press	Bak Amb	1.007	1.004	0.961	1.048	1.011
	Kaplamin	1.028	0.948	1.045	0.984	0.975
	Kelebek Mob	1.030	1.056	0.984	1.047	1.088
	Viking Kağ	0.779	1.045	0.876	0.889	0.814
	Mean	0.961	1.013	0.967	0.992	0.972
Stationery	Adel K	1.085	0.924	1.046	1.037	1.002
	Mean	1.085	0.924	1.046	1.037	1.002

Table 3. Contd.

Textile	Aksu İp	0.951	0.889	1.000	0.951	0.845
	Berdan	1.206	0.843	1.099	1.097	1.016
	Bisaş	1.076	0.879	0.984	1.094	0.946
	Derimod	0.802	1.000	0.986	0.813	0.802
	Desa Deri	1.191	0.896	1.094	1.089	1.067
	Ege Ser Giy	0.867	1.000	0.968	0.896	0.867
	Esem S	1.131	0.909	1.039	1.089	1.029
	Gediz İp	1.076	0.890	1.094	0.984	0.958
	İdaş	1.090	0.942	1.098	0.993	1.027
	Okan Teks	1.141	0.947	1.038	1.099	1.080
	Sonmez Fla	0.890	0.909	1.000	0.890	0.809
	Tumteks	0.986	1.040	1.049	0.940	1.026
	Mean	1.034	0.929	1.037	0.995	0.956
	General Mean	1.007	0.979	1.008	0.998	0.982

over the whole period. The reason for this growth depends on improvement in scale efficiency. The annual average of technological index for 45 firms is measured as 0.979 for whole period. That means there is a techno-logical regression of 2% on average. A technical change index smaller than 1 shows technical regression or decreasing movement of the best practice frontier, a value of greater than 1 means increasing movement of production frontier technical progress. When the firms are considered separately, CBS, Ersu, Burva, Ege, Eminiş, Gerel, Kelebek and Desa experienced technological progress.

Total factor productivity change (TFPC) is simply the multiplication of efficiency and technological change indices. These two changes constitute the total factor productivity growth index. TFPC provides the average annual growth for the SMEs in IMKB in Turkey over the period of 2006 - 2010 [7]. As shown from the Table 3, TFP has decreased by 1.7%, on average due to the annual average of technical regression for 45 firms.

Conclusion

Despite some limitations, the findings of this study still have significant implications for the SME sector in Turkey. Perhaps most importantly, the findings produced by the DEA approach validate SMEs' strategy in the period under consideration. As for this analysis, the identification of the strong and positive correlations between the performances indicators was illuminated by the specific areas of focus for SMEs in the forthcoming years. One of the most important findings in the analysis was the importance of foreign investments in virtually all key aspects of SMEs' financial performance.

The measuring of the annual technical efficiency of sector levels of SMEs in Turkey at the sector average shows that the stationery business and machinery sectors are the most efficient. The electricity sector seems the most extraordinary in the sense of technical efficiency in the current years. Chemistry and machinery sectors seem the most stable fields. While all sectors' technical efficiency increased until 2008, in 2009 all sectors, especially the building sector, plunged because of the late effects of the global economic crisis.

In conclusion, Turkish SMEs, and perhaps SMEs in many developing countries can be characterized as having a "missing middle," as "rarely neither exporting nor importing," and as operating under "local ownership." A growing body of empirical studies suggests that positive effects of globalization, including FPI, occur basically only for large-sized firms, not for SMEs. Based on this obser-vation and the empirical results obtained from the study, the findings can be distilled thus: catching-up effects dominate in the textile and machinery industries; the FPI effect dominates in the electricity and building industries. This study recommends that the textile and machinery industries improve efficiency by introducing quality control and providing appropriate training to their workers. For the electricity and motor vehicle industries, there is a need to loan in a long term level to promote their capital structure and industry-university cooperation.

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