Measuring Efficiency for Egyptian Textile and Apparel Industry Using Stochastic Frontier Analysis and Data Envelopment Analysis

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Synopsis

This thesis gives an overall view of measuring efficiencies in the Egyptian textile and apparel industry via stochastic frontier analysis (SFA) and data envelopment analysis (DEA). Differences between the SFA and the DEA can lead to different estimates for some, or all of the units in an analysis.

Measuring efficiency through production process, (inputs and outputs), lacking factors affecting supply chain operations and other key factors, such as value-adding capabilities, exchange rates, time, inventory turnover, quality, logistics, etc. can lead to inaccurate measures. Thus, to ensure accurate efficiency measures, these factors have to be considered.

Techniques used are; SFA time-varying and metafrontier. Constructing a single production frontier based on all data points would cause an unfitting benchmark due to differences in production technologies, location, ownership type, etc. Hence, metafrontier allows grouping firms with similar characteristics into a separate group frontier for each region with single metafrontier applied to all groups.

Empirical results show clear variability in efficiencies between private and public firms and shows that efficiency scores vary, when assessed against the metafrontier. The evidence also shows the major role of the supply chain factors in improving efficiencies for public firms.

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Declaration

- This dissertation was written by Ibrahim M. Elatroush based on work undertaken by him at Economics Department, School of social sciences, City University London.
- This work has not been accepted for any previous degree.
- This work has not yet been published.

Abbreviations

ACP	African Caribbean and Pacific group
AD	Anti –Dumping
AGOA	African Growth & Opportunity Act
ALCOTEXA	Alexandria Cotton Exporters Association
ANDEAN	South American trade countries Bolivia, Colombia, Ecuador and Peru
AMS	Aggregate Measure of Support
ASEAN	Association of South East Asian Nations
ATPA	Andean Trade Preference Act
ATC	Agreement on Textile and Clothing
Bind	Make a formal commitment in the WTO
BISD	Basic Instruments and Selected Documents
BLS	US Bureau of Labour and Statistics
BSIC	Business Sector Information Centre
BTAs	Bilateral Trade Agreements
BT	Bio-Technology Cotton
CAFTA	Central America –Dominican Republic Free Trade Area
CAPMAS	Central Agency for Public Mobilization and Statistics
CATGO	Cotton Arbitration and Testing General Organisation
CBI	Caribbean Basin Initiative
CBTPA	Caribbean Basin Trade Partnership Act
CCC	Customs Cooperation Council

CEECs	Central and Eastern European Countries
CEFTA	Central and Eastern European Countries FTA
CET	Common External Tariff
CETI	Chamber of Egyptian Textile Industries
CGE	Computable General Equilibrium
CM	Common Market
CMS	Constant Market Share
CO	Competitiveness Observatory
COLS	Corrected Ordinary Least Squares
COMESA	Common Market for Eastern & Southern Africa
COMTRADE	United Nations Commodity Trade Statistics Database
CRS	Constant Returns to Scale
CRI	Cotton Research Institute
CSR	corporate social responsibility
CTC	Cotton ,Textile and Clothing
CTG	Council in Trade in Goods
CTH	Change in Tariff Heading
CU	Custom Union
CUSFTA	Canada-USA Free Trade Agreement
DB	Doing Business ,World Bank Database
DCs	Developing Countries
DDA	Doha Development Agenda
DEA	Data Envelopment Analysis

DITC	Division on International Trade in Goods, Services &Commodities
DMU	Decision Making Unit
DRS	Decreasing Returns to scale
DTI	Department of Trade &Industry
EBA	Everything But Arms (EU preferences for LDCs)
EC	European Community
ECC	Export Commodity Councils
ECES	Egyptian Centre for Economic Studies
ECU	Egyptian Confederation Union
EDEA	Efficiency of a unit estimated under DEA
EEA	European Economic Area
EEC	European Economic Community
EFTA	European Free Trade Association
EGDI	Expert Group on Development Studies
ELS	Extra Long Staple cotton
EOQS	Egyptian Organization for Quality and Standardisation
EPA	Economic Partnership Agreement (between EU & ACP Regions)
ERP	Effective Rates of Protection
ERSAP	Economic Reform and Structural Adjustment Programme
ESC	Economic and Social Council
ESFA	Efficiency of a unit estimated under SFA
ESFMS	Export Support Fund and Marketing Studies
ESS	The Export Support Scheme

ETCF	Egyptian Textile Consolidation Fund
EU	European Union
Euro- Med	European-Mediterranean Partnership Agreements
FCL	Full Container Load
FDI	Foreign Direct Investment
FOB	Free On Board
FTA	Free Trade Area
FTAA	FTA of the Americas
FTZs	Egyptian Free Trade Zones
G90	Group of 94 countries, including all ACP, all LDCs, and all African countries. 63 are members of the WTO
GAFI	General Authority For Investment, Egypt
GATT	General Agreement on Tariffs and Trade
GAFTA	Greater Arab Free Trade Area
GATS	General Agreement on Trade in Services
GCA	General Cooperation Agreement
GCC	Gulf Cooperation Council
GDP	Gross Domestic Production
GIDA	General Industrial Development Authority
GLS	Generalised Least Squares
GM	Genetically Modified Cotton
GOEIC	General Organization of Export and Import Control
GPA	Government Procurement Agreement (WTO)

GPT	General Preferential Tariff, Canada's GSP
GSP	Generalised System of Preferences
GSP Plus	Generalised System of Preference Plus
GSTP	Global System of Trade Preferences (among DCs)
GTAP	Global Trade Analysis Project Model
HS	Harmonised System
ICA	Investment Climate Assessment
ICAC	International Cotton Advisory Committee
ICT	Information and Communication Technology
ICTSD	International Centre for Trade and Sustainable Development
IDB	Inter-American Development Bank
IDS	Institute of Development Studies, University of Sussex
IIT	Intra-Industry Trade
ILO	International Labour Organisation
IMF	International Monetary Fund
IPR	Intellectual Property Rights
IRS	Increasing Returns to Scale
ISIC	International Standard for Industrial Classification
ISO	International Organisation of Standardisation
IT	Information Technology
ITU	International Trade Union
LDCs	Least Developed Countries
LDP	Landed Duty Paid

LS	Long Staple Cotton
MAFTA	Med-Arab Free Trade Area
MENA	Middle East and Northern Africa countries
MFA	Multi-Fibre Arrangement
MFNs	Most Favoured Nations
MLE	Maximum Likelihood Estimation
MMF (61)	Man- Made Fibre Apparel
MMF (62)	Man- Made Fabric
Mode 4	Under GATS services liberalization is classified according to How each service is supplied? Of the four modes, movement Of labour, Mode 4, is often referred to by number
MOU	Memorandum Of Understanding
MPNs	Most Preferred Nations
MPSS	Most Productive Scale Size
MSTQ	Metrology, Standards ,Testing and Quality Systems
MTI	Ministry of Trade and Industry
MU	Monetary Union
NAFTA	North American Free Trade Agreement
NAMA	Non Agricultural Market Access (in Doha Development Agenda)
NDRS	Non Decreasing Returns to Scale
NFIDC	Net Food Importing Developing Countries
NGO	Non-Governmental Organisation
NICs	Non Industrialised Countries

NIRS	Non Increasing Returns to Scale
NTBs	Non-Tariff Barriers
NTTC	New Textile Technology Centre
OECD	Organization for Economic Co-operation and Development
OEMs	Original Equipment Manufactures
OBMs	Original Brand Manufactures
OPCs	Operating Costs
OPT	Outward Processing Transactions
PBDAC	Principal Bank for Development and Agricultural Credit
PCTAS	Personal Computer Trade Analysis System
PPS	Production Possibility Set
PTA	Preferential Trade Arrangement
QIZ	Qualified Industrial Zones
REEF	Real Effective Exchange Rates
R&D	Research and Development
RMG	Ready Made Garments
ROO	Rules Of Origin
RTAs	Regional Trade Agreements
SAARC	South Asian Association for Regional Cooperation
SACU	Southern Africa Customs Union
SADC	Southern African Development Community
SAP	Structural Adjustment Programme
SDT (S&T)	Special and Different Treatment

SEZ	Special Economic Zone
SFA	Stochastic Frontier Analysis
SFD	Social Fund for Development
SITC	Standard International Classification
SMEs	Small and Medium Enterprises
SPS	Sanitary and Phytosanitary measures
SRS	Sample Random Sampling
TB	Tariff Barriers
TBT	Technical Barriers to Trade
T&A	Textile and Apparel
TC	Technical Change
TCR	Technology Closeness Ratio
TE	Technical Efficiency
TEC	Technical Efficiency Change
TFP	Total Factor Productivity
TGR	Technology Gap Ratio
TIM	Trade Integration Mechanism
TNCs	Transnational Corporations
TP	Technological Progress
TPR	Trade Policy Review
TPRM	Trade Policy Review Mechanism in the WTO
TRIMs	Trade-Related Investment Measures WTO
TRIPS	Trade-Related aspects of Intellectual Property Rights WTO
TSSC	Textile Specific Safeguard Clause

UNCTAD	United Nations Conference on Trade And Development
UNIDO	United Nations Industrial Development Organisation
USITC	United States International Trade Commission
VRS	Variable Returns to Scale
WCO	World Custom Organisation
WEF	World Economic Forum
WITS	The UNCTAD/World Bank World Integrated Trade Solution
WTO	World Trade Organisation

Introduction

I. Introduction

Textile and apparel (T&A) industry is one of the oldest sectors in industrial development history. It is also considered one of the oldest industries in Egypt. The T&A industry is one of the leading manufacturing industries Worldwide that contributes significantly to the economic growth of many developing countries (Stengg 2001). This part deals with the rationale for study, the study objectives; design sampling, etc.

II. Rationale for study

Since sustaining and enhancing the industry performance became a prerequisite for industry to survive in both domestic and global markets and according to its importance for employment, contribution to overall GDP and contribution to industrial value added. For industry demand side, rapid pace in international circumstances regarding the enactment of the EU Generalised System of Preference Plus (GSPP) which came into force on 2008 and included 27 provisions should be satisfied from any country desire to confer a free duty access on T&A products by the EU, different ROO agreements ruled the Egyptian exports of the T&A create burdens on exporters to comply with each one since they are not unified. Additionally, the impact of World financial crisis on declining exports rates for all countries implying the increase of competition levels among rivals to maintain their presence in markets as a result of performance surveys stated that international trade barriers affect the performance of local industry. On the other hand, the industry supply side is ruled by problems that affect its ability to compete especially for public units.

The failure of the privatisation policy for the public firms since buyers of those firms eliminate workforce and changes their activities instead of injecting investments for modernisation created pressures on the government together with financial crisis effects drive the government to follow some protection policies in all economic activities and slowdown privatisation programmes as a result of people's anger of privatisation polices on the whole. Therefore, making balance between economic concerns for public sector modernisation and

social considerations is a prerequisite and the government has only one way via improving performance.

Additionally, there is still a dispute among economists since most of theoretical and empirical studies show that there is no evidence that the private sector has a better performance than the public sector in general in which some situations verify that the public sector may give a better performance than private units. Taking into account that the public sector is still the main provider of industry inputs and raw materials to the private sector implies that high rates of performance in the sector will upsurge efficiency scores in the apparel sector. Obstacles of realising a specific rate (40-45%) of domestic value added for products to confer origin also require high quality and low cost inputs. Since the U.S. Bureau of Labour and Statistics and OECD (2001) attributed productivity's variations through time due to four main reasons; variations in; production technology, production processes, operation efficiency, and operating environment. Making links among all industry procedures from planting cotton or other fibres until final stage is a prerequisite (not only final product but also delivering and returning stages). Thus, enhancing industry performance entails not only giving attention to production process but widening our goal to enhance supply chain performance through main factors has an affect supply chain operations. To do so, the main goal will be how one can detect the causes of low efficiency rates in the Egyptian T&A public sector units? This will be fulfilled by giving more attention to the operating environment or extraneous factors (factors affect supply chain operations) influence industry performance especially the public entities. This may raise a question why am I giving an interest in the public sector firms? The answer will be; enhancing performance in textiles sector (mostly concentrated in public units) will lead to greater improvements in the apparel sector (private) in which each stage in this industry gives more value added. For instance, the textile has more value added and profitability than selling cotton as a raw martial and so on apparel and process home furnishing than textile or fabrics.

Thus, the purpose of the study is to examine the problems that face Egyptian T&A

industry in both sectors. Making smooth streamline linkages between both sectors will lead to efficiency gains. Although the Egyptian cotton has World fame for its unique features such as long lint staple and high quality cotton, the market share in textiles and apparel represents less than 1% of the World trade. This leads us to search for the causes of such low proportion in the World market. Thus, the starting point is to determine main causes of the problem to investigate its roots since improving and enhancing productivity and efficiency are the key factors for enhancing industry performance. Hence, the research aims to find answers for the following questions in order to detect whether there is a low performance problem and expected solutions.

❶ Are efficiency rates in public sector firms acceptable?

❷ How can authorities comply with GSP Plus requirements to benefit from free duty access for T&A products to the EU market?

❸ What are their impacts on industry performance?

❹ What is the role of factors affect supply chain operations on enhancing T&A performance?

All these reasons entailed to investigate circumstances behind the phenomenon of low efficiency rates in some public units.

III. Research objectives

The main objective is to explore the reasons of low performance rates via measuring efficiency in public and private firms separately.

Specific objectives:

❶ To go beyond the traditional measurement of production process.

❷ To measure variables or factors affect the performance of T&A supply chain.

❸ To examine the role of factors affect T&A supply chain operations.

❹ To maximise the public firms' value added as a cornerstone for the apparel industry.

❺ To investigate problems and impediments hinder the industry to compete globally.

IV. Research design

The study design is longitudinal in nature, being designed to find out the performance of the T&A industry for public and private units. The T&A industry in Egypt consists of more than

5000 firms ranging from small ones (employing less than 10 workers) to the extra- large ones (employing 21,969 workers). Twenty five of them belong to the public sector where numbers of workers on them range from 500 workers in the smallest one to 21,969 in the largest one. The T&A firms are distributed around the country in four main regions as follows: Delta, Greater Cairo, Alexandria and Canal Zone. As it is impossible for the researcher, within the constraints of time and resources, to collect information for all firms, it is proposed to select a sample around 20% of the study population with the proposed sampling strategy which is a simple random sampling. This sample covers all categories; in relation to size, ownership type and region to represent the population. The actual minimum unbalanced sample for the private firms is (1129) firms and after excluding the number of unrepeated activities (203 firms) (this number including number of activities that are only found in 2006 then we excluded them to set up a balanced panel. For instance, the unrepeated activities are; (27 ginning firms, 78 carpets firms, 28 fabrics car covers firms, 36 wool spinning firms, 24 making fabrics tents firms, 10 sewing thread firms) the total number of the balanced panel after of excluding unrepeated firms is (926 firms) then we exclude 88 non responding firms (non responding firms are; 24 yarn, 42 weaving, 4 fabrics, 12 clothing). The net number of the balanced panel is 838 per year and they are divided into two groups; 379 textile firms and 459 apparel firms.

The public sector unbalanced data average is 55 firms but after excluding privatised and merged ones the total population became 25 firms per year. For the public units we should bear in mind that those 25 firms are equivalent to 500 large and extra-large private units as each one has at least all textile activities such as yarn, weaving, dyeing & bleaching and fabrics plus apparel activity in some of them and each activity has at least 3 extra-large factories. Owing to unavailability of having separate data for each activity for public units and the available data for them are only offered in an aggregated form, thus the whole population of the public units is included.

The grouping of regions follows the cluster sampling technique. The data rely firstly upon raw data obtained via Central Agency of Population Mobilisation And Statistics (CAPMAS) for the private and the public firms which cover all information about inputs and outputs together with the data obtained via questionnaires and interviews. The type of questionnaire is collective which has the merit of obtaining captive information through firms' workers directly and it enables to have a personal contact with the study population. It also gives the opportunity to explain the purpose, relevance and importance of the study and can clarify any questions that respondents may have. The questionnaire questions are a mix of close and open end type. Despite the open end type of questionnaires is difficult when processing data; it has the merit of giving a big area of freedom for respondent to answer questions in details.

In addition, semi-structured interviews with firms' owners for private sector, managers and engineers in public ones are run. Thus, using this method enables me and the assistant group to benefit from the advantages of questionnaires and interviews and give the opportunity to clarify any sort of misunderstanding, saving money in case of sending and receiving them by mail, saving time, and the most important goal is to communicate with workers to know directly their opinion concerning obstacles faced them and their impact on productivity (extraneous factors). Alternatively, interviews help to get mangers and officials thoughts about industry issues.

V. Sampling

Because of the constraints of time and resources and difficulty to cover all sampling population 5000 firms range from small to very large size firms. The study covers 838 private firms together with the whole population of the public firms 25 companies. Most of sampling data rely directly on primary data; in addition a secondary data is obtained through the following sources: Central Agency for Population Mobilisation And Statistics (CAPMAS), Ministry of Trade& Industry (MTI), The Box of Subsidising the Industry of Yarn &Textile, Egyptian Textile Consolidation Fund (ETCF), Egyptian Federation of Industries (EFI), data obtained through Industries Union for the T&A in each industrial city such as (Shubra El- khiema, EL-Mahalla El-

kubra, Tenth of Ramadan City, Sixth of October City, Burg El Arab City, Giza and Nasr City), Business Sector Information Centre (BSIC) and some of the World and international organisations such as (UNIDO, UNCTAD, WTO, etc.). Even though, using both sources of primary and secondary data will not be an easy mission, but they will enable me to ensure validity and reliability on data obtained. Sampling will be done by random method by dividing the sampling population into groups to neutralise heterogeneity that may cause regarding differences in technology implemented and location. Groups are gathered for each related group according to similar features to ensure comparability in terms of firms' population.

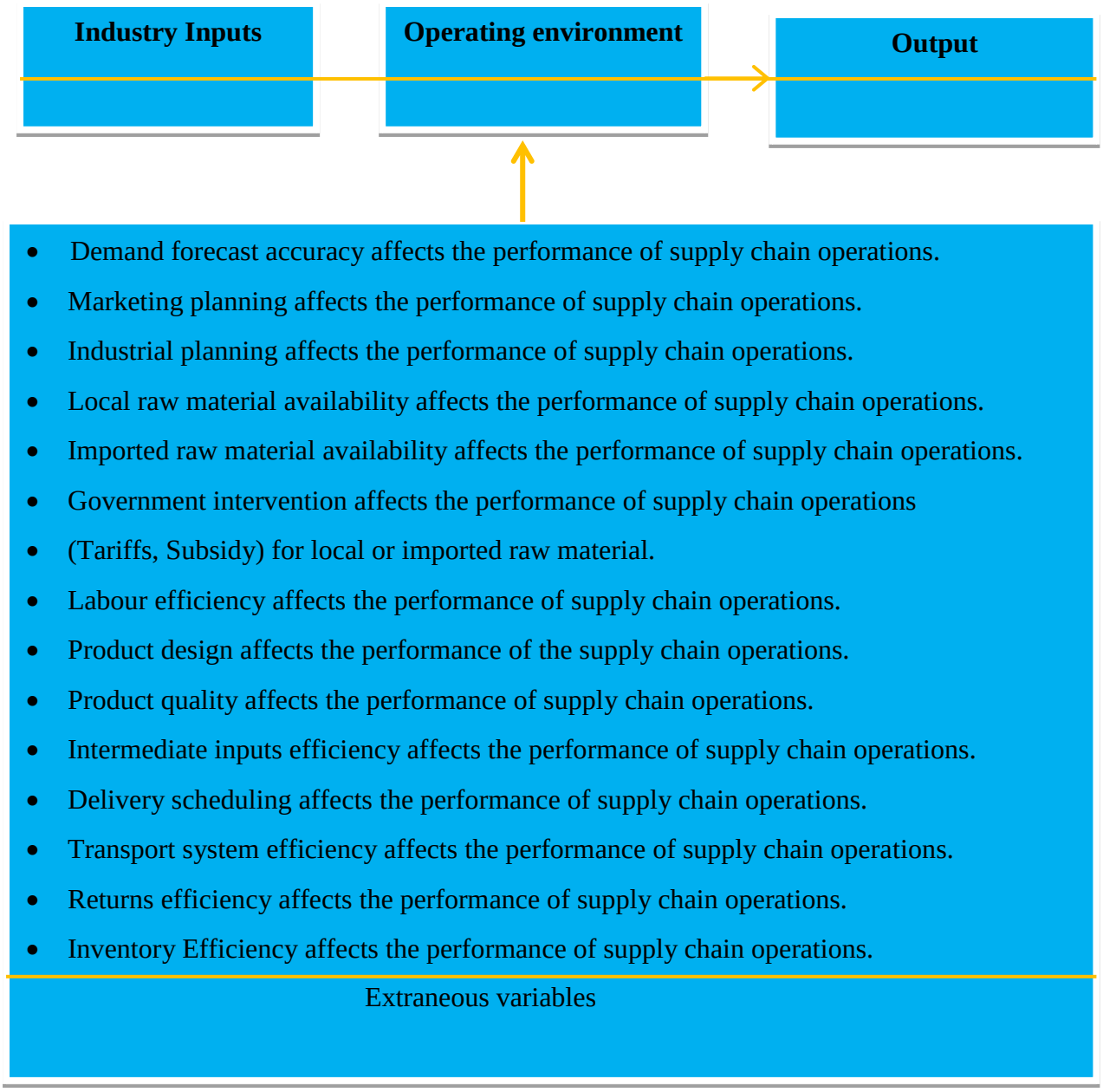
VI. Measurement procedures

Since searching for main causes of the differences in efficiency scores will reveal and facilitate the methods of treatment which will be described in subsequent chapters. This indicates that there is a need to assess the efficiency of firms in both sectors to find out the causes of differences between them in general and among firms in particular. For that reason, popular techniques are employed for measuring productivity and technical efficiency. The main two approaches are; a non-parametric approach Data Envelopment Analysis (DEA) and a parametric approach or statistical approach Stochastic Frontier Analysis (SFA) with the use of LIMDEP 9 software package as programming software. The benefit of LIMDEP 9 software is that the one can process data using both techniques the SFA and the DEA. This also is helpful to benefit from the merits of the DEA and the SFA, to avoid their disadvantages and to make a comparison between results obtained through both of them. The metafrontier technique for measuring TE for firms in both sectors is also used. Reasons behind using this technique are since both the private and the public firms are distributed across the country in four main regions as explained and two of them were established a century ago and others were established during the last three decades indicating implying there are differences in technology used among regions and / or due to ownership differences. Thus, the metafrontier technique is used to avoid the impact of heterogeneity across groups with different technologies used regarding differences in locations

and ownership type by constructing separate group frontier for firms in each group with similar characteristics alongside a single metafrontier that applies to all firms belong to all groups and then benchmark each group relative to a metafrontier.

The Model

Figure1 the model



The next step is data analysis process via employing computer software LIMDEP 9 package

VII. Data analysis

Data is analysed by using the LIMDEP 9 which has numerous features. One of the integrated econometrics programmes currently in general use provides programmes and routines

for frontier and efficiency analysis, LIMDEP/NLOGIT. The freeware program, FRONTIER 4.1 by Tim Coelli can also be used for a of stochastic frontier models. The LIMDEP also is used for the DEA efficiency estimates for Input and output oriented efficiency, retained in the data set for further analysis CRS or VRS. Economic and allocative efficiency bootstrapped confidence intervals for efficiency scores. Finally, the LIMDEP is a measurement tool of efficiency for both the SFA and the DEA in one programme.

VIII. Problems and limitations

Since I have a limited time for collecting data through a four-month period and a limited fund, thus it is too difficult to cover the sampling population as mentioned before and also it is costly and approximately too difficult to make questionnaires cover all industry firms (5000). Thus, the sample covers 838 balanced private firms besides the whole population of the public firms (25) from the sample population and for validity and reliability purposes the sample covers different regions, different firms' size and different ownership types.

IX. Research scheme

The research will be divided into a group of chapters as follows:

Introduction

Chapter one: Literature Review.

Chapter two: The structure of textile and apparel industry.

Chapter Three: Technical efficiency for Egyptian textile and apparel industry firms: SFA panel data time varying approach.

Chapter four: Metafrontier production function and main factors affecting Textile & Apparel supply chain to estimate technical efficiency for firms operating at regional level

Chapter five: Technical efficiency for textile and apparel industry firms a non-parametric analysis of firm level data.

Chapter six: Empirical results summary.

Chapter seven: Summary and conclusions.

Chapter 1

Literature review

1.1 Introduction

Technical efficiency and productivity are considered main indicators of industry performance. In this chapter I cover a sequence of procedures which provide a brief background about performance, industry performance determinants, DEA & SFA and finally the empirical studies relating to the T&A industry are covered.

1.2Performance literature

The discussion of firms' economic performance is known to depict them as being more or less efficient, or productive. It is desirable in this regard to discuss the relationship between efficiency and productivity and therefore the determinants of firm or producer performance. Firm's productivity in a simple term can be defined as the ratio of produced output through given input. This ratio is easy to compute if the firm uses a single input to generate a single output. In situations where the firm employs several inputs to produce several outputs, the outputs in the numerator are aggregated in a particular way, in the same way inputs in the denominator are aggregated and therefore productivity remains the ratio of two scalars and productivity growth is the difference between output growth and input growth. A difference in productivity, through producers or time, is therefore a residual. Abramovitz (1956)[1] characterised the residual as "a measure of our ignorance". Solow (1957)[2] did his best to dispel this ignorance by "whittling away at the residuals" (Stone, 1980)[3]. Thus, a great deal of whittling has implicated minimising measurement error by constructing input and output quantity indices. Broadly, the residual can be ascribed to variations in; production technology, the scale of operations, operating efficiency, and operating environment where production takes place. The U.S. Bureau of Labour and Statistics (BLS) and OECD (2001) attribute productivity's variation through time to these four sources. Appropriate attribution is essential for the implementation of private managerial practices and also a proper design of public policies aimed to improve productivity performance.

[1]Abramovitz M. 1956. Resource and output trends in the United States since 1870. *American Economic Review*.46 (2): 5-23.
[2]Solow R. 1957. Technical change and the aggregate production function. *Review of Economic and Statistics*. 39(3): 312-320.
[3]Stone R. 1980. Whittling away at the residual: some thoughts on Denison's growth accounting. *Journal of Economic Literature*. 18 (4) :1539-1543

In this regard, most of economists are interested in isolating the first three components which are under the control of management whereas the fourth is not. In this regards, the fourth factor (operating environment) plays a crucial role in other three factors and should be taken into account. Thus, one of the aims is to evaluate the impact of the extraneous factors on efficiency.

Generally, a firm or a producer is efficient by making a comparison between observed and optimal values of its inputs and outputs. The user may involve in comparing observed outputs to maximum potential outputs attainable for given inputs, or in comparing observed inputs to minimum potential inputs required to produce the same outputs. Thus, the optimum is defined in terms of production possibilities and technical efficiency as well and is expressed in value terms.

A clear example is provided by the impact of market structure on performance where there is a belief that productive efficiency is a survival condition for a competitive environment. Hicks (1935)[4] provided powerful expression to this belief by declaring that producers having market power "are likely to exploit their advantage much more by not bothering to get very near the position of maximum profit than by straining themselves to get very close to it. The best of all monopoly profits is a quiet life". Williamson (1964)[5] argued along analogous lines where an operating environment is characterised by market power and separation of ownership from control leaves room for "managerial discretion". In the presence of the right to choose, managers would seek to maximise a utility function where profit was either one of several augments or a constraint on the pursuit of alternative objectives. This idea comes again commonly in the organisation literature. Consequently, competition is expected to enhance performance either because it forces producers to concentrate on observable profit generating activities at the expense of Hicks's quiet life, or because it frees producers from the actual or potential constraints imposed by the regulatory and antitrust process.

One important thing of the market structure hypothesis is the impact of international trade

[4] Hicks J. 1935. The theory of monopoly: a survey. *Econometrica*. 3(1): 1-20.
[5]Williamson O. 1964. *The Economics of discretionary behaviour: managerial objectives in a theory of the firm*. Englewood Cliffs, NJ: Prentice-Hall.

barriers on domestic industrial performance. Tybout and Westbrook (1995)[6], Pavcnik (2002)[7], and Schor (2004)[8] have applied modern frontier techniques to longitudinal micro data on the linkage between openness and productivity in Mexico, Chile, and Brazil. A general theme emerges that trade liberalisation brings productivity gains attributable to productivity improvements among continuing firms which offers entry of relatively productive firms and exit of relatively unproductive firms.

The other situation wherein measurement can quantify theoretical proposals is the effect of ownership on performance. Literature has developed based on the assumption that public mangers have greater freedom to follow their own objectives, at the expense of conventional objectives. Alessi (1974)[9] stated that public mangers prefer capital intensive budget, and Lindsay (1976)[10] viewed that public mangers prefer visible variables. These hypotheses propose that measured performance is lower in the public sector than in the private sector. Empirical tests of the public-private performance differential hypothesis are numerous. Many of the comparisons have been conducted using regulated utility data since public and private firms compete in these industries, because of the global trend toward privatisation of the public utilities, and because regulatory organisations collect and provide data.

Jamasb and Pollitt (2003)[11] survey the empirical evidence for electricity distribution. Education and health care are two additional areas in which several public-private performance comparisons have been conducted. For any public-private performance comparison, the problem is how to measure their performance. Pestieau (2007)[12] offer a forceful defence of a narrow focus

[6] Tybout J, Westbrook M. 1995. Trade liberalization and the dimensions of efficiency change in Mexican manufacturing industries. *Journal of International Economics*. 39 (0000): 53-87.
Pavcnik N. 2002. Trade Liberalization, Exit, and Productivity Improvements: Evidence from Chilean Plants. *Review of Economic Studies*. 69(1): 245-276.

[8] Schor A. 2004. Heterogeneous Productivity Response to Tariff Reduction: Evidence from Brazilian Manufacturing Firms. *Journal of Development Economics*. 75: 373-396.

[9] Alessi L. 1974. An Economic analysis of government ownership and regulation: theory and the evidence from the electric power industry. *Public Choice Journal* 19:1-42.

[10] Lindsay C. 1976. A theory of government enterprise. *Journal of Political Economy*. 84 (5): 1061-1077.

[11] Jamasb T, Pollitt M. 2003. International benchmarking and regulation: an application to European electricity distribution utilities. *Journal of Energy Policy*. 31: 1609-1622.

on technical efficiency, in an attempt to level the playing field. He disputes that the public enterprises have objectives and constraints such as uniform price requirements, fiscal balance and universal service different from those of the private sector, but also have a soft budget constraint. So, the common ground is to compare their performance via technical efficiency.

On the subject of industry performance determinants, it is preferable to take into account the impact of the industry supply chain processes, and lean retailing.

Measuring the performance of the T&A industry in Egypt is a tangled mission in view of the fact that it is ruled by lots of considerations where they are not only bounded by production process but also by all supply chain stages. The T&A should comply with the changes in ROO (Rules Of Origin) and competition in both local and international markets. Thus, firms are likely to compete in a fast changing World with more global competition including free trade pressures. To survive, producers need to cope with the challenge of reduction in delivery lead time, product cost, service cost, and inventory cost (Wasusri et al., 2004). Moreover, the challenges facing producers are shifting from internal efficiency measure or narrow concept to a measure of supply chain efficiency or comprehensive concept (Fine, 1998). Olhager and Selldin (2004) stated that a significant competitive advantage cannot be obtained by improving the efficiency of products and processes alone; the manufacturers need to improve the efficiency of product, process, and supply chain. Effective supply chain management requires measures capable of capturing performance across multiple trading partners. In the same direction for supporting the view of the importance of supply chain than production process only in affecting the industry performance on the subject of delivery time, Evans and Harrigan (2005)[13] show that the sources of U.S. apparel imports for timeliness problems have shifted toward products increasingly imported from nearby countries. They establish an empirical link between the rise of Mexico and the Caribbean as major suppliers to the U.S. market and the rise of lean retailing in the 1990s.

[12] Pestieau P. 2007. Assessing the performance of the public sector. *Annals of Public and Cooperative Economics*. 80(1):133-161

[13] Evans C, Harrigan J. 2005. Distance, Time, and Specialization: Lean Retailing in General Equilibrium. *The American Economic Review*. 95 (1): 293-313.

Other studies have also examined the implications of efficient retailing. In his study, Nordås (2004) combines the results of GTAP (Global Trade Analysis Project) simulations and a gravity model to argue that countries close to the major importing markets are likely to be less affected by the competition from China and India. In this regard, Mexico & the Caribbean, Eastern Europe and North Africa are likely to remain important exporters to the U.S. and the EU respectively and possibly maintain their market shares. Hyvarinen (2001)[14] also argues that the post-MFA outlook for Morocco and Tunisia is positive because of their proximity to the EU markets. In the same basis, Birnbaum (2005)[15] notes that, since U.S. buyers are increasingly demanding quick-response services, distant factories will find it harder to satisfy the customer requirements. With shipping time from Bangladesh, India, and Sri Lanka to the U.S. where it takes 20-28 days, compared with 2 days from Mexico, the latter are in advantageous position in the U.S. market. Kheir El-Din and Abdel-Fattah (2000) make a similar argument, suggesting that Middle East and North Africa apparel producers around the Mediterranean will be able to enjoy market shares in fast-moving, high-value items, helped in the large measure by their closeness to EU market. Otherwise, other studies stated that the efficient retailing advantages do not automatically accumulate all the proximate suppliers and all producers in a given country, Since operational mode of efficient retailing requires technological development at both the retailing and supplier levels, technology has become a crucial factor in suppliers' selection.

Moreover, changes in the management practices of the apparel factories are also deemed necessary for flexible production. Smith and Weil (2004)[16] point out those firms with modular assembly are particularly attractive to retailers. Integrated production entails grouping tasks and assigning those tasks into main and few stages instead of separating assembly (sewing) into a long series of small steps. It is considered an important way to reduce the assembly time of a

[14] Hyvarinen A. 2001. Implications of the Introduction of the Agreement of Textiles and Clothing (ATC) on the African Textiles and Clothing Sector. *International Trade Centre*. UNCTAD/WTO.
[15] Birnbaum, D. 2005. Impact of the MFA removal in the EU and the US market. World Bank MNSED. Mimeo.
[16] Smith M, Weil D. 2004. Ratcheting Up: Linked Technology Adoption in Supply Chains. Mimeo.

given product. Finally, exploiting the advantages of lean retailing requires good logistics (Someya, Shunnar and Srinivasan, 2002)[17].

On the subject of theoretical basis of Rules Of Origin (ROO) and its impacts on the T&A industry, some studies examined the effects of using preferential ROO as a commercial policy instrument and the role that ROO play in providing hidden protection to members of the Free Trade Agreements (FTA). Other studies analysed the trade creation, and trade diversion effects of ROO. There was also a growing concern about comparing the benefits of using ROO to avoid trade deflection and the cost of using them on the flow of goods and services between members of the FTAs and non-member countries (Lloyd 1993)[18] and (Krishna and Krueger 1995)[19]. Another distinct category of theoretical research concentrated on examining the distortionary effects of ROO on firms' behaviour, cost of production, profitability, efficiency and welfare. From this survey of theoretical literature concerning main factors affect the T&A industry performance; it is clear that measuring the T&A supply chain performance incorporate all these factors and not only focus on production process but include all processes which have direct and indirect effects on industry. Thus, the aim is to measure efficiency without and with main factors affecting supply chain operations which will give a clear vision for the reasons of efficiency differences between public and private units to enhance the overall industry performance.

1. 3 DEA &SFA

In this section a quick glance is provided for the two familiar employed methods as productivity and technical efficiency measures. With regard to the theoretical background of non-parametric method Data Envelopment Analysis (DEA) and a parametric method Stochastic Frontier Analysis (SFA), the first appearance for both techniques was introduced by the second half of the 1970s. In1978, the method of DEA is introduced by Charnes Cooper and Rhodes

[17] Someya M Shunnar H, Srinivasan T. 2002. Textile and Clothing Exports in MENA: Past Performance, Prospects and Policy Issues in Post MFA Context. *Middle East and North Africa Region Working Paper*, World Bank, Washington, DC.
[18] Lloyd P. 1993. A Tariff Substitute for Rules of Origin in Free Trade Areas *World Economy*. 16: 699-712.
[19] Krishna K, Krueger A. 1995. Implementing Free Trade Areas: Rules of Origin and Hidden Protection. National Bureau of Economic Research. NBER WP No 4983.

(CCR)[20] as a non-parametric technique for measuring decision making units (DMUs) efficiency. As the origin of the DEA started in 1978 with CCR paper, first simultaneous SFA published papers are Meeusen and Van den Broeck (MB) [21], Aigner, Lovell, and Schmidt (ALS) [22] and then Battese and Corra[23] in 1977. SFA papers were developed to estimate the efficiency of organisational units. These units use the same set of inputs to produce the same set of outputs. Those methods is firstly employed to measure efficiency in services such as schools, hospitals, banks and then spread to cover all economic activities.

DEA is a non-parametric approach based on linear programming which takes the observed input and output values and forms a production possibility set (PPS) making certain assumptions. The distance of a DMU from the frontier of this set is then used as a measure of its inefficiency and this method gives efficiency relative to the best practice DMUs. On the other hand, the SFA methodology uses observed input-output correspondences to estimate an underlying relationship between inputs and outputs. This function is then used as the frontier against which to measure the efficiencies. Both methods have very different fundamental structures which lead to efficiency estimates and also can differ between the methods. The option of using a relevant method is frequently reliant upon which one is seen as the easiest to implement rather than any reasoned argument for the better performance of the chosen method. This leads to DEA often being chosen instead of SFA methods. The estimates specified by the SFA method are restricted on the total error and this can be used as a reason to not use the SFA method. Banker et al. (1988); stated that "with SF estimation we encounter problems with lengthy algorithms for estimation and difficulty in isolating estimates for individual observations."

However, recent software programmes make it possible for the SFA estimates to be

[20] Charnes A Cooper W, Rhodes E. 1978. Measuring the Efficiency of decision making units. *European Journal of Operational Research.* 2 (6): 429- 444.

[21] Meeusen, W, van den Broeck J. 1977. Efficiency Estimation from Cobb-Douglas Production Functions with Composed Error. *International Economic Review*. 18: 435-444.

[22] Aigner D Lovell C, Schmidt S. 1977. Formulation and Estimation of Stochastic Frontier Production Function Models. *Journal of Econometrics*. 6: 21-37.

[23] Battese G, Corra G. 1977. Estimation of a Production Frontier Model: With Application to the Pastoral Zone of Eastern Australia. *Australian Journal of Agricultural Economics*. 21 (3): 169-179.

obtained quite easily and the estimates are very good when the assumptions of the methods are satisfied. Unfortunately, there is no easy answer to determine which one of approaches does better: The performance of the methods is notably reliant upon the data set which is being analysed. In some data sets one of the methods will give better estimates for all the units. On the other hand, some of the units will give better estimates under one method and other units will give better estimates under the second. If both methods are applied to same data set, there must be some way to explain similarities and dissimilarities between estimates to validate results.

1.4 Textile and apparel empirical studies

Empirical studies for measuring technical efficiency, productivity and productivity growth with reference to the T&A industry are few for parametric and non-parametric techniques. Therefore, it is preferable to present main papers focused on the T&A industry via SFA and DEA by discussing them. These studies are grouped into three categories. The first set is the TFP studies, the second is the TE measurements using the SFA and the DEA techniques, and the third one is the Meta-frontier technique.

1.4.1 Total Factor Productivity (TFP) studies

There are three studies mentioned for measuring productivity. The first is the study of Margono and Sharma for measuring efficiency and productivity for Indonesian manufacturing sector. While, the second is the study of Handoussa, Nishimizu and Page for measuring productivity change in the Egyptian public sector industries after the openness era and the third one is the study of Galal and El- Megharbel for assessing the industrial policy in Egypt.

Margono and Sharma (2004)[24] aim on their study to examine TFP growth in Indonesian manufacturing for four industries; Food, textile & apparel, chemical, and metal industries. Yearly data from 1993 to 2000 is obtained from yearly surveys conducted by the Indonesian Central Bureau of Statistic for medium and large size manufacturing firms. Output and inputs are

[24]Margono H, Sharma S. 2006. Efficiency and productivity analyses of Indonesian manufacturing industries. *Journal of Asian Economics*. 17 (6): 979-995.

classified as follows: Gross total output is the total value of a firm's output in a specific year, capital is the total cost of firms' capital depreciation and interest paid by the firm. Labour is the total number of employees due to the unavailability of the data for labour- man hours, material is the total value of used material in 1993 thousand rupiah price, the regional location of a firm, ownership and firm size are represented by binary variables.

Average TE of the four sectors is 56% meaning that firms in these sectors, on average, are operating only 56% of their potential outputs. The average TE for food sector is 51%, textile 48% (the lowest) chemical 69% and metal 69%. There are no significant differences in TE regarding the size (slight increase for large firms), region (west, east), ownership (public, private) and there is no effect regarding the firms age. TFP growth estimates reveal that during the period under investigation the average TFP growth is -2.73% for the food, -0.26% for the textile, and -1.65% for the metal products. The chemical is the only sector that recorded positive growth 0.5%. It also noted that the average TFP growth for the food improved from -3.53% before the Asian crisis (1994-1997) to -1.66% after the crisis (1998-2000). On the other hand, for the other three sectors textile, chemical and metal products, the TFP growths is shrunk from1.8% to -0.3 %, from 1.2% to -0.05%, and from -1.1% to - 2.38%, respectively after the crisis. Consequently the hypotheses that the crisis affected the TFP growth in manufacturing sector in Indonesia are confirmed in the textile, chemical and metal products. The elasticities of output with respect to capital are higher than the elasticities of output with respect to material and labour for textile, chemical and metal products indicating that the three sectors are capital oriented compared to the food sector.

Handoussa, Nishimizu and Page[25](1986) measure productivity change for Egyptian public sector industries from 1973-1978 (transition period from central planning regime to liberalisation). The study examine the impact of the openness policy on public firms via TFP

[25]Handoussa H Nishimizu M, Page, J. 1986. Productivity change in Egyptian public sector Industries after the opening. *Journal of Development Economics*. 20: 53-73.

change. The production frontier is estimated separately for 15 Egyptian industries during the study period. Panel data include observations for 96 firms covering most of the public sector firms' population. Output is the gross output in constant 1972 producer prices; labour is the number of employed workers, and materials. The deterministic approach is used in a trans-log form for measuring productivity change and estimating technological progress and TE change for the Egyptian public firms to estimate the frontier production function.

Results show that the openness policy reforms in the public sector favoured firms that followed import substituting activities rather than traditional export activities. Decomposition of TFP change into best practice TFP change and TE change revealed that in most industries the rates of best practice TFP growth are very high relative to what is usually expected as the long term rates of technological change. These high rates of best practice TFP growth compensated the deterioration in TE. The overall trend growth rate in output for the entire sample of the public sector firms is 8.9%. For import substituting firms the trend output growth rate is 11%, while for traditional export firms the trend growth rate is not significantly different from zero. The trend growth rate of TFP for the public sector as a whole is about 1.2, for import substituting firms the trend growth rate is 2.4, while for traditional export firms it is -1.9. Taken together, the results may present a strong association between output growth and productivity performance in the Egyptian public sector. Fast growing import substituting firms experienced rates of productivity change which greatly exceeded those exhibited by traditional exports. The deterioration of the average level of TE and the increased dispersion of relative levels of efficiency which occurred in most industries might be expected due to the movement from highly centralised direction of the public firms to a more decentralised environment for production.

Galal and El-Megharbel (2005)[26] investigate the effect of industrial policy in Egypt by measuring the performance of the manufacturing sector during the period 1980-2000. After

[26]Galal A., El-Megharbel N. 2005. Do governments pick winners or Losers? : An assessment of industrial policy in Egypt. Cairo, Egypt. WP108. The Egyptian Centre for Economic Studies (ECES):1-30.

estimating TFP growth for industries they test whether industrial policy is relevant to TFP changes or not. Data cover outputs, intermediate inputs and labour for 16 industries over the period 1980/81-2000/01 using the Annual Industrial Statistics Bulletin issued by CAPMAS. The data also covered both public and private sector firms. Labour is measured by the number of workers per industry. Material inputs data include all used materials for production process. Capital is the perpetual inventory method to construct the capital stock series for different industries. Data on gross capital formation are also obtained from the CAPMAS. The calculation of the capital stock involved estimating an initial capital stock for each industry. Starting from the initial capital stock, additions to the stock are added and depreciation is subtracted to obtain the capital stock for subsequent years (1981/82-2000/01). Gross capital formation is used in the calculations and is deflated using the GDP deflator. After measuring TFP change for industries the second step is to estimate the effect of industrial policy on TFP change (dependent variable) with the following regressors: GDP growth rates for the study period are calculated using data from the World development indicators. Share of subsidies to total output, data on direct subsidies for industries over the study period. Data from the UNIDO industrial database on the number of firms by industry are used to calculate the share of the number of firms to total industrial firms. This index reflects the degree of concentration in different industries. Effective Rates of Protection (ERP) for different industries are obtained from Refaat (1999). Finally, all data were filtered using Hodrick and Prescott 1980 (HP) filter to smooth the data and to correct for real business cycles fluctuations.

Results show that there is an increase in the Herfindahl-Hirschman Index (HHI) of manufacturing output which ranges from 0.18 to 0.25 indicating that the Egyptian manufacturing sector tends to be more concentrated over time. TFP change average is less than one a year (0.75) over the study period. The peak of productivity improvement is shown in the first half of the1990s, and the weakest performance is found in the second half of the 1990s. For the textile

sector, TFP average in 1980-85 is -0.04; in 86-90 is 0.96, 91-95 was 1.72, and 96-2000 is 0.59 and average for the period 1980-2000 is 0.81. For the apparel sector, TFP average in 80-85 is 0.67, 86-90 is 2.16, 91-95 is 1.89 and 96-2000 0.59 and the average for the period 80-2000 is 1.33. Overall, productivity improvements are modest and results exhibit significant variations across sectors and over time. Regression results show that industries receive greater protection and subsidies perform less well than industries that do not. Industries that operated in relatively less competitive markets perform less well than industries that face greater competition. Rather than benefiting from support to overcome initially high costs of production, supported industries seem to have relaxed and exerted less effort than what is needed for industrial policy to be beneficial.

1.4.2 Technical Efficiency (TE) Studies

On the subject of SFA models, starting by Bhandari and Maiti (2007)[27], this study measures TE for Indian textile industry to examine if there are any differences in efficiency regarding their age and size by using a trans-log functional form. Output is total ex-factory value of products produced by the firm during the year, labour is the total number of man days worked during the year, capital is the net value of fixed assets of the firm at the beginning of a year, intermediate inputs is the nominal value of inputs used by the firm during the year, and age is the difference between the current year and firm's initial production year. Results show that TE values vary among firms regarding state differences. TE in the public sector firms is lower than private sector firms. There is a positive relationship between firm's size and TE. The mean TE tends to be higher for the newer firms meaning that old firms' mean is apt to be lower.

Goaied and Mouelhi (2000)[28] use the national annual survey carried out by the Tunisian National Institute of Statistics as a data source. The data cover nearly all firms for different sizes

[27]Bhandari A, Maiti P. 2007. Efficiency of Indian manufacturing firms: Textile industry as a case study. I*nternational Journal of Business and Economics.* 6(1): 71-88.

[28]Goaied M, Mouelhi R. 2000. Efficiency measurement with unbalanced panel data: Evidence from Tunisian textile, clothing and leather Industries. *Journal of Productivity Analysis*.13: 249-262.

(initially 5000) whom employ at least ten workers over the period 1983-1994 for textile, clothing and leather (TCL). Capital stock is evaluated at historical values, capital and labour variables, intermediate inputs, since firms are assumed to employ varied skills workers, the skills are classified as follows: senior, executive employee, technicians, primary workers and hands. There is information about some time-invariant firm characteristics such as the activity, and whether or not the firm is an exporting one. Unbalanced panel data time-invariant technique in a trans-log form is used to examine technical efficiency for TCL industries. Overall, the mean elasticity of output with respect to capital and labour are of reasonable size, the capital elasticity is 0.23 while the labour elasticity is around 0.72 meaning that labour are used intensely in the TCL industries. The mean value of elasticity of scale is 0.95, suggesting that the TCL industries have been using a technology with decreasing returns to scale. The overall mean rate of TC is negative showing technical regress at an annual average rate of 1 % through the period of study. Similarly, the effect of exporting firms on productivity shows positively significant at a 5% level. With respect to the domestically oriented firms, exporting firms are on average 42% more productive. This is matching the fact that joining in export markets brings benefits to firms where international markets give the best practice and foster learning and productivity growth. Productivity differentials between workers with different skills are found to be significant. The mean efficiency scores vary at a rate of 2.6% to 12.5% regarding the estimation procedures. The mean efficiency level of the Modification of Hausman and Taylor procedure is around 66.5%. This value falls between the within efficiency measure (55.8%) and the feasible generalised least square estimator (68.3%). This indicates the importance of controlling for time-invariant variables when estimating firm specific efficiencies. Efficiencies estimates are fine within the bounds of those reported in other studies of Tunisian TCL industries.

Galvez and Marcos (2000)[29] estimate the levels of TE in the Spanish manufacturing firms

[29]Galvez C, Marcos A. 2000. Technical efficiency of Spanish manufacturing firms: a panel data approach. *Journal of Applied Economics*. (32): 1249-1258.

through an estimation of frontier production functions in a balanced panel for fifteen industrial sectors from 1990 to 1994 covering 855 Spanish firms. In addition to these efficiency indicators other important technological measurements of these productive processes are obtained such as the scale and the technical progress parameters. Outputs are measured by the yearly production whereas inputs are: labour is hours of work, capital is the replacement value of the net capital stock, materials are in constant prices, capacity utilisation measures the percentage of utilisation of the installed capacity. SFA approach is used to estimate TE by using panel data time-invariant technique and time variable is added to measure Hicks-neutral TC. Cobb-Douglas production function form is used where the input coefficients represent elasticities and the sum of them gives elasticity of scale. Within Group technique (WG) was used for 3 sectors while (GLS) was used for the others.

Results show that capital input is insignificant across all the estimations. The explanation may be that the selected functional form is not the adequate one; or there is a great heterogeneity among firms within the sector. The results confirm the non-endogeneity of labour as it appears from the HT. The estimation with the generalised method of moments has been proved and has been due to the absence of correlation between the individual effects and the explanatory variables confirmed by the HT. The WG estimation is the best in only three sectors because the null hypothesis is accepted. Regarding elasticity of scale and the rate of TP by sectors, these results show that the sectors with CRS are 8 sectors and remaining sectors present DRS. Conversely, TP rate revealed great heterogeneity among sectors.

Lundvall and Battese (2000)[30] measure efficiency in Kenyan manufacturing firms regarding differences in firms' size and age using panel data time-varying technique in a trans-log form. Kenyan data include 235 industrial firms (very small, small, medium, large, and very large) in four sectors (food, wood, textile and metal) from 1993 to1995. Outputs are the value

[30]Lundvall K, Battese G. 2000. Firm size, age and efficiency: Evidence from Kenyan manufacturing firms. *Journal of Development Studies*. 36 (3): 146-163.

of all outputs produced by the firm in the given year. Inputs are characterised as follows; capital is defined as the replacement cost of existing machinery and other equipment employed in the production corrected by the degree of capacity utilisation. Wages are the total wage bill, including all allowances for the firm in the year. Intermediate inputs include costs for raw materials, solid and liquid fuel, electricity and water. Outputs and inputs are expressed in thousands of 1992 Kenyan shillings. Separate deflators are used for outputs, capital and wages.

Results show that size often has a strong positive association with TE and it is positive for a great majority of the firms in all sectors, and the parameters associated with the size variables are significant in the wood and textile sectors. The age effects are insignificant in all sectors except textiles, where the relationship is negative for small firms and positive for large firms. Firms' age have insignificant effects on TE for all sectors of the manufacturing industry in Kenya. This may be interpreted in high rates of turnover of firms in an industry, which imply low average firm ages, and may limit size-driven improvements in technical efficiency. The elasticity of TE with respect to age is negative for the three smallest size categories and positive for the two largest. The elasticities of TE with respect to firm size have a positive relationship.

Alvarez and Crespi (2003)[31] investigate TE determinants in Chile using DEA CRS. Annual cross-sectional data in 1996 is used for (1091) observations covering all industrial sectors in Chilean industry for micro, small and medium size firms (MSM) carried out by the Central Bank of Chile and the National Institute of Statistics. The size of firm is classified by total annual sales. Sales are utilised as outputs. Labour and capital are used as inputs.The average efficiency of MSM firms in the Chilean industrial sector is 65% some sectors with higher efficiency 80% and others like textile 40% meaning there are other factors rather than size affecting the reduction of efficiency in sectors. There are elements inherent to some sectors making them more or less efficient regarding policy implications. This can be interpreted as

[31] Alvarez R, Crespi G. 2003. Determinants of technical efficiency in small firms. *Journal of Small Business Economics*.20 (3): 233-244.

traditional resources allocation may not be the best way to increase efficiency meaning that firms' participation in public programmes had weak influence on firm efficiency. Micro firms attained higher average efficiency than small firms. Owner's experience is not related to efficiency. Variables as worker experience and capital modernisation increase firm's efficiency also, there is a positive relationship between efficiency and product differentiation.

1.4.3 Meta-frontier technique

The meta-frontier technique is based on the notion that the observed firms may not have access to the same technology in which different firms or categories of firms may face different production technologies. Variations regarding geographical, institutional, or any other factors may cause such a situation. Therefore, constructing a single production frontier based on all the data points would give rise to an improper benchmark technology. Thus, to measure the impact of technological differences through groups is to set up a separate group frontier for each individual group with the same characteristics together with a single metafrontier that applies to firms from all groups. Metafrontier production function is firstly introduced by Hayami (1969) in agriculture sector "Sources of Agricultural Productivity Gap among Selected Countries" then Hayami and Ruttan (1970) "Agricultural Productivity Differences among Countries" and Hayami and Ruttan (1971) "Agricultural Development: An International Perspective."

The first implementation of this technique in T&A is introduced by Battese, Rao and O'Donnell (2004)[32] to estimate technical efficiencies of Indonesian garment firms. Annual survey of firms in through Indonesia's Central Bureau of Statistics from 1990 to 1995 is used. This survey is basically constrained to medium and large size firms and the objective of the study is to analyse TE of the garment firms at regional level. Indonesian garment firms are grouped into five regions to determine whether the regions share some common characteristics.

[32]Battese G. Rao D, O'donnell C. 2004. A Meta-frontier Production Function for Estimation of Technical Efficiencies and Technology Gaps for Firms Operating Under Different Technologies. *Journal of Productivity Analysis*. 21 (1): 91-103.

The estimation of a metafrontier production function for the industry enables a comparison of the TEs of firms in different regions, together with an analysis of the technology gaps of firms in particular regions, relative to the technology available to the industry as a whole. Empirical results are obtained via the SFA model with time-varying inefficiency effects, proposed by Battese and Coelli (1992). Outputs are total value of the manufacturing output for firm per year. Inputs are divided as; total value of operating costs as a proxy of capital. Labour is the total number of paid labourers. Raw materials are the costs of purchased raw materials. A dummy of total amount of investments is targeted at technology upgrading and finally time variable from 1990:1995. Technology Gap Ratio (TGR) reflects the ratio of the output for the frontier production function for the specific group relative to the potential output that is defined by the meta-frontier function, given the observed inputs and it has values between zero and one.

Obtained results show that five regional stochastic frontiers for Indonesian garment firms are not the same and support technology differences across regions in industry. The mean values of the technology gap ratio vary from about 52 % for East Java to 90% for Jakarta. Results imply that firms in Jakarta produce, on average, about 90% of the potential output given the technology available to the industry as a whole. Consequently, there are significant technological differences among regions. The regional frontiers except East Java are tangent to the metafrontier. Garment firms in East Java have the highest mean TE relative to their regional frontier, but they tend to be furthest from the potential outputs defined by the metafrontier function.

Bahandari & Ray (2007)[33] estimate TE for Indian textile industry via DEA metafrontier. Firm level data are used for several years form Annual Survey of Industries for Indian textile industry in a cross sectional data to construct a metafrontier as well as separate group frontiers for firms that are classified by location, ownership type and organizational type. This classification allows examining group's proximity to the metafrontier and to measure such

[33]Bahandari A, Ray S. 2007. Technical Efficiency in the Indian Textiles Industry: A Nonparametric Analysis of Firm-Level Data. WP 49: University of Connecticut: Department of Economics.

proximity as technology closeness ratio (TCR). The study covers firms entire industry related to the production of natural and synthetic fibres and outputs are measured by the total ex-factory value of products and by-products produced by the firm during the production year. Inputs are; labour (the total number of man-days worked), capital (the net value of fixed assets of the firm at the beginning of a year) and intermediate inputs (measured by the nominal value of material inputs and energy such as power, fuels etc)

The chief findings show that there are technological differences across states. There is evidence that states with less productive technologies are gradually catching up to the national benchmark. Private sector firms are more efficient and also technologically superior than firms from the public sector. Firms organised as public limited companies perform better than firms of other organisational types. Technical efficiency tends to increase with firm size. Finally, the age of a firm does not appear to be significantly influencing TE in the later years in the sample.

1.4 Summary of the chapter

In this chapter a brief theoretical literature is presented relating to technical efficiency performance then the industry performance determinants with regard to textile and apparel industry are mentioned such as supply chain, the impact of industrial policy on industry, etc. Afterwards, a brief theoretical background about the DEA and the SFA techniques is pointed out since both techniques are used through empirical part for T&A industry in forthcoming chapters. Subsequently, empirical studies concerning the T&A are incorporated in a brief approach covering TE measures, metafrontier technique and TFP methods for both DEA and SFA.

Chapter 2

The structure of textile and apparel industry

2.1 Introduction

The structure of the T&A plays a decisive role in industry performance. In this chapter, a quick glance is provided for the industry structure by focusing on industry's importance as in section 2.2. Section 2.3 covers the industry supply side with its components; production processes, ownership type, and production factors. On the subject of production factors, direct and indirect costs have crucial impact on determining industry's ability to compete implying costs reduction direct to an efficient industry. Section 2.4 deals with governmental barriers which also affect industry performance. Section2.5 displays industrial policy and its consequences on industry performance. Section 2.6 presents brief notes for industry demand side and agreements rule it.

2.2 The industry importance

The significance of the T&A industry is based on its ability to create strong backwards and forwards ties from planting cotton and other fibres to final products. The industry is considered a main cotton consumer. Additionally, the textile industry has more value added with more job opportunities rather than exporting cotton as a raw material. Similarly, the apparel industry offers more value added compared to the textile industry and it is characterised by high rates of returns and turn over and does not require intensive investments. In 2007-08, T&A exports amounted to 2.2 billion US$ and 3 billion US$ in 2010. The U.S. market corresponds to 30% - 40% of total exports whereas EU market represents 38%. A total of 5000 enterprises are operated in the Egyptian T&A industry and the number of workers in the apparel sector is 30 % of total employment in the T&A, value-added in apparel amounted to 32 % of the T&A value added and investments are 14% of the T&A investments (CAPMAS, several issues). These indicators display the importance of the apparel relative to the textile industries without ignoring the fact that the textile sector is the main provider of apparel's raw materials. The industry receives from 3.5 to 4 billion U.S$ yearly investments and is considered one of the largest wage providers in industrial sector. Table 2.1 depicts industry importance for the Egyptian economy.

Table 2.1 T&A industry's importance for the Egyptian economy[1]

Contribution of T & A in the Egyptian Economy	%
Contribution to overall GDP	3
Contribution to industrial added-value	30
Employment in industry and related sectors (number)	1,000,000
Share of apparel in T&A employment	30
Share of women in apparel employment to total T&A workforce	25
Contribution to non-oil exports for industry	18
Share of wages in the sector to industrial sector	23

2.3The industry supply side

The structure of industry's supply side is divided into three main categories as follows:

❶Production process ❷Ownership type ❸Production factors

2.3.1 Production process

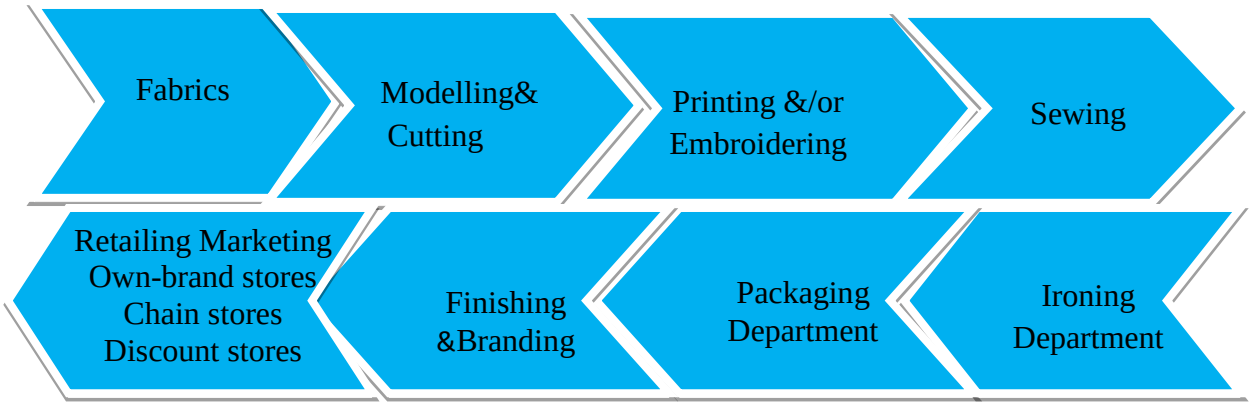
Figure 2.1 characterised the T&A manufacturing supply chain or industrialised procedures.

Figure 2.1 T&A industrialised procedures

Some of these phases may not be put in order or are excluded due to the type of used fibres. For instance, Man-Made fibres such as polyester or acrylic do not have ginning process. If yarn is dyed, there is no dyeing process but only finishing one. Moreover, the apparel stage has different processes where it starts from fabrics and finishes by marketing or other distribution sorts as in figure 2.2. It should take into account that some apparel steps may also exclude or include according to product type. For instance, a T-shirt may have both printing and embroidering or one of them. Also, home furnishing stage differs with apparel ones.

[1]Source: CAPMAS, annual industrial statistics bulletin, several issues

Figure2.2 Apparel processes



2.3.2 Ownership type

The ownership type is divided into public and private sector where most of the textile industry units are mainly concentrated in the public entities whereas the majority of apparel firms belong to the private sector. Briefly, the main differences between the T&A are:

1-Textile manufacturing is more capital and skill intensive than apparel manufacturing.

2- It tends to be less mobile and needs longer lead times to establish itself.

3- Textile industry includes main processes such as ginning, spinning, knitting, dyeing, printing, and other finishing procedures.

4- The capital intensity of the industry is relatively large and minimum order quantities are in metric tons. So, there is a limited scope to adjust production swiftly to clients' desires. For these reasons, it is infrequently to find more than one textile activity at one firm.

On the other hand, apparel industry has different characteristics such as:

1- It is labour intensive, and therefore wages play a major role in determining costs.

2- Therefore, it is clear that most of the apparel units are concentrated in developing countries.

This evidence can be supported by the ministry of trade and industry report (2005) which shows that creating a job in apparel is less costly comparing to creating a job in the textile sector. For instance, the cost of creating a job in yarn is 150000 Egyptian pounds, 100000 for the dyeing and roughly more than 300000 for the ginning, whereas the cost of creating a job in the apparel sector ranges from 15000 to 20000 Egyptian pounds which explains why most of the textile units

are focused in public sector. Figures 2.3, 2.4 show the share of the Egyptian T&A sectors.[2]

Figure 2.3 public & private sector share in Textile sector

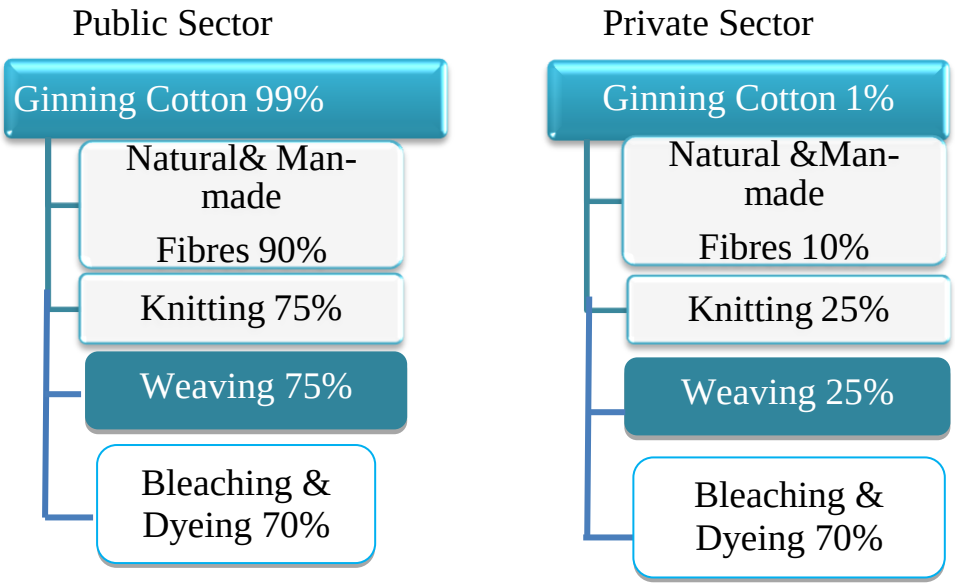
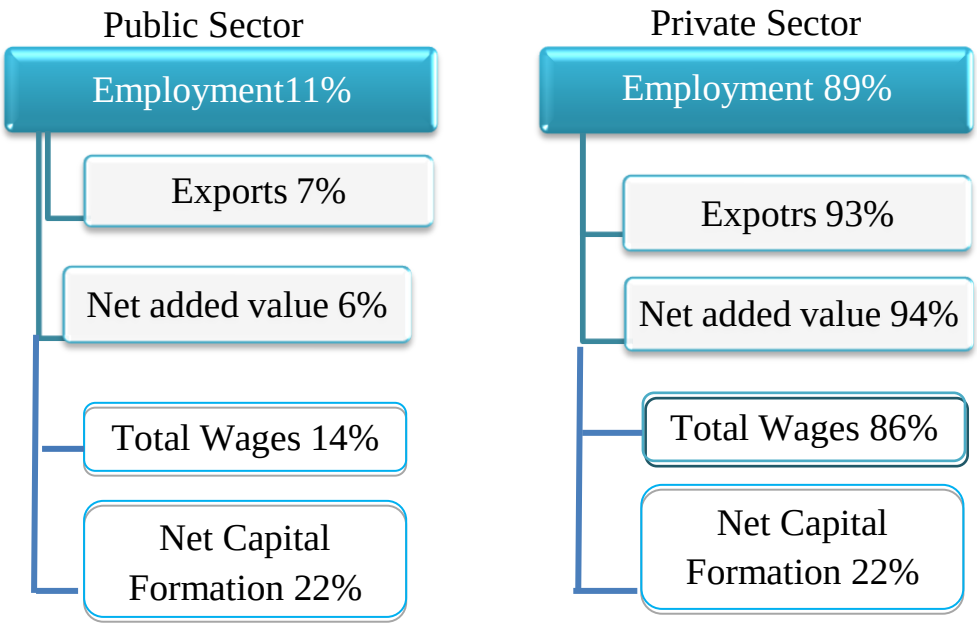


Figure 2.4 public & private sector share in Apparel sector



It is noticeable that small and medium size firms (1-100 workers) in apparel industry represent70 % whereas large & extra-large represent 30%. The large size is (101-1000) and the extra-large is (1001-8000) workers. Despite public units' numbers in apparel industry is negligible relative to private units, the minimum number of workers per each is at least 500 [3].

[2,3] CAPMAS, annual industrial statistics bulletin, several issues.

2.3.3 Production factors

Main direct production factors affect cost are; yarns and fabrics costs, production costs, market access costs and shipping costs whereas indirect factors affect cost are; duration of import procedures, customs, and port operations, etc. Reducing costs is a key factor for increasing competitiveness and the first step is to render direct costs as the main factor in the production process where industry competitiveness is influenced by external and internal factors and most developing countries are now under heavy competitive pressures from China and India that gain market share owing to their unique economies of scale.

- **Direct costs**

❶ **Yarn and fabrics costs**

Fabrics alone represent at least 60 % of the FOB (freight on board) price as shown in table 2-2 meaning that the availability of low-cost high-quality fabrics is a prerequisite to produce competitively priced apparel. In fact, different domestic trade policies, non-zero trade transaction costs and restrictive rules of origin lead to major changes on cost. Egypt is considered one of the oldest Middle East countries that have a large fibre, yarns, and fabrics industry. Its long staple (LS) and extra-long (ELS) staple cottons has a unique standing in World markets and high prices. Albeit domestic cotton price-fixing mechanism formerly taxed farmers and benefited the domestic spinning industry, the first liberalisation of cotton prices in 2002 inverted this trend, leading to increase local yarns. Although efforts were made against overpricing, domestically produced cottons are still expensive. For example, Indian yarn was imported at US$2.75/kg while local Egyptian yarn was sold for USD4.5/kg[4] taking into account that imported cottons are small and medium staples, whereas domestic cottons are LS and ELS. In 2010, World prices increased to be US$ 3.88/kg with similar increase for local at US$ 5.6/kg[5].

Tariff and non-tariff barriers on imported fibres and yarns still constrain the imports of

[4]American Chamber of Commerce in Egypt, 2004.
[5]Yarn and Fibres Exchange and Alexandria Cotton Exports Association ALCOTEXA, Jan 2011.

cheaper World materials. Nonetheless the Egyptian government released tariff barriers on most textile imports in January 1998, non-tariff barriers were introduced. These include excessive technical certification (quality control) requirements and burdensome costly marking requirements. For instance, the name of the importer is required to appear on every 30 meters of fabrics, technical barriers add vastly to the costs of importing inputs and obligatory inspection fees (1% : 4%) on some textile products is also added to costs. Even though crucial reductions started in July 2004, Egypt reduced its tariffs on apparel to 40% (HS 61-62), on home furnishing to 35% (HS 63), on fabrics to 22%, and on yarn to 12 %, additional tariff reductions were made for textile machinery and spare parts including cotton, wool, or synthetic yarns machinery, equipment and accessories. In spite of these reforms, T&A sectors continue to enjoy one of the highest rates of protection across Egyptian industries. High rates of protection on textile industry weaken apparel exporters' competitiveness. Table 2.2 shows protection rates applied to T&A.

Table 2.2 Protection rates on textiles and apparel in Egypt[6]

Sector	Nominal protection (%)		Effective protection (%)	
	2000	2004	2000	2004
Manufacturing simple average %	21.2	13	23.3	14.3
Textiles	24.0	9.2	27. 6	10.3
Ready-made garments& footwear	38.3	26.7	43.4*	31.6
Leather products less footwear	30.0	29.5	34.4	36.1

Although effective procedures are adopted by the ministry of trade and industry after 2004 including reductions in direct tariffs on industry inputs such as yarns, fabrics, machinery & equipment, accessories and other inputs besides exporters' subsidies to encourage them to increase exports, the exports increase is not as hoped. Thus, special efforts should be adopted to remove the remaining non-tariff barriers on imported cottons as industry's main input. Table 2.3 describes total costs for producing jeans as an example supports the role of duties on total costs.

[6]ECES 2005*the effective rate of protection (ERP) is calculated based on Egypt's commitments and not on applied Tariff

Table 2.3 Standard Garment Costing Model: Cost for Women's Fashion Jeans[7]

Factors	Cost $	FOB (%)	LDP (%)
Fabric (main raw material)	4.50	60	45
Production cost (incl. labour, OPC, profit)	2.25	30	22.5
Trim cost	0.75	10	7.5
FOB	7.50	100	75
Agent commission (10%)	0.75		7.5
Market access cost (duty 16.6%)	1.25		12
Shipping cost (freight)	0.35		4
Clearance and inland freight	0.15		1.5
Subtotal LDP	10.00		100

The difference between FOB (Freight-on-Board) and LDP(Landed-Duty-Paid) is that FOB is the paid price by a brand to a supplier facility at factory door including all production costs of the factory such as operating costs, fabrics and materials, labour, and profit. Whereas LDP price is the final price paid for finished goods, including shipping, duty, delivery, insurance, and customs clearance costs indicating that the LDP raises product price 25% than the FOB price.

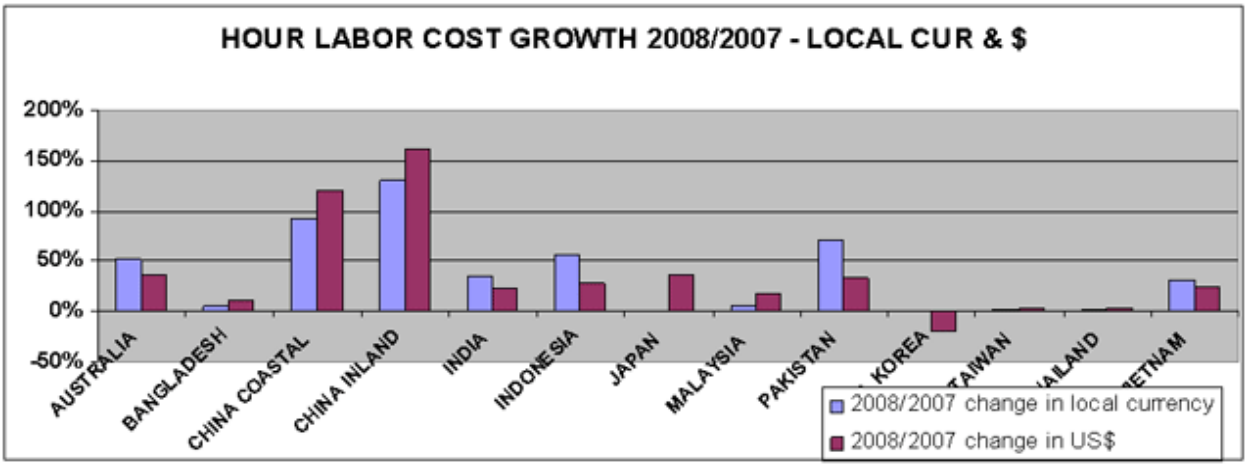
❷ Labour Costs in Egypt relative to world main suppliers

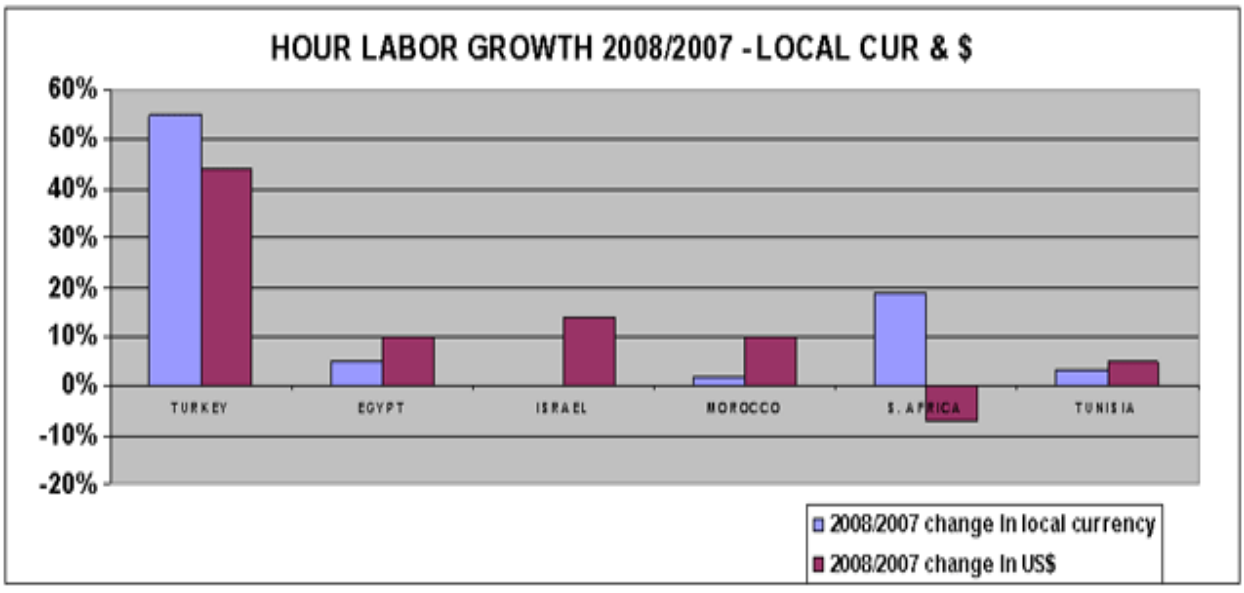
Labour is the second cost item; figures 2.5, 6, and 2.7 show average labour costs collected from textile firms in various countries including social labour costs. Bangladesh and Taiwan denote low and high ends of labour costs for cutting and sewing in turn. Within Eastern Europe, overall labour cost has been catching up fast, with most countries now between 3 and 5 US$ per hour (Bulgaria has a lower labour costs). Egypt's labour costs are still moderate comparing with low cost countries. Following graphs show labour cost increase in textile industry 2008 relative to 2007 prices in local currency and US$. It is noticeable that the global competitive background in T&A has experienced a major shift in 2005 after WTO implementation and other regional trade agreements. The post-MFA era witnessed open competition and volume strategies are fundamentally driven by cost leadership. Hence, cost advantages can be achieved in manufacturing through effective global sourcing together with the advantage of the significant injection of new investments in the industry. The labour cost comparison in the primary textile

[7]Source: Birnbaum (2005). It is reasonable to consider textile wages as a proxy for wages paid to apparel workers.

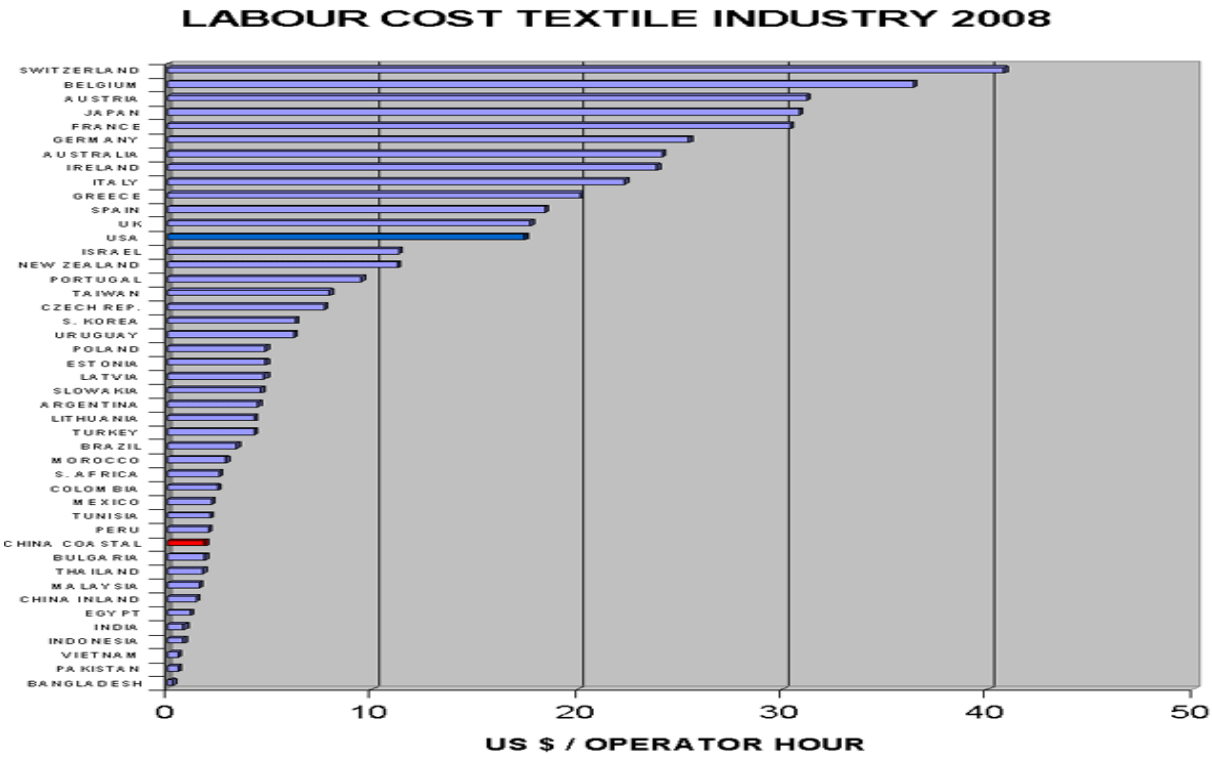
industry is comparing the hourly labour cost in 44 countries covering different economies on 2008 for the majority of textile producers in the World. It is stressed that hourly labour cost is among factors that affect industry's competitiveness. But this is not the whole story, since competitiveness relies on a wide range of other costs, external or internal factors such as exchange rates, raw materials and energy costs, interest costs, inventory turnover, time, quality, value adding capabilities, etc.

Labour cost in the apparel industry is difficult to compare since the industry is highly split with differentiated products, with large fluctuations within the same geographical regions and the size of the firm. Moreover, the informal sector is still occupying a significant position[8].





[8] Werner International, 2009.



Also, productivity differences among firms in the apparel industry are typically moderate. Some investments can automate certain tasks and lead to accelerate in cutting and sewing process. Management can be credited with driving efficiency in certain circumstances relative to the net variance attributable to wages and fabric costs; productivity does not represent a major driver of cost competitiveness. For instance, the production of a t-shirt in Egypt and a pair of jeans in Morocco support this observation and suggest that these firms operate at a global productivity standards. By contrast, Egyptian firms in the textile industry exhibit low levels of productivity, labour and capital utilisation. This low performance is mainly due to overstaffed and lack of investments in public units which correspond to large segment in Egypt's upstream textile firms.

❸ Main Operating Costs (OPCs)

Operating costs represent an important factor influences cost since the industry is electricity and water intensive consumer especially in the textile industry. Spinning factories are water intensive and electricity purchaser whereas dyeing units are intensively users of water, electricity and gas. In contrast, the apparel is less intensive user of electricity and water, but it is mainly telecoms consumer because telecommunication services is a prerequisite for the effective

management of internationally fragmented apparel operations on a just in time basis, and for coordination of distribution and deliveries chain. Telecommunication services facilitate business contacts and supply chain management. So, cheap operating costs enhance performance. Egyptian telecom sector has been heavily regulated; the Internet and mobile segments have been privatised, competition has been intensified, prices have been decreased and service quality has been improved. The price of Internet connection in Egypt represents only one-fourth of Turkey's and one-fifth of Morocco, Jordan and Romania.

Electricity cost and power outage; high electricity costs have a negative impact on the T&A production. Investment Climate Assessment (ICA) survey indicates that power outages decreased but still the most common firms' infrastructure problems. Factories are affected by electrical blackouts. a sample of 261 Egyptian firms assessed (141 textile and 120 apparel) report electricity as a major obstacle to business growth. Sales losses resulting from power outages range from 1% to 5% of total sales for 70 % of firms.

Figure2.8 Internet prices US$ per twenty hours of use[10]

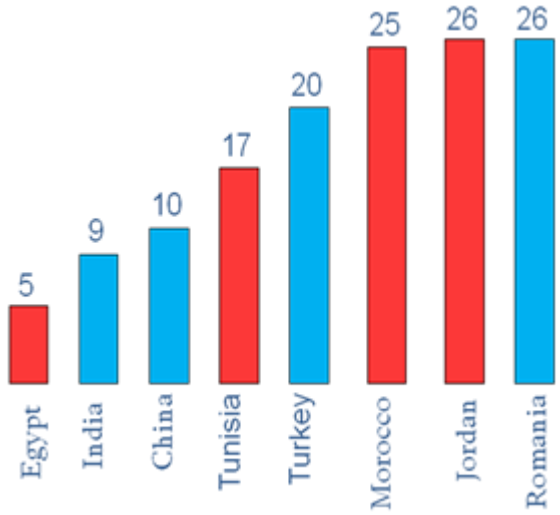
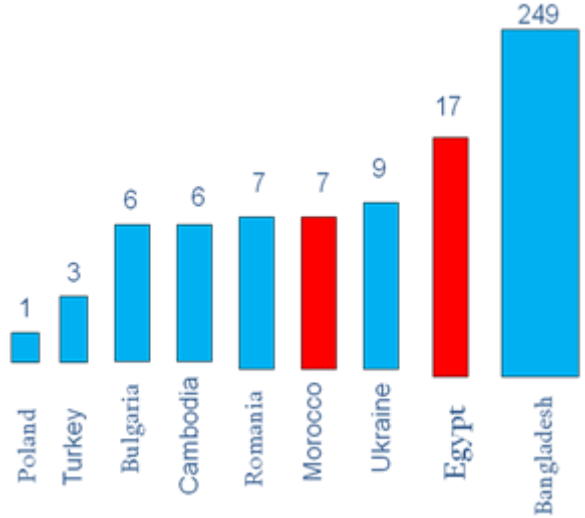


Figure2.9 days of power outages form public grid[11]

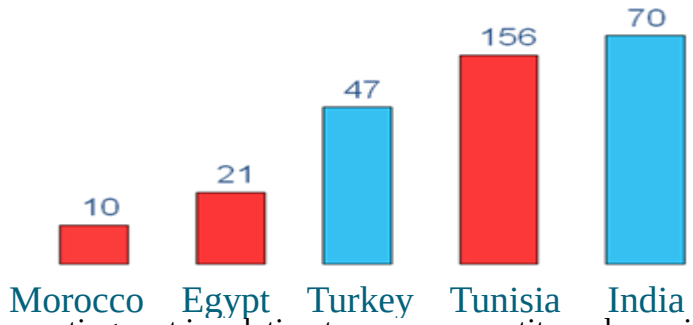


In recent years, power outages are decreased significantly and power outages differ among regions where it is negligible in industrial zones such as Tenth of Ramadan city, Sixth of October city and Burg El-Arab city but it is clear in old zones such as Delta zone factories. Water costs

[10]Source: ITU
[11]Source: ICA, various countries

are also important for water intensive activities such as dyeing, and finishing. For spinning industry, water is the second cost after raw materials cost. The problem of water is even more acute for countries that are poorly endowed with water. The proportion of enterprises affected by water supply problems fell from 14 % to under 8 %. In Jordan, lack of access to water hinders a textile industry to develop.

Figure 2.10 Water Cost per Cubic Meter in US$ cents[12]



A brief description of operating cost in relation to some competitors shown in table2.4

Table 2.4 Operating Costs in Egypt and its Comparators[13]

OPC / Country	Egypt	Jordan	Turkey	India	Tunisia	Italy
Labour cost ($/h)	0.4	0.9	2.8	0.5	1.2	15
Electricity (cent/kwh)	3	5	7.7	8.6	10	9
Water (Cent/m^3)	21	180	46	70	156	28
Natural gas (cent/m^3)	2.5	-	26	24.5	-	21
Building costs ($/$m^2$)	120	200	180	140	400	480

❹ **Costs of market access**

Market access costs represent 12% of LDP costs. Tariffs structure for imported apparel in EU, U.S., and Canada markets are still high whereas tariffs imposed on fabrics is lower and tariffs forced on yarn is nearly half of that imposed on apparel which increases the market access costs. Moreover, both developed and developing countries also use safeguards as illustrated by the reimposition of quotas on many Chinese products by the EU and the United States in June and July2005 regarding Memorandum Of Understanding (MOU) signed between China and both

[12]Source: ITMF International Production Cost Comparison 2003.
[13]Source: American Chamber of Commerce in Egypt 2006.

of the U.S. and the EU. China's agreement with the WTO includes a temporary "transitional, product-specific safeguard mechanism" under which WTO members that are threatened by market disruption from increased Chinese products. Safeguard measures on trade in the T&A need to be non-discriminatory and can be used only if an investigation demonstrates that imports increased too much as to have caused serious harm to an import-competing industry[14].

❺ Shipping Costs

Transportation cost is another significant component of the final landed cost. It is clear that the proximity to the EU providing Egypt with shipping cost advantage over more distant suppliers. On the other hand, Egypt does not enjoy the same advantages in the U.S. market, where Mexico, Central and South American countries take the advantage of lower shipping costs. The positive effect of financial crisis contributed to a reduction on shipping cost around 40% which affect in decreasing LDP costs. For instance, a container shipping cost reduced from1014$ before October 2008 to 613$ thereafter.

- **Indirect factors affect costs, competitiveness and performance**

FOB prices are influenced by number of logistics factors. The main three of these factors are duration of import procedures, customs, and port operations. These factors affect the ability of suppliers to meet deadlines and minimise delays and warehousing requirements.

❶ Duration of Imports and exports Procedures

Logistics indicators include all the procedural requirements for standardised dry-cargo20 feet full container load (FCL).Trading across borders indicators record every official procedure for importing and exporting goods, from the contractual agreement between the two parties to the delivery of goods, along with necessary time for completion. All documents and signatures required for clearance of the goods across the border are also recorded. For importing goods,

[14]The EU-China MOU was agreed on June 10, 2005 and modified on September 12, 2005 because it didn't allow into the EU Chinese T&C goods that were in transit. The EU quotas were 200 odd percent bigger than those in force in 2004. The US-China MOU with the US was agreed on November 8, 2005 and involved remarkably higher increases in quotas. The quota prices have decreased significantly, suggesting that the move from generalized quotas under the ATC to the China safeguards has allowed much of the suppressed adjustment to occur.

procedures range from the container's arrival at the port of entry to the cargo's delivery at the factory warehouse. For exporting goods, procedures range from goods packing at the factory to their departure from the port of exit. Local freight forwarders, shipping lines, customs brokers, and port officials provide information on required documents and signatures as well as the time to complete each procedure. Recently, Egypt's trade across borders has improved significantly to be in the rank 21. For instance, in Egypt it takes on average 12 days to perform a full export process, India 17 days, Bangladesh 25 days and China requires 21days to complete the process. Similarly, the number of needed signatures for export procedures is (6) signatures in Egypt, Mexico (5) and Turkey (7) whereas it requires five days and (1) signature in Denmark. Therefore, streamlining procedures constitute a source of efficiency enhancement.

❷ Customs efficiency

In Egypt, latest reforms undertaken by the Ministry of Finance helped streamlining customs procedures. Clearance time average is dropped by 50% to the range of 3 to 4 days. Imports and exports processing times have been lowered to an average of three days, compared with the initial eight days, and time needed to prepare and process declarations has dropped to 15 minutes, down from three days. Reforms have also included the installation of scanners at key port locations to speed up verification of containers. This has reduced the number of waiting trucks for verification by two thirds. In 2003, physical inspection level reached the target level of 15 %, down from 50-80 % in 1999. In 2008, the customs system was fully computerised and all customs ports in Egypt were connected and controlled by main network. Thus, reforms need to be continued and deepened to enable firms to act swiftly and efficiently.

❸ Port efficiency

Port inefficiency causes not only higher carrier costs, but also higher shipping costs. For example, delays in customs processing increase the risk of theft and raise insurance and inventory costs. Improving port efficiency from the 25^{th} percentile to the 75^{th} percentile reduces shipping costs by10%. Handling costs and charges in the Egyptian ports are relatively moderate

among Mediterranean Basin ports to those in regional competitors. For instance, Alexandria port freight costs are 89$ per 20'FCL among the lowest Barcelona 63$ and highest Marseilles 147$. Port Charges in Alexandria 153 $ per 20'FCL between the lowest Izmir port 126 $ and the highest Casablanca 248 $ per 20'FCL[15]. Additionally, from 1980s the number of ports has increased significantly from 4 main ports to be now 40 ports. The new ports such as Ain Sukhna and New Damietta helped in improving ports services and reducing charges and handling cost. Furthermore, Egypt can benefit from the imbalance in trade deficit (imports exceed exports) indicating there is a surplus of ocean shipping containers reached Egyptian ports full and leave empty. Therefore, if there is consolidation facilities for outbound shipments instead of leaving empty and this can contribute to reduce the shipment cost for both imported and exported items. Issues related to trade facilitation such as inefficient road systems, out-dated trucks, and lack of facilities at ports significantly add to the costs incurred by Egyptian producers and exporters but shipping costs in Egypt is still low relative to its rivals.

2.4 Governmental barriers and Public sector firms

The Egyptian public sector companies consist of 25 which are organised by the holding company, range in size from 500 to 21,969 workers. The public units dominates early stages of production, with 90 % share of spinning, 70 % of weaving but less than 10 % share of the apparel production. The production weaknesses of Egypt's public sector are highlighted by examination machinery's age used at various stages of the value chain; it shows that public companies are burdened with old or outdated machinery where most of them are older than 15 years. The textile public firms are mostly operated in an uneconomical way due to the historical burdens of excess labour, unbalanced financial structure with a lack of investments and obsolete technology. In the apparel industry, public companies face greater competition from the private units, the picture is somewhat better showing a greater share of newer equipment. The findings reinforce awareness that the Egyptian firms have not mastered the ability to turn their high quality cottons into similarly high quality textiles, although their ability to manufacture apparel

is relatively stronger[16].The emerged picture from analysis is that while the Egyptian T&A industry have some relative advantages, Egyptian firms' have not fully succeeded in controlling the country's natural resources into building a superior developed industry. Although the T&A industry is clearly important to Egypt, Egyptian T&A exports accounted for less than 1% of global trade. Table2.5 shows machinery's age in public firms.

Table2.5 Age of machinery in the public sector firms[17]

Activity	Age ≤5	10 ≥ Age > 5	Age ≥ 15
Cotton yarn	5%	23%	72%
Cotton fabric	2%	6%	92%
Cotton finishing	7%	6%	87%
Wool yarn	0	10%	90%
Wool fabric	0	10%	90%
Wool finishing	11%	3%	86%
Apparel	20%	10%	70%
Medical cotton	1%	14%	85%

Other ways for Egypt to strengthen its domestic T&A industry would be to attract FDI and to motivate local private enterprises aimed at establishing industrial operations directed towards export markets. This section explores how attractive Egypt is to international business and local entrepreneurs looking to a manufacturing platform for exports.

2.4.1 The ease of setting up a new business

Two decades ago setting up a business in Egypt was not an easy mission; the government has made clear steps to improve the investment climate. The Law 8 of investment incentives and guarantees 1997 allows for 100% foreign ownership of companies and guarantees the right to send back profits and capital. In 2004 and with the foundation of the Ministry of Investment and its organisations the image changed. In 2004, the number of procedures for starting up a business was 13 and took a period of 37 days but in 2011 the number of procedures witnessed significant

[16]Economists at Cairo University show that the revealed comparative advantage across Egypt's value chain demonstrated a bimodal distribution of strength at the early stage of manufacturing textile fibres and later in apparel (Sakr and Abdel-Latif, "International Competitiveness of Egypt's Textile Industry," Cairo University, no date given). A British report on trade and investment in Egypt suggests that Egyptian firms use local textiles primarily for products targeting local markets while using imported textiles to assemble clothing destined for developed markets.

[17]Source: Egyptian Textile Consolidation Fund; ETCF

reduction to be 6 with a period of 6 days and Egypt's rank is 18 (World Bank Doing Business Database, 2011). Comparing to competitor set of countries as in table 2.12, Egypt is relatively in a better situation.

Turning to factors affecting the ability of foreign or local entrepreneurs to set up new businesses, such as access to capital via loans and private or public equity, Egypt seems to rate slightly above the mean for all countries surveyed. China rates poorly on several indicators, although those rates do not seem to prevent the vast flows of FDI into it. For paying taxes, Egypt is in the middle of the group and the number of payments and total tax rate are moderate, but for the time being it needs more improvements to reduce it and to achieve high ranks. For trading across borders indictor, Egypt is in the top of the set sample with the rank 21 the prices of an exported container witnessed significant reductions from 1014US$ on 2004 to 613 US$ on 2010.

Table2.6 starting a business[18]

Country	Year	Rank	Procedures (number)	Time (days)	Cost (%of income per capita)	Paid-in Min. Capital % of income per capita
Egypt	2006	---	10	22	104.9	739.8
Egypt	2007	---	10	19	68.8	694.7
Egypt	2008	---	7	9	28.6	12.9
Egypt	2009	---	6	7	18.3	2.0
Egypt	2010	23	6	7	16.1	0.0
Egypt	2011	18	6	7	6.3	0.0
M. East &N.Africa	2011	---	8.1	20	38.0	104.0
OECD	2011	---	5.6	13.8	5.3	15.3

Table 2.7 paying taxes[19]

Country	Year	Rank	Payments number / year	Time(hours per year)	Profit tax%	Labour tax and contributions%	Other taxes %	Total tax rate % profit
Egypt	2006	---	42	504	---	---	---	54.3
Egypt	2007	---	41	596	---	---	---	46.4
Egypt	2008	---	36	711	---	---	---	45.1
Egypt	2009	---	29	711	---	---	---	44.0
Egypt	2010	136	29	480	---	---	---	43.0
Egypt	2011	136	29	433	13.2	25.8	3.6	42.6
M. East &N.Africa	2011	---	21.6	194.1	12.0	16.8	4.1	32.8
OECD	2011	---	14.2	199.3	16.8	23.3	3.0	43.0

Table 2.8 trading across borders[20]

Country	Year	Rank	Documents to Export (number)	Time to Export (days)	Cost to export (US$ per container)	Documents to import (number)	Time to import (days)	Cost to import (US$ per container)
Egypt	2006	---	6	27	1,014	7	29	1,049
Egypt	2007	---	6	20	1,014	6	25	1,049
Egypt	2008	---	6	15	714	6	18	729
Egypt	2009	---	6	14	737	6	15	823
Egypt	2010	30	6	14	737	6	15	823
Egypt	2011	21	6	12	613	6	12	698
Middle East & North Africa	2011	---	6	20.4	1,048.9	7.5	24.2	1,229.3
OECD	2011	---	4.4	10.9	1,058.7	4.9	11.4	1,106.3

T able 2.9 starting a business for Egypt's main competitors [21]

Country	Year	Rank	Procedures (number)	Time (days)	Cost (%of income per capita)	Paid-in Min. Capital (% of income per capita)
Bangladesh	2011	79	7	19	33.3	0.0
China	2011	151	14	38	4.5	118.3
Egypt	2011	18	6	7	6.3	0.0
India	2011	165	12	29	56.5	188.8
Indonesia	2011	155	9	47	22.3	53.1
Jordan	2011	127	8	13	44.6	17.9
Mexico	2011	67	6	9	12.3	9.2
Morocco	2011	82	6	12	15.8	11.2
Tunisia	2011	48	10	11	5.0	0.0
Turkey	2011	63	6	6	17.2	9.9

Table 2.10 paying taxes for Egypt's main competitors [22]

Country	Year	Rank	Payments (number per year)	Time(hours per year)	Profit tax %	Labour tax and contributions%	Other taxes %	Total tax rate % profit
Bangladesh	2011	93	21	302	25.7	0.0	9.3	35.0
China	2011	114	7	398	6.0	49.6	7.9	63.5
Egypt	2011	136	29	433	13.2	25.8	3.6	42.6
India	2011	164	56	258	24.0	18.2	21.1	63.3
Indonesia	2011	130	51	266	26.6	10.6	0.1	37.3
Jordan	2011	29	26	101	15.2	12.4	3.6	31.2
Mexico	2011	107	6	403	23.1	26.6	1.3	50.5
Morocco	2011	124	28	358	18.1	22.2	1.4	41.7
Tunisia	2011	58	8	144	15.0	25.2	22.6	62.8
Turkey	2011	75	15	233	17.0	32.1	4.4	44.5

Table 2.11 trading across borders for Egypt's main competitors [23]

Country	Year	Rank	Documents to Export (number)	Time to Export (days)	Cost to export (US$ per container)	Documents to import (number)	Time to import (days)	Cost to import US$ per C
Bangladesh	2011	112	6	25	985	8	31	1,390
China	2011	50	7	21	500	5	24	545
Egypt	2011	21	6	12	613	6	12	698
India	2011	100	8	17	1,055	9	20	1,025
Indonesia	2011	47	5	20	704	6	27	660
Jordan	2011	77	7	14	825	7	18	1,335
Mexico	2011	58	5	12	1,420	4	12	1,880
Morocco	2011	80	7	14	700	10	17	1,000
Tunisia	2011	30	4	13	773	7	17	858
Turkey	2011	76	7	14	990	8	15	1,063

2.4. 2 Operating a Business

The new firms should follow some requirements to benefit from investment incentives. For the case of gathering operations, they must meet at least local content of 45 % to benefit from reductions in customs tariffs. Additionally, they can also qualify for customs reductions on industrial inputs after complying with the 45% local content requirement. A 10% sales tax for imports is imposed and quality control is voluntary. Furthermore, Egypt has developed a system of seven public free zones which offer companies with a range of operating benefits[24]. Firms operating in these zones that produce more than 80 % of their output for export are exempt from custom duties, sales tax, and taxes and fees of capital assets and intermediate goods. Further incentives through reducing the corporate tax on firms established in these zones by the law of Special Economic Zones with more flexible labour laws. In 2002 Customs Law 66 was amended to allow for temporary admission of basic materials and intermediate goods exempted from customs and provided for refunds of customs and service fees on imported inputs that are used in manufactured goods if they are exported within two years (Articles 102 and 103). Recently, a sequence of customs laws is come into force to facilitate and simplify procedures and time.

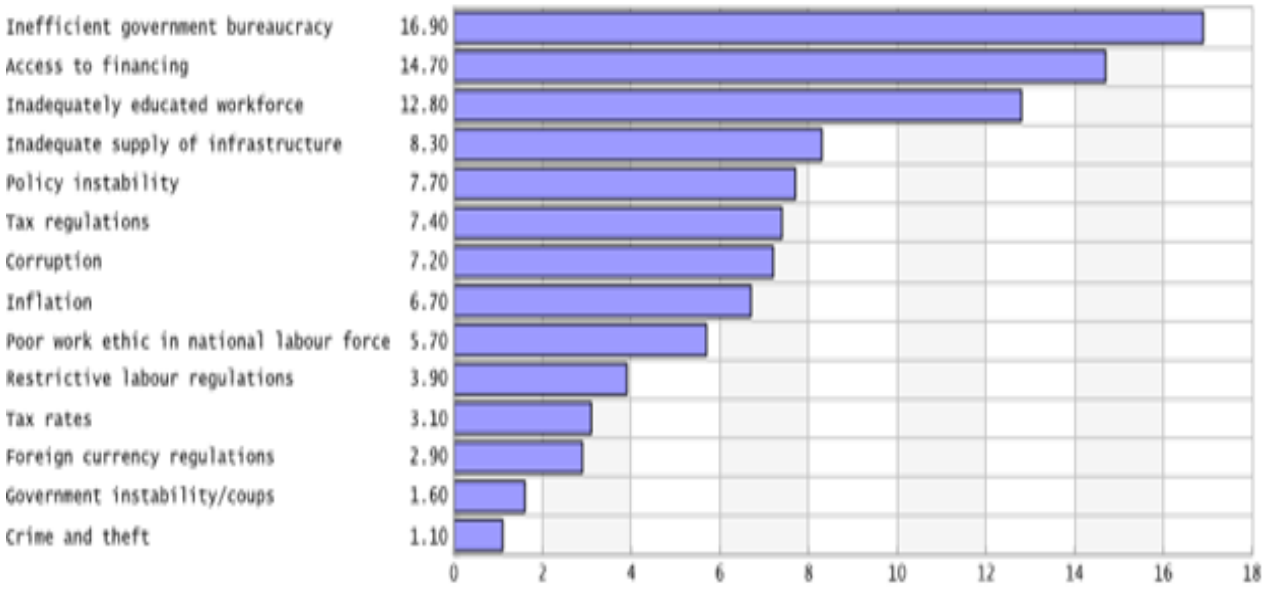
Since labour productivity and quality are important factors in comparing costs, wages on

[18, 19, 20, 21, 22, 23] Source: World Bank Doing Business Database, 2011

[24] First stage included Nasser City, Alexandria, Damietta, Ismailia, Sixth of October City, Suez, and Port Said. The 70 apparel and 25 textile companies that operate in these zones accounted for approximately 47 % of apparel exports and 23%of textiles exports in 2003(Egyptian Ministry of Foreign Trade. New areas are added after the implementation of QIZ agreement such as Shubra El-Khema, EL-Mahalla El-Kubra, 10th of Ramadan city and Burg El-Arab city.

their own help telling part of the story. Here, Egypt shows up well compared to its regional competitors, with a slight advantage over Mauritius and almost half the wage costs of Morocco. Looking at additional indicators as bribes and other necessary factors to facilitate the flow of imports and exports and the business costs of corruption; Egypt scores less well on the other indicators, suggesting that Egypt's corruption problem is that of a rule-ridden economy heavily dominated by the government. After January 2011 revolution and setting up the state of law the corruptions rates and commissions as well governmental bureaucracy are expected to be eliminated significantly as main targets of revolution. In these respects, Egypt's rate by its competitors is low[25]. Figures 2.11 and 2.12 show main problematic factors affect investment environment in Egypt, but one should not deny the efforts made by the government to facilitate and attract investments despite its slow pace as in figure 2.11[26].

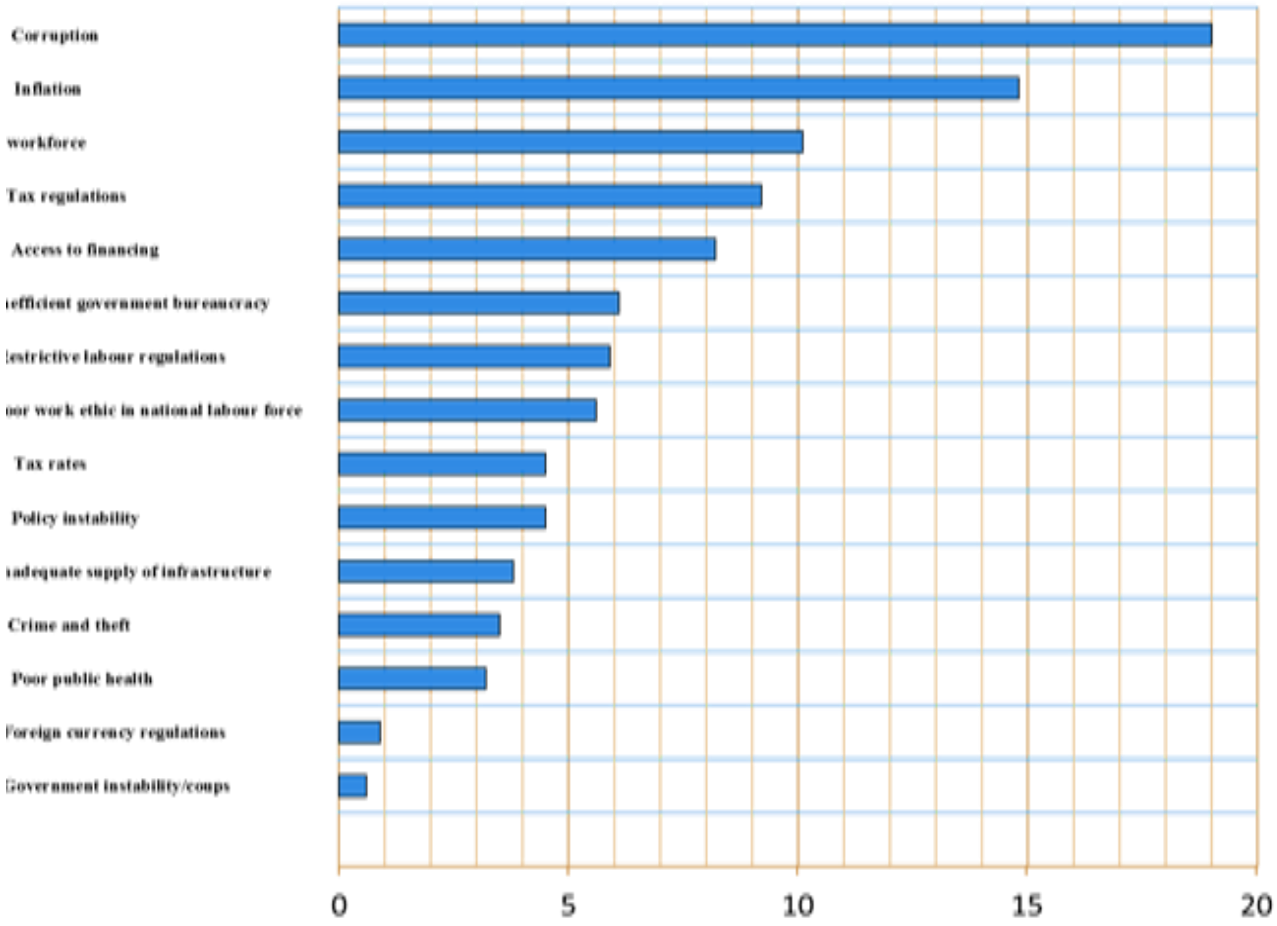
Figure 2.11 Egypt problematic factors 2008.



[25] In comparison to its ratings the previous year, Egypt has improved slightly on the measures regarding irregular payments and the costs of corruption, suggesting an improvement in the business climate, though at the same time its rating on organized crime fell considerably.

[26]Source: the Global Competitiveness Reports 2008, 2011.

Figure 2.12 Egypt problematic factors 2011.



2.4. 3 Exports

Exporters in Egypt face problems regarding transportation costs and logistics. Old ports and Delta zone roads infrastructure are generally poor, and efficiency is low. High tariffs on trucks cause their price to be approximately high forcing companies to keep their trucks longer, leading to higher maintenance costs in addition to higher associated capital costs. Together with dense congestion on the roads, high operating costs for trucks lead to low road transportation productivity. Strong competition in trucking and careless enforcement also lead to overloading, and then cause damage to roads and further increases in maintenance costs. A lack of information is another systemic logistical problem. A different story for new industrial zones and new ports, where ports are efficient and roads infrastructure are generally good with less congestion and waiting periods for trucks are decreased sharply. In general, recent improvements in ports and lead time shift Egypt's rank for trading across borders to be 21 among 183 countries.

2.4. 4 Governmental restrictive tariffs in imported yarn, fabrics and apparel:

There is no doubt that one of the most common problems facing the Egyptian T&A industry is that a combination of structural factors produce incentives wherein it is more profitable for Egyptian firms to sell goods at home than to export them (Galal & Fawzy, 2003). This is can be explained since import tariffs increase prices in domestic markets, allowing local manufacturers to raise prices and capture profits. The presence of large local market covering 85 million customers who are less demanding than foreign ones and the ability to avoid logistical troubles as transporting products encourage Egyptian firms to focus on their home markets. The structure of high tariffs gives some support to these influences. When Egypt complied with WTO commitments and lifted the import ban on the last item on its apparel list, it imposed non-tariffs, as mentioned before that reached as high as $300 per item on more than 1,000 categories of apparel. A quick glance at the activity of the Egyptian companies suggests that tariffs may in fact be causing companies to look inward. In a sample of nearly 2000 Egyptian T&A firms collected in 2004, only 4.5 % export 10 to 25% of their production while just 8.6 % export more than 25 % implying that a small set of firms are interested in exporting. Thus, the larger firms which have the scale and skilled labour required navigating the marketing and logistical challenges involved in exporting and overcome the impediments that tariffs provide. Not surprisingly, larger firms export a greater percentage of their sales. for example, among the firms with annual sales of 5 million to 50 million Egyptian pounds, 19% of them export from 10 to 25 % of their production, and 31 % of them export 25% or more; however, for companies with50 million to 250 million Egyptian Pounds sales, nearly 37 % of them export from 10 to 25 % of their production, and over 34 % export 25 % or more. Data seem consistent and support the notion that tariffs create fairly more profitable home market and this requires extra incentives for firms to see beyond artificially attractive local market and begin to export.

From this review of industry importance, cost indicators, imbalance between sectors, direct

and indirect factors affect competitiveness, it is essential to investigate the industrial policy to see what is done and what is needed to be done since industrial policy not only can affect the industry but also it affects the whole manufacturing sector; also since the public sector belongs to the business sector owned by the government then there is a relationship between sector enhancement and the industrial policy.

2.5 Industrial policy

The involvement in the T&A value chain has been taking place since the mid1980s. Recent policies have mainly focused on correcting the structural imbalances within the chain, integrating its different components, supporting and encouraging the expansion of the highest value added within the chain, mainly in the apparel sub-sector. This strategy gave priority to the promotion of the apparel exports, strengthening the industrial infrastructure, and generally providing the suitable environment for deeper integration of local enterprises into the global value chain. Thus, the government divided policies of promoting the Egyptian T&A industry into three groups: ❶ The first is the structural changes in the framework conditions that benefit all manufacturing not only the T&A industry. ❷ The second is regarding the policies affecting the T&A industry. ❸ The third is the specific initiatives by the private sector within the T&A sector. A brief notes is given to policies affecting T&A.

2.5.1 Policies and strategies affecting the T&A industry.

Egyptian textile and apparel industry is influenced by the following factors:

❶ Privatisation

Privatisation had been slowed particularly in the T&A public enterprises, especially those operating in spinning and weaving; this had accumulated huge losses and became a bottleneck for the whole value chain. The biggest obstacle to privatisation had been the excessive number of workers in firms[27]. Important initiative by the EU was the restructuring of a number of the public spinning and weaving enterprises with specific focus on overstaff problem. The 80

[27]One company alone Ghazel El-Mahalla has 21,969workers.

million Euro projects, which were initiated in 2004, were related to compensating and retraining workers in the nominated public companies.

❷ Manufacturing and export promotion policies

Exports are promoted through the marketing assistance, official credits and marketing schemes. There are some tools and laws established for promoting exports such as, exports promotion law, the Free Trade Zones (FTZs), and the duty drawback or the temporary admission schemes for imports. The Export Support Scheme (ESS) consisted of promotional services, while the Export Support Fund and Marketing Studies (ESFMS) were offered to exporters of diverse sectors, including the T&A sectors. The scheme has a positive impact on exports from all industrial sectors receiving the support. Export Commodity Councils (ECC), which was created in 2004, had the objective of letting the private sector to play a role in the policy making by officially representing the interests of their sectors through an official institutional set-up. Both exports fund and exports councils have made a positive impact on increasing T&A exports. Another promotion policy is the design and registering of Egyptian cotton logo to preserve its property rights.

❸ Training Programmes

There are a number of major projects, currently implemented with international or bilateral cooperation aiming at improving vocational and educational training and are mainly focused on highly specialised technical training, which is directly beneficial to T&A.

❹ The new textile technology centre

A technology development division is created under the Ministry of Trade and Industry (MTI) in 2004 to initiate a network of technology transfer and innovation centres. The new textile technology centre is operated in collaboration with Cairo University. It makes a positive impact on increasing the T&A exports and encouraging investments in the sector.

2.5.2 Private sector initiatives

Government plans to make the T&A more competitive has gained success. In 2004, the successful lobbying of the private sector emphasised the urgent need for policy changes. The pressures by private sector leaders of the T&A industry coincide with changes in cabinet structure, which has a positive effect on speeding up the policy changes. The T&A private sector were also ready to contribute to the implementation of new projects, such as the new technology centre, export councils, etc. The T&A private sector began to focus on following proposals;

❶ Egyptian-Turkish Private Industrial Park:

Following the signing of the FTA Agreement between Turkey and Egypt on February 2007, a consortium of Egyptian and Turkish investors has taken the initiative to establish an Egyptian-Turkish Private Industrial Park, as a large scale joint collaboration between the two countries in the specific field of manufacturing. It is contributed to attract considerable FDI in the T&A industry, which is important to both countries. Turkish investors enjoyed much lower manufacturing costs relative to manufacturing costs in Turkey, while the products manufactured in Egypt have the opportunity of entering the U.S. market under the Egyptian QIZ protocol.

❷ The Competitiveness Observatory (CO)

The idea in establishing a Competitiveness Observatory (CO) had already been accepted as an integral part of the strategy for future development of the Egyptian T&A industry performance. Roles of the government & various institutions, data collection procedures and performance indicators are all crucial for the proper running of the CO. Furthermore, the elimination of bureaucratic impediments is crucial to enable firms to act swiftly, efficiently, and predictably. The new version of industrial policy should aim at moving the economy into areas of new relative advantages to go beyond the current forms of production. Perhaps the most important principles of the new industrial policy are those seem to have characterised the successful experiences of Eastern Asia as they use the T&A industry as a leader of export growth.

The main features of this policy are:

- Rewarding entrepreneurs on the basis of measureable outcomes rather on prior convictions.
- Targeting new activities rather than existing ones**.**
- Following a serious programme for public firms' modernisation will cause industry development.
- Providing support only for a specific period of time rather than open-ended commitments.
- Sufficient injected investments in the public factories as 90% of yarn and fabric processes are held in these factories and most of the machinery are outdated. This may happen via sharing private sector in this upgrading to provide new sources of fund to reduce fabrics' costs.

2.6 The industry demand side

2.6.1 Demand for textile and apparel in Egypt

Exports of the T&A represent 15% of total production, whereas domestic market stands for 85% of total production showing that the market is domestically oriented. Despite World trade liberalisation of the T&A from 2005, another type of restrictions take effect and is considered key factors urge producers focusing on local market rather than exports. One of these factors is the impact of the EU ROO which directly affects exports besides other agreements ruling the T&A exports. The main agreements ruling the demand of the Egyptian T&A are: Qualified Industrial Zones with the U.S. (QIZ), EU ROO, Great Arab Free Trade Area (GAFTA) and Common Market for Eastern and Southern Africa (COMESA). Although Egypt's textiles exports witnessed fluctuations in values where their values are $ 454 million in 1990, $ 412 million in 2000 and $ 813 million in 2009, the apparel sector witnessed a boom in which exports are $144 million in1990, $710 million in 2000 and $1441 million in 2009 (WTO statistics, 2010). Even though this progress in apparel exports, it is still not as hoped for Egypt's capabilities in industry.

2.6.2 Main agreements ruled Egyptian exports of T&A

There are bilateral, international agreements and protocols ruling the trade of T&A such as ROO, WTO, GAFTA, QIZ, etc. the next step is to focus on these agreements with a quick glance on their merits and side effects on the Egyptian exports.

2.6.3 QIZ protocol and Egyptian T&A industry

The United States is considered one of Egypt's largest single trading partners; it absorbs around 30% of Egypt's total exports and it also offers very hopeful export opportunities. T&A represents 50.4 % of non-oil exports in 2005 (43.4% for apparel, 4.4% for home furnishing and 2.6% for cotton). Total T&A exports to the U.S. in 2010 are $1014 million comparing to $561.1 million in 2004 where achieving a growth around 80 % in this period, apparel exports increases from $422 million in 2004 to $838 million in 2010 with increasing rate of 99%[28].

- **Egypt's QIZ Zones**

QIZ is a trade agreement allowing Egyptian products to access the U.S. market duty-free. To qualify for QIZ treatment, products should be produced in specific zones and comply with certain rules of origin. Current qualified zones include Greater Cairo, Alexandria, Suez Canal (Port Said, Ismailia and Suez) and Delta governorates. Zones selection criteria were actual exports in 2003, exports potential and workers number. Firms are qualified for QIZ treatment if they register with the QIZ unit at MTI and if 35 % of product value is manufactured locally[29].

- **Assessment the effect of QIZ on T&A sector**

QIZ protocol was an opportunity for Egypt, without the protocol exports of the T&A were intended to decline and exporters would have lost this market. However, QIZ is only a temporary remedy to the problems facing the T&A industries in Egypt and serious steps should be done to increase its competitiveness.

2.6.4 Rules Of Origin (ROO)

ROO in T&A have progressed to serve conditions on access to markets or to provide protection to domestic industries. ROO are also a major factor behind concerns about the sustainability of developing countries' exports after the expiry of quota restrictions. For more than four decades, the T&A markets in developed countries are protected from imports by a

[28] United State of America: *Department of Commerce*, International Trade Administration, 2011.
[29] Ministry of Trade and Industry, QIZ protocol.

series of international arrangements allowing them to enforce limits on the imported quantities from particular countries. Beginning with "Short Term" arrangement regarding international trade in cotton and textiles in 1961, then it was replaced in1974 by the arrangement regarding international trade in textiles called the Multi-Fibre Arrangement (MFA) and it was reinstated by the Uruguay round Agreement on textiles and clothing (ATC) from January 1995.

Under Section XI of the Harmonised Commodity Description and Coding System (HS), it has been described in details rules specifying the criteria for each main group of products. This is the method of determining origin. Therefore, origin is granted to an imported product if it has transformed by working or processing in the exporting country in order to fall under a different tariff heading[30]. The relevant EU regulation provides a listing of the working or processing operations that must be carried out on non-originating materials. This list or EU regulation annex is contained item by item. For example, finished or complete apparel of woven fabrics classified under HS chapter 62 receives origin if it has received 'complete making up' in the exporting country. Complete making up is defined as "all operations following the cutting of the fabric". Product receives origin either if it is manufactured from yarn or is manufactured from unembroidered fabric, provided that the value of the fabric does not exceed 40% of the ex-works price of the final product. However, this ratio differs from one country to another. Countries without duty-free access are referred as "non-preferred" countries.

- **Non-Tariff Barriers (NTBs)**

NTBs are considered significant constraints for the T&A trade. Developing countries and least developed countries (LDCs) that export T&A have high commercial stakes in the NTBs negotiations. NTBs negotiations are taking place in the Non-Agricultural Market Access (NAMA) group with the objective of eliminating NTBs, in particular on products of interest to the developing countries. The T&A face various NTBs that often take the form of complex and

[30]Eupoean Economic Community (EEC) Council Regulation No.2913/92 dated 12 October 1992.

rigorous internal regulations and standards. The NAMA group has proceeded to identify, examine and categorise NTBs based on the notifications made by members. Among the NTB notifications made in the NAMA negotiations, those identified specifically for the T&A include: The NAMA 11 group of developing countries and the EU[31] have proposed that WTO establish a "NTBs Resolution Mechanism" that would be a horizontal mechanism but would be independent from the WTO dispute settlement mechanism.[32] Participation in the NTB resolution mechanism procedure would be compulsory whereas implementation of the recommended solution would not. Any party unwilling to implement the recommended solution would be required to state its reasons. Unfortunately, until now mechanisms fail to meet the needs of the exporters.

- **The new version of EU Generalised System of Preferences (GSP Plus)**

In July 2005, European commission adopted the guidelines for the EU GSP for the period 2006-2015, and the first implementation period of 1 January 2006 to 31 December 2008 was ended.[33] The new EU GSP addresses the concerns of LDCs and other vulnerable countries for their T&A exports in the post-ATC phase, and it introduces the new graduation mechanism to focus the GSP benefits on those developing countries that are most in need. The new criteria for graduation of T&A include: Qualification would take place when a "group of products" from a particular country exceeds 12.5 % on average of the total EU imports of the same products under GSP over the last three consecutive years. Groups of products are defined by reference to the "sections" in the EU customs code, which are identical with sections of the HS classification. Section 11 of the HS classification (HS chapters 50 to 63) covers the T&A (50:60 for textiles and 61-63 for apparel).

Vulnerable countries, i.e., those representing less than 1% of the total EU GSP imports of

[31]Group are: Argentina, Brazil, Egypt, India, Indonesia, Namibia, Philippines, South Africa, Tunisia and Venezuela.
[32]"Negotiating Proposal on WTO Means to Reduce the Risk of Future NTBs and to Facilitate their Resolution: Communication from the European Communities", WTO document, TN/MA/W/11/Add.8, 1 May 2006, and "Resolution of NTBs through a Facilitative Mechanism: Submission by NAMA 11 Group of Developing Countries", WTO document, TN/MA/W/68/Add. 1, 8 May 2006.
[33]"Generalised System of Preferences Communication from the European Communities", WTO/COMTD/57, Mar 2006.

those for which a group of products represents more than 50 % of its total exports to the EU under GSP, will not be qualified. The T&A exports from "vulnerable" developing countries may benefit from the "GSP Plus" provision under certain conditions. "GSP Plus" benefits comprise duty-free access to the EU for some 7,200 products including the T&A. As for required conditions, a country must first demonstrate that it is "vulnerable", that is, the five largest sections of its GSP covered imports to the community must represent more than 75% of its total GSP covered imports, and the GSP covered imports from that country must represent less than 1% of the total EU imports under GSP. Then, country needs to consent 27 key international conventions to enable its products benefitting from free duty access. In brief, the country should comply with international conventions of: the elimination of all forms of racial discrimination, all forms of discrimination against women, the rights of the child, minimum age for admission to employment, prohibition of worst forms of child labour, the abolition of forced labour, discrimination in respect of work and occupation, Montreal protocol on substances that deplete the ozone layer, biological diversity, on bio safety and United Nations convention against corruption.

In this issue the cases of extremely poor working conditions in the T&A firms in developing countries are clear, and there is also a danger that working conditions will deteriorate given the heavy pressure on developing countries exporters to cut prices. Hence, firms have faced two opposite situations; the first is to comply with the 27 factors and ILO requirements which entail an increase in production cost. The second is the EU-buyers desire in obtaining cheap products.

From this survey, it is noticeable that ROO themselves are varied from free duty access for certain countries to complicated and restricted for others which lacks equal trade conditions. Compliance to GSP plus conventions and retailers looks like walking into opposite directions. Thus, the Egyptian-EU partnership agreement is relatively complicated and follows a mixture of value added, change of tariff headings, and specific production processes that indicate the sufficient transformation of the traded products and the diagonal cumulation is not always valid.

2.6.5 Other RTAs and their effects

➢ **Great Arab Free Trade Area (GAFTA)**

The GAFTA was established to facilitate trade among Arab countries. Principally, the agreement was signed in 1997 and was a planned yearly reduction in tariffs by 10% to reach FTA within 10 years (01/01/2007).The trade between Egypt and the GAFTA countries increased from US$ 808 million in 1994, to total trade US$ 9 billion in 2008. The surplus was US$ 145 million in 1994 then was reversed to trade deficit of US$ 800 million in 2000, but in 2008 a trade deficit of US$800 million out of 9 billion. So, comparing to great increase deficit is declined[34].

- **GAFTA ROO**

The general ROO indicate that the value added within the boundaries of one or more member countries should be no less than 40 % of the final ex-factory price of the products[35], and this percentage is lowered to 20% in the case of joint Arab production, such a joint enterprise officially carrying the name of two or more Arab countries. One of the GAFTA problems is a lack of detailed protocol and confusion about the concept of 'value added' with regard to the ROO; the 40 % local component is a more relaxed concept than the 'value added'. If the value added concept is adopted, then this would be stringent, since one would have to keep out those inputs that are imported from abroad and included in the product when running calculations.

- **NTBs within GAFTA**

Several problems within GAFTA have risen, among them customs valuation and import permissions. The import permissions form a big problem among the GAFTA countries, since they can be considered strong NTBs. For example, it is very hard for Tunisian importers to import Egyptian products due to NTBs imposed from Tunisian authorities. There are so many burdens facing the Egyptian exports in Arab countries, including imports permissions. The cases differ from one importer to another and from one period to another. Although GAFTA officially

[34]Ministry of Trade and Industry, *international trade bulletin*, 2009.
[35]An example for that is Egypt contributing with 30 % of the final ex-factory price of the product separately and Sudan which contributes with 10 %. In this case, both of them together contribute with 40 %.

cancelled this sort of burdens, each country has a different trade barriers and needs different manipulations. Egyptian ministry of trade and industry succeeded in solving most of these obstacles facing exports and this contributes to increase total trade to be more than 5 times in 2008 relative to 2003 with more than 3 times increase on exports to Saudi Arabia and Libya in 2008 relative to 2007.So, it is possible for the Egyptian exports to expand their existence in these markets.

➢ **The Common Market for Eastern and Southern Africa (COMESA)**

COMESA was established in 1994 as a reinforced successor to the Preferential Trade Area (PTA) for Eastern and Southern Africa and founded in 1981. COMESA comprises of 20 members[36.] Initially, the reduced tariffs to products originating in the region apply to a group of selected commodities contained in a common list. The common list is expanded every two years by the inclusion of additional commodities.

- **COMESA ROO**

Any product confers origin if added value resulting from the process of production accounts for at least 40% of the final product. Albeit the implementation of a protocol of ROO in COMESA[37] is set, there have been many claims of incidents of deception in origin certificates (Particularly on the part of Egypt). Moreover, there is a long list of exemptions from those ROO, where members are allowed to apply different ROO to some goods of economic importance (145 goods). These procedures are usually undertaken and reviewed under the ministerial meetings.

- **NTBs in COMESA**

There is no specific appropriate treatment for trade provisions, for NTBs in COMESA. The member countries devise their own measures to counter what they considered to be major market disruptions and this is the main drawback. For example, when faced with the surge of

[36]Angola, Burundi, Comoros, Democratic R. Congo, Djibouti, Egypt, Eritrea, Ethiopia, Kenya, Madagascar, Libya(2005) Malawi, Mauritius, Rwanda, Seychelles, Sudan, Swaziland, Uganda, Zambia and Zimbabwe. Egypt joined in the year 1998. Countries that used to be members of COMESA and withdrew are Lesotho (1997), Mozambique (1997), Tanzania (2000) and Namibia (2004).

[37]Common Market for Eastern and Southern Africa (COMESA), official website, available at internet link: http://www.comesa.int/index-html/view.

imports from Egypt in a number of products, Mauritius and Kenya had bilateral talks with the Egyptian authorities to reintroduce duties on these products. Similarly, Egypt had bilateral talks with Kenya to stop the surge of Kenyan tea exports. Such unilateral measures can be double-edged swords and their abuse can frustrate trade. Egypt has been a victim to some of these unilateral measures. But many analysts believe that such safeguards helped to have greater participation of smaller countries in the FTA. Even though lots of efforts were done to rapid and maximise the benefits of COMESA, there are some reasons slowing the speed of success and levels of integration. These causes are: trade liberalisation does not provide special incentives to COMESA members, political instability, inadequate transport systems, wars, etc.

2.7 Summary of the chapter

In this chapter general ideas are provided about the supply and demand side of the Egyptian T&A industry. The first aim is to show the importance of the industry for the Egyptian economy in different aspects such as employment, contribution to value added, etc. then the supply side components are introduced. After that the production costs are mentioned as a crucial factor in improving performance and competitiveness among rivals; in this view, the direct and indirect costs are presented to confirm their effect on industry competitiveness.

Then, governmental barriers are commenced as a major factor contributed to the deterioration of public firms. The industrial policies also are investigated to find out the influence of new policies, laws and incentives on enhancing the industry performance. It is also remarkable to recommend that it is better for the Egyptian farmers to follow the Turkish path in gathering the crop wherein its mechanic picking can reduce costs significantly by one third of crop's total production costs. Egyptian research institutes also should give attention to plant short and medium staple cottons to satisfy local factories needs instead of importing them and to avoid more pressures and restrictions imposed from main exporters of short and medium cottons. For

Instance, yarn prices are doubled in July 2010 putting more burdens on industry. Applying GM (genetically Modified) cotton techniques for short and medium cottons is a prerequisite to reduce the amount of imported cottons together with the use of LS and ELS cottons in valuable T&A products and to maximise the added value.

Finally, section 2.6 deals with main international agreements rule the T&A exports. This part discusses the impact of QIZ protocol in enhancing the T&A exports to the U.S. market. Afterwards the EU ROO is mentioned with focusing on the impact of GSP Plus provisions on T&A exports without ignoring the conflict between rules satisfaction and retailers' rights for having cheap products regardless complying with the rules or not. Moreover, the inequality criteria implemented by EU on imported T&A products from different suppliers which affect the Egyptian T&A products' access, additionally, complicated required documentations and other NTBs. Although the EU is regarded as one trading community, Egypt still needs to consider the differences between specific standards of each separate EU member, alongside common standards of Egyptian-EU partnership agreement. There are also other RTAs such as COMESA and GAFTA. In some cases, there is a wide gap between the provisions of the RTAs and what is implemented in reality. GAFTA and COMESA are clear examples of non-transparency and many provisions of these two RTAs need more development, elaboration, editing and many of the clear provisions have not been implemented to date also passed time since the implementation is not enough to allow for testing this gap.

Chapter 3

Technical efficiency for Egyptian textile and apparel industry firms: SFA panel data time varying approach

3.1 Introduction

This chapter measures efficiency for Egyptian T&A industry. Section 3.2 deals with the industry historical developments in the modern period for both textile and apparel. Section3.3 provides brief notes on T&A and factors affect supply chain operations. Section 3.4 describes the model, data and variables wherein raw data are collected form CAPMAS industrial bulletin statistics. Data cover public units from 2001/02 to 2008/09 and from 2006 to 08 for private ones. Additionally, questionnaires and interviews are held with firms' executives, managers and workers to examine the impact of factors affect industry's supply chain operations on efficiency (planning, inputs sourcing, delivery and inventory) via measuring firms' efficiency without and with factors to check their effect. Section 3.5 provides empirical results for all T&A private firms, textile private firms, apparel private firms and public firms.

3.2 Industry historical developments in the modern period

3.2.1 The historical development for the textile industry

Cotton was firstly introduced by the Arab in Spain and they named it as cotton[1]. In the first quarter of the 19th century, the country witnessed the first industrialised attempt by Mohammed Ali. During the period 1815-1840 a considerable progress was achieved in textile industry as a result of planting cotton in a mass scale: In 1840, London treaty imposed limitations on Egyptian army numbers (the main consumer of textiles) together with an imposed provision of removing barriers towards imported products. The efficient imported products led infant local factories to close subsequently[2]. In 1899, a new attempt was made to reestablish the industry by constructing a newly mechanised factory in Alexandria, but the competition from foreign products and high tariff rates imposed on local products gave rise to its closure. In 1911, the same factory was reconstructed under the name of" The National yarn company" but due to harsh and deliberate colonial policies aimed to keep Egypt as a market for their products forced it to close again.

[1] Mubarak A, Elsharkawi A. 1997. T&C problems, industry& energy committee report. The Egyptian people's Assembly: first report, third session: 11.
[2] future horizons for T&C industry in Egypt: National Institution of planning. 1985. Series of planning and development issues in Egypt (28):1.

During First World War textile industry was flourished in small size firms, but by the end of the War and because of country's openness policy towards foreign products and deregulations most of firms are closed down.

In 1922, under the slogan of encouraging Egyptian products by Talaat Harb the well-known nationalist industrialist who is the main contributor of the establishment of Banque Misr (the bank of Egypt) which is the first real Egyptian bank owned by the Egyptian shareholders and staffed by Egyptians. Afterwards, several ventures are established to create national modernised industries. In 1927, Talaat Harb established the first national industry in an accurate methodical base via setting up the biggest company for yarn and cotton weaving in the Middle East in El-Mahalla El-Kubra. A sequence of companies followed El-Mahalla such as Kafr El-Dawwar, Misr Helwan, etc. Those companies were considered cornerstone for T&A industry and great institutes for generating practical expertise in the industry. In 1930, the first enactment of imposing tariffs on imported textile products was come into force, although tariffs were moderate, the industry still in progression relying upon the use of the World reputation Egyptian ELS cotton alongside the support of Banque Misr. The Second World War was considered as a turning point in industry development due to imports stop, local demand increases and the demand of the Middle East militant armies. These factors led industry to flourish and to set up new factories, but because accidental growth during and post the war the industry faced difficulties during 1949-1952. These difficulties were; imports competition and an increase in local yarn stock due to its higher prices comparing to foreign yarn because its unique features as a long staple cotton[3]. In 1953, the agency of yarn, cotton and textiles subsidies was established with its goals to improve production conditions, products quality, increase productivity efficiency and to focus on yarn production from medium and thin yarns. The government give subsidy to exporters to compete against low price yarns.

[3] National specialists' councils' encyclopaedia. 1989. Textile and clothing industry. Second round industry: 10-14.

By the end of July 1961, all yarn companies were nationalised and were under the authority and supervision of the Egyptian Public Organisation for Textile and Clothing (EPOTC). Small units were excluded from nationalisation whether they were separated across the country or concentrated in El-Mahalla El-kubra and Shubra El- khiema. The public sector firms continued as a dominant sector because it represented 90% of total yarn capacity and 70% of weaving, bleaching &dyeing[4] and the industry was affected by prevailed thoughts in this era. The target was to satisfy low income people's needs. The protectionism policy continued as the main aspect in international trade until the beginning of the ninetieths; where economic reform policy was adopted through bundles such as gradual prices liberalisation, structural adjustments, and private ownership growth.

3.2.2 The historical development of the apparel sector

In relation to apparel industry, it can also be divided into three main stages: the first is Mohammed Ali era; the second is the first quarter of the twentieth century until 1973and the third is the period after 1973. In first stage, apparel factories were constructed in Mohammed Ali era for satisfying military needs, and familiarising people to industrialisation more than making profits as his saying to Boring" The desire for constructing an industry during this period was for developing, political and military purposes not for earning financial benefits" [5]. But under London treaty 1840 which included reduction on armed forces numbers, the prohibition of imposing any duties against foreign products, the industry was deteriorated and the style of small units as tailors' shape still dominant until the beginning of the first World War[6].

The second stage was started by constructing some knitting apparel plants and most of them were owned by foreigners and some other local workshops which use textiles as a raw material for making apparel to satisfy governmental authorities and other organisations needs.

[4] National Bank of Egypt. 1997. *Textile industries in Egypt*. Economical periodic 50(4): 11-12.
[5] Mabro R, Radwan S. 1981. *Industrialisation in Egypt (1939-1973) policy and performance*: 27.
[6] Hansen B, Nashashibi, K. 1988. *International trade systems and economic developing in* Egypt: p 11 with Mayerd R, Radwan S. 1981: 34-36 and national specialists' councils. 1989: 62.

By the end of the 1960s integrated public factories started in building apparel units using their textile products as a raw material; also some specific private sector units were constructed and those knitting units were expanded to satisfy domestic and global markets' needs.

Third stage started in 1974, the government adopted openness policy "Infitah" by setting programs to encourage private sector, Arab, and foreign investors as a result act 43 aimed to;

❶ Guarantee mutual benefits for Egyptian economy, Arabian, and foreigner investors.
❷ Facilitate the proper environment for Arab and foreign capital transfers by eliminating administrative and procedural impediments that affect investments growth besides providing sufficient guarantees against un-commercial risks.
❸ Give the opportunity to national capital to share with Arab and foreign capital.
❹ Give priority to ventures provide advanced technology or increase foreign currencies.

The outcomes of policy led to make a notable growth but it was semi-random in T&A industry[7].

On September 1975, the act 111 was issued for public firms which contained on its provisions:

❶ The cancelation of the EPOTC.
❷ Enlarge the authorities of companies' administrative boards which enable them to be free on decision making relating to their companies.
❸ Constructing the Textile and Clothing Council (TCC) which includes in its membership the minister of industry, companies' administrative panels, at least three experts in the field and one representative from ministries of finance, planning, and economics.

Even though the seventieths era witnessed a notable growth in T&A industries, these expand seemed to be unorganised and random despite economic changes domestically and internationally. The main aspects were an increase in foreign currency flow through tourism, Suez Canal revenues, workers' remittances and oil revenues. Instead of directing these returns in industrial investments, unfortunately investments were directed to consumption which led to inflation pressures and their impacts on input prices, wages, other costs and output prices. Those factors led to reduce products' ability to compete locally or globally. These accumulations still affect the industry in the 1980s until the 1990s reforms took place[8].The period from 1981 to

[7] The state council. 1992. Cotton in Egypt its plant, manufacturing, and its trade. Industry's series reports (7): 123.

1991 witnessed modernisation in Egyptian textile industry with clear growth in apparel industry as well led to exports expansion in EU and the U.S. markets. In first of May 1990, the first programme of encouraging private sector followed by economic reform programme which was launched in 91 after agreement with both IMF and IBRD. This agenda was applied to the 31 companies and entailed to widen private ownership in the sector. In 1992, Egyptian government declared its aim to get rid of its share in some public units. Thus, some acts were issued to organise investment environment for privatisation process such as act (2) 92, (95) 92 for money market, (37) 92 for banking and credit, (18) 94 for foreign currencies regulation and act (8) 97 for investment incentives guarantees[9]. These acts contributed to provide guarantees and incentives for private, Arab and foreign investments. It also helped to attract investments and to enlarge private ownership. Consequently, private sector firms in the apparel started to broaden and to take place in the Egyptian market because the apparel industry does not require intensive investments similar to textiles. In contrast, governmental ignorance started to take place in the public sector firms. By the end of 2007, the government started again to give attention to the sector and the main goal was to enhance efficiency and performance to be a chief industry.

3.3 Textile and Apparel (T&A) features

The Egyptian T&A industry is one of the leading sectors due to its characteristics in place of a low capital and a labour intensive industry comparing with other industries. It accounts for 20% of the non-oil exports, employs around one million workers, almost 30% of the manufacturing employment and 7% of the total employment. The share of the apparel sector in the T&A employment is 30% and women employment are 70% of the total apparel workers (World Bank, 2006)[10]. The number of workers in the apparel sector is 30% of the total T&A employment, value-added in the apparel amounted to 32% of the T&A value added and

[8]Mohammed H. 1999. *The effect of Uruguay round on Egyptian Textile industries exports*. Ph.D. Arab University: 57-58.
[9] El-Demerdash M. 1999. *Privatisation as an instrument to treat structural imbalance in public sector firms*. Ph.D. Cairo University: Faculty of Law: 57, 60, and 70.
[10] World Bank Documents. 2006. Morocco, Tunisia, Egypt and Jordan after the end of the MFA: Impact, Challenges and Prospects: 1-70.

investments were 14% of the T&A investments (CAPMAS) [11]. In 2010, exports were 3 US$ billion. However, the Egyptian T&A exports account for only some 0.8% of the global trade in the sector meaning that Egypt is not fully utilising its capabilities. The private firms represent 99% of firms; the total number is ranging from small firms with less 10 workers to extra-large 8000 employees (CAPMAS, 2010). The way textile products are delivered to consumers in terms of lead-time and costs have changed and the competitive environment has become aggressive (Kilduff, 2000)[12]. The main causes of this situation are textile pipeline globalisation process, high demand pressures and the pace of technological change (Camargo et al., 2003)[13].

The main four factors affecting supply chain operations are; planning, materials sourcing, hauling and inventory & returns. Albeit Egypt has relative advantages in exports of some T&A products, its comparative advantage decreases as moving downstream in the production chain. The Egyptian T&A industry own a complete supply chain with many operations that amounts to separate activities. However, the supply chain is not operating efficiently due to some weaknesses. Thus, the target is to give attention to the variables affecting the performance of supply chain operations for the Egyptian T&A firms, and hence their ability to compete globally. Hurdles facing producers are to move from narrow internal efficiency concept to comprehensive supply chain efficiency. Outstanding producers assume that the whole supply chain is World class. It may be necessary but no longer sufficient to continuously improve the internal operations if the external linkages are not up to the same level. A supply chain focus is vital for the long-term well-being of any manufacturing firm (Olhager and Selldin, 2004) [14]. Additionally, producers are likely struggling to improve their products quality and to

[11]Central Agency for Population Mobilization and Statistics (CAPMAS), Annual industrial bulletin, several issues.
[12] Kilduff P. 2000. Evolving strategies, structures and relationships in complex and turbulent business environments: the textile and apparel industries of the new millennium. *Journal of Textile and Apparel Technology and Management*.1(1):1–9.
[13] Camargo M Rabenasolo B Jolly-Desodt AM, Castelain J-M. 2003. Application of the parametric cost estimation in the textile supply chain. *Journal of Textile and Apparel Technology and Management*. 3 (1): 1–12.
[14] Olhager J, Selldin E. 2004. Supply chain management survey of Swedish manufacturing firms. *International Journal of Production Economics*. 89: 353–361.

compete in a rapid pace markets. To obtain that, Producers are in need to reduce products and services costs, to shorten delivery period and inventory cost in order to find a place in highly competitive markets (Kritchanchai and Wasusri, 2007)[15]. Therefore, the objective is to examine the impact of supply chain operations variables on the T&A firms' efficiency. The first step is to predict efficiency scores for firms and then to add the main supply chain operations variables and re-predict firms' efficiency scores. These variables are as follows:

1- Planning for the industrial firm; the firm ability of setting plans and strategies aim at managing all its resources that goes toward satisfying customers' demand for product or service through monitoring the supply chain operations efficiently through industrial planning and marketing planning. Thus, better planning process leads to provide products with low cost and high quality and within the lead time. The planning system questions in both parts (industrial and marketing) are pointed out in appendix 1 part F310.

2- Sourcing process for raw materials; the firm ability to follow best purchasing strategies aim at obtaining cheap and high quality raw materials regardless their source (local and/or international). It includes ordering and receiving shipments, verifying them and transferring them to manufacturing units. Therefore, efficient sourcing process enables the firm to choose among varied sorts of supplies with cheap, and high quality and avoids any form of bottleneck in production process. The sourcing questions are exposed in appendix 1 part F320.

3- Hauling (delivery): the flow of raw materials and final products through the firm whether it uses its own transport means or hiring the service, developing a network of warehouses and picking carriers to get products to customers. Having an efficient delivery system lead to satisfy customers' orders at lead time and also enhance firm's ability to replenish extra orders swiftly. The delivery system questions are shown in part F340.

[15]Kritchanchai D, Wasusri T. 2007. Implementing Supply Chain Management in Thailand Textile Industry. *International Journal of Information Systems for Logistics and Management*. 2(2): 107-116.

4- Inventory (returns) system: deals with firm's inventory and returns flow. This includes the ability of the firm to control and minimise the stock and customers' returns at minimum level. Additionally, setting strategies lead to get rid of stock via promotions, fairs, etc. The returns system questions are displayed in part F350. The aim of using these variables is to improve the management and the structure of the firm.

3.4 Descriptions of Model, variables and data

Stochastic production frontier in a translog form for is used via time varying inefficiency effects model proposed by Battese and Coelli (1992). The first translog stochastic frontier production function model for the T& A firms is defined by:

$$Y_{it} = f(x_{it}) \tag{1}$$

$$Y_{it} = B_0 + \sum B\, x_{it} + \varepsilon_{it} \tag{2}$$

Where

$$\varepsilon_{it} = v_{it} - u_{it} \tag{3}$$

The u_{it} is assumed to be defined by

$$u_{it} = \eta_t\, u_i \qquad i = 1,2,\ldots, N\,;\, t = 1,2,\ldots,8 \tag{4}$$

Where

$$\eta_t = \{\exp[-\delta\,(t-T)]\} \tag{5}$$

Output: represents the natural logarithm of total value of manufacturing output for *i* firm, *t* year in Egyptian pound 2001 constant prices (denoted Y_{it}).

$X_{it:}$ is industry inputs (labour, material and capital) for firm *i* at period *t*.

ε_{it}: is the compound error term including *vit* (the two- sided "noise" component of the error term) which is assumed to be independently and identically distributed as $N\ (0,\ \sigma_v^2)$ and u_{it} (inefficiency component). u_{it} is assumed to be independently and identically distributed non-negative random variables as $N^+\ (0,\ \sigma_v^2)$. Both v_{it} and u_{it} are distributed independently of each other and regressors.

δ is a parameter that acts a significant role in the behaviour of technical efficiency over time. Battese and Coelli (1992) stated that if $\delta > 0$, technical efficiency rises at a decreasing rate, if $\delta <$ 0 technical efficiency declines at an increasing rate, and if $\delta = 0$ the technical efficiency remains the same. Inputs are divided into three components as follows:

Labour (L_{it}): represents the natural logarithm of total paid wages per year in Egyptian pound 2001 constant prices (denoted x_1).

Materials (M_{it}): represents the natural logarithm of total costs of raw materials purchased by the firm during the year in Egyptian pound 2001 constant prices (denoted x_2).

Capital (K_{it}): represents the natural logarithm of expenditures on electricity, fuel and lubricants, maintenance, repairs of capital goods, rents of buildings and machinery, machinery upgrading, etc. as a proxy of Capital during the year in Egyptian pound 2001 constant prices (denoted x_3). Maximum-likelihood estimates of parameters are obtained using the LIMDEP 9.0 programme (Greene). Parameters estimates are obtained and predicted TE for each firm per year. The next step is to add the main four variables (planning, sourcing, delivery and inventory) to the previous model to examine if there is a direct influence on the production structure (the shape of the production technology) for each firm which enables to compare the results before and after. The modified model will be as follows:

$$Y_{it} = f(x_{it}, z_{it}) \tag{6}$$

$$Y_{it} = B_0 + \sum B_i x_{it} + \alpha_1 P_{it} + \alpha_2 SP_{it} + \alpha_3 DS_{it} + \alpha_4 RS_{it} + \varepsilon_{it} \quad \text{Where;} \tag{7}$$

$$\varepsilon_{it} = v_{it} - u_{it} \tag{8}$$

and the u_{it} is assumed to be defined by

$$u_{it} = \eta_t \, u_i \qquad i = 1,2,\ldots, N \; ; \; t = 1,2,\ldots,8 \tag{9}$$

$$\eta_t = \{\exp[-\delta (t-T)]\} \tag{10}$$

Z_{it} represents supply chain variables for firm *i* at period *t* and includes the following four variables; P_{it} represents the planning process for firm *i* at period *t,* Sp_{it} denotes the sourcing process for firm *i* at period *t,* Ds_{it} signifies delivery process for firm *i* at period *t* and Rs_{it} symbolises the inventory process for firm *i* at period *t.* These variables are obtained via answering questionnaire questions and through historical information for each firm during a covered period of 3years for the private units and 8 years for the public entities. Interviews also are run with firms' chief executives, production units' managers, employees and workers for both sectors. The number of questions relating to supply chain variables are 40 and are classified as follows; 16 questions for planning process (8 for marketing planning and 8 for industrial planning), 12 questions for sourcing process, 6 questions for delivery and haulage process and 6 questions for stock and returns process, besides other general questions about workers numbers, educational levels and general information about the firm. All questions have same weights and getting value 2 for yes answer and the value 1 for the answer of no then answers are processed to obtain their mean for each part (P_{it}, SP_{it}, Ds_{it} and Rs_{it}) e.g. 1.25, 1.44, etc.

After predicting TE scores, they are regressed as a dependent variable against following regressors to examine their impact on firms' efficiency where:

a- Firm's size: includes three values; zero for small, one for medium and two for large and extra-large size for the private firms. For the public units, two values are regarded as; zero for large firms and one for extra-large ones. Reasons behind using dummies for size instead of continuous measure are: firstly, the number of workers as a proxy of firm size will be improper because the differences among activities within sector or between textiles and apparel sector are high. Secondly, using capital measure as number of machinery, or cost of creating a job as a size determinant will be also irrelevant since variations among sectors are clear. For instance, an apparel factory with 50 workers is considered as a medium size firm, whereas a home furnishing (textiles) factory with the same number of workers is treated as big size firm. However, the same

number of workers within the same sector also differs; a women lingerie factory with 50 workers is regarded as a large size firm whereas it is considered as a medium size firm if it is a shirt factory. Battese, Rao and O'Donnell (2004) (in their paper of measuring efficiency for medium and large Indonesian garment firms) use a survey that is basically restricted to the medium and large size firm which have at least 20 employees. Others such as (Alvarez & Crespi, 2003) and (Margono& Sharma, 2004) use total sales as an indicator of size. Therefore, the size measure is relative and relies on firm's activity and the best option is to deal with each firm separately via employing dummies.

b- Firm's age for the private units is treated as new if its age is less than 15 years and old for firms more than 15 years. For the public entities, new is for firms less than 30 years and old are for firms more than 30 years because new firms are established during the 1980s. Value zero is given for the new firms and one for the old ones. Also, the reason behind using dummies for firm's age is that constructing a new firm in a textile sector differs per activity. For instance, setting up a yarn or a spinning factory needs form 3 to 4 years with intensive investments and at least one year for market access whereas setting up an apparel factory needs less than one year to set up and to provide products in markets. Thus, each case need different manipulation to decide whether it is considered as old or new and using dummies will make it easier to deal with each case in a simple way. Differentiations between textiles and apparel are illustrated in ownership type section (chapter 2 pages32, 33).

c- Governmental Barriers (GB): zero value means that GB do not affect firm's competitiveness and efficiency whereas value one affect firm's ability to compete.

d- Bureaucracy (B): zero value means that B hinders working environment and hence affects efficiency while value one means B does not hinder working environment.

f- Exchange Rates (EXR): value zero means that EXR has not an impact on production process or output prices and one means it has an impact on input prices, output prices or both.

Variables descriptive statistics show that the standard deviation of supply chain factors is lower than size, age, GB, B and EXR. The high rates of other variables may be attributed to clear differentiations between sectors and activities within the same sector. For instance, the firm in the textile sector with 50 workers is considered as large whereas the same number of workers in apparel sector is considered as a medium size firm. Also, the gap between costs of creating a job among sectors is clear. For instance, creating a job in yarn activity costs 150000 Egyptian pounds in 2005 prices whereas it costs 100000 for weaving and from 15000 to 20000 for apparel (the ministry of trade and industry 2005 report.) and this explain that size measures differs according to sector and activity within the same sector. Moreover, the distribution of firms' size, age, GB, B and EXR differ in yarn, weaving, fabrics and home furnishing as each activity within sector has its own characteristics. Similarly, the apparel sector and the public sector statistics and firms distribution differ from sector to another.

To conclude, the impact of variables on efficiency scores vary between sectors and among activities within the sector and the importance of each variable also differs. For instance, the impact of sourcing process is important for apparel firms since raw materials represent 60% of total costs (Birnbaum, 2005) and the impact of the B and the EXR are clear whereas there is no impact in the textile sector since textiles' outputs are used as industry inputs for the apparel sector. For the public units, the impact of the planning especially the marketing planning and controlling the returns system factor with inventory play major role in enhancing efficiency in the public units and the impact of size, age, GB, B and EXR have chief role on efficiency scores (appendix 8 contains all details about sectors statistics and activities distributions). The impact of those factors on firms' efficiency is explained on empirical results.

Data cover a sample of 838 private sector firms for the T&A activities; yarn, weaving, fabrics, home furnishing, underwear and clothing from 2006 to2008. The private units' sample covers all firms' sizes; small, medium and large & extra-large firms. The sample also includes

firms' products for local and global markets. Most of the large and extra-large firms' production is dedicated for local and international markets; additionally they are fully integrated meaning that more than one activity can be included in one firm such as weaving, bleaching &dyeing, fabrics and apparel. Small and medium firms have at least one activity, but most of the private firms have their transport means to obtain raw materials, industry inputs from suppliers and to deliver products to clients.

Alternatively, the public units are large and extra-large size and they are varying from 500 to 21969 workers (BSIC, 2010)[16]. All firms are yarn producer for natural and man-made fibres. Firms' activities range from fully integrated activities covering all the T&A supply chain processes to others covering only the textile supply chain process (yarn, weaving, dyeing& finishing, fabrics and home furnishing) but all of them have their own transportation means. For market share, most of them produce for local and global markets. Despite their small number (25 firms) relative to private units' numbers, each firm has at least four activities and each production unit is equivalent to 5 large and extra-large size private firms. For instance, Ghazel El-Mahalla company has 13 activities covering all T&A processes among them the medical cotton plant which is the biggest medical cotton factory in the Middle East. Plus 7 extra-large clothing factories, 4 extra-large yarn factories, 8 weaving factories, bleaching, etc. unfortunately, obtained raw data from CAPMAS for public units is aggregated which include the whole value of used inputs and obtained outputs during the year in Egyptian pounds which make the number of observations seems to be small relative to private units. Raw data are obtained via Egyptian CAPMAS for 8 years panel from 2001/02 to 2008/09 including all information about industry inputs and outputs in current prices. Then prices are deflated to obtain constant prices with 2001 as a base year. Separate deflators are used for outputs, capital, wages and raw materials.

[16] Business Sector Information Centre: Textile and Apparel Annual Reports, 2001-2008.

3.5 Empirical Results

3.5.1 T&A Private sector results

MLE for the stochastic frontier production function cover 838 Egyptian T&A private firms denoting the majority of industry activities together with data obtained via questionnaires and interviews to construct factors that affect the supply chain operations. Measuring technical efficiency through production process (inputs and outputs) is not the whole story because total competitiveness depends on a wide range of other costs (external or internal factors) such as exchange rates, raw materials, energy costs, interest costs, inventory turnover, time, quality, value adding capabilities, logistics, etc. Thus, accurate technical efficiency measures entail not only estimating technical efficiency via production process but also via supply chain factors.

Table 3.1a denotes the T&A estimates for the private firms revealing that all inputs variables are significant at 1% level of significance. For supply chain variables (SCV), it is noticeable that both the planning process and the returns system variable are significant at 10% and 1% level in turn and this can be explained due to the private units are utilised industrial and marketing planning processes efficiently and the ties between producers and retailers are strong in other words the producers are producing according to actual requests. For returns system, the private firms have the ability to get rid of returned goods and inventory through their own exhibitions or via local fairs meaning that stocks tend to be near zero. Thus, products diversifications play a major role in reducing stocks and inventory in private firms. Mean TE without SCV is 88% with minimum 69% and maximum 99% and the mean with SCV is 89% with minimum73% and maximum 99% showing that the minimum increases by 4% on average and firms' TE scores shifted up and concentrated as shown in 3.1 figures. The estimated regression for all the T&A private firms using fixed effects model since Hausman test favours fixed effects. The dependent variable is the measured level of the TE of the firms for a three year panel whereas Firms' size, age, GB, B and EXR are the regressors.

Table 3.1b shows that the size variable is insignificant and this may be due to the size concept differs per activity within the sector and per sector and most of the T&A firms have differentiated products and integration ties among firms are high. Firm's age is significant at 5% level wherein the age facilitates firm's access to finance, experience, and hence market position. The B coefficient is insignificant and this may be ascribed to private sector managers' favour bribing to facilitate business instead of following bureaucratic procedures that are time consuming (as mentioned on manger's interviews). The EXR coefficient is also insignificant and this may be due to exchange rates have minor impact in products pricing for the whole industry in general. The GB is insignificant owing to differentiations in infrastructure and services. It also should take into account that results may be differ per sector since each one has its own characteristics.

The potential endogeneity problem of the inputs may appear because inputs combinations are varied from one activity to another or within the same activity. Moreover, the correlation between inputs and error term may be found due to unavailability to separate the complicated relationship between inputs and activities due to industry nature (strong backwards and forwards ties among industry phases) as it is a group of separate industries. For instance, in textile sector although yarn is considered as a final product of the fibre stage, it is considered as an input or a raw material for fabrics industry and both activities belong to textiles industry. Therefore, it is too difficult to separate the relationship between cause and effect as what is considered as an effect for one stage is considered as a cause for the next one. In the model, it is assumed that both error term components (v_{it} & *uit*) are distributed independently of each other and regressors.

3.5.1.1 for textile private sector

Table 3.2a displays estimates for textile firms where labour and materials are significant at 5% without and with SCV and capital variable is significant at 1% without and with SCV. Mean TE without SCV is 83% with minimum 60% and maximum 99% whereas values with SCV are

84%, 66%, 99% for mean, minimum and maximum respectively. Efficiency scores in figures 3.2 a, b, c, d with SCV are shifted up by 6% on average to be more concentrated

Table 3.2b shows estimated regression for the textile firms via fixed effects since Hausman test supports fixed effects. All variables are insignificant due to the textile firms are capital intensive and are the main provider of raw materials to the apparel sector implying what is produced in the sector is sold to the apparel as yarn or fabrics. For instance, thin yarns such as 36 and 40 and higher gauges are used for fine branded apparel and low ranks of yarn or thick yarns such as 20, 16 and 10 gauges are used on home furnishing products such as towels, bed linen, etc. supporting the notion of what is produced in the sector is sold. The B coefficient is insignificant and this may be attributed to private sector managers prefer to buy off to ease their business rather than doing complicated bureaucratic processes (this is explained by firms' mangers interviews). The EXR coefficient is insignificant and this may be due to exchange rates have minor impact on products pricing as the textile sector dominate apparel sector and most of the textile products are locally oriented. The GB is insignificant and this may be as a result of recent improvements in services and liberal procedures followed by the government. The firms' size and the age are also insignificant where industry by nature is capital intensive and the concept of size vary per activity so the firm with the number of 50 workers in weaving is treated as large size firm whereas an apparel firm with the same numbers is treated as medium size.

3.5.1.2 for the apparel sector

Table 3.3a exhibits the apparel firms' coefficients estimates where the inputs coefficients are significant without and with SCV. The sourcing and the returns system variables are significant at 5% and 1% level respectively. The significance of the sourcing may be attributed to the fact that raw materials represent 60% of the total FOB production costs since main apparel costs factors are; materials and labour. Returns system is significant at 1% level since apparel industry by nature are highly differentiated and varied which reduces firms' stocks. Mean TE, minimum and maximum values without SCV are 97%, 95% and 99% while values with SCV are

99%, 98%, and 99.5% correspondingly revealing that minimum values are increased by2% as shown in 3.3 figures. Hausman test for the apparel sector supports random effects.

Table 3.3b shows that size, age and GB are insignificant and this may be due to the apparel products are differentiated, local purchasing power is large since local market covers 85 million customers over 70% of them are youth and children with different desires which deepens products differentiations and interpret reasons for insignificant variables besides variation in firms' size and activities in the apparel sector are so clear. In addition, the GB is insignificant and this may be due to major improvements in services such as customs, taxes, ports and airports infrastructures, and reductions in customs procedures from 28 days to 4 days, thus all these factors contributed to facilitate working environment. The B and the EXR variables are significant and this may be ascribed to the fact that the bureaucracy plays major role on working environment and industry procedures are more complicated than textile sector besides the textile is a capital intensive sector and the cost of following bureaucratic procedures is less but makes more loses comparing to the apparel sector. The EXR play major role in industry since industry's accessories are imported and 70% of the T&A exports are attributed to the apparel sector.

3.5.2 Public sector results

Table 3.4a estimates reveal that coefficients are insignificant. Labour is interpreted as a result of several factors; imbalance between the distribution of white and blue collar employees, wages increases for social considerations whether labour's productivity increased or decreased, the target of early pension scheme is to minimise white collar employees by giving them the opportunity of optional retirement but the opposite has happened where blue collar employees are retired and the gap between the white and the blue collar increased. This lack of the blue collar creates more burdens on existing labour and led to productivity slowdown. A lack of machinery modernisation and the increase of raw materials prices due to cotton prices liberalisation affect capital and materials variables. On the other hand, efficiency scores for firms differ without and with SCV significantly. Mean TE, minimum and maximum values without

SCV are 83%, 14%, and 99% respectively whereas mean TE, minimum and maximum values with SCV are 98%, 83% and 99.9% correspondingly. It is clear that managing production process through the planning process with its factors marketing planning (most firms are suffering from a clear strategy of this factor) and industrial planning, sourcing process, delivery system and the strategies of dealing with inventory and returns led to efficiency score changes significantly from 14% to 83% for inefficient firm (firm 5) meaning that controlling factors affecting the supply chain operations have major impact on efficiency scores especially inefficient ones.

Two interesting points should be taken into account; random shocks play significant role on firms' inputs and outputs. For instance, liberalisation of exchange rates on 2003 constitute to net losses of three hundred million pounds after subtract the profits of twelve million pounds due to the increase of the inputs prices overcame the increase of exports[17]. In 2007, losses of thirty four million pounds due to a strike for few days in one firm and its effects on clients' creditability for delaying orders led to sharp reductions on sales. The second is that all firms witnessed reductions in efficiency scores on 2008/09 because of World financial crisis and its impacts on firms' exports and inventory.

Table 3.4b shows public sector regression via random effects. Results show that regressors are significant. The size coefficient is significant at 5% level and this may be attributed to most of the public firms are large and extra-large size which benefit from economies of scale. Firm's age is significant at 1% level since age deepen firm's presence in markets and its experience. The B coefficient is significant at 5% and this may be ascribed to the B hinder working environment and this also agrees with the economic sense since governmental firms in general are suffering from bureaucracy as well and they belong to the holding company which deepens bureaucracy. The EXR coefficient is significant and this may be due to exchange rates have a major impact since some of raw materials (natural fibres and man-made fibres) are imported besides EXR

[17] the previous source

changes affect firms' exports. The GB is significant at 1% level and this may be due to the public firms are suffering from poor infrastructure services.

3.6 Conclusions

Technical efficiency scores for the Egyptian T&A firms are predicted for the private and the public firms using a translog production function. The private units' results indicate that the average TE of all firms was 84% with variation in efficiency scores per firm. On the one hand, by adding the main variables affecting supply chain operations; firms' efficiency scores improve slightly by 4% on average and all input variables coefficients were significant without and with the SCV implying that private firms are utilised their inputs in an efficient way to obtain desired outputs. On the other hand, the impact of factors affecting supply chain operations (SCV) on the public units is significant and results show that the minimum TE is raised by 69% in some firms due to following proper strategies of controlling SCV.

Table 3.1a: Maximum likelihood estimates for production function via panel data time varying model for the Egyptian textile and apparel private sector firms.

Variable	Coefficient	Model1 without SCV	Model 2 With SCV
Constant	β_0	0.727 (0.172)***	0.779(0.174)***
Labour	β_1	0.294(0.089)***	0.289(0.089)***
Material	β_2	0.230(0.054)***	0.228(0.055)***
Capital	β_3	0.516(0.057)***	0.538(0.059)***
Year	β_4	-0.011(0.043)	-0.013(0.043)
$(Labour)^2$	β_{11}	0.108(0.016)***	0.110(0.017)***
$(Material)^2$	β_{22}	0.232(0.007)***	0.233(0.007)***
$(Capital)^2$	β_{33}	0.102(0.013)***	0.102(0.013)***
$(Year)^2$	β_{44}	-0.002(0.008)	-0.001(0.008)
Labour x Materiel	β_{12}	-0.218(0.015)***	-0.215(0.016)***
Labour x Capital	β_{13}	-0.000(0.022)	-0.002(0.023)
Labour x Year	β_{14}	0.004(0.014)	0.003(0.015)
Material x Capital	β_{23}	-0.232(0.016)***	-0.234(0.016)***
Material x Year	β_{24}	0.003(0.009)	0.004(0.009)
Capital x Year	β_{34}	-0.006(0.012)	-0.006(0.012)
Planning(P_{it})	α_1	-----	0.144(0.083)*
Sourcing Process(Spit)	α_2	-----	-0.086(0.087)
Delivery System(Dsit)	α_3	-----	0.102(0.079)
Returns System(Rsit)	α_4	-----	-0.218(0.055)***
Log-Likelihood		688.96	704.15

Estimated Efficiencies	**Mean**	**Min**	**Max**	**St. DEV.**
Efficiency without SCV	0.8849	0.6940	0.9876	0.048
Efficiency with SCV	0. 8905	0.7272	0.9878	0.045

*, ** and *** illustrate significant at 10%, 5% and 1% respectively in a two-tailed test.

2514 observations

Table 3.1b: Regression results explaining technical efficiency score for the T&A private firms via size, age, governmental barriers, bureaucracy& corruption and exchange rates dummies 06-08 panel data.

Variables	Estimated Coefficients	Estimated Coefficients
	Fixed Effects without SCV	Fixed Effects with SCV
SIZE	-0.0006(0.0005)	-0.0006(0.0005)
AGE	-0.0008(0.0004)**	-0.0008(0.0004)**
GB	0.99D-06(0.0005)	0.99D-06(0.0005)
B	0.100D-05(0.0005)	0.100D-05(0.0005)
EXR	-0.0003(0.0005)	-0.0003(0.0005)
Fixed vs. Random Effects (Hausman)	128.85	126.58
R^2 %	13.20	13.04

*, ** and *** illustrate significant at 10%, 5% and 1% respectively in a two-tailed test.

2514 observations

Table 3.2a: Maximum likelihood estimates for production function via panel data time varying model for the Egyptian textile private sector firms.

Variable	Coefficient	Model1 without SCV	Model 2 With SCV
Constant	β_0	1. 751 (0.242)***	1.697 (0.292)***
Labour	β_1	0.297(0.125)**	0.285(0.129)**
Material	β_2	-0.210(0.089)**	-0.190(0.097)**
Capital	β_3	0.704(0.096)***	0.715(0.105)***
Year	β_4	-0.021(0.057)	-0.020(0.058)
$(Labour)^2$	β_{11}	0.065(0.023)***	0.066(0.022)***
$(Material)^2$	β_{22}	0.232(0.012)***	0.233(0.012)***
$(Capital)^2$	β_{33}	0.096(0.016)***	0.096(0.017)***
$(Year)^2$	β_{44}	0.003(0.010)	0.004(0.009)
Labour x Materiel	β_{12}	-0.131(0.022)***	-0.133(0.023)***
Labour x Capital	β_{13}	0.007(0.032)	-0.004(0.033)
Labour x Year	β_{14}	-0.007(0.018)	0.008(0.019)
Material x Capital	β_{23}	-0.247(0.024)***	-0.250(0.026)***
Material x Year	β_{24}	0.013(0.014)	0.019(0.013)
Capital x Year	β_{34}	0.006(0.015)	-0.006(0.016)
Planning(Pit)	α_1	-----	0.079(0.134)
Sourcing Process(Spit)	α_2	-----	0.031(0.141)
Delivery System(Dsit)	α_3	-----	0.024(0.117)
Returns System(Rsit)	α_4	-----	-0.144(0.111)
Log-Likelihood		426.95	450.48

Estimated Efficiencies	**Mean**	**Min**	**Max**	**St.Dev.**
Efficiency without SCV	0.8308	0.6043	0.9866	0. 081
Efficiency with SCV	0. 8367	0.6572	0.9866	0.077

1137 observations

Table3.2b: Regression results explaining technical efficiency score for the textile private firms via size, age, governmental barriers, bureaucracy and exchange rates dummies 06-08 panel data.

Variables	Estimated Coefficients	Estimated Coefficients
	Fixed Effects without SCV	Fixed Effects with SCV
SIZE	-0.0009(0.0021)	-0.0007(0.0017)
AGE	0.60D-05(0.0021)	0.40D-05(0.0017)
GB	-0.0022(0.0021)	-0.0018 (0.0017)
B	0.0028(0.0022)	0.0021(0.0018)
EXR	-0.99 D-04(0.0016)	-0.62 D-04(0.0013)
Fixed vs. Random Effects (Hausman)	31.79	30.74
R^2 %	8.09	7.96

*, ** and *** illustrate significant at 10%, 5% and 1% respectively in a two-tailed test.

1137 observations

Table 3.3a: Maximum likelihood estimates for production function via panel data time varying model for the Egyptian apparel private sector firms.

Variable	Coefficient	Model1 without SCV	Model 2 With SCV
Constant	β_0	0.912 (0.213)***	1.024(0.228)***
Labour	β_1	0.271(0.120)**	0.236(0.120)**
Material	β_2	0.221(0.071)***	0.223(0.072)***
Capital	β_3	0.415(0.071)***	0.423(0.076)***
Year	β_4	-0.048(0.062)	-0.045(0.091)
$(Labour)^2$	β_{11}	0.127(0.028)***	0.131(0.030)***
$(Material)^2$	β_{22}	0.199(0.008)***	0.202(0.009)***
$(Capital)^2$	β_{33}	0.147(0.022)***	0.145(0.022)***
$(Year)^2$	β_{44}	-0.000(0.012)	-0.000(0.018)
Labour x Materiel	β_{12}	-0.163(0.026)***	-0.169(0.028)***
Labour x Capital	β_{13}	-0.079(0.036)**	-0.075(0.037)**
Labour x Year	β_{14}	0.005(0.022)	0.003(0.022)
Material x Capital	β_{23}	-0.226(0.024)***	-0.227(0.025)***
Material x Year	β_{24}	0.001(0.011)	0.003(0.011)
Capital x Year	β_{34}	0.001(0.018)	-0.000(0.018)
Planning(Pit)	α_1	-----	-0.002(0.112)
Sourcing Process(Spit)	α_2	-----	0.286(0.130)**
Delivery System(Dsit)	α_3	-----	-0.088(0.103)
Returns System(Rsit)	α_4	-----	-0.231(0.088)***
Log-Likelihood		521.13	527.45

Estimated Efficiencies	**Mean**	**Min**	**Max**	**St.Dev.**
Efficiency without SCV	0.9740	0.9463	0.9928	0.006
Efficiency with SCV	0. 9867	0.9789	0.9951	0.003

*, ** and *** illustrate significant at 10%, 5% and 1% respectively in a two-tailed test.

1377 observations

Table3.3b: Regression results explaining technical efficiency score for the apparel firms via size, age, governmental barriers, bureaucracy and exchange rates dummies 06-08 panel data.

Variables	Estimated Coefficients	Estimated Coefficients
	Random Effects without SCV	Random Effects with SCV
SIZE	0.0001(0.0003)	0.0001(0.0003)
AGE	-0.0004(0.0004)	-0.0004(0.0004)
GB	-0.0003(0.0004)	-0.0004(0.0005)
B	-0.0024(0.0007)***	-0.0024(0.0007)***
EXR	0.0010(0.0006)*	0.0010(0.0006)*
Constant	0.9760(0.0006)***	0.9751(0.0007)***
Fixed vs. Random Effects (Hausman)	6.75	6.67
R^2%	20.01	19.88

*, ** and *** illustrate significant at 10%, 5% and 1% respectively in a two-tailed test.
1377 observations

Table 3.4a: Maximum Likelihood Estimates for production function via panel data time varying Model for Egyptian public sector firms.

Variable	Coefficient	Model1 without SCV	Model 2 With SCV
Constant	β_0	-7.925 (20.923)	-16.464(19.022)
Labour	β_1	0.007(8.509)	4.104(8.006)
Material	β_2	3.568(3.938)	0.947(6.277)
Capital	β_3	-0.476 (4.767)	0.339(7.314)
Year	β_4	-0.486(1.389)	-1.120(3.035)
$(Labour)^2$	β_{11}	0.177(1.406)	-0.291(1.218)
$(Material)^2$	β_{22}	0.177(0.998)	0.119(0.610)
$(Capital)^2$	β_{33}	-0.249(0.546)	-0.230(0.549)
$(Year)^2$	β_{44}	0.002(0.029)	0.017(0.090)
Labour x Materiel	β_{12}	-0.821(1.535)	-0.318(1.138)
Labour x Capital	β_{13}	0.401(1.786)	0.238(1.629)
Labour x Year	β_{14}	0.202(0.254)	0.246(0.380)
Material x Capital	β_{23}	0.180(0.988)	0.181(0.992)
Material x Year	β_{24}	-0.213(0.127)*	-0.227(0.140)*
Capital x Year	β_{34}	0.076(0.150)	0.074(0.233)
Planning(Pit)	α_1	-----	-0.123(0.777)
Sourcing Process(Spit)	α_2	-----	2.661(0.871)***
Delivery System(Dsit)	α_3	-----	-1.157(0.998)
Returns System(Rsit)	α_4	-----	-0.271(0.891)
Log-Likelihood		-117.90	-102.75

Estimated Efficiencies	**Mean**	**Min**	**Max**	**St.Dev.**
Efficiency without SCV	0.8270	0.1359	0.9891	0.166
Efficiency with SCV	0.9781	0.8323	0.9999	0.044

*, ** and *** illustrate significant at 10%, 5% and 1% respectively in a two-tailed test.

200 observations

Table3.4b: Regression results explaining technical efficiency score for public sector firms via size, age, governmental barriers, bureaucracy and exchange rates dummies 2001-2008 panel data.

Variables	Estimated Coefficients	Estimated Coefficients
	Random Effects without SCV	Random Effects with SCV
SIZE	-0.0598(0.0272)**	0.0139(0.0068)**
AGE	0.0877(0.0248)***	-0.0371(0.0071)***
GB	-0.0445(0.0195)**	0.0178(0.0059)***
B	-0.011 (0.0194)***	0.009(0.0059)**
EXR	0.0815(0.0174)***	0.0131(0.0055)***
Constant	0.9030(0.0718)***	0.9517(0.0189)***
Fixed vs. Random Effects (Hausman)	6.77	6.30
R^2 %	20.86	31.39

*, ** and *** illustrate significant at 10%, 5% and 1% respectively in a two-tailed test.
200 observations

Textile and Apparel private sector firms

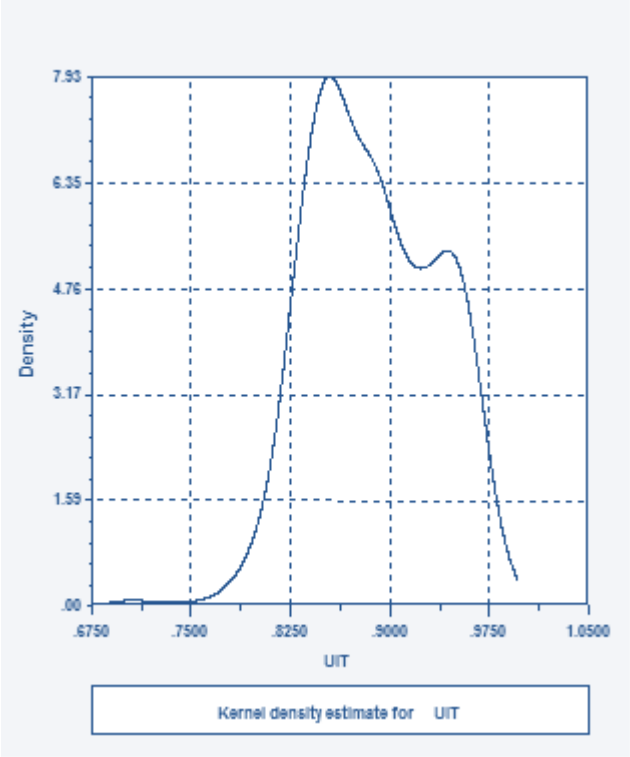


Figure 3.1a TE for All private sector firms without SCV

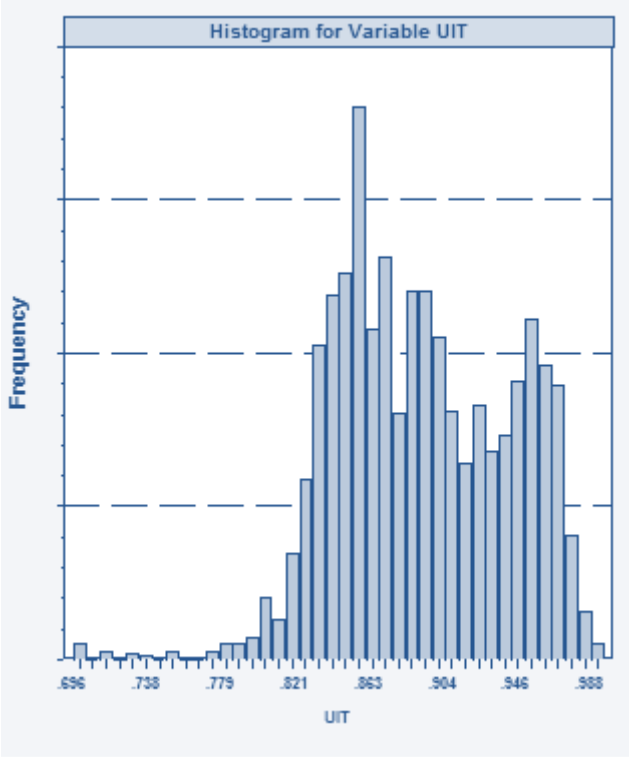


Figure 3.1b TE for All private sector firms without SCV

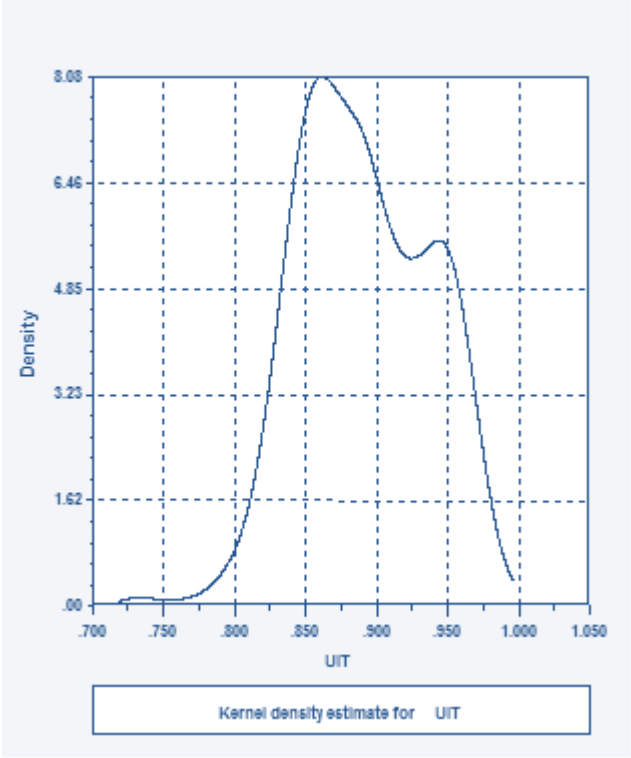


Figure 3.1cTE for All private sector firms with SCV

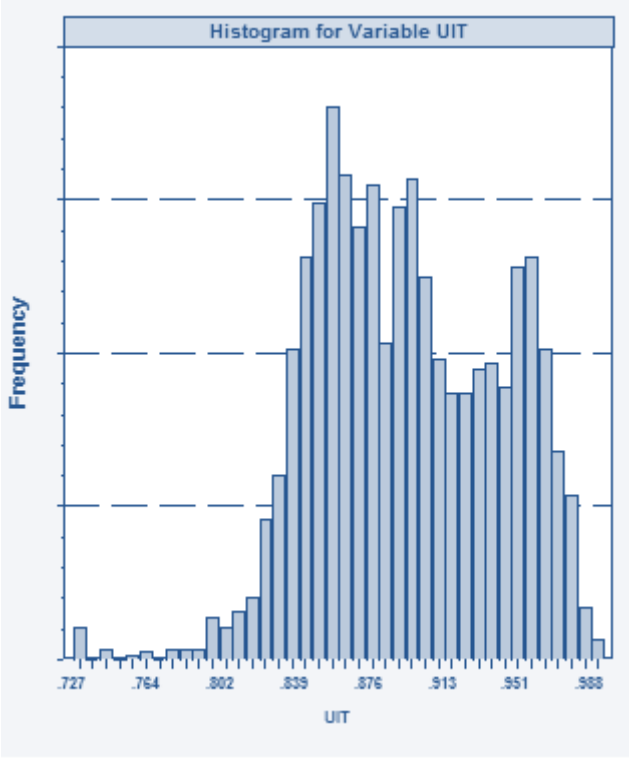


Figure 3.1d TE for All private sector firms with SCV

Textile private sector firms

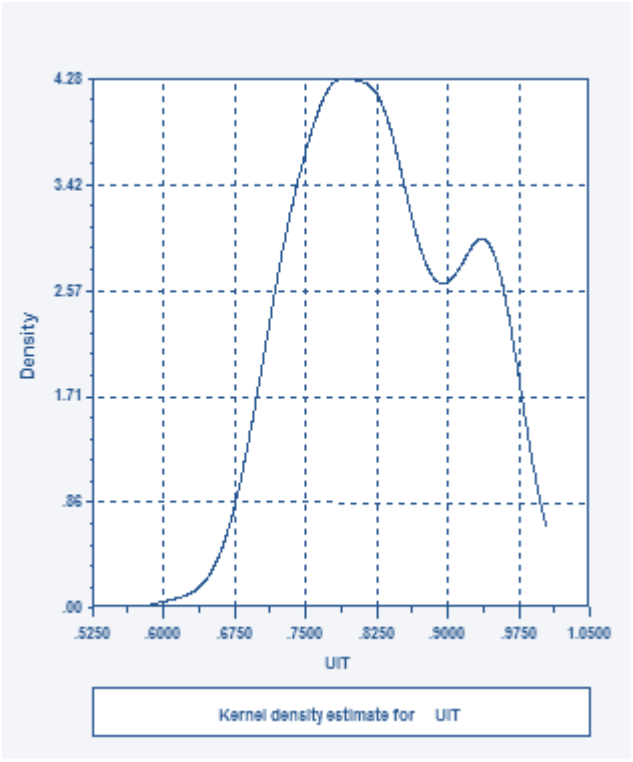


Figure3.2aTE for Textile private sector firms without SCV

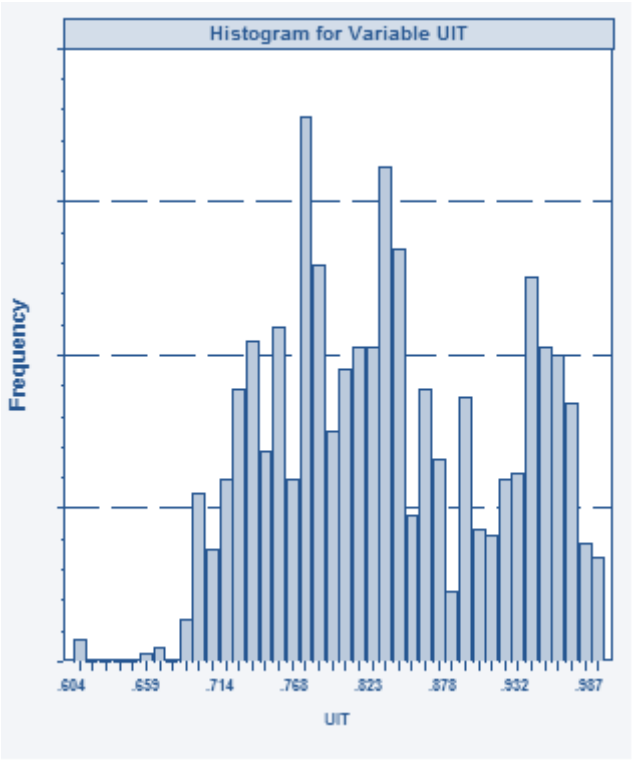


Figure3.2bTE for Textile private sector firms without SCV

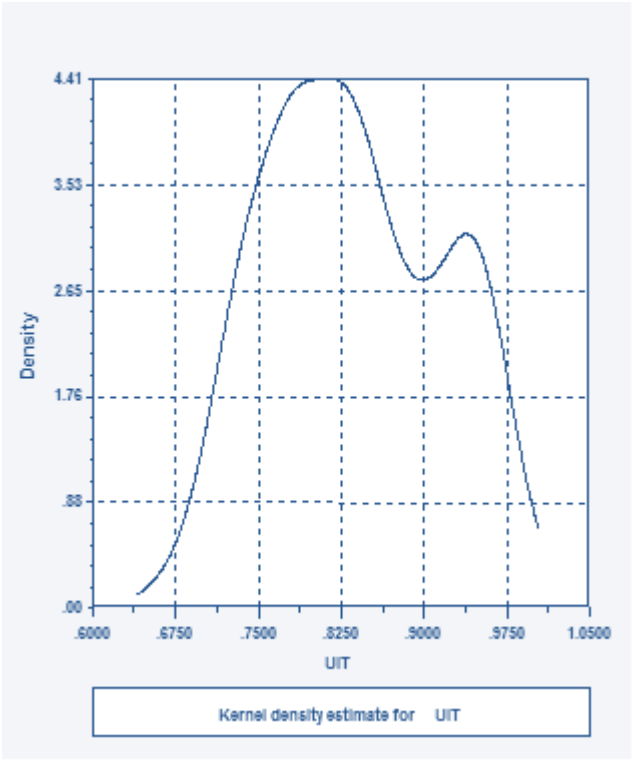


Figure 3.2cTE for Textile private sector firms with SCV

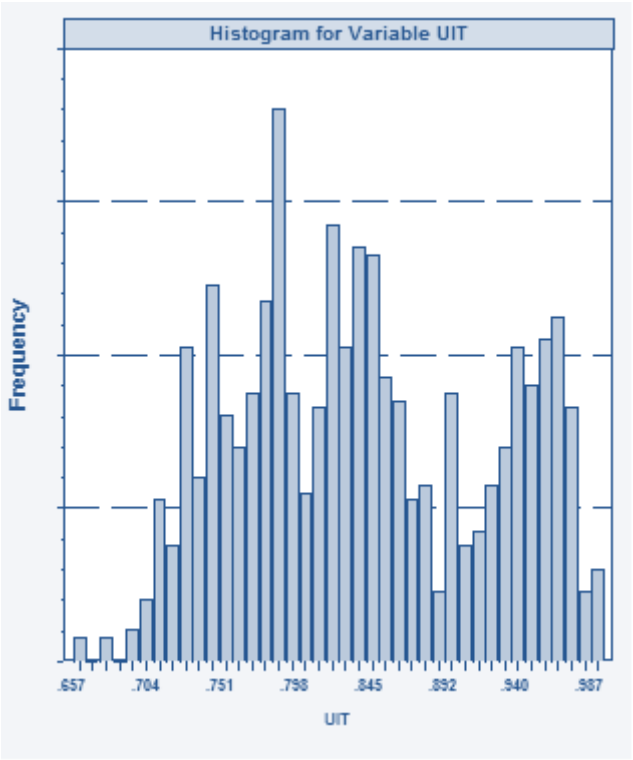


Figure 3.2d TE for Textile private sector firms with SCV

Apparel private sector firms

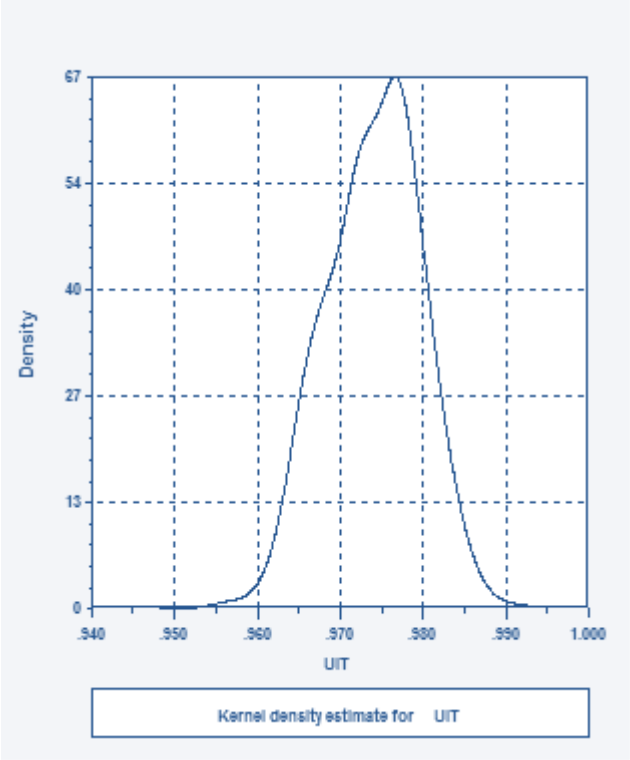


Figure3.3aTE for Apparel private sector firms without SCV

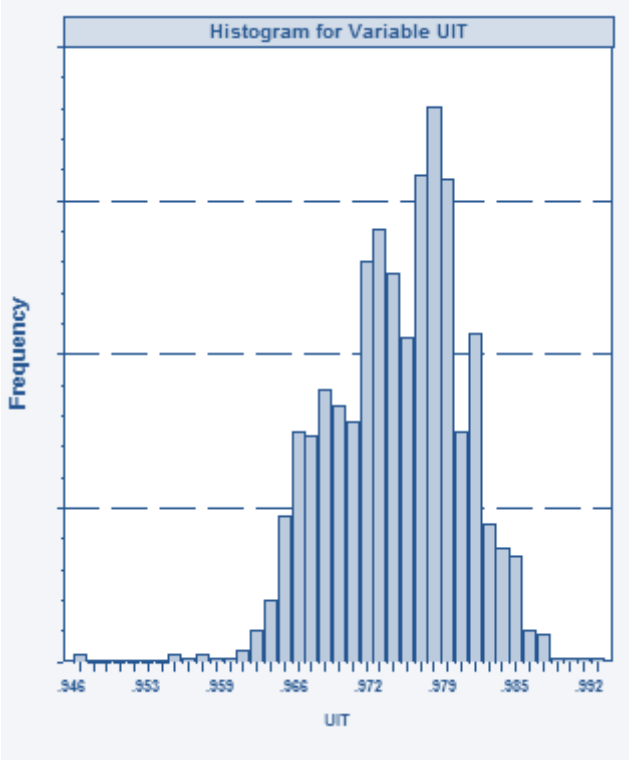


Figure3.3bTE for Apparel private sector firms without SCV

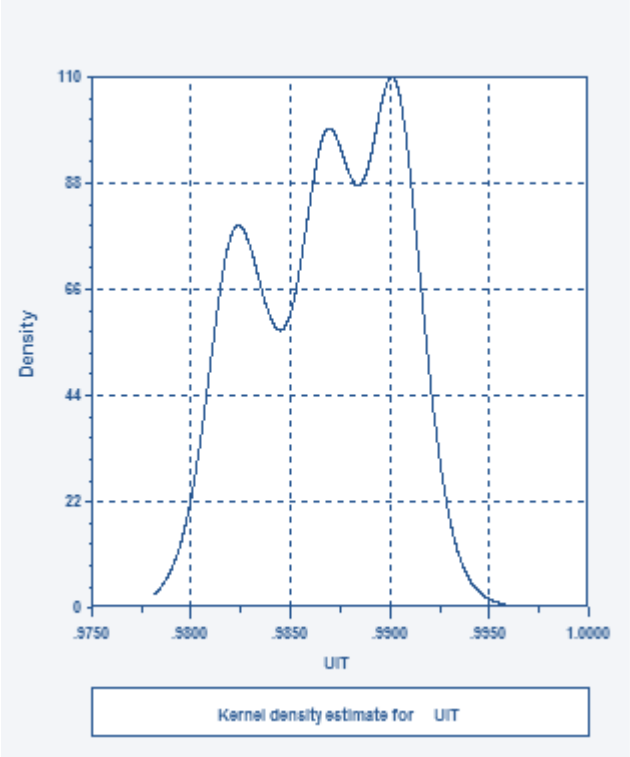


Figure 3.3c TE for Apparel private sector firms with SCV

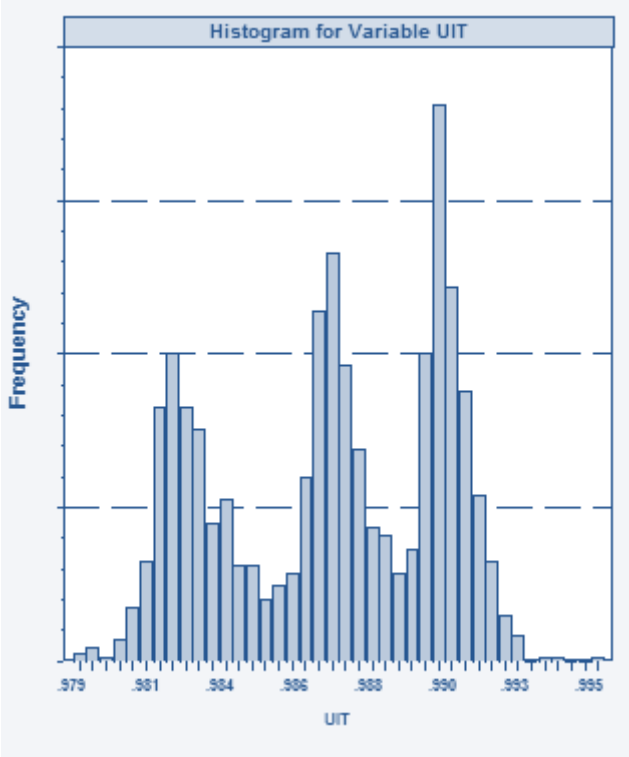


Figure 3.3d TE for Apparel private sector firms with SCV

Public sector firms

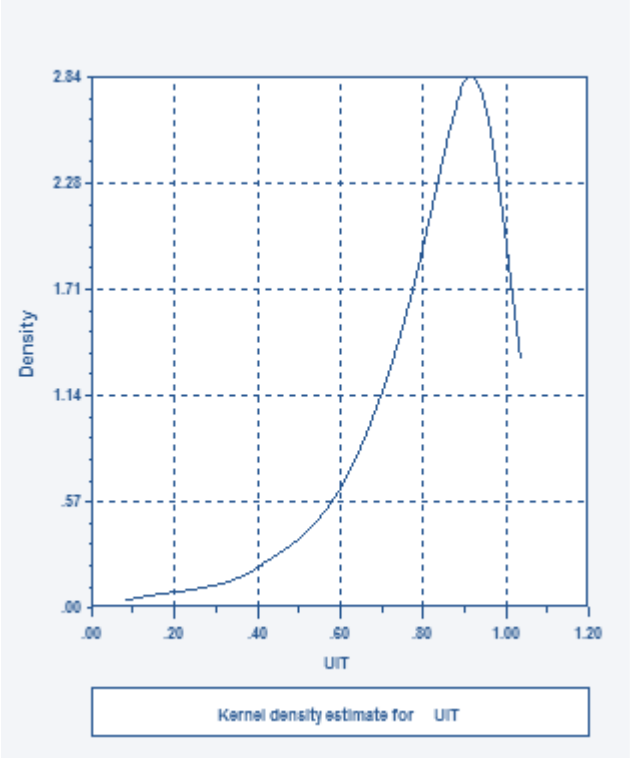


Figure 3.4a TE for Public sector firms without SCV

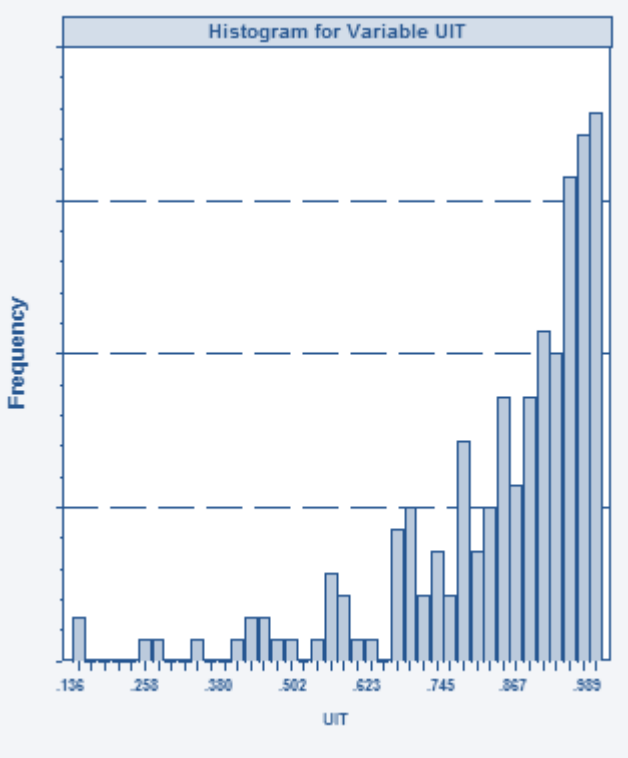


Figure 3.4b TE for Public sector firms without SCV

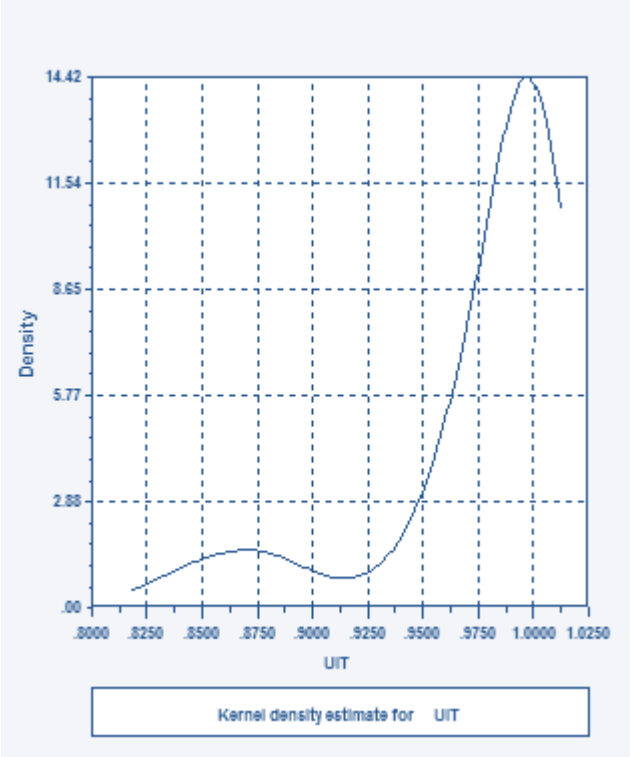


Figure 3.4c TE for Public sector firms with SCV

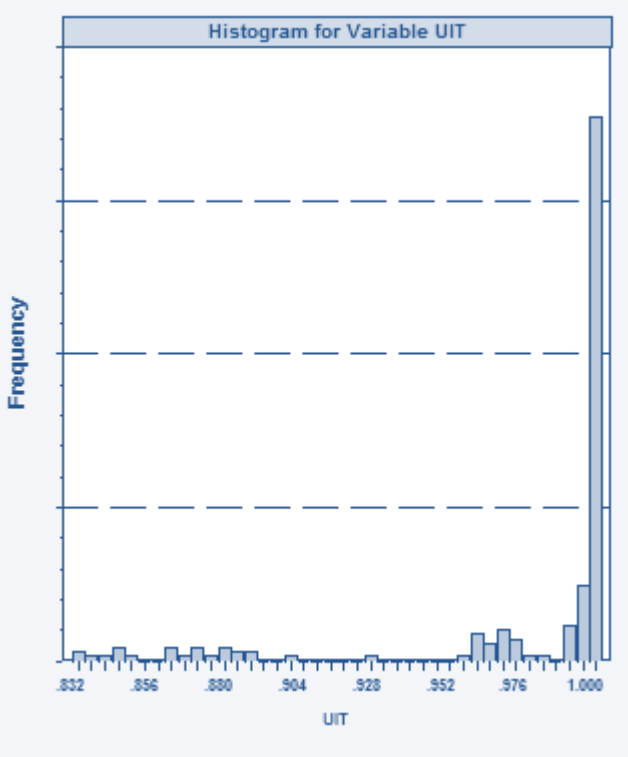


Figure 3.4d TE for Public sector firms with SCV

Chapter 4

Metafrontier production function and main factors affecting Textile &Apparel supply chain to estimate technical efficiency for firms operating at regional level

4.1Introduction

This chapter presents a metafrontier production function model. This model enables to calculate comparable technical efficiencies for firms operating under different technologies. It also permits to estimate technology gaps for firms under different technologies relative to the potential technology available in the industry as a whole. The model is applied to a panel data for the textile and the apparel firms in four regions for the private firms and three regions for the public ones. Section 4.2 stands for the metafrontier model. In section 4.3 data description is presented whereas sections4.4 and 4.5 denote empirical results and conclusions.

4.2 Metafrontier model

Firms' technical efficiencies operating under particular production technology are not comparable with those of firms operating under different technologies. Battese and Rao (2002) presented a stochastic metafrontier model by which comparable TE can be estimated. This methodology adopts a modified model assumes that there exists only one data-generation process for the firms operating under a given technology. The metafrontier function is a principal function that incorporates the deterministic components of the stochastic frontier production functions for firms that operate under different technologies involved.

For a single output, the frontier of the technology is defined by the stochastic frontier production function for different regions (represented by groups) R within the industry. For the *j*th group there is data on N_j firms and the stochastic frontier model for this group is defined by

$$Y_{it(j)} = f\left(x_{it(j)}, \beta_{(j)}\right) e^{v_{it(j)} - u_{it(j)}}, \quad i = 1,2,...,N_j, t = 1,2,...,T, j = 1,2,..,R \tag{1}$$

where $Y_{it\,(j)}$ is the output for the *i*th firm in the *t*th time period for the *j*th group: $x_{it(j)}$ is a vector of values of functions of the inputs used by the *i*th firm in the *t*th time period for the *j*th group; $\beta_{(j)}$ symbolises the parameter vector associated with the *x* variables for the stochastic frontier for the *j*th group involved; the $v_{it(j)}$ is assumed to be identically and independently distributed as $N(0,\sigma^2_{V(J)})$ random variables, independent of the $u_{\text{it }(j)}$ (inefficiency term), is distributed as $N^{+}(0, \sigma^2_{u(j)})$ Therefore, the model for the *j*th group is given by:

$$Y_{it(j)} = f\left(x_{it(j)},\beta_{(j)}\right) e^{v_{it(j)} - u_{it(j)}} \equiv e^{x_{it}\beta_{(j)}+v_{it(j)}-u_{it(j)}} \qquad (2)$$

Thus, the exponent of the frontier production function is linear in the parameter vector $\beta_{(j)}$ and then x_{it} is a vector of logarithms of the inputs for the *i*th firm in the *t*th time period involved. Following Battese and Coelli (1992, 1995) models, the metafrontier production function model for firms in the industry can be expressed by

$$Y^{*}_{it} \equiv f(x_{it},\beta^{*}) = e^{x_{it}\beta^{*}},\ i = 1,2,\ldots,N = \sum_{j=1}^{R} N_j;\ t = 1,2,\ldots,T \qquad (3)$$

β^{*} stands for the vector of parameters for the metafrontier function in which

$$x_{it}\beta^{*} \geq x_{it}\beta_{(j)} \qquad (4)$$

The metafrontier production function values (as a deterministic parametric function) are no smaller than the deterministic components of production functions of the different regions and time periods. The metafrontier is assumed to be a smooth function and not a segmented envelope as in figure 4.1

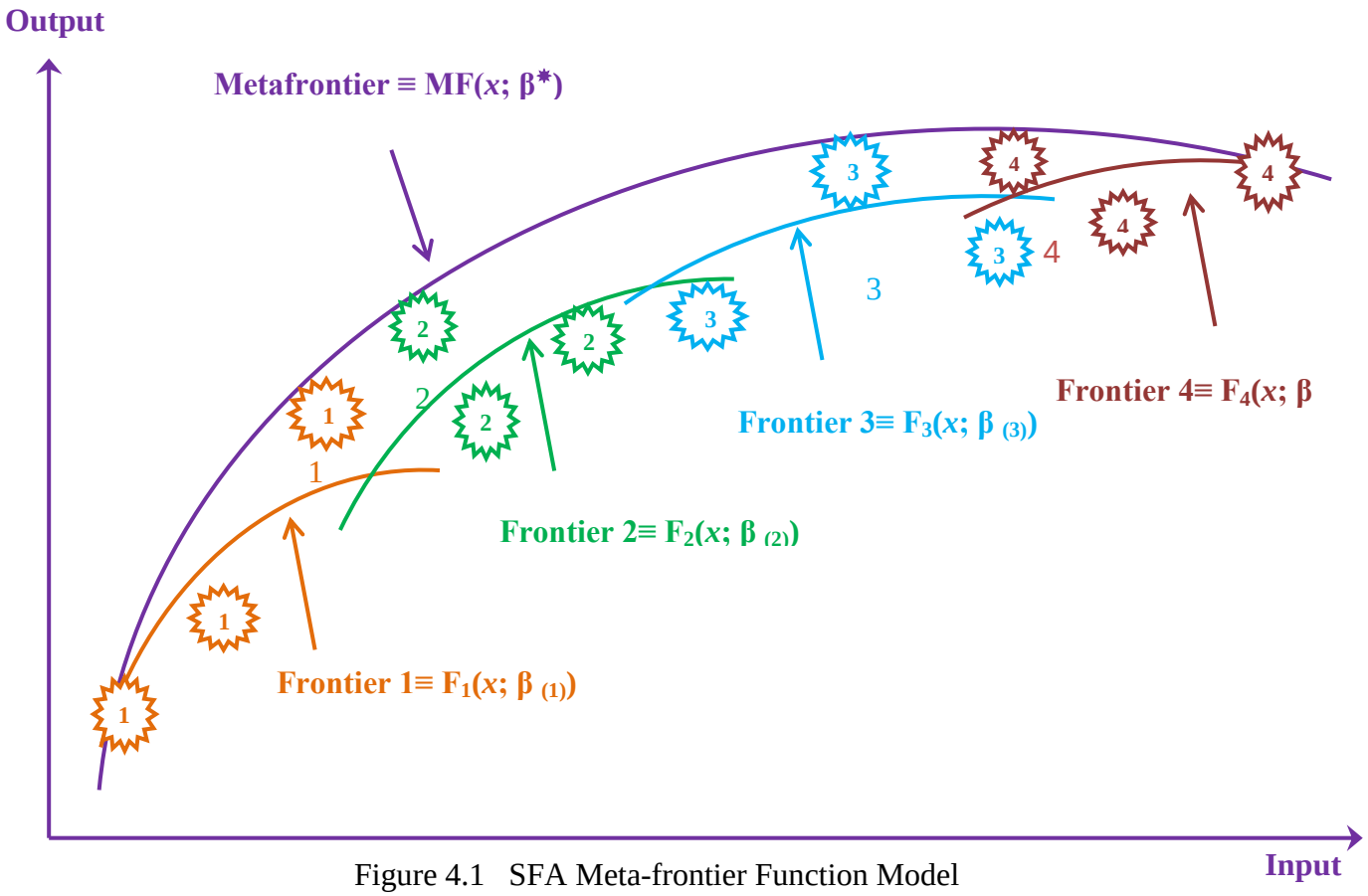


Figure 4.1 SFA Meta-frontier Function Model

For instance, the private sector firms are illustrated with four stochastic frontier models represented via four regions (Alex, Delta, G.Cairo & Canal firms) as in Figure 4 wherein observed values are indicated by numbers that relate to the particular regional frontiers, whereas their unobservable stochastic frontier outputs are shown by the numbers in circles above them. The values of the curves corresponding to the circled numbers can be considered as means of the potential stochastic frontier outputs for the given levels of the inputs. The metafrontier function values are no less than the deterministic functions associated with stochastic frontier models for different regions involved. The same methodology is implemented for the public three regions. Equations (3) and (4) are associated with Hayami & Ruttan's concept of the metaproduction function: "The metaproduction function can be regarded as the envelope of commonly conceived neoclassical production functions" (1971, p. 82) and with Battese, Rao and O'Donnell (2004)

model of the metafrontier function in which a production function of specified functional form does not fall below the deterministic functions for the stochastic frontier models of involved groups. This model assumes that data generation models are only defined for the frontier models for the firms in the different regions. Observed output for the *i*th firm at the *t*th time period, defined by the stochastic frontier for the *j*th region in equation (2) is alternatively expressed in terms of the metafrontier function of equation (3) by

$$Y_{it} = e^{-u_{it(j)}} \times \frac{e^{x_{it}\beta_{(j)}}}{e^{x_{it}\beta^*}} \times e^{x_{it}\beta^* + v_{it(j)}} \tag{5}$$

First term on the right-hand side of equation 5 stands for the technical efficiency (TE) relative to the stochastic frontier for the *j*th region.

$$TE_{it} = \frac{Y_{it}}{e^{x_{it}\,\beta_{(j)} + V_{it(j)}}} = e^{-U_{it(j)}} \tag{6}$$

The second term in equation (5) is the technology gap ratio (TGR) for the observation for the sample firm involved.

$$TGR_{it} = \frac{e^{x_{it}\beta_{(j)}}}{e^{x_{it}\beta^*}} \tag{7}$$

It measures the ratio of the output for the frontier production function for the *j*th group relative to the potential output (the metafrontier function) obtained via observed inputs. The technology gap ratio has values between 0 and 1 because of the equation (4). Technical efficiency of the *i*th firm, given the *t*th observation, relative to the metafrontier denoted by TE^*_{it} where it is the ratio of the observed output relative to the metafrontier output adjusted for the corresponding random error (last term on the right-hand side of the equation5).

$$TE_{it}^{*} = \frac{Y_{it}}{e^{x_{it}\beta^{*}+v_{it(j)}}} \quad (8)$$

Equations (5)-(8) imply that an alternative expression for the Technical Efficiency (TE^{*}) relative to the metafrontier is

$$TE_{it}^{*} = TE_{it} \times TGR_{it} \quad (9)$$

Technical efficiency relative to metafrontier function (TE*) is the product of technical efficiency relative to region stochastic frontier (TE) and TGR. Since both TE and TGR are between zero and one, then (TE*) is also between zero and one, but is less than group (TE).

Data on the Egyptian T&A firms used through annual surveys of firms in the manufacturing industries by the Egyptian CAPMAS from 2001 to 2008 for the public entities and 2006 to 2008 for the private ones covering all firms' sizes and activities. Combined with acquired data through questionnaires and interviews, information obtained through the ministry of investment and the BSIC to construct factors affect industry supply chain operations. It is important to measure efficiency scores at regional levels especially for the public units to detect whether there are regional differences in efficiency scores among regions and to enable policy makers to focus on reasons of these differences. The private firms are divided into four regions; 1- Greater Cairo covers firms in Cairo and Giza governorates 2- Canal zone includes Port Said, Ismailia, Suez, and Sharqia governorates firms 3- Delta zone incorporates Dakahlia, Gharbia, Qalyubia and Monufia provinces firms 4- Alex zone covers Beheira and Alexandria governorates firms.

The public firms are divided into three regions 1- Cairo and Upper Egypt zone cover firms located in Cairo , Giza , Qalyubia, Minya, Asyut, Sohag and Qena governorates 2- Delta zone covers firms located in Gharbia, Dakahlia, Damietta and Sharqia provinces 3- Alex zone covers Alexandria , Beheira and Port Said governorates firms.

Carrying out stochastic frontier analysis at regional level is desirable since industry's firms in different regions are probably operating under different technologies and followed different ownership type. Additionally, metafrontier production function estimation for industry permits to compare firms' TE in different regions relative to the metafrontier and technology gaps among regions relative to the industry. Empirical results are obtained through stochastic frontier production model with time varying inefficiency effects, proposed by Battese and Coelli (1992) in a Cobb-Douglas form. The first Cobb-Douglas model symbolizes the production technology for the textile and the apparel firms for specific region is obtained by

$$Y_{it} = \beta_0 + \sum_{j=1}^{4} \beta_k K_{it} + \sum_{j=1}^{4} \beta_m M_{it} + \sum_{j=1}^{4} \beta_l L_{it} + \gamma_t + \varepsilon_{it}$$
$$\varepsilon_{it} = v_{it} - u_{it} \qquad (10)$$

The merit of the Cobb–Douglas form is that the coefficients β_k , β_m , β_l are the output elasticities of inputs, and the sum of them provides the elasticity of scale, indicate returns to scale.

$$U_{it} = \{\exp[-\eta_t (t-T)]\}\, u_i$$
$$i = 1,2,...,N, \text{ t} = 1,2,...,T \qquad (11)$$

Output: represents the natural logarithm of total value of manufacturing output for the *i* firm, *t* year in Egyptian pound 2001 constant prices (denoted Y_{it}).

Labour (L_{it}): represents the natural logarithm of total paid wages per year (denoted x_1).

Materials (M_{it}): represents the natural logarithm of total costs of raw materials purchased by the firm during the year in Egyptian pound 2001 constant prices (denoted x_2).

Capital(K_{it}): represents the natural logarithm of all operating costs as a proxy of capital (including expenditures on electricity, fuel and lubricants, maintenance and repairs of capital goods, rents of buildings and machinery, machinery upgrading…etc. during the year in Egyptian pound 2001 constant prices (denoted x_3).

ε_{it} is the compound error term including v_{it} is the two- sided "noise" component of the error term. The v_{it} is assumed to be iid as $N(0,\sigma^2_{V(J)})$ and the u_{it} is inefficiency component where u_i is assumed to be iid non-negative random variables as $N^+(0,\sigma^2_{V(J)})$, both v_{it} and u_{it} are distributed independently of each other, and of the regressors.

The next step is to add the four variables (planning, sourcing, delivery and inventory) to the previous model to examine their impact on inputs coefficients and predicted TE for each firm to compare results before and after. The modified model is

$$Y_{it(j)} = \beta_0 + \sum_{j=1}^{4} \beta_k K_{it} + \sum_{j=1}^{4} \beta_m M_{it} + \sum_{j=1}^{4} \beta_l L_{it} + \gamma_t + \alpha_1 P_{it} + \alpha_2 SP_{it} + \alpha_3 DS_{it} + \alpha_4 RS_{it} + \varepsilon_{it} \quad (12)$$

Where P_{it} is planning process for firm *i* at period *t*, SP_{it} is sourcing process for firm *i* at period *t*, DS_{it} is delivery process for firm *i* at period *t*, RS_{it} is inventory process for firm *i* at period *t*.

4.3 Descriptions of data

Data cover the Egyptian T&A industry for the private firms over the period 2006-08 in four regions and the public sectors over the period 2001/02: 2008/09 in three regions. The data envelop a sample of the 838 private sector firms (379 textile and 459 apparel firms) covering all T&A activities: 1-Yarn includes; natural fibres as cotton, flax, silk, jute and wool; synthetic as acrylic, polyester, nylon, viscose, etc. 2- Weaving comprises; cotton weaving, flax weaving, natural-synthetic silk & nylon weaving, jeans weaving, weaving & finishing knitting fabrics, other types of knitting fabrics, fabrics tapes making, and other types of weaving. 3-Fabrics includes; bleaching, dyeing, printing and finishing stages for the natural and the man-made fibres, home furnishing fabrics, underwear and apparel fabrics 4- Home furnishing contains; curtains making and tables' linens, quilts covers, bed linens, embroidered home furnishing,

blankets making, terry towels and kitchen towels. 5-Underwear & socks stage which covers; men& boys' underwear, women& girls 'lingerie, knitted underwear, brassiere, boys and girls socks, women socks, men socks and gloves. 6- The apparel stage involves; suits, shirts, pyjamas, T-shirts, men &boys wear, women &girls wear, kids wear, sportswear, swimming wear, leather wear, sewing women wear, sewing men wear, jumpers & knitting products, other types of knitting wear, sewing domestic wear, scarf, ties and other types of apparel. Activities from1 to 4 belong to textiles sector whereas activities 5and6 belong to the apparel sector. The apparel sector is a labour intensive with highly differentiated products while the textile sector is a capital intensive with less differentiated products relative to the apparel.

The private sector firms sample covers all sizes including small (1-25 workers), medium (26-100), large (101-1000) and extra-large firms (over1000) for apparel firms, but the size for the textile sector is determined by activity (yarn firm with 50 worker is considered large) ; also the sample includes firms produce for the local and the global markets. The large and extra-large firms' production is dedicated for both markets and they are fully integrated meaning that more than one activity can be included in one firm such as weaving, fabrics and apparel. Small and medium size firms have at least one activity, but most of private firms have their own vehicles to obtain raw materials and industry inputs from suppliers and to deliver products to clients.

Additionally, all the public units are used where they are large and extra-large size ranging from 500 to 21969 workers. They are natural and man-made fibres producers. Firms' activities vary from fully integrated activities covering all the T&A supply chain processes to the textiles process. Each firm has its own transportation means and most of them also produce for domestic and global markets. Raw data is obtained through the CAPMAS for eight years from 2001/02 to 2008/09 including all information about industry inputs and outputs in current prices. These prices are deflated to obtain constant prices with 2001 as a base year. Similarly, the private

sector firms' raw data are obtained in a three year panel from 2006 to 08 including all information about industry inputs and outputs in current prices then prices are also deflated to obtain constant prices. Separate deflators are used for outputs, capital, wages and materials.

4.4 Empirical Results

4.4.1 Private sector firms

Empirical results for private firms are divided into textile private units and apparel private units

4.4.1.1 Textile sector firms

Table 4.1a reports MLE for production function via panel data time varying model for the textile private units in a Cobb-Douglas form. This form enables to interpret inputs coefficients as production elasticities and the sum of them denotes scale economies. The elasticity of labour is 16%, materials are58% and capital is 17% and their sum are 0.91 revealing that textile firms exhibit decreasing returns to scale (DRS) without SCV whereas the values with the SCV are 19%, 61% and 21% for labour, materials and capital respectively and their sum are 1.01 and then exhibit constant returns to scale (CRS). Inputs coefficients are significant, λ value is significant where $\lambda=\sigma_u/\sigma_v$. Mean TE without the SCV is 84% with minimum 64% and maximum 98% and the mean with the SCV is 84% with minimum 68% and maximum 99%.

Table 4.1b denotes regional TE, metafrontier TE* and TGR ratios for Alex, Delta, G.Cairo and Canal regions. For Alex region, TE mean without the SCV for the Alex firms is 70%, TE* the technical efficiency for the Alex firms relative to the metafrontier is 28% and hence TGR is 40%. In contrast, the Alex values with the SCV are 73%, 33% and 46% for the

For Delta region, TE without the SCV is 81%, TE* is 63% and TGR is 78% and values with TE, the TE* and the TGR correspondingly. The SCV values are 81%, 66% and 81% for TE, TE* and TGR in turn.

For G.Cairo region, TE without the SCV for the G.Cairo firms is 88%, TE* for G.Cairo firms relative to the metafrontier is 88% and TGR is 1 and the same with the SCV. For Canal region, Canal TE is 49%, TE* for Canal region relative to the metafrontier is the lowest among regions which is 5% and also TGR is 11% which is the lowest among regions. However, with the SCV TE is 86%, TE* is 86% and TGR is 1 meaning that Canal region firms has the highest response among the textile firms to SCV. It is interesting to note that Delta and G.Cairo regions' regional frontiers are tangent to the metafrontier (the maximum value for the technology gap ratio, namely one, was obtained in each of these two regions) and for Canal with SCV.

After obtaining efficiency scores, they are regressed as a dependent variable against firm's size, age, Governmental Barriers (GB), Bureaucracy (B) and Exchange Rate (EXR) dummies as regressors and detailed explanation for the variables is given in chapter 3. The textile firms are estimated via fixed effects since Hausman test supports fixed effects. Also variables Alex, Delta, G.Cairo and Canal are regions' dummies are added to the model as regressors. Table 4.1.c results show that all variables are insignificant owing to the textile firms are capital intensive and they are the main provider of raw materials to the apparel sector meaning what is produced in the sector is sold to apparel sector as yarns or fabrics. For instance, different gauges of yarn such as 36 and 40 or higher are used for the fine branded apparel and thick yarns such as20, 16 and 10 gauges are used on other products such as towels, bed linen, etc. meaning that all sorts of yarns are utilised efficiently. These results are matched with results obtained in chapter3.

4.4.1.2Apparel sector firms

Table4.2a denotes MLE for the production function in the Egyptian apparel private firms. Labour elasticity is 34%, materials are 50% and capital is 16% and the sum is 1 meaning that the apparel firms exhibit (CRS). Labour elasticity supporting the fact that apparel sector is labour intensive and the values with the SCV are 38%, 52% and 20% for labour, materials and capital

respectively and their sum is 1.1 which exhibits increasing returns to scale (IRS). Inputs coefficients are significant, λ is insignificant. Labour, materials and capital factors are significant at 1% sourcing process is significant at 10% since materials play a major role in input costs as mentioned in chapters 2 and 3. Mean technical efficiency without the SCV is 99% with minimum 99% and maximum 99%. The mean with the SCV is 99% with minimum 99% and maximum 99%. This may be ascribed to the apparel industry has wide-ranging products, fashion trends, variety in production process and integration ponds among firms within the sector are high comparing with the textile sector.

Table 4.2b signifies regional TE, metafrontier TE* and TGR ratios for the four regions. For Alex region, mean TE without SCV for the Alex firms is 95%, TE* the technical efficiency for the Alex firms relative to the metafrontier is 95% and hence TGR is 1 and values with the SCV are the same meaning that Alex firms are highly efficient among regions and Alex firms have highly efficient scores with more differentiated products than other regions and this is the opposite for the Alex textile firms. For Delta region, TE is 98%, TE* is 63% and TGR is 64% without the SCV whereas values with the SCV are approximately 100%, 68% and 68% for TE, TE* and TGR correspondingly. Despite the fact that the Delta firms are highly efficient relative to its regional frontier but relative to the metafrontier are not. G.Cairo region without the SCV shows that TE for G.Cairo firms is 99%, TE* for G.Cairo firms relative to the metafrontier is 97% and TGR is 97% while with the SCV 85%, 85%, 100% for TE, TE* and TGR respectively. For Canal region, Canal TE is 88%, TE* 88% and TGR is 1 and the same with the SCV. It is remarkable that all regions' regional frontiers are tangent to the metafrontier except Delta (the maximum value for the technology gap ratio, namely one, was obtained in each of these two regions) and for Canal with SCV.

Table 4.2c displays estimated regression for the apparel firms through random effects. Results show that regions' variables are statistically significant at 1% including that efficiency scores are varied among regions due to differences in technology and infrastructure. Results show that the size, the age and the GB, are insignificant and this may be due to the apparel firms' products are differentiated, local purchasing power is large since local market covers 85 million customers with different ages, desires and this deepen products differentiation. In addition, The GB is insignificant and this may be as a result of differentiations on infrastructures and services among regions and also due to latest improvements in services such as customs, taxes, ports, airports and reductions in customs procedures from 28 days to 4 days. All these governmental procedures helped in facilitating working environment. The B and EXR variables are significant and similar results are achieved in chapter 3.

4.4.2 Public sector firms

Table 4.3a shows the MLE for production function via panel data time varying model. Labour elasticity is 27%, materials are 75% and capital is 22% and the sum is 1.24 meaning that public firms display (IRS) and the values with SCV are 28%, 69% and 31% for labour, materials and capital respectively with sum 1.28 and also exhibit (IRS). Labour coefficient is insignificant without and with the SCV and low labour productivity can be interpreted due to several factors; overstaff problem and the other factors explained in chapter 3. This is also can be supported at regional level. For instance, labour factor contributes to 5% of output for the Alex& Beheira region with 81% for materials and 13% for capital, in Delta labour's contribution is 3% with materials contribution of 55% and capital share of 71% of output and in Cairo and Upper Egypt firms the share of labour in output is 40% with 29% for materials and 25% for capital supporting that labour factor in two regions is too low and this also can interpret the reason for labour insignificance. Capital variable with the SCV is significant at 10% level and this may be

explained by the optimal usage of industrial planning process and machinery modernisation shifts capital factor to be significant. Materials are significant at 1% without and with the SCV since the public firms are the main provider of yarn and fabrics to the apparel and the home furnishing private firms. The returns & inventory system factor is significant at 10% level and this may be due to firms at recent years start to activate the process of inventory control and reduce its values since inventory and returns are considered main burdens facing the public firms. Additionally, inventory restructuring strategies should be implemented to reduce financial burdens. The mean TE exhibit great variability in efficiency levels among firms without and with the SCV. The mean TE without SCV is 84% with minimum is 3% and maximum 99% and the mean with the SCV is 97% with minimum 80% and maximum 99%.

Table 4.3b denotes regional TE, metafrontier TE* and TGR ratios for three regions. Alex& Behera region is the lowest efficiency scores without and with SCV where TE mean without SCV for the Alex firms is 82%, TE* for Alex firms is 0.1% and hence TGR is 0.01%. On the other hand, the Alex & Beheira values with the SCV are as follows; 83%, 18% and 22% for TE, TE* and TGR correspondingly explaining the great role of the SCV on enhancing firms' efficiency scores relative to the metafrontier from 0.1% to 18%. For Delta region, TE is 80%, TE* is 0.4% and TGR is 0.5% without the SCV and values with the SCV are 84%, 54% and 64% for TE, TE* and TGR respectively. G.Cairo & Upper Egypt region without the SCV shows that TE for G.Cairo firms is 77%, TE* for G.Cairo & Upper Egypt firms is 0.01% and TGR is less than 0.1% and values with the SCV are 78%,24% and 31% for TE,TE* and TGR in turn.

Table 4.3c shows regression results for the public firms via random effects. The measured level of TE* is the dependent variable. Regions with firm's size, age, GB, B and EXR are included as regressors. Results display that regions variables are significant at 1% meaning that efficiency scores are varied among regions because of differences in technology implemented

and infrastructure facilities within regions or firms belonging to the same region. For instance, Ghazel El Mahalla firm in Delta region is a self-sufficient firm and it has its own infrastructure facilities such as electricity generators, social services, transportation services, etc. The size, age, GB, B and EXR coefficients are significant and have the same explanations as in chapter3.

4.5 Conclusion

In this chapter, a Cobb-Douglas production function is used to estimate TE for the Egyptian T&A industry. It is estimated for the private firms from 2006 to 08 and the public firms from 2001/02 to 2008/09 through the metafrontier technique that covers four regions for the private units and three regions for the public sector across the country. The study permits one to individually classify the contribution of variations across groups of firms towards the overall measure of TE. Differentiations among regions relating to technology used, infrastructure and among sectors raising this assumption. On the other hand, the public firms are large and extra-large size firms, self-sufficient and integrated wherein each firm at least has textile activities and some of them cover all industry's activities for T&A. Efficiency scores for TE are around 80% per region, but by comparing their TE relative to TE* it is realised that their scores are too low but with applying SCV it is found that TE* scores are raised significantly. Therefore, efficient employ of SCV variables leads to improve the management and the structure of the firm. However, there is also a great concern to design programmes aim at changing the production environment due to the restrictions derive from the lack of economic infrastructure, access to markets, access to finance, poor infrastructure conditions and other factors affect the production environment.

Table 4.1a Maximum likelihood estimates for production function via panel data time varying model for Egyptian textile private sector firms.

Variable	Coefficient	Model1 without SCV	Model 2 With SCV
Constant	β_0	1.424(.069)***	1.396(.086)***
Labour(L_{it})	β_1	0.156(0.017)***	0.192 (.018)***
Material(M_{it})	β_2	0.576(0.007)***	0.614 (0.007)***
Capital(K_{it})	β_3	0.173(0.014)***	0.213 (0.014)***
Year	γ_t	-0.019(0.011)*	-0.018(.0112)*
Planning(P_{it})	α_1	____	-0.161(0.146)
Sourcing Process(Sp_{it})	α_2	____	0.148(0.146)
Delivery System(Ds_{it})	α_3	____	0.155(0.128)
Returns System(Rs_{it})	α_4	____	-0.114(0.115)
Log-Likelihood		245.6	248.4
Lambda	λ	1.945(0.043)***	1.933(0.045)***
Eta	η	-0.031(0.050)	-0.028(0.050)

Estimated Efficiencies	**Mean**	**Min**	**Max**	**St.Dev.**
Efficiency without SCV	0.8384	0.6424	0.9848	0.076
Efficiency with SCV	0.8430	0.6828	0.9884	0.075

*, ** and *** illustrate significant at 10%, 5% and 1% respectively in a two-tailed test.

1137 observations

Table 4.1b TGR and the TE obtained from the regional stochastic frontiers and the metafrontier production function for the Egyptian textile private sector firms.

Region/statistic	Values without SCV				Values with SCV			
ALEX	Mean	Min	Max	St.Dev.	Mean	Min	Max	St.Dev.
Metafrontier TE*	0.2810	0.2622	0.9812	0.0855	0.3322	0.3034	0.9719	0.0824
Regional TE	0.6986	0.4386	0.9837	0.1334	0.7258	0.4933	0.9857	0.1282
TGR	0.4022	0.3978	0.7716	0.1273	0.4577	0.4416	0.8412	0.1013
DELTA								
Metafrontier TE*	0.6680	0.6302	0.9954	0.0438	0.6560	0.6941	0.9988	0.0389
Regional TE	0.8599	0.6615	0.9832	0.0656	0.8764	0.7240	0.9846	0.0609
TGR	0.7786	0.5564	1.000	0.0735	0.8103	0.5816	1.000	0.0543
G.Cairo								
Metafrontier TE*	0.8564	0.7322	0.9823	0.0357	0.8737	0.7416	0.9818	0.0381
Regional TE	0.8748	0.7343	0.9799	0.0615	0.8740	0.7418	0.9825	0.0611
TGR	0.9790	0. 6671	1.000	0.0837	0.9999	0.6973	1.000	0.0766
CANAL								
Metafrontier TE*	0.0544	0.0409	0.9586	0.1923	0.8597	0.6042	0.9648	0.0335
Regional TE	0.4851	0.1289	0.9621	0.2432	0.8598	0.6509	0.9650	0.0713
TGR	0.1122	0.0344	0.6218	0.2513	0.9999	0.6018	1.000	0.0466

1137 observations

Table 4.1c: Regression results explaining metafrontier TE* score for the textile firms via different regions, size, age, GB, B and EXR dummies 2006-2008 panel data.

Variables	Estimated Coefficients	Estimated Coefficients
	Fixed Effects without SCV	Fixed Effects with SCV
ALEX	0.69D-04 (0.007)	0.57D-04(0.006)
DELTA	0.35D-04(0.007)	-0.010(0.006)
G.CAIRO	-0.0109(0.007)	0.29D-04(0.006)
CANAL	0.007(0.007)	0.006(0.006)
SIZE	-0.0102(0.007)	-0.009(0.006)
AGE	0.71D-04(0.007)	0.55D-04(0.006)
GB	-0.009(0.007)	-0.008(0.006)
B	0.79D-04(0.007)	0.64D-04(0.006)
EXR	-0.008(0.007)	-0.007(0.006)
Fixed vs. Random Effects (Hausman)	70.04	75.29
R^2%	7.33	7.31

1137 observations

Table 4.2a: Maximum likelihood estimates for production function via panel data time varying model for the apparel private sector firms.

Variable	Coefficient	Model1 without SCV	Model 2 With SCV
Constant	β_0	0.537(10.695)	0.569 (6.707)
Labour(L_{it})	β_1	0.342(0.014)***	0. 376 (.015)***
Material(M_{it})	β_2	0.498 (0.007)***	0.519 (0.007)***
Capital(K_{it})	β_3	0.164(0.012)***	0.196(0.012)***
Year	γ_t	-0.004(2.99)	-0.004(2.28)
Planning(P_{it})	α_1	____	-0.162(0.119)
Sourcing Process(Sp_{it})	α_2	____	0.244(0.147)*
Delivery System(Ds_{it})	α_3	____	-0.011(0.134)
Returns System(Rs_{it})	α_4	____	-0.103(0.010)
Log-Likelihood		362.9	365.2
Lambda	λ	0.001(2.012)	0.001(1.922)
Eta	η	-0.821(2.067)	-1.014(2.050)

Estimated Efficiencies	**Mean**	**Min**	**Max**	**S.DEV.**
Efficiency without SCV	0.9993	0.9998	0.99997	0.00004
Efficiency with SCV	0.9999	0.9998	0.99998	0.00006

*, ** and *** illustrate significant at 10%, 5% and 1% respectively in a two-tailed test.

1377 observations

Table 4.2b TGR and the TE obtained from the regional stochastic frontiers and the metafrontier production function for the Egyptian apparel private sector firms.

Region/statistic	Values without SCV				Values with SCV			
ALEX	Mean	Min	Max	St.Dev.	Mean	Min	Max	St.Dev.
Metafrontier TE*	0.9455	0.7241	0.9410	0.0275	0.9428	0.7481	0.9886	0.0460
Regional TE	0.9459	0.8465	0.9899	0.0246	0.9432	0.8456	0.9899	0.0264
TGR	0.9996	0. 8114	1.000	0.0341	0.9996	0.8644	1.000	0.0291
DELTA								
Metafrontier TE*	0.6305	0.6075	0.9912	0.0329	0.6806	0.6302	0.9785	0.0425
Regional TE	0.9812	0.9725	0.9924	0.0044	0.9978	0.9955	0.9994	0.0016
TGR	0.6425	0.4815	0.8843	0.0376	0.6821	0.5243	0.9017	0.0294
G.Cairo								
Metafrontier TE*	0.9692	0.7067	0.9894	0.0284	0.8887	0.8038	0.9918	0.0381
Regional TE	0.9999	0.9999	0.9999	0.00003	0.8890	0.8881	1.000	0.00002
TGR	0.9693	0.8216	1.000	0.0172	0.9997	0.8477	1.000	0.0042
CANAL								
Metafrontier TE*	0.8820	0.5400	0.9295	0.0277	0.8803	0.5731	0.9466	0.0449
Regional TE	0.8822	0.5702	0.9851	0.0713	0.8803	0.6450	0.9812	0.0646
TGR	0.9998	0.8122	1.000	0.0412	1.000	0.8827	1.000	0.0382

1377 observations

Table 4.2c Regression results explaining metafrontier TE score for the apparel firms via different regions, size, age, GB, B and EXR dummies 2006-2008 panel data.

Variables	Estimated Coefficients	Estimated Coefficients
	Random Effects without SCV	Random Effects with SCV
ALEX	0.51D-04(0.000)***	0.42D-04(0.000)***
DELTA	0.30D-06(0.000)***	0.26D-06(0.000)***
G. CAIRO	0.28D-06(0.000)***	0.34D-05(0.000)***
CANAL	-0.15D-05(0.000)***	-0.12D-05(0.000)***
SIZE	-0.14D-07(0.000)	-0.26D-06(0.000)
AGE	-0.26D-06(0.000)	-0.47D-06(0.000)
GB	0. 31D-06(0.000)	0.66D-06(0.000)
B	-0.0049(0.000)***	-0.0089(0.000)***
EXR	0.0029(0.000)*	0.0048(0.000)*
Constant	0.999(0.000)***	0.999(0.000)***
Fixed vs. Random Effects (Hausman)	7.45	7.16
R^2%	33	40

*, ** and *** illustrate significant at 10%, 5% and 1% respectively in a two-tailed test.
1377 observations

Table 4.3a: Maximum likelihood estimates for production function via panel data time varying Model for the public sector firms.

Variable	Coefficient	Model1 without SCV	Model 2 With SCV
Constant	β_0	-1.615(1.922)	-4.31 (1.777)**
Labour(L_{it})	β_1	0.273(0.301)	0. 277 (.31)
Material(M_{it})	β_2	0.746 (0.188)***	0.686(0.174)***
Capital(K_{it})	β_3	0.217(0.218)	0.310 (0.173)*
Year	γ_t	-0.008(0.061)	-0.091 (0.074)
Planning(P_{it})	α_1	____	-2.05(1.66)
Sourcing Process(Sp_{it})	α_2	____	-0.736(1.83)
Delivery System(Ds_{it})	α_3	____	1.92(2.44)
Returns System(Rs_{it})	α_4	____	2.731 (1.46)*
Log-Likelihood		-157.7	- 164.8
Lambda	λ	0.050(0.041)	0.436(1.88)
Eta	η	0.551(0.104)***	-1.19(8.22)

Estimated Efficiencies	**Mean**	**Min**	**Max**	**St.Dev.**
Efficiency without SCV	0.8370	0.0293	0.9967	0.1967
Efficiency with SCV	0.9678	0.7988	0.9999	0.0576

*, ** and *** illustrate significant at 10%, 5% and 1% respectively in a two-tailed test.

200 observations

Table 4.3b TGR and the TE obtained from the regional stochastic frontiers and the metafrontier production function for the Egyptian public sector firms.

Region/statistic	Values without SCV				Values with SCV			
ALEX & BEH	Mean	Min	Max	St.Dev.	Mean	Min	Max	St.Dev.
Metafrontier TE*	0.0010	0.0003	0.9982	0.1130	0.1795	0.1455	0.9977	0.1042
Regional TE	0.8158	0.0126	0.9984	0.2518	0.8276	0.1537	0.9984	0.1135
TGR	0.0012	0.0020	0.7723	0.2713	0.2169	0.1642	0.8213	0.1317
DELTA								
Metafrontier TE*	0.0050	0.0004	0.9652	0.1271	0.5417	0.2684	0.9769	0.0716
Regional TE	0.8034	0.1274	0.9752	0.1796	0.8416	0.2939	0.9867	0.1004
TGR	0.0062	0.1178	0.8816	0.1541	0.6821	0.2768	0.9240	0.0912
Cairo & Upper								
Metafrontier TE*	0.0020	0.0007	0.9158	0.0916	0.2442	0.2019	0.9104	0.0895
Regional TE	0.7655	0.2674	0.9372	0.1560	0.7812	0.3509	0.9388	0.1371
TGR	0.003	0.0712	0.6413	0.1611	0.3126	0.2216	0.7126	0.1127

200 observations

Table 4.3c: Regression results explaining metafrontier TE scores for public sector firms via different regions, size, age, GB, B and EXR dummies 2001-2008 panel data.

Variables	Estimated Coefficients	Estimated Coefficients
	Random Effects without SCV	Random Effects with SCV
ALEX&BEH	-0.008(0.088)***	0.009(0.028)***
DELTA	-0.021(0.051)***	0.012(0.011)***
CAIRO& Upper Egypt	0. 036(0.050)***	0.013(0.010)***
SIZE	0.004 (0.032)	0.021(0.009)**
AGE	0.095(0.030)***	-0.048(0.009)***
GB	-0.048(0.024)**	0.024(0.008)***
B	-0.162(0.024)***	0.014(0.008)***
EXR	0.124(0.022)***	0.019(0.007)***
Constant	0.829(0.090)***	0.916(0.026)***
Fixed vs. Random Effects (Hausman)	8.84	7.08
R^2 %	28	33

*, ** and *** illustrate significant at 10%, 5% and 1% respectively in a two-tailed test.
200 observations

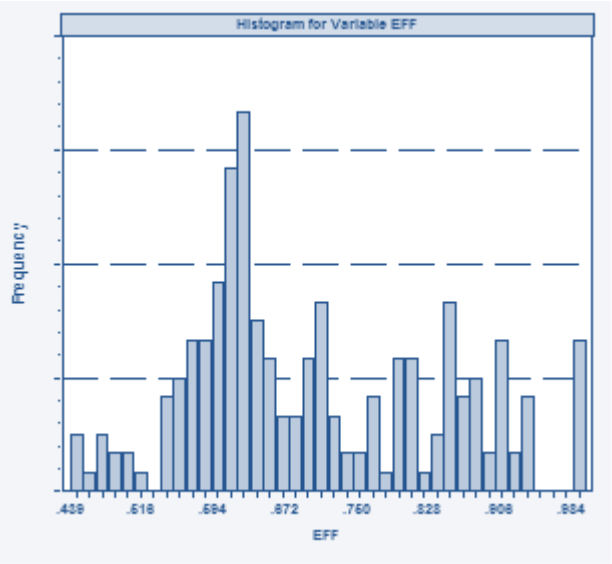


Figure 4.2a Alex TE for private sector textile firms without SCV

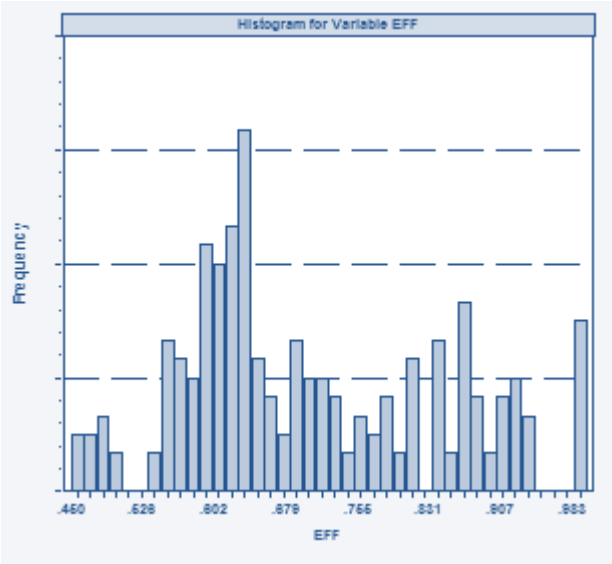


Figure 4.2b Alex TE for private sector textile firms with SCV

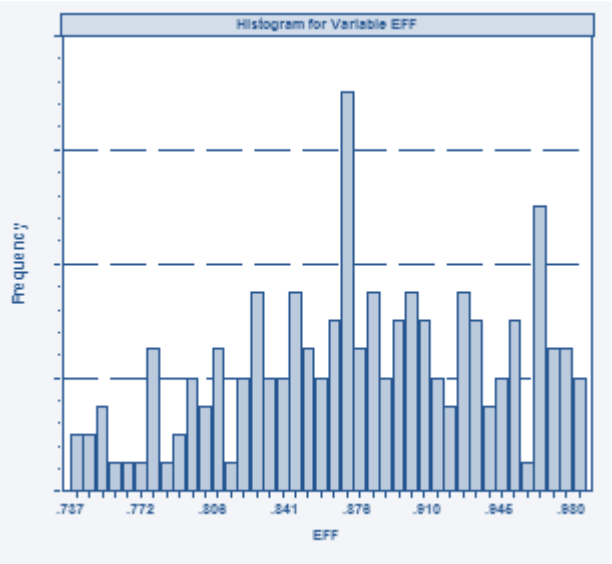


Figure 4.2c G.Cairo TE for private sector textile firms without SCV

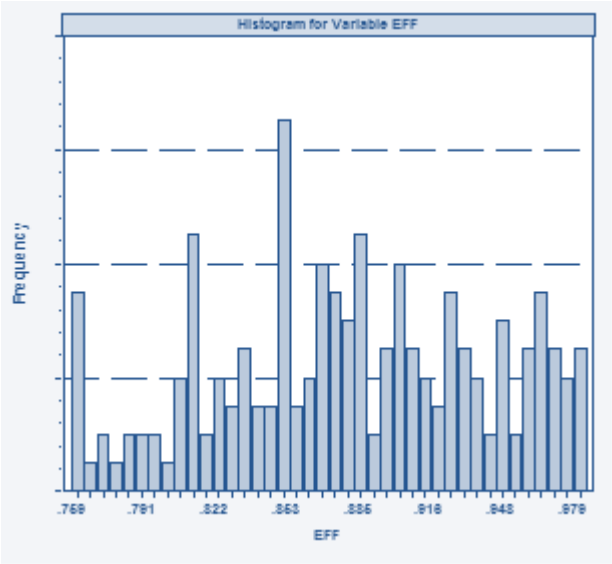


Figure 4.2d G. Cairo TE for private sector textile firms with SCV

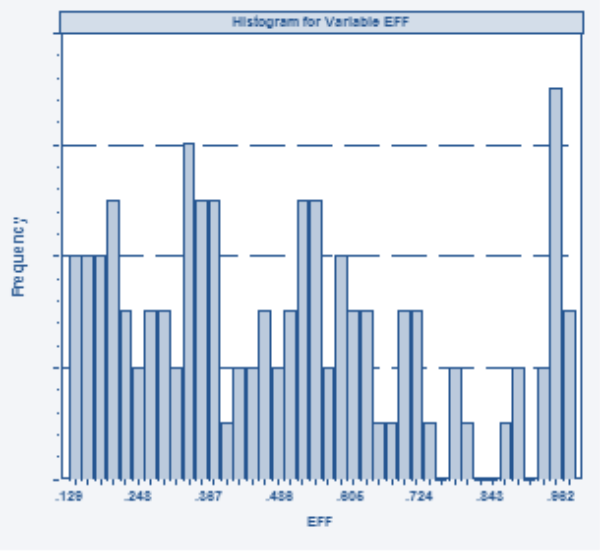


Figure 4.2e Canal TE for private sector textile firms without SCV

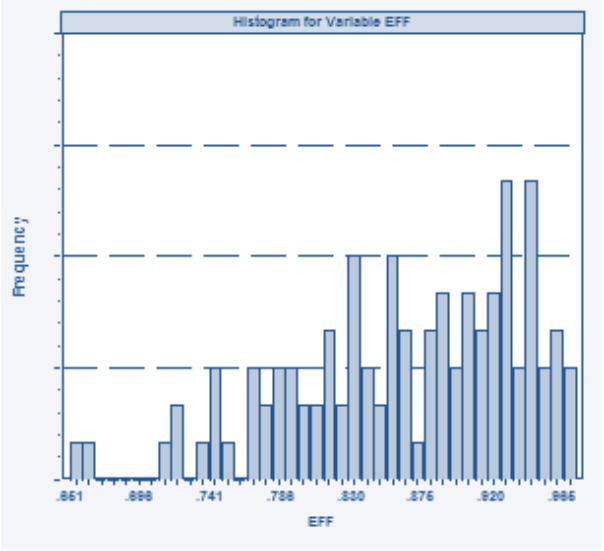


Figure 4.2f Canal TE for private sector textile firms with SCV

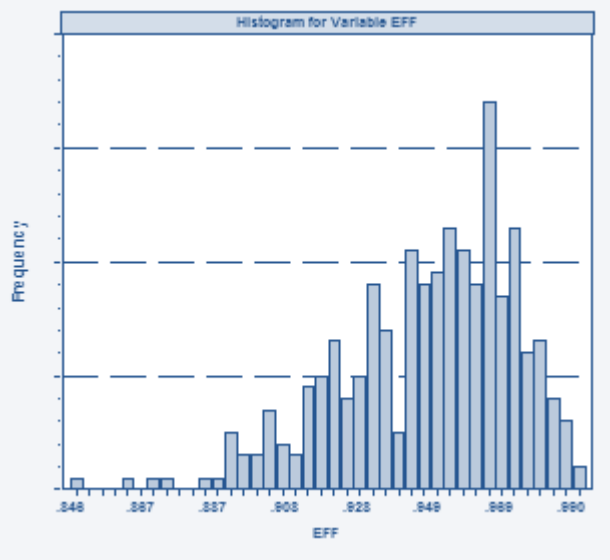


Figure 4.3a Alex TE for private sector apparel firms without SCV

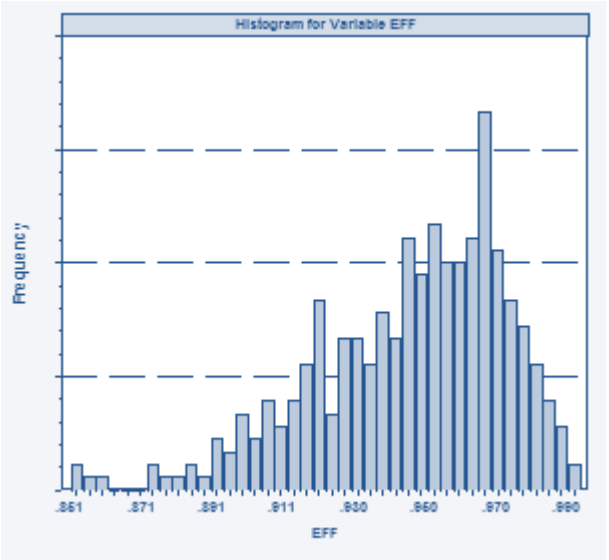


Figure 4.3b Alex TE for private sector apparel firms with SCV

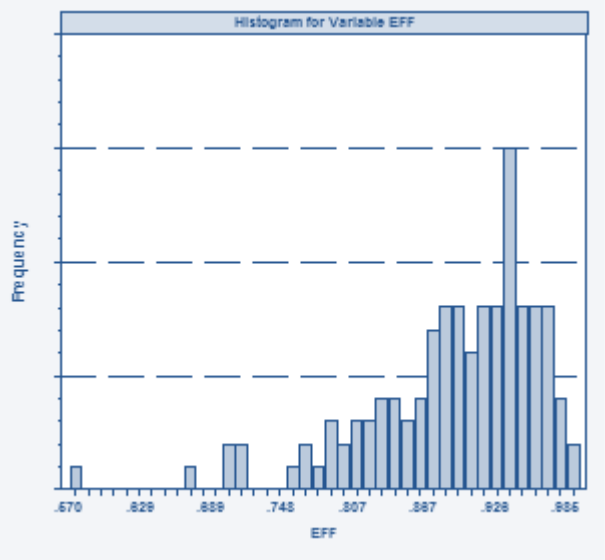


Figure 4.3c Canal TE for private sector apparel firms without SCV

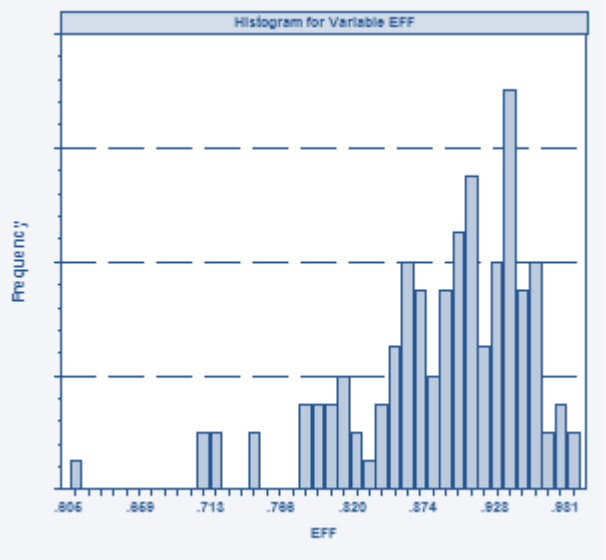


Figure 4.3d Canal TE for private sector apparel firms with SCV

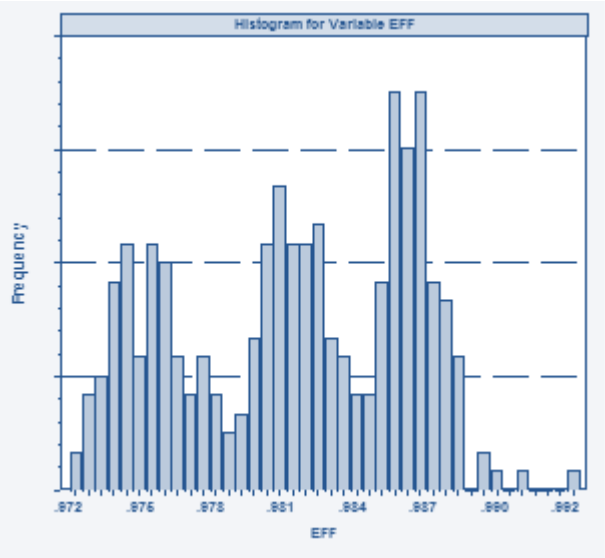


Figure 4.3 e Delta TE for private sector apparel firms without SCV

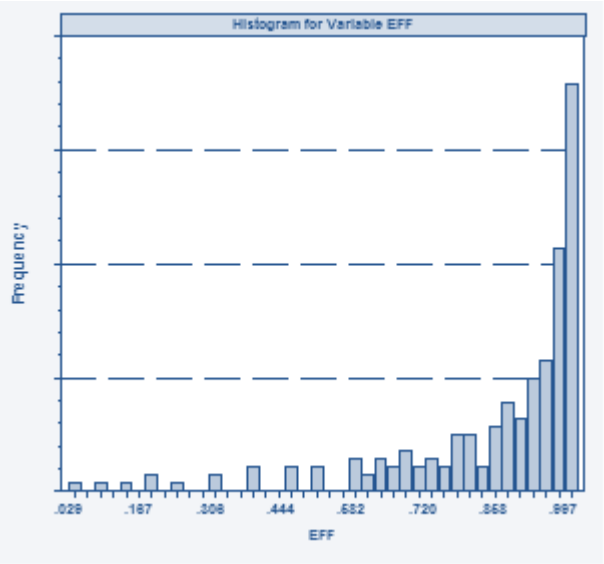


Figure 4.4 a TE for Public sector firms without SCV

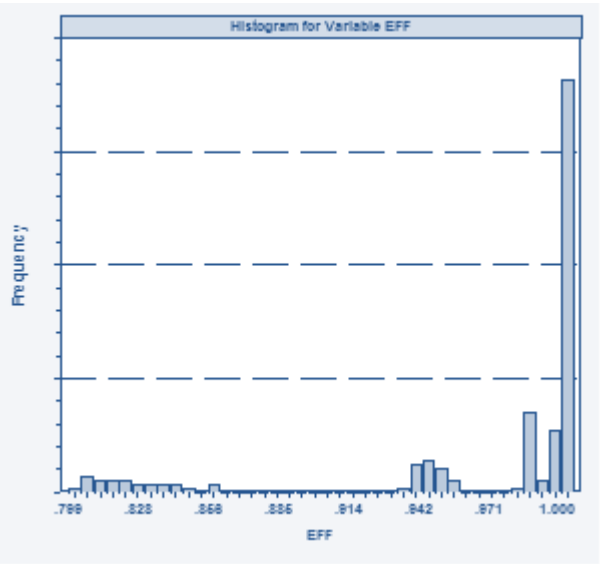


Figure 4.4b TE for public sector firms with SCV

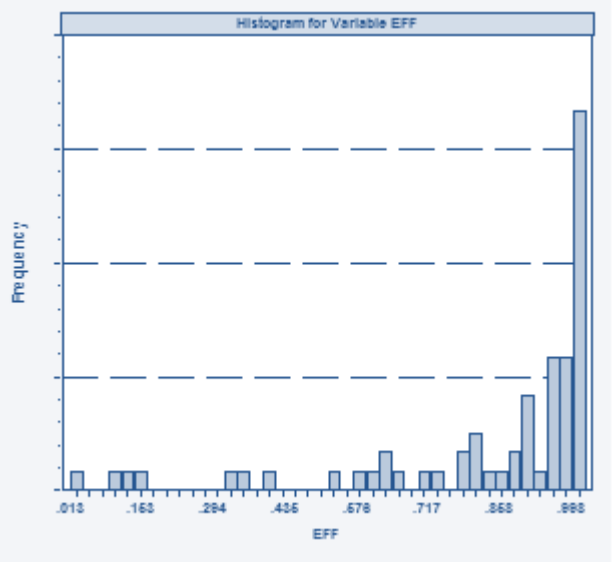


Figure 4.4c Alex& BEH TE for Public sector firms

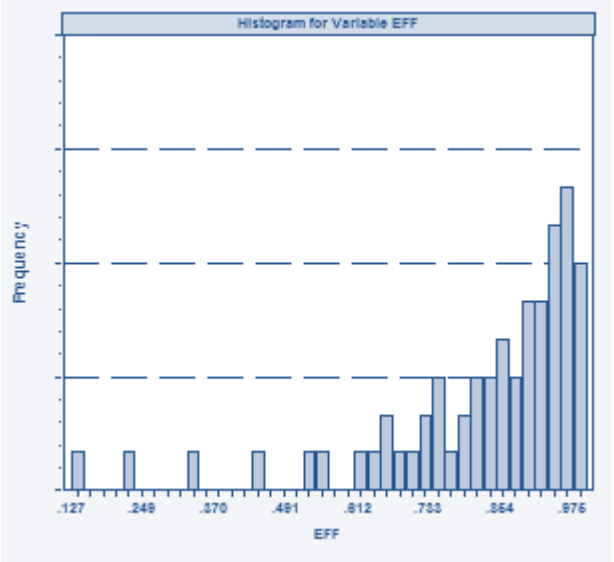


Figure 4.4d Delta TE for public sector firms

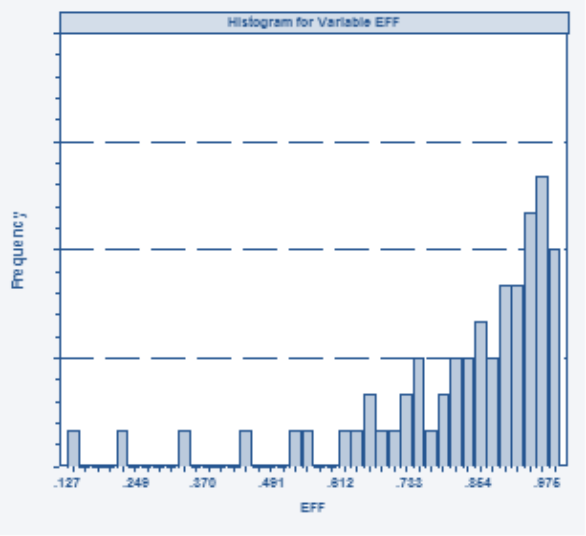


Figure 4.4e Cairo & Upper Egypt TE for public sector firms

Chapter 5

Technical efficiency for Egyptian textile and apparel industry firms a non- parametric analysis of firm level data

5.1 Introduction

This chapter aims to measure TE for the Egyptian T&A private and public firms via DEA using metafrontier technique. Raw data are collected form annual industrial bulletin to measure TE scores for the industry at the firm level. Then, supply chain variables are added to the model (planning, sourcing, delivery and stock & returns system) to examine their impact on efficiency scores. Afterwards, factors as firms' size, age, governmental barriers, bureaucracy and exchange rate are examined. A grand frontier related to all firms is constructed alongside a group frontier specific to individual region firms to evaluate their efficiencies and to identify how locational and technological features of a firm influence on its performance? Section 5.2 deals with the DEA model whereas sections 5.3 and 5.4 describe data and empirical results.

5.2 DEA model

The purpose of the DEA is to construct a nonparametric envelopment frontier over the data points wherein observed points lie on or below the production frontier. This frontier is used as a benchmark for DMUs.

5.2.1 DEA output –orientation model

Using an input-output data sample in order to derive a benchmark output quantity wherein actual firm's output can be compared for (output-oriented) efficiency measurement. Output Y is a nonnegative vector of quantities of outputs produced from X, a nonnegative vector of quantities of inputs, to obtain feasible input-output bundle (x, y) where feasible input-output bundles form production possibility set T

$$T = \{(x, y): y \text{ is produced from } x;\ x \geq 0;\ y \geq 0\} \quad (1)$$

For single output, the frontier is defined by the production function:

$$g(x) = \text{maximum value of } y, \text{ given } x, \text{ where } (x, y) \in T \quad (2)$$

Where g(x) is the maximum quantity of y produced from the input bundle x:

Therefore, the production possibility set is: T = {(x, y): y ≤ g(x); x ≥ 0, y ≥ 0}. For multiple-output multiple-input and under the production possibility set convexity assumption with free disposability of inputs & outputs. So, the production possibility set is

$$\mathrm{T} = \left\{ (x, y) : x \geq \sum_{i=1}^{N} \lambda_i x^i ; y \leq \sum_{i=1}^{N} \lambda_i y^i ; \sum_{i=1}^{N} \lambda_i = 1; \lambda_i \geq 0; i = 1,2,..., N \right\} \quad (3)$$

(x^i, y^i) denotes observed input-output bundle for firm $i \in N$ firms.

It is important to emphasise that observed firms may not have access to the same technology, or different firms may face different production technologies. Variability in geographical or any other factors may lead to such a situation and constructing a single production frontier based on all the data points would result in an unfitting benchmark technology. A way to measure the impact of technological heterogeneity across groups is to construct a separate group frontier for each region alongside a single metafrontier applied to all groups without SCV and with SCV to the model. For that reason, different production possibility sets for different groups are constructed. Groups include four regions for the private firms and three for public ones. The distribution of firms across regions and activities is explained in details in appendix 8. The regions are the same as in chapter 4. Assume *N* observed firms where they are classified in relation to some criteria into *G* number of distinct and exhaustive groups, g^{th} group containing N_g number of firm and the index set of observations $I = \{1,2,..., N\}$ and separating it into non- overlapping subsets where:

$$I_g = \{ i : i \in g; (g = 1,2..., G) \} \quad (4)$$

$$\left(N = \sum_{g=1}^{G} N_g \right)$$

Therefore, the production possibility set for g is:

$$T^g = \left\{ (x,y): x \geq \sum_{i \in Ig} \lambda_{gi} x^i ; y \leq \sum_{i \in Ig} \lambda_{gi} y^i ; \sum_{i \in Ig} \lambda_{gi} = 1; \lambda_{gi} \geq 0 \right\} \ (g = 1, 2, ..., G) \tag{5}$$

T^g is the free disposal convex hull set of observed input-output bundles of firms for group g. By solving linear programming (LP) problem for firm s $\in$ g where

$$\begin{aligned} &\varphi_g^s = \max \varphi \\ &s.t. \sum_{i \in I_g} \lambda_{gi} y_g^i \geq \varphi \, y_g^s ; \\ &\sum_{i \in I_g} \lambda_{gi} x_g^i \leq x_g^s ; \sum_{i \in I_g} \lambda_{gi} = 1; \\ &\lambda_{gi} \geq 0 \quad (\mathrm{i} = 1, 2, ..., N_{\mathrm{g}}) ; \quad \varphi \text{ unrestricted} \end{aligned} \tag{6}$$

Where Φ is a scalar for i[th] firm and (1/Φ) is the efficiency score range from 0 to 1. A value of 1 indicating a point is on the frontier and hence a TE firm. This liner programming problem is solved for each firm in the g^{th} group and TE within group output-oriented for firm s is

$$TE_g^s = \frac{1}{\varphi_g^s} \tag{7}$$

Technical efficiency of the same firm s from group g relative to the metafrontier is estimated. The metafrontier is the outer envelope of all of the group frontiers. It consists of the boundary points of the free disposal convex hull of the input-output vector of all firms in the sample. The metafrontier (M) TE of the firm s from group g is measured as:

$$\begin{aligned} &\varphi_M^s = \max \varphi \\ &s.t. \sum_{g=1}^{H} \sum_{i \in I_g} \lambda_{gi} y_g^i \geq \varphi \, y_g^s ; \\ &\sum_{g=1}^{H} \sum_{i \in I_g} \lambda_{gi} x_g^i \leq x_g^s ; \quad \sum_{g=1}^{H} \sum_{i \in I_g} \lambda_{gi} = 1; \\ &\lambda_{gi} \geq 0 \quad (\mathrm{i} = 1, 2, ..., N_{\mathrm{g}}; \mathrm{g} = 1, 2, ..., H) ; \quad \varphi \text{ unrestricted} \end{aligned}$$

$$TE_M^s = \frac{1}{\varphi_M^s} \tag{8}$$

As metafrontier production possibility set encloses every group production set, it is noticeable that $\varphi_g^s \leq \varphi_M^s$ and therefore $TE_g^s \geq TE_M^s$, for every s and g implicating firm cannot be more technically efficient when assessed against the metafrontier than when evaluated against group frontier.

5.2.2 Technology Gap Ratio (TGR)

When, for any firm s in group g, the group efficiency and the metafrontier efficiency measures are close, it may argue that evaluated at the input bundle x_g^s , the relevant group frontier is close to the metafrontier. Instead of evaluating the proximity of the group frontier to the metafrontier at individual points, it is useful to get an overall measure of proximity for the group as a whole. An average technical efficiency for group firms' is taken via a geometric mean of such individual technical efficiencies. For the group g geometric mean can be obtained by:

$$TE_g(g) = \left(\prod_{s=1}^{N_g} TE_g^s \right)^{1/N_g} \tag{9}$$

In the same way, the average technical efficiency of group g, measured from the metafrontier is

$$TE_M(g) = \left(\prod_{s=1}^{N_g} TE_M^s \right)^{1/N_g} \tag{10}$$

Therefore, for group g, an overall measure of the gap of the group frontier to the metafrontier is its technology Gap ratio which can be depicted as follows:

$$TGR(g) = \frac{TE_M(g)}{TE_g(g)} \tag{11}$$

TGR decreases if the group frontier shifts towards the metafrontier, vice versa, and is bounded by unity which would be realised if and only if group frontier coincides with the meta-frontier. Same sequences of equations for input-orientation are implemented for input-orientation by minimising used inputs to obtain the same amount of outputs where $TE_g^s = \theta_g^s$, $TE_M^s = \theta_M^s$

Figure 5.1 demonstrates these notions for the case of a single input single output for four groups of firms R, S,T and X where points from R_1 to R_4 denote the first group, S_1 to S_4 for the second, T_1 to T_4 for the third and $X_1$to X_4 for the fourth one. The first frontier is exposed by the broken line $AR_1R_3R_4C$ for group R, the broken line $BS_1S_2S_3D$ for group S, line $ET_1T_4G$for group T and $WX_1X_2X_4B^*$ for group X. The metafrontier is the outer envelope of all frontiers shown by the broken line $AR_1R_3S_2S_3T_4X_4D$. Points S_1, S_2, S_3 are technically efficient and equal unity relating to their own frontier while S_4 is inefficient for both its group frontier and metafrontier. But, when judged against the metafrontier, TE of the points S_2 and S_3 remains unity. However, the TE of S_1 falls from unity to BS_1/ BN, while the inefficient point S_4 is the same with respect to its group frontier JS_4 / JK. Consequently, the average TE of group S measured from its group frontier is given by, $TE_S\ (S_4) = (JS_4\ /JK)^{¼}$ and that measured from the metafrontier is given by $TE_M\ (S) = ((BS_1\ /BN)\ (JS_4\ /JK))^{¼}$ which is obviously smaller than $TE_S(S)$. The ratio of the two measures is the TGR of this group. Inputs and outputs are classified as follows;

Output denotes the natural logarithm of total value of manufacturing output for the *i* firm, *t* year in Egyptian pound in constant prices. Labour denotes the natural logarithm of total paid wages per year in constant prices. Materials: denote the natural logarithm of total costs of raw materials purchased by the firm during the year constant prices. Capital: denotes the natural logarithm of expenditures on electricity, fuel and lubricants, maintenance and repairs of capital goods, rents of buildings and machinery, machinery upgrading, etc., as a proxy of capital during the year in Egyptian pound in constant prices.

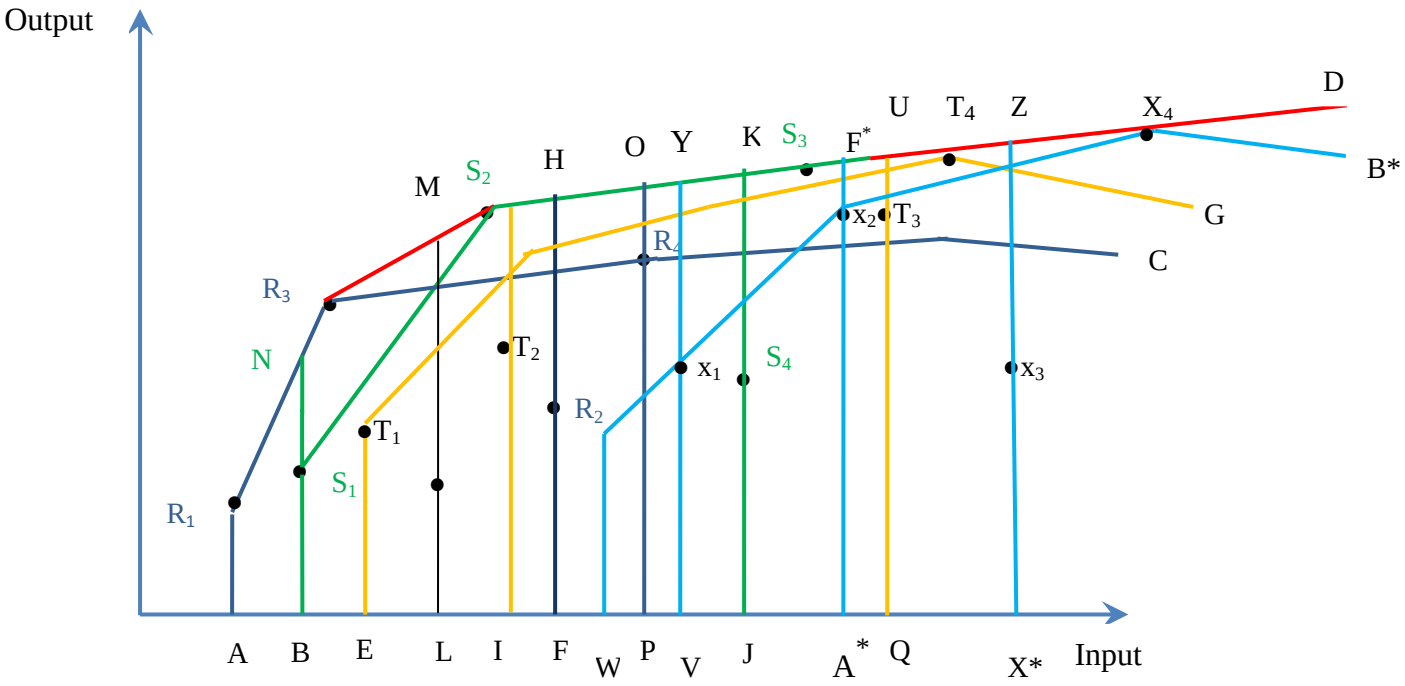


Figure 5.1 DEA Metafrontier Function Model

After obtaining efficiency scores without and with the SCV for both inputs–orientation and output-orientation at firm level for each firm the efficiency scores are regressed as a dependent variable against region, firms' size, age, GB, B and EXR as regressors. Details of variables are explained in chapter 3. Reasons for using both input and output-orientation are; using VRS means that input and output-orientation are different whereas input and output orientation results will be the same with CRS. Since the empirical study covers all industry sectors the private and the public with different activities within textile and apparel sectors themselves make it difficult to separate input-orientation firms from output-orientation firms and also it is hard to generalise the use of the CRS since returns to scale may differ among sectors, activities or per firm. Also, there is no guarantee that all firms in different sectors, activities or within the same sector are operating in an optimal way to use the CRS. The input-orientation addresses the question; "By how much can input quantities be proportionally reduced without changing the output quantities produced?" whereas output-orientation addresses the question "By how much can output quantities be proportionally expanded without altering the input quantities used?"

5.3 Descriptions of data

A micro level data is used for a sample of 838 private sector firms (379 textile and 459 apparel firms).The sample includes all the T&A activities and detailed description of activities is given in chapter 4. Data obtained through the CAPMAS in a panel form for 3years from 2006 to 2008 covering all information about industry inputs and outputs in current prices, then the prices are deflated to obtain constant prices. Furthermore, a whole population of the public firms (25 large and extra-large firms) from 2001 to 2008 is used. These firms employ 500 to 21969 workers. All firms' are fibres producer (natural & man-made fibres). Firms' activities range from fully integrated activities covering all the T&A supply chain processes to others with only the textile process, but each firm has its own transportation means. For market share, most of them produce for domestic and global markets. Data cover 8 years from 2001/2002 to 2008/2009 in current prices then the prices are deflated to obtain constant prices with 2001 as base year.

5.3 Empirical Results

The DEA input-orientation and output-orientation production function for the Egyptian T&A private and public units are obtained, then acquired data via questionnaires and interviews held with information obtained through the ministry of investment and the BSIC to construct main factors affect supply chain operations and regression dummies.

5.4.1 Private sector firms

This section shows empirical results for the T&A private firms, the textile and the apparel firms

5.4.1.1 T&A private firms

Tables 5.1a, 5.1b, 5.1c and 5.1d signify mean TE for T&A firms for four regions; Alex, Delta, G.Cairo and Canal revealing that the TE scores groups are different among regions as shown in appendix 9. Minimum group input-orientation is 86% at the Canal and maximum 89% at the Alex whereas minimum TGR is 92% at the Delta and maximum is 94% at the Canal.

Minimum group input-orientation after the SCV is 90% at the Canal and maximum 91% at the Delta, minimum TGR after the SCV is 97% at the Canal with maximum 98% at the G.Cairo. Figures 5.2a and 5.2b show input-orientation and 5.2c and 5.2d show output-orientation without and with the SCV. Firms' TE on diagrams with the SCV shifts and concentrates towards higher efficiency levels by 7% and 5% for inputs, output orientation respectively. Table 5.1e denotes the estimated regression for the T&A firms using the random effects model as Hausman test supports fixed effects model. The dependent variable is the measured level of metafrontier TE while region's variables and the size of a firm, its age, GB, B and EXR are regressors. The T&A firms' portions per region are: Alex 22%, Delta38%, G.Cairo31% and Canal 9%.

Input-orientation and output-orientation results show that regions variables are statistically significant at 1% meaning that efficiency scores varied among regions due to technology and infrastructures differences. For instance, Canal zone has well equipped industrial zones wherein its firms are large size firms, new and have good infrastructure conditions as in Tenth of Ramadan city; Port Said and Ismailia cities whereas Delta firms are totally differentiated in size, age with moderate infrastructure conditions but their products are varied and more differentiated than other regions. The age coefficient is significant whereas size, GB, B, EXR are insignificant and variables explanations are given in chapter 3.

5.4.1.2 Textile private firms

For the textile sector practices; their ratios are: Alex 18%, Delta 56%, G.Cairo16% and Canal 10 %. Tables 5.2a, 5.2b, 5.2c, and 5.2d (appendix9) denote the TE means for the textile firms for the four regions revealing that the TE efficiency scores are different among regions. The minimum group input-orientation is 90% at the Canal and the maximum 92% at the Alex whereas the minimum TGR is 95% at the Canal and the maximum is 98% at the Alex. The minimum group input-orientation after the SCV is 92 % at Delta and the maximum 94% at Alex,

the minimum TGR after supply chain variables is 96% at the Canal with the maximum 99% at the Delta. Figures 5.3a, 5.3b and 5.3c and 5.3d illustrate the input-orientation and the output-orientation without and with the SCV in turn where firms' TE on figures with the SCV shift and distillate toward higher efficiency levels.

Table 5.2e symbolises the estimated regression for the textile firms via the fixed effects model. The input-orientation and the output-orientation results show that the regions variables are statistically significant at 1% meaning the efficiency scores are varied among regions due to the differences in technology and infrastructures. For instance, Shubra Al-Khema industrial area in Delta region included poor infrastructure conditions which hinder the delivery system process despite its proximity to Cairo (main country local market). The size, age, B, GB and EXR coefficients are insignificant and same results are achieved in chapters 3 and 4.

5.4.1.3 Apparel private firms

Finally, the apparel firms' percentages are: Alex 26%, Delta 22%, G.Cairo 43% and Canal9%. Tables 5.3a, 5.3b, 5.3c, and 5.3d (appendix 9) denote mean TE for the four regions' apparel firms revealing that the TE scores groups are varied among regions. The minimum group input-orientation is 88% at Canal and the maximum 90% at Alex whereas the minimum TGR is 90% at Delta maximum is 93% at G.Cairo. The minimum group input-orientation with SCV is 91% at canal and the maximum 93% at Alex, the minimum TGR with SCV is 94% at Alex with the maximum 97% at G.Cairo and this agrees with logic since 43% of firms are concentrated in Cairo besides main apparel inputs accessories is located in Cairo. Figures 5.4a, 5.4b and 5.4c and 5.4d show input-orientation and output-orientation without and with the SCV sequentially where firms' TE graphs with the SCV shift and concentrate toward higher efficiency levels.

Table 5.3e signify estimated regressions for the apparel firms through the random effects model. The input-orientation and the output-orientation results for regions variables show that

they are statistically significant at 1% indicating that efficiency scores are varied among regions owing to differences in technology and infrastructures. The size, age, GB coefficients are insignificant whereas B and EXR are significant for both input and output-orientation as in chapter 3.

5.4.2 Public sector firms

DEA input-orientation and output-orientation production function for the Egyptian T&A public firms are depicted in tables 5.4a, 5.4b, 5.4c and 5.4d (appendix 9) which denote mean TE for the T&A firms for three regions; Alex, Delta and Cairo& Upper Egypt. They reveal that TE scores differ among regions. The minimum group input-orientation is 96% at the Cairo & UP and maximum 97% at the Alex whereas minimum TGR is 98% at the Alex and maximum is 99% at the Cairo & UP. The minimum group input-orientation with the SCV is 97% at the Alex and the maximum 98% at Delta, the minimum TGR with the SCV is 98% at Alex with maximum 100% at the Cairo & UP and the efficiency scores differ clearly from year to year. Figures 5.5a and 5.5b show input-orientation, 5.5c and 5.5d show the output-orientation without and with the SCV where firms' TE on diagrams with the SCV shift and concentrate toward higher efficiency levels by 4% and 2%on average for input and output-orientation respectively. It is noticeable that firms' responses to the SCV varied among firms. For instance, firms' efficiency scores increase by 5%, 7%, 1% and three by 13%.

Table 5.4e denotes estimated regressions for the public firms via random effects model. The input-orientation and the output-orientation results show that regions variables are statistically significant at 1% meaning efficiency scores are varied among regions owing to differences in technology and infrastructure facilities within the regions or firms belonging to same region. For instance, Ghazel El-Mahalla firm in Delta region is a self-sufficient firm which includes its own infrastructure facilities such as, social services, transportation services, etc. The size, age, GB, B and EXR coefficients are significant and this agrees with the economic logic in

industry since big size firms are benefiting from the economies of scale. The B coefficient is significant and this may be ascribed to the B hinder working environment and this also agrees with economic sense since the public firms are contaminated by bureaucracy as explained in chapter3. For the EXR, this may be due to exchange rates have major impact since some raw materials of the natural and man-made fibres are imported besides the role of the EXR on determining exports and firms' competitiveness against rivals. The significance of the GB may be as results of the public firms are suffering from poor infrastructure conditions.

5.5 Conclusion

In this chapter, the DEA technical efficiency for the Egyptian T&A, textile and apparel are estimated separately for private and public units via metafrontier technique. The private firms cover four regions and the public ones cover three regions. The study enables to individually classify the contribution of technological variations across groups of firms towards the overall measure of TE. Differentiations among regions relating to technology used, infrastructure and sectors raise this assumption.

On the other hand, the public firms are large and extra-large size, self-sufficient and integrated firms wherein each firm at least covers all textile activities and some of them cover all T&A industrial activities. Efficiency scores for the TE input-orientation are higher than output-orientation and this indicates that most of firms' tend to be input-oriented due to differences in technology used. Infrastructure conditions are also varied significantly among industrial zones and this is also supported through visits to the Delta zone firms to run questionnaires and interviews where it is noticed that infrastructure services are poor in cities such as El-Mahalla El-kubra and Shubra El Khema (old zones) whereas new cities such as 10^{th} of Ramadan and 6^{th} of October (new zones) have good infrastructure facilities.

Table 5 Mean TE I-orientation & O-orientation for Textile & Apparel, Textile, Apparel & public firm without SCV

I-Orientation without SCV					O-Orientation without SCV			
Firm type	Mean	Min.	Max.	St.Dev	Mean	Min.	Max.	St.Dev.
All firms T&A	0.8244	0.7023	1.000	0.0501	0.8210	0.7070	1.000	0.0497
Textile firms	0.8863	0.7614	1.000	0.0499	0.8757	0.7874	1.000	0.0460
Apparel firms	0.8196	0.7048	1.000	0.0521	0.8048	0.7114	1.000	0.0459
Public firms	0.9537	0.8388	1.000	0.0366	0.9262	0.5958	1.000	0.0816

Table 5 Mean TE I-orientation & O-orientation for Textile & Apparel, Textile, Apparel & public firm with SCV

I-Orientation with SCV					O-Orientation with SCV			
Firm type	Mean	Min.	Max.	St.Dev	Mean	Min.	Max.	St.Dev.
All firms T&A	0.8862	0.7573	1.000	0.0604	0.8452	0.7070	1.000	0.0636
Textile firms	0.9218	0.8076	1.000	0.0503	0.9011	0.7976	1.000	0.0528
Apparel firms	0.8852	0.7707	1.000	0.0540	0.8409	0.7114	1.000	0.0582
Public firms	0.9872	0.9218	1.000	0.0164	0.9584	0.6757	1.000	0.0708

Table 5.1e: Regression results explaining metafrontier TE scores for T&A firms: different regions, size, age, GB, B and EXR 2006-08 panel data (i & o-orientation)

Variables	Estimated Coefficients	Estimated Coefficients
	fixed Effects Input-Orientation	Fixed Effects Output-Orientation
ALEX	-0.028(0.039)***	-0.003(0.033)***
DELTA	-0.032(0.004)***	-0.022(0.033)***
G.CAIRO	-0.041(0.005)***	0.004(0.033)***
CANAL	- 0.018(0.006)***	-0.019(0.033)***
SIZE	0.028(0.040)	-0.011(0.034)
AGE	-0.003(0.028)***	0.010(0.023)***
GB	0.023(0.039)	0.041(0.033)
B	-0.030(0.040)	-0.032(0.033)
EXR	-0.007(0.039)	-0.002(0.033)
Fixed vs. Random Effects (Hausman)	129.01	130.56
R^2 %	23.81	23.75

*, ** and *** illustrate significant at 10%, 5% and 1% respectively in a two-tailed test.

2514 observations

Table 5.2e: Regression results explaining metafrontier TE scores for textile firms: different regions, size, age, GB, B and EXR 2006-08 panel data (i & o-orientation)

Variables	Estimated Coefficients	Estimated Coefficients
	Fixed Effects Input-Orientation	fixed Effects Output-Orientation
ALEX	- 0.034(0.021)***	-0.019(0.019)***
DELTA	-0.053(0.021)***	-0.033(0.019)***
G.CAIRO	-0.055(0.021)***	-0. 046(0.019)***
CANAL	-0.076(0.021)***	- 0.014(0.020)***
SIZE	0.001 (0.044)	0.003(0.003)
AGE	0.017(0.051)	-0.006(0.004)
GB	0.009(0.051)	0.002(0.006)
B	-0.054(0.044)	0.003(0.005)
EXR	-0.033(0.044)	-0.001(0.006)
Fixed vs. Random Effects (Hausman)	70.35	72.01
R^2 %	16.43	16.38

*, ** and *** illustrate significant at 10%, 5% and 1% respectively in a two-tailed test.
1137 observations

Table 5.3e: Regression results explaining metafrontier TE scores for apparel firms: different regions, size, age, GB, B and EXR 06-08 panel data (input &O-orientation)

Variables	Estimated Coefficients	Estimated Coefficients
	Random Effects Input-Orientation	Random Effects Output-Orientation
ALEX	-0.041(0.019)***	-0. 020 (0.017)***
DELTA	-0.007(0.006)***	-0.0004(0.005)***
G.CAIRO	- 0.001(0.005)***	-0.006(0.005)***
CANAL	-0. 003(0.007)***	-0.039(0.006)***
SIZE	- 0.024(0.003)	0.003(0.003)
AGE	0.007(0.004)	-0.003(0.004)
GB	0.012(0.006)	-0.001(0.005)
B	0.018(0.007)***	-0.006(0.006)***
EXR	0.217D-4(0.006)***	0.002(0.005)***
Constant	0.8200(0.008)***	0.8046(0.007)***
Fixed vs. Random Effects (Hausman)	4.24	5.32
R^2 %	13.02	13.72

*, ** and *** illustrate significant at 10%, 5% and 1% respectively in a two-tailed test.
1377 observations

Table 5.4e: Regression results explaining metafrontier TE scores for public units via different regions, size, age, GB, B and EXR 2001-08 panel data (I &O-orientation)

Variables	Estimated Coefficients Random Effects	Estimated Coefficients Random Effects
ALEX	0.010(0.018)***	-0.029(0.045)***
DELTA	0.010(0.010)***	0.013(0.017)***
CAIRO&UP	0.016(0.010)***	-0.007(0.016)***
SIZE	-0.0130(0.007)*	-0.009(0.014)*
AGE	0.012(0.006)**	0.029(0.015)**
GB	-0.007(0.005)*	0.009(0.013)***
B	-0.011(0.005)**	-0.049(0.013)***
EXR	0.020(0.004)***	0.031(0.012)***
Constant	0.9552(0.026)***	0.9076(0.041)***
Fixed vs. Random Effects (Hausman)	16.22	11.67
R^2 %	13.65	15.48

*, ** and *** illustrate significant at 10%, 5% and 1% respectively in a two-tailed test.
200 observations

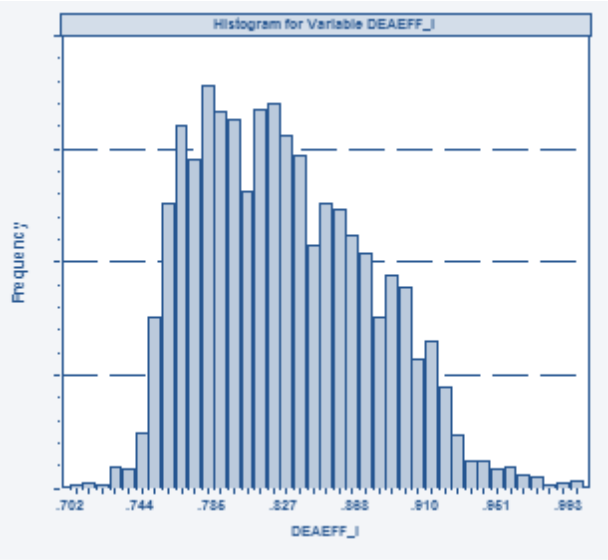


Figure 5.2aTE I-Orientation all sector's firms without SCV

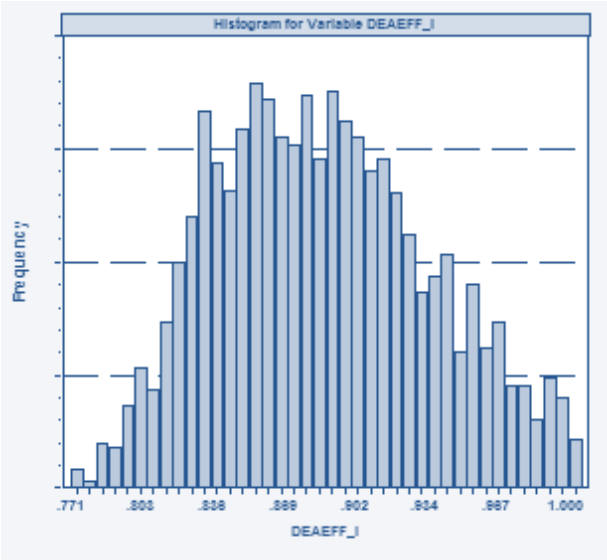


Figure 5.2b. TE I-Orientation all sector's firms with SCV

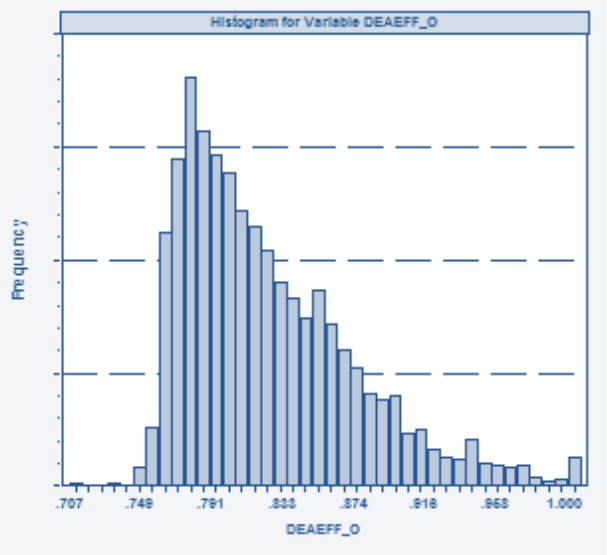


Figure.5.2cTE O-Orientation all sector's firms without SCV

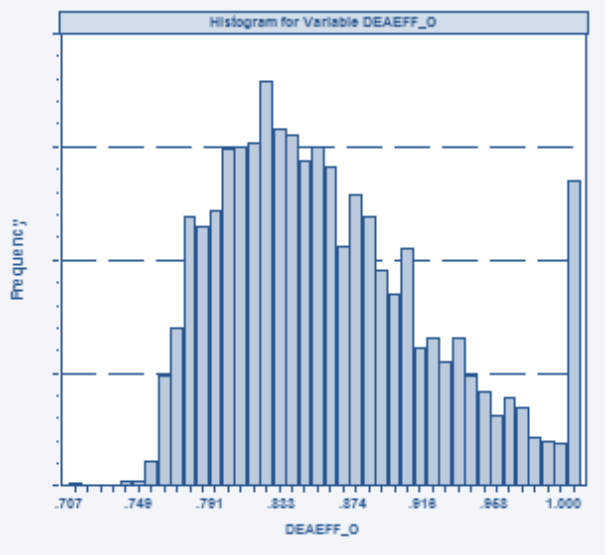


Figure 5.2d. TE O-Orientation all sector's firms with SCV

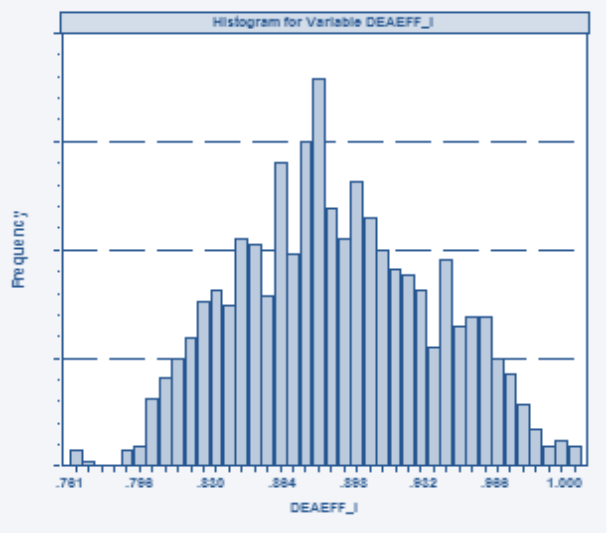


Figure5.3aTE Input-Orientation textile firms without SCV

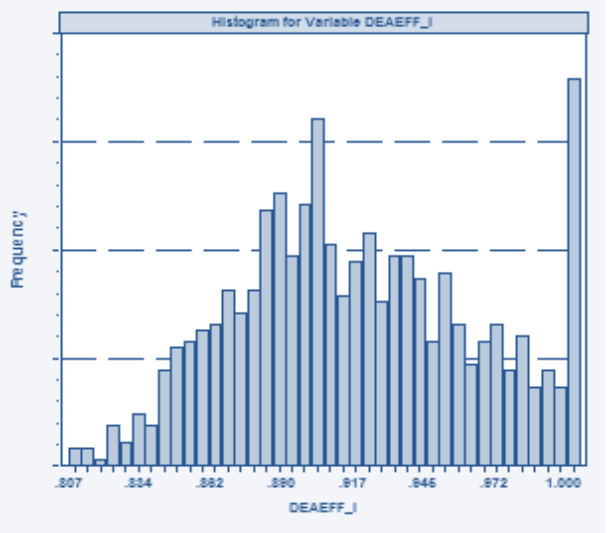


Figure 5.3b.TE Input-Orientation textile firms with SCV

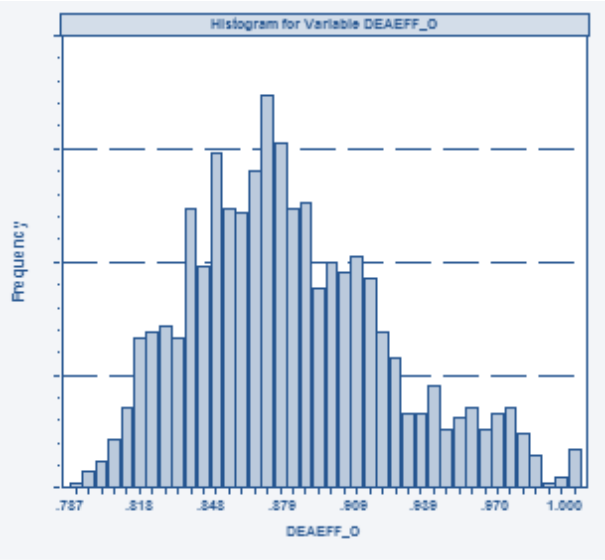


Figure 5.3cTE Output-Orientation textile firms without SCV

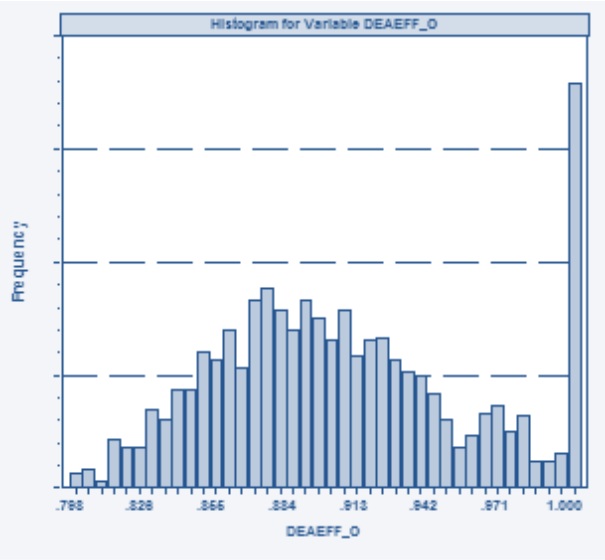


Figure 5.3d TE Output-Orientation textile firms with SCV

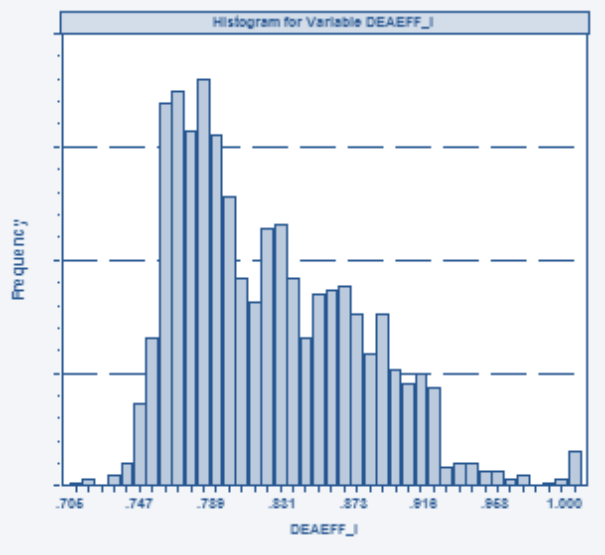


Figure 5.4a TE Input-Orientation apparel firms without SCV

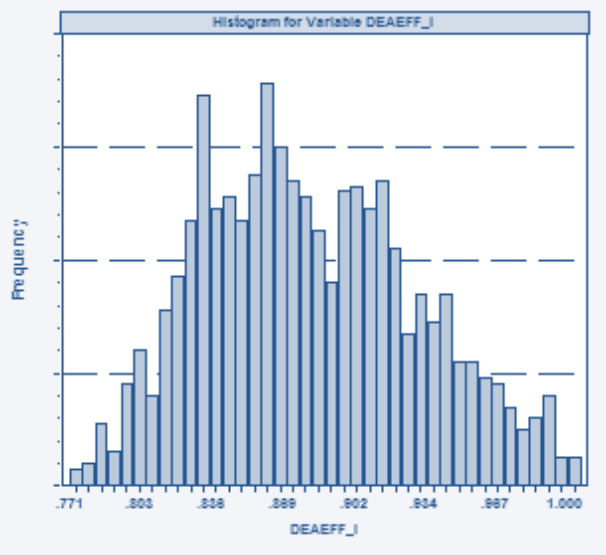


Figure 5.4b.TE Input-Orientation apparel firms with SCV

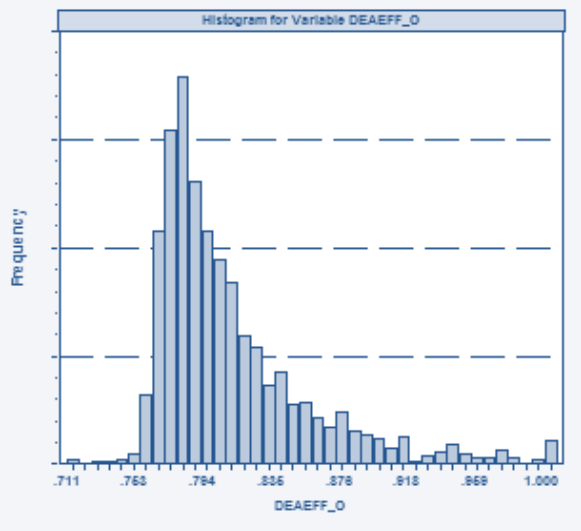


Figure 5.4cTE Output-Orientation apparel firms without SCV

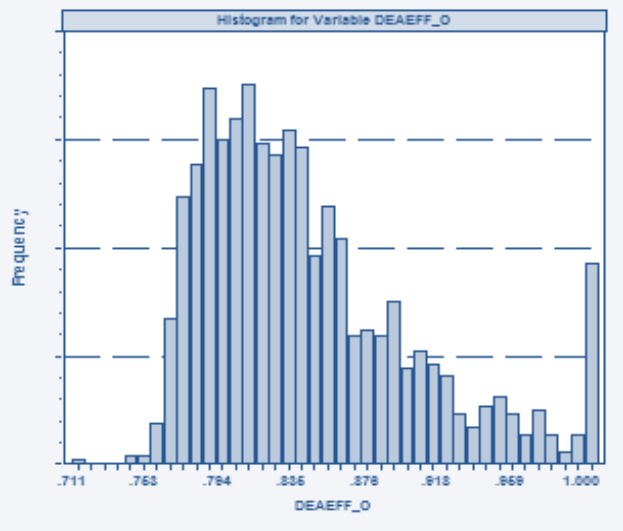


Figure 5.4d TE Output -Orientation apparel firms with SCV

Public Sector Figures

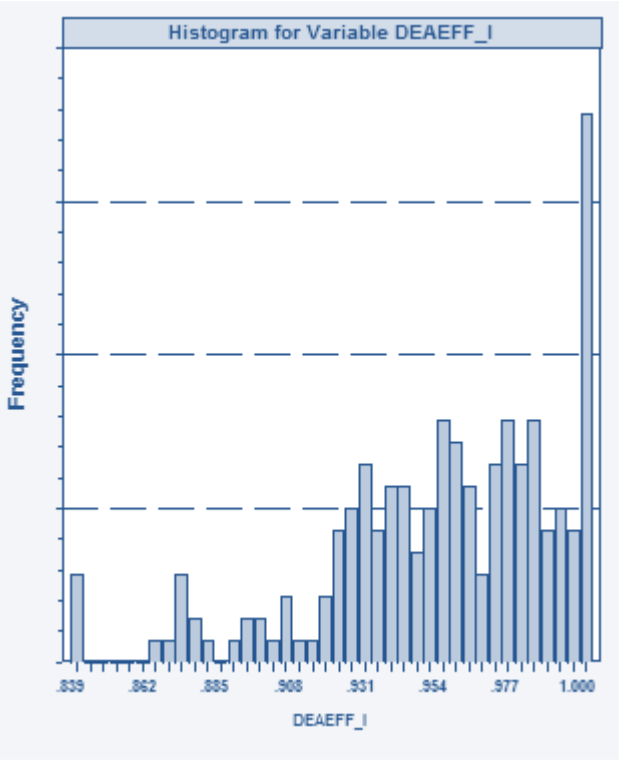


Figure 5.5a TE Input-Orientation public firms without SCV

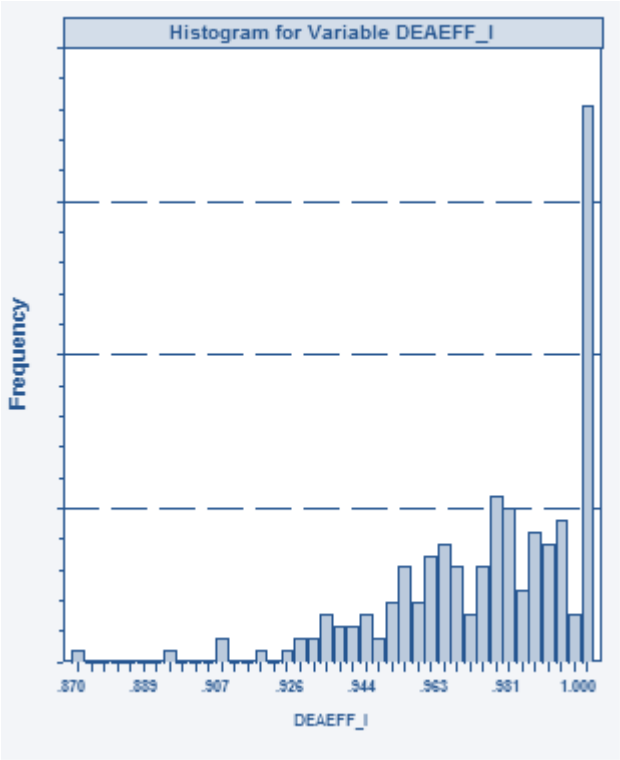


Figure 5.5bTE Input-Orientation public firms with SCV

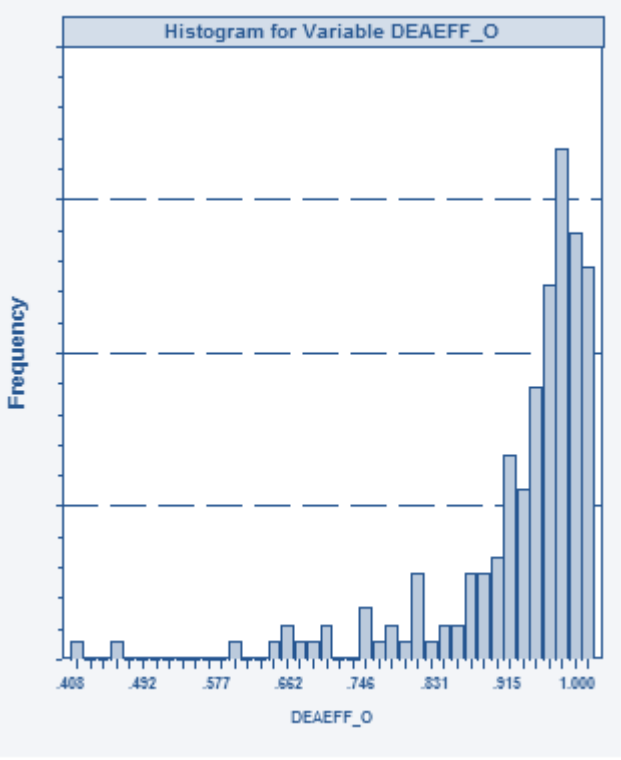


Figure 5.5cTE Output-Orientation public firms without SCV

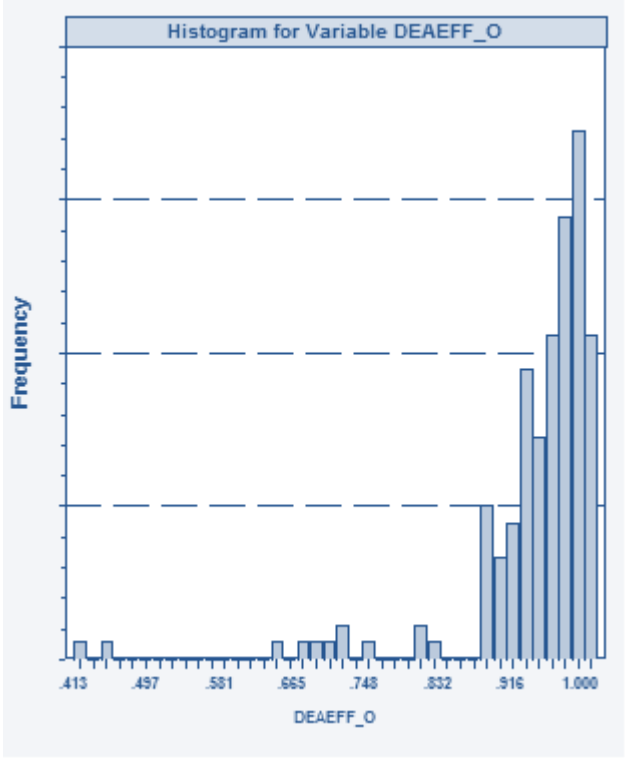


Figure 5.5d TE Output -Orientation public firms with SCV

Chapter 6

Empirical results summary

6.1 Introduction

This chapter gives empirical results' summary for the Egyptian T&A industry since analysing results helps in improving industry performance. Section 6.2 displays summery of the achieved results of the empirical studies.

6.2 Empirical results summary

Three different techniques are run in chapters three, four and five as empirical techniques. In chapter three, a translog technique is utilised for the T&A industry for private and public units. This technique is used for efficiency estimation in a three year time varying panel data (2006-2008) for the private units and eight years (2001/2002-2008/2009) for the public units. The SFA metafrontier technique is employed in chapter four in a Cobb-Douglas form using time varying panel data whereas the DEA metafrontier method is applied in chapter five for the same data. The three different techniques results show similarities. Consequently, efficiency scores for the T&A private units; the textile private units, the apparel private units, and the public units without and with the variables affecting supply chain operations are articulated in table 6.1.

Table 6.1 Mean Technical Efficiency for T&A, T, A and public firms via SFA translog, SFA metafrontier Cobb-Douglas and DEA metafrontier techniques.

Mean Technical Efficiency Without SCV					Mean Technical Efficiency With SCV			
Sector& Technique	Mean	Min.	Max.	St.Dev	Mean	Min.	Max.	St.Dev.
T&A firms SFA translog	0.8849	0.6940	0.9876	0.048	0.8905	0.7272	0.9876	0.045
T&A firms DEA I-O	0.8244	0.7023	1.000	0.0501	0.8862	0.7573	1.000	0.0636
T&A firms DEA O-O	0.8210	0.7070	1.000	0.0497	0.8452	0.7070	1.000	0.0528
Textile firms SFA Translog	0.8308	0.6043	0.9866	0.081	0.8367	0.6572	0.9866	0.077
Textile SFA Cobb-Douglas	0.8384	0.6424	0.9848	0.076	0.8430	0.6828	0.9824	0.075
Textile DEA I-Orientation	0.8863	0.7614	1.000	0.0499	0.9218	0.8076	1.000	0.0503
Textile DEA O-Orientation	0.8757	0.7874	1.000	0.0460	0.9011	0.7976	1.000	0.0528
Apparel firms SFA Translog	0.9740	0.9463	0.9928	0.006	0.9867	0.9789	0.9951	0.003
Apparel SFA Cobb-Douglas	0.9993	0.9998	0.9999	0.0000	0.9999	0.9998	0.9999	0.0001
Apparel DEA I-Orientation	0.8196	0.7048	1.000	0.0521	0.8852	0.7707	1.000	0.0540
Apparel DEA O-Orientation	0.8048	0.7114	1.000	0.0459	0.8409	0.7114	1.000	0.0582
Public firms SFA Translog	0.8270	0.1359	0.9891	0.166	0.9781	0.8323	0.9999	0.044
Public SFA Cobb-Douglas	0.8370	0.0293	0.9967	0.1967	0.7988	0.9678	0.9999	0.0576
Public DEA I-Orientation	0.9537	0.8388	1.000	0.0366	0.9872	0.9218	1.000	0.0164
Public DEA O-Orientation	0.9262	0.5958	1.000	0.0816	0.9584	0.6757	1.000	0.0708

6.2.1 The T&A efficiency scores

The Mean TE for the T&A private firms via translog technique is 88%, the minimum value is 69% for the firm 243 (underwear, Sharqia governorate, Canal zone) and the maximum value is 99% for the firm 562 (apparel firm, Qalyubia governorate, Delta zone). The mean TE for the second model with the SCV is 89% with 73% for the minimum and 99% for the maximum.

Alternatively, the DEA mean TE input-orientation method without the SCV model is 82% with minimum value 70% for firm 550 (apparel firm, Qalyubia governorate, Delta zone) and the maximum value for full efficient firm 562 (apparel firm, Qalyubia governorate, Delta zone) is one whereas the mean TE for the second model with the SCV is 89%, 76% for the minimum and one for full efficient firms. For the DEA output-orientation the mean TE without the SCV is 82% and the minimum firm is 71% for the firm 243(underwear, Sharqia governorate, Canal zone) and the maximum is the firm 562 (apparel firm, Qalyubia governorate, Delta zone) and the mean TE model with the SCV is 85% with the minimum 71% and the maximum is one. It is clear that the efficiency scores with the SCV increase from 3% to 17% depending upon firm's response to the supply chain factors and whether the weakness is relating to one factor or more. Moreover, the TE scores for SFA translog and DEA are not varied significantly between the two methods. Then the TE scores for the T&A is regressed as a dependent variable against firm's size, age, governmental barriers (GB), bureaucracy (B) and exchange rate (EXR) as regressors and applied to each technique. For the SFA translog T&A private firms; size, GB, B, and EXR variables are insignificant whereas firm's age is significant (details in chapter 3). The DEA input and output-orientation show that the size, GB, B and EXR coefficients are insignificant whereas the age coefficient is significant. The DEA results are described in chapter 5.

6.2.2 Textile private firms

The mean TE for the textile private firms through the SFA translog technique is 83%, the minimum value is 60% for the firm 167 (yarn, Monufia governorate, Delta zone) and the maximum value is 99% for the firm 46 (weaving firm, Beheira governorate, Alex zone). The mean TE for the second model with the SCV is 84% with the minimum 66% and the maximum 99%. The SFA metafrontier Cobb-Douglas method mean TE value is 84%, the minimum value is 64% for firms 17 (fabrics, Alex governorate, Alex zone) and 167 (yarn, Monufia governorate, Delta zone) and the maximum value is 98 % for the firm 199 (yarn, Qalyubia governorate, Delta zone). The mean TE for the second model with the SCV is 84% with the minimum 68% and the maximum 99%.

However, the mean TE for the DEA input-orientation method without the SCV model is 89% wherein the minimum value is 76% for firms 102 (fabrics firm, Sharqia governorate, Canal zone) and 243(fabrics firm, Qalyubia governorate, Delta zone) and the maximum value for fully efficient firm 46 is one (weaving firm, Beheira governorate, Alex zone). Values of the second model with the SCV are 92% for mean TE, 81% for the minimum and one for the maximum. For the DEA output-orientation the mean TE without the SCV is 88% and the minimum value is 79% for the firm 102 (fabrics, Sharqia governorate, Canal zone) and the maximum value is one for firm 46 (weaving firm, Beheira governorate, Alex zone) and the model with the SCV is 91%, the minimum is 80% and the maximum is one. It is clear that firms' efficiency scores with the SCV increase in a variable range from 3% to 17% reliant on firm's responses to the supply chain factors. Moreover, the TE scores for the SFA translog and the SFA Cobb-Douglas are not varying significantly between the two methods.

Regression results for the textile private firms with the SFA translog show that the size, age, GB, B and EXR are insignificant and detailed results are explained in chapter 3. The SFA Cobb- Douglas results coincide with SFA trans-log technique wherein the size, age, GB, G and

EXR coefficients are also insignificant and the results in details are exposed in chapter 4. The DEA input and output orientation results exhibit that the size, age; B, GB and EXR are insignificant. Also, the DEA detailed results are shown in chapter 5.

6.2.3 Apparel private firms

The mean TE for the apparel private firms via the SFA translog technique is 97%, the minimum value for firms 133 and 138 (underwear, Sharqia governorate, Canal zone), (apparel, Sharqia governorate, Canal zone) are 95% and the maximum value is 99% for the firm 246 (apparel, Qalyubia governorate, Delta zone). The mean TE for the second model with the SCV is 98%, the minimum is 98% and the maximum is 99.5%.

The mean TE for the SFA Cobb-Douglas method for the private apparel firms is 99% where the minimum value is 99% for the firm 133 (underwear, Sharqia governorate, Canal zone) and the maximum value is 99 % for firm 246 (apparel firm, Qalyubia governorate, Delta zone). Results for the second model with the SCV match results without the SCV.

The mean TE for the DEA input-orientation method without the SCV is 82%, the minimum value is 70% for the firm 235 (apparel, Qalyubia governorate, Delta zone) and the maximum value is one for the full efficient firm 246 (apparel, Qalyubia governorate, Delta zone). The mean TE for the second model with the SCV is 89%, 77% for the minimum and one for the maximum. For DEA output-orientation the mean TE without the SCV is 81% with the minimum value is 71% for firm 79 (apparel, Alex governorate, Alex zone) and the maximum value is one for the firm 246 (apparel, Qalyubia governorate, Delta zone) and the mean TE DEA model with the SCV is 91% with the minimum 80% and the maximum one. In the same direction, firms' efficiency scores with the SCV increase in a variable range from 3% to 17 % relying upon each firm's responses to the supply chain factors and whether the weakness in one factor or more. The TE scores for the SFA trans-log and the SFA Cobb-Douglas also do not vary between methods.

Regression results for the apparel firms with the SFA translog illustrate that the size, age and GB are insignificant whereas the B and EXR are significant. Detailed results are explained in chapter 3. The SFA Cobb-Douglas results also agree with the SFA translog technique wherein the size, age and GB are also insignificant while the B and EXR coefficients are significant and results in details are publicised in chapter 4. The DEA input-orientation and output-orientation regression results show that the size, age, GB coefficients are insignificant but, the B and EXR are significant and detailed results are described in chapter 5.

6.2.4 Public sector firms

The mean TE for the public firms through the SFA translog technique is 83%, the minimum value is 14% for firm 5 (Beheira 2001, Behera governorate, Alex zone) and 15% for firm 11 (Dakahlia 2001, Dakahlia governorate, Delta zone) and the maximum value is 99% for firm 2 (Alex 2008, Alex governorate, Alex zone). The mean TE for the second model with the SCV is 98%, the minimum is 83% and the maximum is 99.5%.

The mean TE for the public firms though the SFA Cobb-Douglas method is 84%, the minimum value is3% for firm 5 (Beheira 2001, Behera governorate, Alex zone) and9% for firm 11 (Dakahlia 2001, Dakahlia governorate, Delta zone) and the maximum values are 99 % for firms 2 (Alex 2008, Alex governorate, Alex zone) and firm20 (Port Said 2008, Port Said governorate, Alex zone). The mean TE for the model with the SCV is 97%, the minimum is 80% and the maximum is 99.5%.

The mean TE for the DEA input-orientation method without the SCV model is 95%, the minimum is 84% for firm 5 (Behera 2001, 2002 and 2003, Beheira governorate, Alex zone) and the maximum value for full efficient are firms 20 (Port Said, 2007, 2008, Port Said governorate, Alex zone), firm 18(Qalyubia 2001, Qalyubia governorate, Delta zone) and firm12 (Ghazel El-Mahalla 2004- 07, Gharbia governorate, Delta) and the values for second model with the SCV

are 97% for the mean TE, 87% for the minimum and one for the maximum. For the DEA output-orientation the mean TE without the SCV is 92% and the minimum value is 41% for firm 5 (Behera 2001, 2002 and 2003, Beheira governorate, Alex zone) and the maximum firms are 8 (Sharqia 04- 07, Sharqia governorate, Delta zone) and firm12 (Ghazel El-Mahalla 04-06, Gharbia governorate, Delta). The mean TE for the DEA model with SCV is 94%, the minimum is 46% and the maximum is one. It is clear that firms' efficiency scores with the SCV increase in a significant way from 5% to 70 for the SFA techniques subject to firm's responses to the supply chain factors; planning, sourcing, delivery and inventory & returns system since these factors play a major role in efficiency improvements. Moreover, the TE scores for the SFA translog and SFA Cobb-Douglas are not varying significantly between the two methods.

Regression results for the public sector firms with the SFA translog exhibit that the size, age, GB, B and EXR are significant and detailed results are clarified in the chapter 3. The SFA Cobb-Douglas results also show that the size, age, GB, B and EXR are significant and results in details are shown in the chapter 4. The DEA input-orientation and output-orientation regression results also display that the size, age, GB, B and EXR are significant. Detailed regression results are also explained in the chapter 5.

To conclude, the mean TE scores for the private firms (the T&A, the textile and the apparel firms) via the SFA translog technique and the SFA metafrontier technique show that the efficiency scores are matched and the mean technical efficiency for the DEA technique is not varied significantly where changes between the DEA and other techniques are different from 6% for the private units to 12% for the public units according to each unit response to the supply chain factors. These changes are expected since the DEA is a non-parametric technique and firm's deviation from the frontier is only attributed to inefficiency whereas for the SFA technique any deviation from the frontier is ascribed to random shocks (v_{it}) and the inefficiency

(u_{it}) and this explain the slight differences in efficiency scores between the two techniques. Similarly, regression analysis for the SFA techniques coincides.

For the public sector units, the mean TE for the SFA techniques also coincide with only differences in the minimum values and this is expected since the translog technique is a generalisation of the Cobb-Douglas production function and therefore calculations are varied. However, inefficient and efficient firms are still the same. Additionally, the public units (v_{it}) variances are very high (random shocks part) comparing with (u_{it}) variances and also relative to the private sector firms where (v_{it}) variances and (u_{it}) variances gaps for the private firms are not high and this explains why the impact of the random shocks are clear for the public units. It is also clear that the impact of factors affecting supply chain operations plays a major role in improving public firms' efficiency particularly inefficient ones. For instance, Beheira governorate firms show the lowest efficiency scores among the public firms without applying the SCV whereas after applying the SCV Beheira firms' efficiencies are raised by 40% to 70%. Moreover, it is clear that most of public firms' problems are due to random shocks problems such as outdated machinery, financial problems, overstaffed problems (the imbalance between white and blue collar employees). Regression analysis for the public units shows that B, GB and EXR are significant for all techniques and this agrees with the economic sense. Thus, to improve efficiency and then performance in the public firms, factors affecting supply chain operations should be fulfilled.

From this provided analysis, it is clear that public sector firms in general have worse performance than private units. This low performance is due to two main problems; the first is the problem of management & structure of the firm and the second is the production environment. Therefore, there is a great concern to follow two strategies; the first is to design programmes include changes to the management and structure of the firm. In other words,

activating the role of factors affecting supply chain operations (Industrial planning, marketing planning, sourcing process of obtain raw materials, delivery system and controlling and managing stock and returns). The second strategy is to improve the production environment because the public units are also suffering from production environment problems. Therefore, there is also a great concern to design programs involve changes to the production environment due to the restrictions derive from the lack of economic infrastructure, access to markets, access to finance, poor infrastructure conditions and other factors affect the production environment.

A merger policy may be used as an effective solution for the problem of low performance at public units. From public firms results, it is clear that Beheira governorate companies has the lowest efficiency scores, thus merging those five companies (Sebaghi El Beda, Synthetic Silk Kafr El Dawwar, El Mahmoudia and Kum hamada companies) in one great entity will be helpful to overcome their problems of overstaffed, outdated machinery, and other financial issues and to enhance their performance.

Chapter 7

Summary and conclusions

7.1 Summary

This thesis measured the technical efficiency for the Egyptian textile and apparel industry in both private and public firms as a case study. The two approaches used for measuring technical efficiency are the SFA and the DEA. The SFA technique in a translog form with time varying panel is utilised for the overall data that cover given inputs and obtained outputs, then the main factors affecting the supply chain operations are added to the model to examine their impact on the efficiency scores. Afterwards, The SFA and the DEA metafrontier techniques are employed to obtain fitting benchmark for firms operating under different technologies, ownership type, etc. by grouping firms which have similar characteristics into a separate group frontier for each region against a single metafrontier applied to the all groups.

Chapter 1 gives an outline of the performance theoretical background. Brief notes are given for the origin of DEA and SFA techniques. Then, the textile and the apparel empirical studies are covered.

In chapter 2, the industry supply side is described in details wherein it covers all factors affect the industry inputs such as direct and indirect costs because cost is one of the crucial factors for the industry to compete in both local and global markets. It also covers the governmental barriers and the industrial policy as main factors affect the industry supply side. Chapter 2 also deals with the industry demand side which it covers agreements and provisions rule the textile and the apparel exports with the global markets whether they are bilateral or multilateral agreements such as QIZ, ROO, GAFTA and COMESA agreements.

Chapters 3, 4, 5 and 6 predict the technical efficiency for the Egyptian T&A industry. In order to obtain this, three techniques are used. In chapter 3, the technical efficiency for the T&A, the textile, the apparel private firms and the public units are estimated using the SFA translog form for the primary model then a modified model with the supply chain variables is predicted. After obtaining efficiency scores, the measured level of the technical efficiency is regressed as a dependent variable against firm's size, age, governmental barriers, bureaucracy and exchange rates as regressors to examine their impact on efficiency.

In Chapter 4, the SFA metafrontier technique is used for estimating the regional technical efficiency, the metafrontier technical efficiency TE* and the technology gap ratio TGR for the T&A private sector units and the public sector units without and with the supply chain variables then the metafrontier TE* values are regressed as the dependent variable against regions, firm's size, age, governmental barriers, bureaucracy and exchange rates as the independent variables.

In chapter 5 the DEA metafrontier method via input-orientation and output-orientation is estimated and same procedures are followed also to estimate the regional technical efficiency, the metafrontier technical efficiency TE* and the technology gap ratio TGR without and with the supply chain variables. Efficiency scores are regressed as regresand in contrast to regions, size, age, governmental barriers, bureaucracy and exchange rates as regressors.

Chapter 6 gives the summary of the achieved results from the empirical studies for the Egyptian T& A, the textile sector, the apparel sector and the public sector units since analysing obtained results helps in improving industry performance.

7.2 Conclusions

The thesis is set out to measure the technical efficiency for the Egyptian T&A industry in the private and the public units via the SFA and the DEA methods. Owing to the differences between two approaches, the two methods can give very different estimates for some, or all, of the units in the analysis. The relative performance of the approaches has been shown to be reliant on the nature of the underlying data set (i.e. the nature of the returns to scale of the production frontier, the level of random noise in the data, etc.). It has been shown throughout this thesis (see in table 6-1) that the mean technical efficiency between the SFA and the DEA is roughly the same for the private units. For the public sector units, the mean TE for the SFA technique is lower than the mean TE for the DEA due to the impact of random shocks (noise) is very high in the public units (overstaffed problem, outdated machinery, financial problem, etc.) as explained in chapter 3.

It is noticeable that the results from the two methods are roughly similar; hence it is possible to say that both methods are likely to be giving good estimates of the true efficiencies. But when the units are given very different efficiency estimates under the two methods are in specific regions of the technology, then stronger conclusions can be drawn. And the image is clear for the public units when assessed against the metafrontier. It is also clear at regional level that the contribution of the labour productivity in the public sector in Delta and Alex regions is lower than Cairo &UP region (as in chapter4).

The impact of the factors affecting supply chain operations is also very clear in improving efficiency scores especially for the public units. Empirical results show a great impact of the planning factor with its components; the industrial and the marketing planning

and also the impact of the inventory and the returns factor. This is may be ascribed to most of the public units are suffering from the problems of overstaffing in some sectors and shortages in others, imbalance between blue and white collars employees, inefficiency in controlling and reducing inventory and returns and the impact of the random shocks such as strikes which cause loses and affect firms' creditability with clients and in markets, the outdated machinery and limits set on firm's managers to follow their own strategies since general strategies such as machinery upgrades, raw materials purchasing orders, products pricing, and financial issues are done through the holding company not as each firm policy and its priorities. However, the private units are efficient in utilising technology and controlling supply chain factors.

The proposals for enhance the industry performance are to get rid of main obstacles facing the public sector (as shown in chapters 2 and 3) such as overstaffed, outdated machinery, unskilled labour, governmental ignorance, extending and maximising the use of the man-made fibres with natural fibres and spread out the use of the technical textiles. Improving and enhancing the public sector units will lead to provide the apparel sector with cheap and high quality raw materials and then improve the industry competitiveness locally and globally.

One direction for future research would be to extend this work to the manufacturing sector (food processing, chemicals, rubber, plastic and related products, Steel, Iron and metal products, porcelain, ceramics, etc.) to examine the impact of the technology differences, the ownership type and factors affecting supply chain operations on manufacturing sector. Additionally, further research will commence to implement the same methodology on the total factor productivity to detect the impact of factors influence the supply chain operations on productivity.

Appendix1

Managers and executives interviews

Survey for Textile and Apparel Industry in Egypt

Managers and Executives interviews

In Confidence

- Here are some questions for you to answer on your own.
- We are interested in honest answers.
- Your answers will be treated in self-confidence.
- Most answers can be answered via ticking the box. ☑
- Ask the interviewer for help if you do not understand a question or are not sure what to do.
- Answering questions is optional and there is no obligation.

Thank you for taking part in this survey

Company name: _____ City: (10-17)_____

Public (1) ☐ Private (2) ☐ Date: _____

Activity: (Yarn (3) / Weaving (04)/ Dyeing& finishing (5)/ Home furnishing (6)/ Fabrics (7)

Apparel (8)/Knitting fabrics (9)/ others (10) _____

F300

1. How many workers does the company have?

1-10	11-20	21-50	51-100	101-500
☐	☐	☐	☐	☐

501-1000	1001-5000	5001-10000	10001-20000	> 20000
☐	☐	☐	☐	☐

2. What is the type of ownership?

Individual	Family	Persons	Corporate
☐	☐	☐	☐

3. For first three types; do owners contribute only on administrative works?

Yes (Go to Q5) ☐ No ☐

4. If no, do they have any payments for their work?

Yes ☐ No ☐

5. Do firm's owners have any education level?

Yes ☐ No (Go to Q7) ☐

6. If yes, which type of education is she/he/ they obtained?

Primary	Preparatory	Secondary	Higher education
☐	☐	☐	☐

7. Does the owner have any experience in operating the firm?

Yes ☐ No (Go to Q9) ☐

8. If yes, how many years of experience do you have?

Less 2	2-5	6-10	11-15	16-20	21-30	>30
☐	☐	☐	☐	☐	☐	☐

9. Does the firm follow regular tax payments?

Yes ☐ No ☐

10. What is the age of the firm?

Less 5 years ☐ 5-10 ☐ 11-15 ☐ 16-20 ☐ 21-25 ☐ 26-30 ☐ >30 ☐

11. Does the firm have problems in access to finance?

Yes ☐ No ☐

12. How can it get money for expanding or machinery upgrading?

Family ☐ Banks ☐ Profits ☐ Retailers ☐

F310: Planning

13. What is the age of machinery in the firm?

Less 5 years ☐ 5-10 ☐ 11-15 ☐ >15 ☐

14. Does the firm follow regular maintenance system?

Yes ☐ No ☐

15. Does it have the ability to respond to fluctuations in demanded quantities (increasing or decreasing)?

Yes ☐ No ☐

16. For increasing demand, how can firm respond?

Expanding capacity ☐ manufacturing outside ☐

17. Do retailers or consumers orders are satisfied according to planned production schedules?

Yes ☐ No ☐

18. Does the firm face the problem of having underutilised capacity or overstretched capacity?

Yes ☐ No ☐ (Go to Q20)

19. If yes, how can it deal with each situation?

1- _____

2- _____

3- _____

4- _____

20. Does firm's industrial planning include machinery upgrading?

Yes ☐ No ☐

21. Does the firm follow industrial planning to satisfy retailers' requirements (deliver orders in leading time)?

Through:

a- Managing production process ☐

b- Solving any problems affecting production process? ☐

c- Both ☐

22. Does the firm have information about market demand from retailers or customer?

Yes ☐ No ☐

23. Does it have the ability of high response to frequent changes in global fashion and style including firm's flexibility to respond to changes in colours, models and features?

Yes ☐ No ☐

24. Does the firm have a marketing plan for selling its products?

Yes ☐ No ☐ (Go to Q25)

25. If yes, does marketing plan include the following?

a- Knowing firm's product ☐

b- Setting right prices ☐

c- Using right communication channels with retailers and consumers. ☐

26. Does firm's prices are competitive comparing with prices offered in domestic and international markets?

Yes ☐ No ☐

27. Does its production is dedicated to domestic, international market or both markets?

Domestic ☐ International ☐ Both ☐

28. What is the share of each market?

Domestic ☐ International ☐

F320: Sourcing

29. Does the firm have the ability to get credit or pay by instalments for its purchases of raw material and accessories?

Yes ☐ (Go to Q31) No ☐

30. If no, does inability have an impact on its ability to compete?

Yes ☐ No ☐

31. Does the credit obtained from raw materials suppliers have influential effect on product costs?

Yes ☐ No (Go to Q33) ☐

32. If yes, is there any ability for buying inputs for cash to reduce production costs?

Yes ☐ No ☐

33. Does the firm have any problems with local raw materials accessibility and their quality?

Yes ☐ No (Go to Q35) ☐

34. If yes, what are main complaints?

1- _____

2- _____

3- _____

4- _____

35. Does the quality of local raw materials are good?

Yes ☐ No ☐

36. Does the firm have any problems with imported raw materials accessibility and their quality?

Yes ☐ No ☐

37. Does the quality of imported raw materials are good?

Yes ☐ (Go to Q 39) No ☐

38. If no, what are their main problems?

1- _____

2- _____

3- _____

39. Is there any need for imported raw materials?

Yes ☐ No ☐

40. Does government regulations affect the efficiency of local or imported raw materials (incentives, duties, tariffs)?

Yes ☐ No ☐

F330: Production process

41. Does skilled labour help managers to operate firm efficiently?

Yes ☐ No ☐

42. What are the numbers of labour categories in the firm?

Primary workers	Hands	Technicians	Employee	Senior executive

43. Does firm's labour is efficient?

Yes ☐ No ☐

44. Does the firm follow any type of encouragement for skilled labour?

Yes ☐ No ☐

45. Are managers /owners actions or behaviour affect labour's loyalty towards company?

Yes ☐ No ☐

46. Is there any impact for operating environment on labour productivity? (Non-financial factors)

Yes ☐ No ☐

47. What is the ratio of workers' movement form the firm to others?

Less 5% ☐ 5-10% ☐ > 10% ☐

48. Does the firm have separate department for product design?

Yes ☐ No ☐

49. Does the firm apply any type of quality control?

Yes (Go to Q51) ☐ No ☐

50. If no, how can it deal with quality issues?

1- _____

2- _____

3- _____

F340: Delivery System

51. Does the firm deliver orders within the lead time?

Yes (Go to Q53) ☐ No ☐

52. If no, is it due to inefficient infrastructure system?

Yes ☐ No ☐

53. Does Egyptian transportation cost is competitive compared with other countries?

Yes ☐ No ☐

54. Does the service in general is good?

Yes ☐ No ☐

55. Does the firm itself have an efficient transportation system to satisfy production process and to deliver final products?

Yes ☐ No ☐

56. Do transportation cost and transportation service affect the production process?

F350: Returns System

57. Does the firm have a clear strategy to deal with returns?

Yes ☐ No ☐

58. Does these returns due to domestic or international market?

Domestic ☐ International ☐

59. If returns from international markets, Does it have an impact on firm's position in global market or for its retailers?

Yes ☐ No ☐

60. Does the firm take into account the cost of ironing and packaging of returns?

Yes ☐ No ☐

61. Does the firm make loses form the difference between their original prices and their return prices taking into account the cost of re-ironing and repackaging?

Yes (Go to Q 62) ☐ No ☐

62. If yes, does it follows, any accountancy manipulation to manage it on its costs ?

Yes ☐ No ☐

Appendix 2

Arabic managers and executives interviews

قائمة استقصاء حول قياس الكفاءة الانتاجية لصناعة المنسوجات والملابس الجاهزة فى مصر

أسئلة مقابلة الشركة

Ibrahim Elatroush

مسح إحصا ئى عن قياس الانتاجية فى قطاع الغزل والنسيج والملابس فى مصر

سرى وخاص

تحتوى هذة الاستمارة على بعض الأسئلة للاجابة عليها

يوجد إهتمام بإجابتك بطريقة واضحة وصريحة

إجابات الأسئلة خاصة بموضوع البحث ولن يتم إعطائها لأى جهة أو أى شخص أخر

☑ معظم الأسئلة يمكن الاجابة عليها عن طريق وضع علامة داخل الصندوق

فى حالة عدم فهم السؤال أو غير متأكد من الاجابة يمكنك سؤال مجرى المقابلة

شكرا جزيلا لتعاونكم فى إنجاز هذا المسح الاحصائى

قطاع : عام(01) /خاص (02) _____

المدينة (7- 13) _____

النشاط :(غزل (03)– نسيج (04)– ملابس(05)- (06) مفروشات منزلية _____

F 300

١ – ماهو عدد العمالة فى الشركة ؟

174

١ - ١٠	١١ - ٢٠	٢١-٥٠	٥١-١٠٠	١٠١ - ٥٠٠
1	2	3	4	5

٥٠١ - ١٠٠٠	١٠٠١ - ٥٠٠٠	٥٠٠١ - ١٠٠٠٠	١٠٠٠١ - ٢٠٠٠٠	٢٠٠٠٠<
6	7	8	9	10

٢- ما هو نوع الملكية ؟

175

فردى	عائلى	أشخاص	مساهمة
1	2	3	4

٣- هل يساهم الملاك فى الادارة فقط فى حالة التقسيمات الثلاث الأولى ؟

176

نعم	لا إذهب إلى (٤)
1	2

٤- إذا ,هل هناك مقابل نظير المساهمة فى العملية الانتاجية ؟

177

نعم	لا
1	2

٥- بالنسبة للمالك، هل هناك مؤهل دراسى تم الحصول عليه ؟

178

نعم إذهب إلى (٦)	لا
1	2

٦- إذا، أى مؤهل؟

179

إبتدائى	إعدادى	ثانوى	جامعى أو أعلى
1	2	3	4

٧- هل للمالك سابق خبرة فى أعمال إدارة المنشأة ؟

180

نعم إذهب إلى (٨)	لا
1	2

٨- ما هو عدد سنوات الخبرة ؟

181 أقل من ٢	٢ - ٥	٦- ١٠	١١-١٥	١٦- ٢٠	٢١ - ٣٠	٣٠ <
1	2	3	4	5	6	7

٩- ما هو عمر الشركة 182 ؟

أقل من ٥ سنوات	٥ - ١٠	١١- ١٥	١٦- ٢٠	٢١ - ٢٥	٢٦- ٣٠	٣٠ <
1	2	3	4	5	6	7

١٠- هل يتم سداد الضرائب بطريقة منتظمة ؟

183نعم	لا
1	2

١١- هل تجد الشركة صعوبة فى الحصول على تمويل ؟

184نعم إذهب إلى (١٢)	لا
1	2

١٢- إذا , ماهى الطرق الأخرى للحصول على التمويل اللازم للتوسع أو تحديث الآلات ؟

185 ذاتي	عائلي	أرباح محتجزة	تمويل من البائعين
1	2	3	4

F310

١٣- ما هو عمر الآلات في الشركة ؟

186أقل من ٥ سنوات	٥ - ١٠	١١- ١٥	١٥ <
1	2	3	4

١٤- هل تتبع المنشأة نظام دورى لصيانة الآلات و المعدات ؟

187نعم	لا
1	2

١٥- هل تحصل المنشأة على تسهيلات عند شرائها الخام المواد ومستلزمات الانتاج ؟

188نعم	لا إذهب إلى (١٦)
1	2

١٦- وهل يؤثر ذلك على قدرتها التنافسية ؟

189نعم	لا
1	2

١٧- هل يساهم الشراء الآجل للمواد الخام و مستلزمات الانتاج فى زيادة تكلفة الانتاج ؟

190نعم إذهب إلى (١٨)	لا
1	2

١٨- إذا ,هل هناك امكانية لشراء الخامات نقدا وخفض تكلفة الانتاج ؟

191نعم	لا
1	2

١٩- هل تحصل الشركة على معلومات عن طلب السوق من خلال التجار أو المستهلكين ؟

192نعم	لا
1	2

٢٠- هل لدى الشركة سرعة إستجابة للتغيرات المستمرة فى الموضة (مرونة الاستجابة للتغيرات فى الموديلات

- الألوان – الخصائص النسجية ؟

193نعم	لا
1	2

٢١- هل لدى الشركة سرعة استجابة للتقلبات فى الكميات المطلوبة سواء بالزيادة أو النقصان ؟

194نعم	لا
1	2

٢٢- كيف تستجيب الشركة للطلبيات الزائدة ؟

195 توسيع الطاقة الانتاجية	التصنيع خارج الشركة
1	2

٢٣- هل لدى الشركة خطة تسويقية لمنتجاتها ؟

196نعم إذهب إلى (١٨)	لا
1	2

٢٤- 197 هل تشتمل تلك الخطة التسويقية على الأتى :

١- تعريف بمنتجات الشركة.	1	٢-نظام تسعير سليم	2
٣- إستخدام قنوات إتصال ملائمة مع التجار و المستهلكين.	3	٤- جميع ماسبق	4

٢٥- هل أسعار الشركة تنافسية بالنسبة لاسعار السوق المحلى والسوق الخارجى ؟

198نعم	لا
1	2

٢٦- هل إنتاج الشركة مخصص للسوق المحلى والسوق الخارجى ؟

199محلى	خارجى	كلاهما
1	2	3

٢٧- ما هى حصة كل سوق ؟

200محلى	خارجى
1	2

٢٨- هل يتم إستيفاء طلبات التجار و المستهلكين وفقا لجداول إنتاج زمنية ؟

201 نعم	لا
1	2

٢٩- هل تواجه الشركة مشكلة وجود طاقات عاطلة أو طاقات فائضة ؟

202 نعم إذهب إلى (٣٠)	لا
1	2

٣٠- 203 إذا ، كيف تتعامل الشركة مع الطاقات العاطلة ؟

١ - التشغيل لحساب الغير [1] ٢- تقليل عدد الورديات [2]

٣١- وفى حالة وجود طلبيات زائدة ، كيف يتم تلبية تلك الطلبيات ؟ عن طريق

١ - التصنيع لدى الغير [1] ٢-زيادة خطوط الا نتاج [2]

٣٢- 204هل تتبع الشركة نظام التخطيط الصناعى لاستيفاء متطلبات المستهلكين فى التوقيت المناسب ؟ عن طريق :

١ - إدارة العملية الانتاجية بطريقة سليمة . [1]

٢- حل أى مشاكل تؤثر على العملية الانتاجية . [2] ٣- كلاهما [3]

٣٣ - هل يشتمل التخطيط الصناعى للمنشأة على تحديث الآلات ؟

205 نعم	لا
1	2

F320

٣٤- هل تواجه الشركة صعوبة فى الحصول على المواد الخام المحلية ؟

206 نعم إذهب إلى (٣٥)	لا
1	2

٣٥- إذا , ما هى أهم تلك الصعوبات ؟ 207

١ - _____

٢- _____

٣٦- هل تواجه الشركة مشاكل أو إختناقات فى مرحلة التصنيع (عملية الغزل - النسج - الصباغة - التجهيز) ؟

208 نعم [1] لا [2]

٣٧-- هل نوعية الخامات المحلية جيدة ؟

209نعم [1] لا إذهب إلى (٣٨) [2]

٣٨- إذا , فما ما هى أهم العيوب ؟ 210

١ - _____

٢- _____

٣- _____

٣٩- هل تواجه الشركة أى صعوبات فى الحصول على المواد الخام المستوردة ؟

211 نعم إذهب إلى (٤٠) [1] لا [2]

٤٠- إذا , فما هى تلك الصعوبات ؟ 212

١ - _____

٢- _____

٣- _____

٤١- هل نوعية الخامات المستوردة جيدة ؟

213 نعم [1] لا إذهب إلى (٤٢) [2]

٤٢- إذا , فما هى أهم العيوب ؟ 214

١ - _____

٢- _____

٣- _____

٤٣- هل هناك حاجة للمواد الخام المستوردة ؟

215 نعم إذهب إلى (٤٤) [1] لا [2]

٤٤- هل ذلك راجع لجودة أو رخص الخامات المستوردة ؟

216 نعم	لا
1	2

٤٥ ضرائب – - هل تؤثر اللوائح الحكومية على كفاءة أو أفضلية الخامات المحلية أو المستوردة عن طريق: حوافز- تعريفةجمركية؟

217 نعم	لا
1	2

F330

٤٦ - هل العمالة الماهرة تسهل مهمة المديرين فى تشغيل و إدارة الشركة بكفاءة ؟

218 نعم	لا
1	2

٤٧- ما هى أعداد كل تصنيف من العمالة فى الشركة ؟

219	عمالة أولية	مناولة	عمالة فنية	موظفين	مديرى تنفيذ
	1	2	3	4	5

٤٨- هل عمالة الشركة كفؤة ؟

220 نعم	لا إذهب إلى (٤٩)
1	2

٤٩- إذا من وجهة نظرك، أى من تلك التصنيفات غير كفؤ؟

221	عمالة أولية	مناولة	عمالة فنية	موظفين	مديرى تنفيذ
	1	2	3	4	5

٥٠-هل تتبع الشركة أى نوع من التشجيع للعمالة الماهرة ؟

222 نعم	لا
1	2

٥١- هل يؤثر سلوك أو تصرفات المديرين على ولاء العمالة للشركة ؟

223 نعم	لا
1	2

٥٢- هل هناك تأثير لبيئة العمل على إنتاجية العامل ؟ (العوامل غير المالية)

224 نعم [1]　　لا [2]

٥٣- هل هناك قرارات إدارية تتخذ تجاه العمالة فى حالة عدم وجود طلبيات وهل هناك أجازات إجبارية ؟

225 نعم [1]　　لا [2]

٥٤- هل هناك تأثير لتلك الاجازات أو الراحات الاجبارية علي ولاء العمالة للشركة ؟

226 نعم [1]　　لا [2]

٥٥- ما هى نسبة تحركات أو تنقلات العمالة من الشركة لشركات أخرى ؟

227　أقل من ٥ % [1]　　٥ - ١٠ % [2]　　>١٠% [3]

٥٦- هل لذلك تأثير على الانتاجية الكلية للشركة ؟

228 نعم [1]　　لا [2]

٥٧-هل يوجد فى الشركة قسم مستقل لتصميم الانتاج ؟

229 نعم [1]　　لا [2]

٥٨- هل تطبق الشركة أى نوع من الرقابة على الجودة ؟

230نعم [1]　　لا إذهب إلى (٥٩) [2]

٥٩- 231 إذا ,كيف تتحكم الشركة فى عملية الرقابة على الجودة ؟

١ - _____

٢- _____

٣- _____

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٦٠- هل لدى الشركة مرتجعات نتيجة أى مشاكل أو تأخير فى عملية الشحن ؟

23 نعم إذهب إلى (٦١) [1]　　لا [2]

٦١- 233 إذا , كيف تتغلب الشركة على تلك المشاكل ؟

١ - _____

٢- _____

٣- _____

٦٢- هل تقوم الشركة بتوصيل طلبيات العملاء فى الوقت المناسب ؟

234نعم	لا إذهب إلى (٦٣)
1	2

٦٣- إذا , هل هذا راجع كفاءة لعدم البنية الأساسية من طرق و مواصلات ؟

235 نعم	لا
1	2

٦٤-هل تكلفة النقل فى مصر تنافسية بالمقارنة مع الدول الأخرى ؟

236 نعم	لا
1	2

٦٥- هل خدمة النقل بصفة عامة جيدة ؟

237 نعم	لا إذهب إلى (٦٥)
1	2

٦٦- 238 إذا , فما هى أهم المشاكل التى تواجه المنتجين فيما يتعلق بنظام النقل ؟

١ - _____

٢- _____

٣- _____

٦٧- هل الشركة لديها نظام نقل كفؤ لاستيفاء متطلبات الشركة من المواد الخام و توصيل الطلبات للعملاء؟

239 نعم	لا
1	2

٦٨- من وجهة نظرك، هل لتكلفة وخدمة النقل أثر على تكلفة المنتج وكفاءة العملية الانتاجية ككل ؟

240 نعم	لا
1	2

٦٩- هل لدى الشركة إستراتيجية واضحة للتعامل مع المرتجعات ؟

241 نعم	لا إذهب إلى (٧٠)
1	2

٧٠- 242 إذا ,كيف تتعامل الشركة مع تلك المرتجعات ؟

١ - _____

٢- _____

٣- _____

٧١- هل تلك المرتجعات من السوق المحلى أم السوق ا لخارجى ؟

243 محلى [1] خارجى [2]

٧٢ - إذا كانت المرتجعات من السوق ا لخارجى , هل لذلك تأثير على وضع الشركة بالنسبة لموزعيها ؟

244 نعم إذهب إلى (٧٣) [1] لا [2]

٧٣- 245 إذا , كيف تتغلب الشركة على تلك المشاكل ؟

١ - _____

٢- _____

٣- _____

٧٤- هل تأخذ الشركة فى الحسبان تكلفة إعادة كى و تكييس المرتجعات ؟

246 نعم [1] لا إذهب إلى(٧٣) [2]

٧٥- و هل تحقق الشركة خسائر من الفرق بين السعر الأصلى للمنتج و سعر بيعه كمرتجع ؟

247نعم [1] لا [2]

٧٦- إذا كانت الاجابة بنعم ,هل هناك معالجة محاسبية لاضافة تلك الخسائر على تكلفة المنتج ؟

248 نعم [1] لا [2]

Appendix 3

Labours questionnaire

Survey for Textile and Apparel Industry in Egypt

Labour's Questionnaire

In Confidence

- Here are some questions for you to answer on your own.
- We are interested in honest answers.
- Your answers will be treated in self-confidence.
- Most answers can be answered via ticking the box. ☑
- Ask the interviewer for help if you do not understand a question or are not sure what to do.
- Answering questions is optional and there is no obligation.

Thank you for taking part in this survey

Company name: _____ City: (10-17) _____

Public (1) _____ Private (2) _____ Date: _____

Activity: (Yarn (3) / Weaving (04)/ Dyeing& finishing (5)/ Home furnishing (6)/ Fabrics (7)

Apparel (8)/Knitting fabrics (9)/ others (10) _____

1. What is your gender?

Male ☐ Female ☐

2. What is your age?

Less 15 ☐ 15-20 ☐ 21-30 ☐ 31-40 ☐ > 40 ☐

3. What type of education you have?

No education ☐ Primary ☐ Preparatory ☐ Secondary ☐ Higher education ☐

4. Which types of labour categories you follow?

Primary workers ☐ Hands ☐ Technicians ☐ Employee ☐ Senior executive ☐

5. Did you have any type of experience?

Yes ☐ No (Go to Q7) ☐

6. If yes, how many months you were in the firm?

Less 6 months ☐ 6-12 ☐ 13-24 ☐ 25 -36 ☐ >36 ☐

7. How many machines can you use?

1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ >5 ☐

8. Are there any programmes used to enhance your skills?

Yes ☐ No ☐

9. Are there any programmes or practices used to enhance the whole labour skills?

Yes ☐ No ☐

10. What type of salary you follow?

By Production	Fixed salary	Variable salary
☐	☐	☐

11. What is your satisfaction concerning your salary?

Strongly satisfied	Satisfied	Fair	Dissatisfied	Strongly dissatisfied
☐	☐	☐	☐	☐

12. What is your general satisfaction towards the company?

Strongly satisfied	Satisfied	Fair	Dissatisfied	Strongly dissatisfied
☐	☐	☐	☐	☐

13. Is the relationship between you and owners or managers affected on your productivity? (Encouragement)

Yes	No
☐	☐

14. Do managers' actions or behaviours affect your loyalty towards company?

Yes	No
☐	☐

15. Is there any impact for operating environment on your productivity? (Non- financial factors)

Yes	No
☐	☐

16. What are the factors you think that they have an impact on your productivity except salary?

1 _____

2 _____

3 _____

17. What is the impact of management decisions concerning off-peak work circumstances on you? Is there any type of obligatory vacancies?

Yes	No
☐	☐

18. Is there any impact of these vacancies on your loyalty?

Yes ☐ No ☐

19. Did you prefer to stay on the firm or move to others that give higher salaries?

Yes ☐ No ☐

20. If no, what are other reasons encourage you to stay?

1 _____

2 _____

3 _____

21. Does machinery maintenance process happen regularly?

Yes ☐ No (Go to Q23) ☐

22. If yes, does it have an impact on enhance your productivity and performance?

Yes ☐ No ☐

23. Is the firm following the policy of providing sufficient inventory of accessories and production requirements (such as: thread, rubber, buttons, collars, .etc.) to not waste your time?

Yes ☐ No (Go to Q25) ☐

24. If yes; do these requirements have an impact on saving time and then enhance your productivity?

Yes ☐ No (Go to Q26) ☐

25. If yes; is there an impact on production process streamline and production process in general?

Yes ☐ No ☐

26. Are you insured?

Yes (Go to 28) ☐ No ☐

27. If no, does this due to your preference to add the money of insurance on your salary?

Yes (Go to 29) ☐ No ☐

28. If no, are there other reasons?

1 _____

2 _____

3 _____

4 _____

29. What are the main reasons you think that they affect directly on your productivity?

1 _____

2 _____

3 _____

4 _____

30. What are the indirect reasons influences on your productivity?

1 _____

2 _____

3 _____

4 _____

Appendix 4

Arabic labours' questionnaire

قائمة استقصاء حول قياس الكفاءة الانتاجية لصناعة المنسوجات والملابس الجاهزة فى مصر

استقصاء العمالة

Ibrahim Elatroush

مسح إحصا ئى عن قياس الانتاجية فى قطاع الغزل والنسيج والملابس فى مصر

سرى وخاص

تحتوى هذة الاستمارة على بعض الأسئلة للاجابة عليها

إجابتك للاسئلة هامة لموضوع البحث، من فضلك أجب بطريقة واضحة وصريحة

إجابات الأسئلة خاصة بموضوع البحث ولن يتم إعطائها لأى جهة أو أى شخص أخر

معظم الأسئلة يمكن الاجابة عليها عن طريق وضع علامة ☑ داخل الصندوق

فى حالة عدم فهم السؤال أو غير متأكد من الاجابة يمكنك سؤال مجرى المقابلة

شكرا جزيلا لتعاونكم فى إنجاز هذا المسح الاحصائى

الأسئلة المتعلقة بالعمالة

اسم الشركة : _____ التاريخ _____

قطاع : عام(01) /خاص (02) _____ المدينة _____

النشاط :(غزل (03)– نسيج (04)– ملابس(05)- مفروشات منزلية (06) (7-13) _____

١- النوع

115 ذكر	أنثى
1	2

٢- ماهى نسبة كل نوع فى الشركة تقريبا؟

116 ذكر	أنثى
1	2

٣ - أى فئة عمرية تتبع ؟

117 ١٥ - ٢٠	٢١ - ٣٠	٣١ - ٤٠	٤٠<
1	2	3	4

٤-هل أنت حاصل على أى مستوى تعليمى؟

118نعم	لا إذهب إلى (٦)
1	2

٥-- ما هو هذا المؤهل؟

119 إبتدائى	إعدادى	ثانوى	جامعى
1	2	3	4

٦- أى تصنيف من العمالة تتبع ؟

120 عمالة أولية	مناولة	عمالة فنية	موظفين	مديرى تنفيذ
1	2	3	4	5

٧- هل تعلم نسبة كل فئة ؟

121 عمالة أولية	مناولة	عمالة فنية	موظفين	مديرى تنفيذ
1	2	3	3	4

٨- ما هى الفترة التى قضيتها فى المنشأة ؟

122 أقل من ٦ شهور	٦ - ١٢	١٣ -٢٤	٢٥ - ٣٦	> ٣٦ شهر
1	2	3	4	5

٩- هل تجيد إستعمال الألات ؟

123 نعم	لا إذهب إلى (١١)
1	2

١٠- ما هى عدد الآلات التى تجيد استعمالها ؟

١ 124	٢	٣	٤	٥	٥ <
1	2	3	4	5	6

١١- هل يتم إستخدام سياسة المكافأة للعمالة المنتجة والخصم للعمالة المقصرة ؟

125نعم	لا
1	2

١٢- وهل لتلك الحوافز دور فى زيادة إنتاجيتك ؟

126 نعم	لا
1	2

١٣- ما هى أ نواع الحوافز المستخدمة معك ؟127

١ - _____

٢- _____

١٤- هل هناك برامج يتم استخدامها لتحسين مهاراتك ؟

128 نعم	لا
1	2

١٥- كيف يتم احتساب أجرك ؟

129 بالانتاجية	مرتب ثابت	مرتب متغير
1	2	3

١٦- وأى نوع من الأجر تفضل؟

130 بالانتاجية	مرتب ثابت	مرتب متغير
1	2	3

١٧- ما هو مستوى رضاك تجاه الشركة بصفة عامة؟

131راض تماما	راض	مقبول	غير راض	غير راض تماما
1	2	3	4	5

١٨- ما هو مستوى رضاك تجاه الأجر بصفة عامة؟

132راض تماما	راض	مقبول	غير راض	غير راض تماما
1	2	3	4	5

١٩- هل علاقتك بمديرك لها تأثير على إنتاجيتك (سياسات التشجيع) ؟

133نعم 1 | لا 2

٢٠- هل سلوك أو تصرفات المديرين أو الملاك يؤثر على ولائك تجاه الشركة ؟

134نعم 1 | لا 2

٢١- هل هناك تأثير لبيئة العمل على إنتاجيتك (العوامل غير المالية) ؟

135نعم 1 | لا 2

٢٢-هل هناك قرارات إدارية تتخذ تجاهك فى حالة عدم وجود طلبيات (أجازات إجبارية مثلا) ؟

136نعم 1 | لا 2

٢٣- وهل تؤثر تلك الأجازات أو الراحات الاجبارية علي ولائك تجاه الشركة ؟

137نعم 1 | لا 2

٢٤ -هل تعلم نسبة تحركات العمالة من الشركة لشركات أخرى ؟

138أقل من ٥ % 1 | ٥ - ١٠ % 2 | >١٠% 3

٢٥- هل صيانة الماكينات تتم بإنتظام ؟

139 نعم 1 | لا 2

٢٦- هل إجراء تلك الصيانة بصفة دورية تؤدى إلى تحسين أدائك وبالتالى إنتاجيتك ؟

140 نعم 1 | لا 2

٢٧- هل تقوم المنشأة بتوفير مخزون كافى من مستلزمات ا لانتاج الياقات- الزرايز - الخيوط-إلخ؟

141نعم 1 | لا 2

٢٨- و هل لتلك المستلزمات دور فى توفير الوقت وبالتالى زيادة إنتاجيتك ؟

142نعم 1 | لا 2

٢٩- و هل لها تأثير على سلاسة الانتاج والعملية الانتاجية ككل ؟

143نعم 1 | لا 2

٣٠- هل أنت مؤمن عليك ؟

144 نعم (٣٣) 1 | لا إذهب إلى (٣١) 2

٣١- هل عدم التأمين راجع لرغبتك فى إضافة قيمة التأمين لاجرك وبالتالى زيادته؟

145نعم 1 | لا إذهب إلى(٣٢) 2

٣٢- 146 هل هناك أسباب أخرى ما هى ؟

١ - _____

٢- _____

٣٣-147 من وجهة نظرك وبإختصار ما هى الأسباب الرئيسية المؤثرة بطريقة مباشرة على إنتاجيتك ؟

١ - _____

٢- _____

٣٤-148 و ما هى الأسباب غير المباشرة المؤثرة على إنتاجيتك ؟

١ - _____

٢- _____

_____

٣-

Appendix 5

Firms' enlargements and licensing

Survey for Textile and Apparel Industry in Egypt

Firms' enlargements and licensing

In Confidence

- Here are some questions for you to answer on your own.
- We are interested in honest answers.
- Your answers will be treated in self-confidence.
- Most answers can be answered via ticking the box. ☑
- Ask the interviewer for help if you do not understand a question or are not sure what to do.
- Answering questions is optional and there is no obligation.

Thank you for taking part in this survey

1- Does the firm face any troubles concerning governmental bureaucracy?

Yes ☐ No ☐

2. If yes, what are these forms?

Licence ☐ Insurance ☐ Labour bureau ☐ Electricity ☐

Water ☐ Telecoms ☐ Imported raw materials tariffs ☐ others ☐

3. Does governmental monetary policy facilitate access to finance?

Yes ☐ No ☐

4. Does governmental training programmes for workforce are effective?

Yes ☐ No ☐

5. Does infrastructure base facilitate working environment?

Yes ☐ No ☐

6. If no, in which field of the following the shortfalls are found?

Roads ☐ Shipping ☐ Airports ☐ River ☐

7. Do governmental policies are stable or fluctuated concerning incentives, duties and tariffs?

Yes ☐ No ☐

8. Do tax regulations are clear?

Yes ☐ No ☐

9. Do tax rates are acceptable?

Yes ☐ No ☐

10. Does corruption hinder working environment?

Yes ☐ No ☐

11. Does inflation have an impact to give more attention to domestic or international market?

Yes ☐ No ☐

12. Is there any poor work ethics in national workforce?

Yes ☐ No ☐

13. Do exchange rates regulations facilitate exports?

Yes ☐ No ☐

14. Does it hinder competition in domestic market with foreign products or imported accessories?

Yes ☐ No ☐

15. Does government stability have an impact on work environment?

Yes ☐ No ☐

16. Do the rate of crime and theft rates are high to hinder work environment?

Yes ☐ No ☐

Appendix 6

Arabic firms' enlargements and licensing

قائمة استقصاء حول قياس الكفاءة الانتاجية لصناعة المنسوجات والملابس الجاهزة فى مصر

استقصاء التوسعات

Ibrahim Elatroush

مسح إحصا ئى عن قياس الانتاجية فى قطاع الغزل والنسيج والملابس فى مصر

سرى وخاص

تحتوى هذة الاستمارة على بعض الأسئلة للاجابة عليها

يوجد إهتمام بإجابتك بطريقة واضحة وصريحة

إجابات الأسئلة خاصة بموضوع البحث ولن يتم إعطائها لأى جهة أو أى شخص أخر

☑ معظم الأسئلة يمكن الاجابة عليها عن طريق وضع علامة داخل الصندوق

فى حالة عدم فهم السؤال أو غير متأكد من الاجابة يمكنك سؤال مجرى المقابلة

شكرا جزيلا لتعاونكم فى إنجاز هذا المسح الاحصائى

الأسئلة المتعلقة بإنشاء شركات جديدة أو التوسعات فى شركات قائمة

اسم الشركة : _____	التاريخ _____
قطاع : عام(01) /خاص (02) _____	المدينة _____
النشاط :(غزل (03)– نسيج (04)– ملابس(05)- (06) مفروشات منزلية	(7-13) _____

١- هل هناك أى عقبات بيروقراطية تواجه المنشأة ؟

150نعم إذهب إلى(٢)	لا
1	2

٢- هل تلك المشاكل متعلقة بأى من تلك العناصر؟

151الترخيص	التأمينات	القوى العاملة	الكهرباء
1	2	3	4

المياة	الاتصالات	التعريفة الجمركية على الخامات	مشاكل أخرى
5	6	7	8

٣- هل السياسة النقدية المتبعة تسهل عملية الحصول على التمويل البنكى ؟

152نعم	لا إذهب إلى (٤)
1	2

٤-153 إذا فما هى أهم معوقات الحصول على تمويل ؟

١ - _____

٢- _____

٣- _____

٤- _____

٥- هل برامج التدريب الحكومية فعالة ؟

154نعم	لا إذهب إلى (٦)
1	2

٦- 155 من وجهة نظرك ما هى أسباب عدم فعاليتها ؟

١ - _____

٢- _____

٣- _____

٤- _____

٧- هل طبيعة ونوعية خدمات البنية الأساسية الحالية تسهل بيئة العمل ؟

156نعم	لا إذهب إلى (٨)
1	2

٨- إذا أى نوع من تلك الخدمات فى حاجة إلى التحسين و التطوير ؟

157الطرق	النقل البحرى	النقل الجوى	النقل النهرى
1	2	3	4

٩- هل السياسات الحكومية المتعلقة بالحوافز - الضرائب - التعريفة الجمركية مستقرة أم متغيرة ؟

158 مستقرة	متغيرة
1	2

١٠- هل السياسات الضريبية المتبعة تتميز بالبساطة والوضوح ؟

159نعم	لا
1	2

١١- هل معدلات الضرائب الحالية معقولة ؟

160نعم	لا إذهب إلى (١٢)
1	2

١٢- 161 من وجهة نظرك هل توجد مشاكل أخرى متعلقة بنوعية أو معدلات الضرائب الحالية ؟

١ - _____

٢- _____

٣- _____

٤- _____

١٣- من وجهة نظرك، هل وجود رشاوى أو فساد يؤثرعلى أو يعيق بيئة العمل ؟

162نعم إذهب إلى (١٤)	لا
1	2

١٤-163 إذا من وجهة نظرك، لماذا ؟

١ - _____

٢- _____

٣- _____

٤- _____

١٥– هل تؤثر معدلات التضخم على إهتمام المنتجين بالسوق المحلى أو الخارجى ؟

164نعم	لا
1	2

١٦- هل أسعار الصرف الحالية تسهل من عملية التصدير ؟

165نعم	لا
1	2

١٧- هل أسعار الصرف الحالية تعيق التنافسية فى السوق المحلى بين المنتجات المحلية والأجنبية ؟

166نعم	لا
1	2

١٨ - هل معدلات الجريمة والسرقة عالية لكى تعيق بيئة العمل ؟

167نعم	لا
1	2

١٩ - هل الاستقرار الحكومى يؤثر على بيئة العمل ؟

168نعم	لا
1	2

Appendix 7

Public sector visits and recommendations

Results of factories visits and Industry Recommendations

The dissertation aimed to assess the results obtained via empirical results and visits to the public sector and the private sector units and then provide proposals for enhancing industry performance. The study got hold of the following results to get rid of the industry impediments to compete against rivals locally and worldwide via eliminating the following hurdles:

Main Hurdles

1. Modernise machinery to eliminate raw materials defects and industry inputs such as yarns especially in the public sector yarns, since new machineries are dedicated to exported yarns and obsolete machinery are dedicated to local needs and this increase defects rates in fabrics and hence an increase in production costs for apparel industry.
2. Labour rationalisation particularly the imbalance between the blue-collar and the white-collar in the public units to increase productive efficiency and hence performance. Also, the optimal usage of materials reduces the waste and raises the productive efficiency.
3. Give importance to set up a fashion base to follow continuous changes in fashion trends and make links with World fashion institutes to modernise products and track the World styles.
4. Give attention to cost reductions in the operating costs by eliminating customs on the imported raw materials such as yarns, accessories and industrial equipment.
5. Get rid of bureaucratic impediments such as tax regulations, corruption, access to finance, restrictive labour regulations.
6. Activate negotiations aim to eliminate exports barriers on existing markets (U.S. & EU) alongside enhance the presence in new markets such as African markets (COMESA, SADC) and also support the attendance of Egyptian products in the GAFTA countries.

Results of the public sector visits:

❖ Raw materials:

- Running different types of imported yarns such as Syrian-Russian-Sudanese-Indonesian-Indian-Greek and Egyptian cotton where they have different characteristics which leads to significant rates of time consuming since each type of yarn requires different machinery adjustments plus random moving from one class to another according to supplied quality yarn.

- Frequent yarn types changes, difficult working conditions in the yarn sector compared to other sectors, poor types of imported cottons, the poor condition of the machinery and the absence of incentives for productive workers, and if it is found incentives they are distributed to all productive and unproductive workers led yarn sector's workers to escape to other administrative sectors (managerial works – dyeing -security, etc.) and then put more burdens on existing employment in the sector.

- Serving more than one productive stage at the same time (the machine that requires more than one worker in yarn rotating stage) is reflected negatively on product quality and worker's productivity. Thus, we should not blame the worker for productivity slowdown and also should not ignore that efficiency and product quality in yarn phase has a great impact on next stages (fabrics-dyeing & finishing -apparel) and hence maximise the value added.

- Continuity to produce traditional fabrics and textiles products leads to greater burdens on sales initiatives from severe competition locally and globally and increases production costs.

- Lack of attention to product quality in fabrics' finishing stages in terms of wrinkle ratios and softness processes led to consumers complaints from high rates of wrinkles and finish defects in final product.

❖ Machinery:

- Out-dated machinery and hence low productivity affect directly on production costs and product quality.
- Machines are not used for their purposes and thus decrease economic yield (instead of using sewing machines in the production of garments they are used in towels pleat thereby reducing value added).
- The utilised capacity for machinery in some knitted garment units in some cases is less than 50% due to high rates of workers absenteeism and lack of spare parts.
- Machinery modernisation is done as a general policy from holding company and not due to actual needs of each individual company or by the needs of the productive sectors.

❖ Labour:

- The rates of the white-collar in all corporate rates alongside continuous shortages in the blue-collar and productive labour are high comparing with the private units where the lowest corporate managers are 20% and their direct impact on rising production costs. While in the private sector the maximum rate of corporate rates to total employment represents less than 10%.
- Lack of leadership as a result of the gap between first and second row managers in some companies led to summon the expertise of retired managers to compensate the lack in some sectors.
- Scarcity of skilled labour, despite the existence of training centres in all companies.
- Employment surplus in some sectors with special circumstances, such as spinning and weaving and services and shortages in other sectors as yarn led to disguise unemployment in surplus sectors.

Recommendations

❖ Public sector proposals:

- The external sales departments should open new markets through working as agents or proxies for some global enterprises such as (Puma, Nike, Adidas, Reebok, FILA, etc.) where the whole production of these firms no longer produced by the head-quarter company but in countries like (China-Viet-Nam-Bangladesh-India-Indonesia-Morocco-Tunisia-Turkey) Despite poor cotton types used in those products compared to the Egyptian cotton, which would undoubtedly enhance the comparative advantage and also maximise profitability, returns and the added values where profitability rates in the apparel products exceed traditional products such as home furnishing products (towels-bedcovers-bed linen, etc.)
- In this context, they can also act as a proxy for global jeans products as jeans products are widespread in European and American markets and they are manufactured from thick cotton yarns with high returns, and can be produced in most companies according to their possibilities.
- Expand the use of the technical textiles applications where their global growth rate are 4% annually, while the growth rate of household furnishings, fabrics and clothing grew 1% per annum and these types of textiles are produced in three major areas are China, EU and Turkey (Turkey's sales alone is U.S.$5 billion in three years) and these types of textiles have a very low competitive rates and are not produced in the Middle East region and those textiles have comparative advantage and their profitability rates are high as they have many uses in agricultural and industrial fields. Main technical textiles fields are classified as follows: Agro-tech (Agro-textiles) Build-tech (Construction Textiles) Geo-tech (Geo-textiles) Home-tech (Domestic Textiles) Ind-tech (Industrial Textiles) Mobil-tech (Textiles used in transport) Sport-tech (Sports Textiles) Cloth-tech (Clothing Tech) Eco-tech (Environmentally-friendly textiles) Automotive textiles Pack-tech (Packaging textiles) Pro-tech (Protective textiles). The use of these applications is determined due to possibilities and operating conditions.

Management Proposals

- Limit imported cottons in two or three sorts utmost to avoid bad qualities and to reduce time-consuming since different types of cotton require different treatments and machinery gauges adjustments for each one as poor sorts of cotton leads to produce poor yarns.

- Encourage farmers to increase cultivated cotton areas through incentives, satisfying spinning mills needs and then if there is an excess quantity, it can be exported for several reasons:

❶ Value-added of using cotton products exceeds exporting cotton as raw material several times.

❷ Yarn denotes 60% of production costs hence increasing planted area reduces production costs.

❸ Noted in most companies that spinning units are not utilised in a full capacity because if machinery worked in a full capacity the stock of cotton will finish and replace it with imported cottons and then waste time for adjusting machines for these types which increase production costs and production process is managed in an inefficient way.

- Expand existing units and establishment new industrial units producing cotton yarns and synthetic fibres since they have guaranteed returns. Moreover, local market does not reach saturation for those products and still has a lack in various gauges of polyesters such as 300, 150, 30, 24, 20 and acrylic materials used extensively in blankets and garment products.

- Give more attention to training programmes, providing leadership of second row of leaders and chiefs in some sectors and activate employment training centres to satisfy labour deficit in some sectors and to absorb unemployment since the industry is labour -intensive.

- Reduce the ratio of white-collar to reduce disguised underemployment, to lower production costs, to increase wage's productivity and to help companies to compete locally and globally. Since it is illogic that each blue collar worker supports three white collars and this provides inaccurate standards on labour productivity.

- Boost incentives for productive employment and quality incentives for its role in increasing productivity.
- Specific working regulations and their obligations besides activate labour unions role via notifying labour's rights and liabilities besides sustain working environment.
- Update and replace out-dated machinery, especially in textiles stages to improve product quality, increase productivity and reduce costs. Moreover, update should have clear strategy due to each company circumstances and in accordance with the urgent needs of the productive sections to follow successive developments in fashions and changes in consumer preferences.
- Increase machinery utilised capacity through providing spare parts and making labour's absence rotating to avoid the abruption of machines.
- Optimise the use of sewing machines in a correct way to maximise value added since value added for garments exceeds the value added of other production phases.
- Be a part of the funding necessity to update the machines through serious partners from the private enterprises, either by providing them with goods which led to update firms' machinery and hence benefit two parties via:

❶ Avoiding financial burdens for machinery upgrade.

❷ Increasing utilised capacity through payment though production not via unaffordable premiums.

- Activating sales departments' in particular external sales sector in terms of new markets access in accordance with the theory of cost-benefit terms and restrictions observed via financing promotional tours or participate in international fairs also to follow developments in the raw materials as the industry is among rapidly evolving industries.

New investments proposals

- Expand synthetic yarn investments to satisfy the increase need in polyester, acrylic and special yarns to reduce imported yarns and costs.
- Give more attention for importing substitution in feeding industries such as sewing threads, zips, buttons, accessories and other apparel requirements. Additionally, encouraging investments in spare parts manufacturing and textile accessories.
- The cancelation of sales tax on imported machinery, equipment and spare parts since they are capital goods and industry inputs not final products.

Raw Materials proposals

- Encouraging the cultivation of small and medium staple cottons which they are more productive than large and extra-large cottons to reduce the imported small and medium cottons since recent years witnessed great increases in yarn prices besides in 2010 the Indian government stopped exporting any sort of cotton to maximise its value added for cottoned textiles and cottoned apparel and these factors create more burdens for local products to compete due to the increase in raw materials costs.
- Give more attention to other natural products such as jute, flax, wall, etc.
- Give more attention to Tech-Textiles to maximise industry value added and minimise competitiveness rates between local producers and rivals and have a full capacity for machinery and equipment.
- Put restriction on cotton residuals exports to reuse it in producing thick yarns.
- Give attentions to petrochemical projects as a raw material for polyester products.

Costs proposals

- Make a balance between output prices in local and exports markets and between input prices and output prices.
- Activate linkage between wages and labour productivity especially in public units.

- Fair pricing policy for non-exported cottons such as Giza 80 and Giza 83 which represent 30% of mills consumptions.
- Using cost factors efficiently through managing operating costs via supply chain factors.

Quality proposals

- Upgrading machinery and equipment particularly in some textile sector processes to get rid of fabrics problems as in public units.
- Give more attention to machinery and equipment maintenance especially precaution maintenance with training programmes to raise workers skills.
- Modernise check laboratories in production units together with improve labour skills and quality reports.
- Activate the role of governmental authorities on quality controls and encouraging firms to satisfy International Organization for Standardisation (ISO) requirements.
- Applying Quality control in all supply chain processes.

Products Modernisation proposals

- Activate the co-operation between national industry and global fashion institutions & associations to follow the latest fashion developments.
- Make links between manufacturers and fashions markets via participating in international fairs.
- Maximising the relative advantages of the apparel products for their profitability and their World demand increase.

Apparel Industry Proposals

- Upgrading industry's machinery and equipment with high-tech ones that are more productive and accurate.
- Preparing skilled labour via modern training courses to deal with the new technologies.

- Controlling fabrics widths, lengths, quality and specifications to minimise cutting wastes and hence minimise costs.
- Increasing local component of fabrics and threads to maximise value added of yarn and textile sector.
- Increasing computer programmes applications in fashion, styles, cutting and other processes.
- Free duties on inputs' accessories and production necessities to help producers compete in global markets and increasing exports rates.
- Setting up an organisation to be responsible for providing data and information for World changes and developments in industry and trade to help producers following current improvements and to give them advice.

Marketing proposals

- Setting up a clear and detailed marketing strategies aiming at benefiting from relative advantages of Egyptian cotton products to maximise exports.
- Making regular marketing studies for international markets along with arranging visits to these markets to identify patterns of consumptions, prices, logistics and their needs.
- Making a link between commercial bureaus belong to Egyptian embassies and fashion bureaus and agents to facilitate information swap and to benefit from marketing opportunities efficiently.
- Preparing updated brochures and booklets including all data, information and photos for companies; their capabilities, capacities, clients, exports and transactions to expand existing markets and open new markets.
- In the same direction, expand the use of firm's web sites to introduce their products and to seek exports opportunities.

R&D proposals

- Eligible human resources and develop creativity to have distinguished thoughts able to make fast decisions in a correct way in all aspects managerial, technical and innovative solutions in fashion including yarns, fabrics designs, fashion trends, production processes, products coordination, information technology and modern methods of management.

- Modernise Egyptian products in all facets relating to accessories and trims.
- Participating in all World exhibitions (yarn, home furnishing, fabrics, apparel, accessories) with giving attention to cotton products with designing a logo distinguishes Egyptian cotton products than other products.
- Developing technologies for textile processes especially finishing procedure by giving attention to environmentally friendly technologies.
- Expand the use of the environmentally friendly natural pigments and enzymes used in dyeing process as an alternative for imported pigments.
- Implementation of comprehensive quality management for improving working environment in industry with more attention to products' quality, human factor quality and modernise firms' R&D units.
- Helping firms to satisfy ISO requirements as a prerequisite for non-exporting firms to access World markets.

Appendix 8

Descriptive Statistics

Table 1 All T&A private sector's P, SP, DS, RS, Size, Age, GB, B and EXR variables

Variable	Mean	Min	Max	St.Dev.
Planning	1.5552	1.0400	1.9400	0.1710
Sourcing	1.6023	1.0800	1.9600	0.1736
Delivery System	1.5437	1.2000	1.9600	0.1419
Returns System	1.6041	1.2500	1.9600	0.1511
Size	1.0366	0	2	0.8577
Age	0.5565	0	1	0.4969
GB	0.4753	0	1	0.4995
B	0.5319	0	1	0.4431
EXR	0.3170	0	1	0.4654

Table 1 Textile sector's P, SP, DS, RS, Size, Age, GB, B and EXR variables

Variable	Mean	Min	Max	St.Dev.
Planning	1.5282	1.0400	1.900	0.1717
Sourcing	1.5678	1.0800	1.9500	0.1766
Delivery System	1.5190	1.2000	1.8500	0.1415
Returns System	1.5707	1.2500	1.9400	0.1503
Size	1.0026	0	2	0.8428
Age	0.6174	0	1	0.4862
GB	0.3017	0	1	0.4592
B	0.5154	0	1	0.5000
EXR	0.3289	0	1	0.4700

Table 2 Apparel sector's P, SP, DS, RS, Size, Age, GB, B and EXR variables

Variable	Mean	Min	Max	St.Dev.
Planning	1.5776	1.0800	1.9400	0.1669
Sourcing	1.631	1.200	1.9600	0.1650
Delivery System	1.5639	1.200	1.9100	0.1385
Returns System	1.6315	1.2500	1.9600	0.1457
Size	1.0668	0	2	0.8701
Age	0.5062	0	1	0.5001
GB	0.6238	0	1	0.4846
B	0.0886	0	1	0.2843
EXR	0.3123	0	1	0.4636

Table 3 Public sector's P, SP, DS, RS, Size, Age, GB, B and EXR variables

Variable	Mean	Min	Max	St.Dev.
Planning	1.3664	1.0500	1.7600	0.1633
Sourcing	1.4850	1.1000	1.7500	0.1808
Delivery System	1.4441	1.1000	1.8800	0.1543
Returns System	1.4693	1.0000	1.7600	0.1388
Size	0.3500	0	1	0.4782
Age	0.3650	0	1	0.4826
GB	0.5750	0	1	0.4956
B	0.4000	0	1	0.4911
EXR	0.3450	0	1	0.4766

Total number private sector firms are 838 and they are divided into 379 textile firms with 459 apparel firms. The distribution of activities is shown as follows:

Textile (Activity) / Zone	Yarn	Weaving	Fabrics	Home Furnishing	Total
1-ALEX Zone	**19**	**11**	**19**	**20**	**69**
1-Alexandria(Governorate)	11	4	10	10	35
1-Behera (Governorate)	8	7	9	10	34
2- Delta Zone	**49**	**103**	**21**	**41**	**214**
2-Dakahlia (Governorate)	___	5	3	___	8
2-Gharbia (Governorate)	18	64	8	28	118
2-Minofia (Governorate)	11	4	___	4	19
2-Qalybia (Governorate)	20	30	10	9	69
3- Greater Cairo Zone	**11**	**7**	**18**	**24**	**60**
3-Cairo (Governorate)	8	5	16	20	49
3- Giza (Governorate)	3	2	2	4	11
4- Canal Zone	**14**	**12**	**4**	**6**	**36**
4-Sharkia (Governorate)	11	12	4	6	33
4-Suez (Governorate)	3	___	___	___	3
Total	**93**	**133**	**62**	**91**	**379**

The distributions of textile sector firms for size and age variables

Textile (Activity) / Zone	Yarn Size			Weaving Size			Yarn Age		Weaving Age	
	S*	M*	L*	S	M	L	O*	N*	O	N
1-ALEX Zone	**2**	**5**	**12**	**6**	**3**	**2**	**11**	**8**	**7**	**4**
1-Alexandria(Governorate)	1	0	10	2	0	2	6	5	3	1
1-Behera (Governorate)	1	5	2	4	3	0	5	3	4	3
2- Delta Zone	**16**	**12**	**21**	**36**	**42**	**25**	**28**	**21**	**79**	**24**
2-Dakahlia (Governorate)	0	0	0	3	2	0	0	0	2	3
2-Gharbia (Governorate)	6	5	7	23	25	16	10	8	49	15
2-Minofia (Governorate)	1	2	8	0	1	3	5	6	2	2
2-Qalybia (Governorate)	9	5	6	10	14	6	13	7	26	4
3- Greater Cairo Zone	**3**	**3**	**5**	**2**	**1**	**4**	**4**	**7**	**6**	**1**
3-Cairo (Governorate)	3	2	3	2	1	2	3	5	4	1
3- Giza (Governorate)	0	1	2	0	0	2	1	2	2	0
4- Canal Zone	**0**	**0**	**14**	**0**	**1**	**11**	**7**	**7**	**8**	**4**
4-Sharkia (Governorate)	0	0	11	0	1	11	5	6	8	4
4-Suez (Governorate)	0	0	3	0	0	0	2	1	0	0
Total	**21**	**20**	**52**	**44**	**47**	**42**	**50**	**43**	**100**	**33**

S= small size firm, M= medium size firm, L= large and extra-large firms.

O= old firm, N= new firm.

The distributions of textile sector firms for size and age variables

Textile (Activity) / Zone	Fabrics Size			Home-furnishing Size			Fabrics Age		H. furnishing Age	
	S*	M*	L*	S	M	L	O*	N*	O	N
1-ALEX Zone	**11**	**5**	**3**	**8**	**7**	**5**	**10**	**9**	**11**	**9**
1-Alexandria(Governorate)	4	3	3	2	3	5	5	5	5	5
1-Behera (Governorate)	7	2	0	6	4	0	5	4	6	4
2- Delta Zone	**8**	**9**	**4**	**19**	**6**	**16**	**11**	**10**	**30**	**11**
2-Dakahlia (Governorate)	0	2	1	0	0	0	1	2	0	0
2-Gharbia (Governorate)	4	2	2	14	3	11	4	4	20	8
2-Minofia (Governorate)	0	0	0	0	2	2	0	0	4	0
2-Qalybia (Governorate)	4	5	1	5	1	3	6	4	6	3
3- Greater Cairo Zone	**9**	**3**	**6**	**13**	**6**	**5**	**11**	**7**	**16**	**8**
3-Cairo (Governorate)	8	3	5	13	5	2	10	6	13	7
3- Giza (Governorate)	1	0	1	0	1	3	1	1	3	1
4- Canal Zone	**0**	**1**	**3**	**1**	**2**	**3**	**2**	**2**	**3**	**3**
4-Sharkia (Governorate)	0	1	3	1	2	3	2	2	3	3
4-Suez (Governorate)	0	0	0	0	0	0	0	0	0	0
Total	**28**	**18**	**16**	**41**	**21**	**29**	**34**	**28**	**60**	**31**

S= small size firm, M= medium size firm, L= large and extra-large firms.

O= old firm, N= new firm.

The distributions of textile sector firms for GB, B and EXR variables

Textile (Activity) / Zone	Yarn GB		Yarn B		Yarn EXR	
	Affect	Not affect	Affect	Not affect	Affect	Not affect
1-ALEX Zone	**5**	**14**	**12**	**7**	**13**	**6**
1-Alexandria(Governorate)	5	6	6	5	7	4
1-Behera (Governorate)	0	8	6	2	6	2
2- Delta Zone	**12**	**37**	**13**	**36**	**23**	**26**
2-Dakahlia (Governorate)	0	0	0	0	0	0
2-Gharbia (Governorate)	0	18	6	12	11	7
2-Minofia (Governorate)	6	5	1	10	6	5
2-Qalybia (Governorate)	6	14	6	14	6	14
3- Greater Cairo Zone	**1**	**10**	**3**	**8**	**1**	**10**
3-Cairo (Governorate)	1	7	0	8	1	7
3- Giza (Governorate)	0	3	3	0	0	3
4- Canal Zone	**7**	**7**	**6**	**8**	**14**	**0**
4-Sharkia (Governorate)	4	7	3	8	11	0
4-Suez (Governorate)	3	0	3	0	3	0
Total	**25**	**68**	**34**	**59**	**51**	**42**

Affect= each factor has an impact on industry's competitiveness.

Not affect= there is no impact.

The distributions of textile sector firms for GB, B and EXR variables

Textile (Activity) / Zone	Weaving GB		Weaving B		Weaving EXR	
	Affect	Not affect	Affect	Not affect	Affect	Not affect
1-ALEX Zone	**1**	**10**	**10**	**1**	**1**	**10**
1-Alexandria(Governorate)	1	3	3	1	1	3
1-Behera (Governorate)	0	7	7	0	0	7
2- Delta Zone	**7**	**96**	**64**	**39**	**10**	**93**
2-Dakahlia (Governorate)	0	5	5	0	3	2
2-Gharbia (Governorate)	5	59	59	5	5	59
2-Minofia (Governorate)	0	4	0	4	0	4
2-Qalybia (Governorate)	2	28	0	30	2	28
3- Greater Cairo Zone	**7**	**0**	**0**	**7**	**4**	**3**
3-Cairo (Governorate)	5	0	0	5	2	3
3- Giza (Governorate)	2	0	0	2	2	0
4- Canal Zone	**9**	**2**	**2**	**9**	**9**	**2**
4-Sharkia (Governorate)	9	2	2	9	9	2
4-Suez (Governorate)	0	0	0	0	0	0
Total	**24**	**108**	**76**	**56**	**24**	**108**

Affect= each factor has an impact on industry's competitiveness.

Not affect= there is no impact.

The distributions of textile sector firms for GB, B and EXR variables

Textile (Activity) / Zone	Fabrics GB		Fabrics B		Fabrics EXR	
	Affect	Not affect	Affect	Not affect	Affect	Not affect
1-ALEX Zone	**2**	**17**	**14**	**5**	**5**	**14**
1-Alexandria(Governorate)	2	8	5	5	5	5
1-Behera (Governorate)	0	9	9	0	0	9
2- Delta Zone	**5**	**16**	**6**	**15**	**12**	**9**
2-Dakahlia (Governorate)	1	2	2	1	3	0
2-Gharbia (Governorate)	1	7	4	4	6	2
2-Minofia (Governorate)	0	0	0	0	0	0
2-Qalybia (Governorate)	3	7	0	10	3	7
3- Greater Cairo Zone	**9**	**9**	**7**	**11**	**9**	**9**
3-Cairo (Governorate)	9	7	7	9	7	9
3- Giza (Governorate)	0	2	0	2	2	0
4- Canal Zone	**3**	**1**	**1**	**3**	**3**	**1**
4-Sharkia (Governorate)	3	1	1	3	3	1
4-Suez (Governorate)	0	0	0	0	0	0
Total	**19**	**43**	**28**	**34**	**29**	**33**

Affect= each factor has an impact on industry's competitiveness.

Not affect= there is no impact.

The distributions of textile sector firms for GB, B and EXR variables

Textile (Activity) / Zone	Home-furnishing GB		Home-furnishing B		Home-furnishing EXR	
	Affect	Not affect	Affect	Not affect	Affect	Not affect
1-ALEX Zone	**3**	**17**	**17**	**3**	**4**	**16**
1-Alexandria(Governorate)	3	7	7	3	4	6
1-Behera (Governorate)	0	10	10	0	0	10
2- Delta Zone	**14**	**27**	**21**	**20**	**15**	**26**
2-Dakahlia (Governorate)	0	0	0	0	0	0
2-Gharbia (Governorate)	11	17	16	12	11	17
2-Minofia (Governorate)	0	4	3	1	1	3
2-Qalybia (Governorate)	3	6	2	7	3	6
3- Greater Cairo Zone	**24**	**0**	**0**	**24**	**2**	**22**
3-Cairo (Governorate)	20	0	0	20	1	19
3- Giza (Governorate)	4	0	0	4	1	3
4- Canal Zone	**3**	**3**	**3**	**3**	**3**	**3**
4-Sharkia (Governorate)	3	3	3	3	3	3
4-Suez (Governorate)	0	0	0	0	0	0
Total	**44**	**47**	**41**	**50**	**24**	**67**

Affect= each factor has an impact on industry's competitiveness.

Not affect= there is no impact.

Textile sector's P, SP, DS, RS average across regions

Textile (Activity) / Zone	Yarn P*	Yarn SP*	Yarn DS*	Yarn RS*
	Average	Average	Average	Average
1-ALEX Zone	**1.5725**	**1.5984**	**1.5423**	**1.6012**
1Alexandria(Governorate)	1.6427	1.6745	1.6303	1.6709
1-Behera (Governorate)	1.4063	1.4129	1.3825	1.4621
2- Delta Zone	**1.5199**	**1.5660**	**1.5201**	**1.5673**
2-Dakahlia (Governorate)	___	___	___	___
2-Gharbia (Governorate)	1.5224	1.5800	1.5102	1.5515
2-Minofia (Governorate)	1.5306	1.5803	1.5467	1.5779
2-Qalybia (Governorate)	1.4983	1.5470	1.4978	1.5430
3- Greater Cairo Zone	**1.4939**	**1.5363**	**1.4982**	**1.5462**
3-Cairo (Governorate)	1.4604	1.5163	1.4663	1.5038
3- Giza (Governorate)	1.4844	1.5378	1.5111	1.5278
4- Canal Zone	**1.6933**	**1.7338**	**1.6502**	**1.7084**
4-Sharkia (Governorate)	1.7285	1.7691	1.6815	1.7309
4-Suez (Governorate)	1.5422	1.5956	1.5178	1.5867
Total Average	**1.5681**	**1.6069**	**1.5516**	**1.6048**

P= planning process. SP= sourcing process.

DS= Delivery system. RS= returns system.

Textile sector's P, SP, DS, RS average across regions

Textile (Activity) / Zone	Weaving P	Weaving SP	Weaving DS	Weaving RS
	Mean	Average	Average	Average
1-ALEX Zone	**1.4442**	**1.4508**	**1.4242**	**1.4801**
1Alexandria(Governorate)	1.4708	1.4808	1.4750	1.5158
1-Behera (Governorate)	1.4181	1.4214	1.3752	1.4452
2- Delta Zone	**1.5161**	**1.5572**	**1.5187**	**1.5643**
2-Dakahlia (Governorate)	1.4827	1.5113	1.4913	1.5227
2-Gharbia (Governorate)	1.5134	1.5551	1.5135	1.5660
2-Minofia (Governorate)	1.5975	1.6525	1.5883	1.6375
2-Qalybia (Governorate)	1.4742	1.5139	1.4838	1.5337
3- Greater Cairo Zone	**1.5384**	**1.5720**	**1.5184**	**1.5640**
3-Cairo (Governorate)	1.5220	1.5493	1.5053	1.5613
3- Giza (Governorate)	1.5550	1.5950	1.5317	1.5667
4- Canal Zone	**1.7161**	**1.7536**	**1.6811**	**1.7358**
4-Sharkia (Governorate)	1.7161	1.7536	1.6811	1.7358
4-Suez (Governorate)	___	___	___	___
Total Average	**1.5506**	**1.6069**	**1.5516**	**1.6048**

P= planning process. SP= sourcing process.

DS= Delivery system. RS= returns system.

Textile sector's P, SP, DS, RS average across regions

Textile (Activity) / Zone	Fabrics P	Fabrics SP	Fabrics DS	Fabrics RS
	Average	Average	Average	Average
1-ALEX Zone	**1.4719**	**1.4596**	**1.4253**	**1.4923**
1Alexandria(Governorate)	1.5290	1.5413	1.4777	1.5497
1-Behera (Governorate)	1.4170	1.3822	1.3748	1.4370
2- Delta Zone	**1.5552**	**1.5925**	**1.5400**	**1.5948**
2-Dakahlia (Governorate)	1.5678	1.5933	1.5356	1.6089
2-Gharbia (Governorate)	1.5813	1.6213	1.5646	1.6129
2-Minofia (Governorate)	___	___	___	___
2-Qalybia (Governorate)	1.5173	1.5633	1.5201	1.5630
3- Greater Cairo Zone	**1.5463**	**1.5752**	**1.5338**	**1.5905**
3-Cairo (Governorate)	1.5246	1.5606	1.5146	1.5694
3- Giza (Governorate)	1.5683	1.5900	1.5533	1.6117
4- Canal Zone	**1.7250**	**1.7608**	**1.6758**	**1.7317**
4-Sharkia (Governorate)	1.7250	1.7608	1.6758	1.7317
4-Suez (Governorate)	___	___	___	___
Total Average	**1.5719**	**1.5935**	**1.5412**	**1.6001**

P= planning process. SP= sourcing process.

DS= Delivery system. RS= returns system.

Textile sector's P, SP, DS, RS average across regions

Textile (Activity) / Zone	Home-furnishing P	Home-furnishing SP	Home-furnishing DS	Home-furnishing RS
	Average	Average	Average	Average
1-ALEX Zone	**1.5056**	**1.5494**	**1.4711**	**1.5460**
1Alexandria(Governorate)	1.5790	1. 6187	1. 5370	1. 6103
1-Behera (Governorate)	1. 4356	1. 4830	1. 4080	1. 4843
2- Delta Zone	**1.5524**	**1.6075**	**1.5517**	**1.6031**
2-Dakahlia (Governorate)	___	___	___	___
2-Gharbia (Governorate)	1.5479	1. 6033	1. 5505	1. 5901
2-Minofia (Governorate)	1. 5375	1. 6008	1. 5467	1.6008
2-Qalybia (Governorate)	1.5719	1. 6185	1. 5578	1. 6185
3- Greater Cairo Zone	**1.5176**	**1.5666**	**1.5273**	**1.5792**
3-Cairo (Governorate)	1.4432	1. 4875	1.4670	1. 5152
3- Giza (Governorate)	1. 5958	1. 6500	1.5900	1. 6458
4- Canal Zone	**1. 6378**	**1. 6806**	**1.5800**	**1.6578**
4-Sharkia (Governorate)	1. 6378	1. 6806	1. 5800	1.6578
4-Suez (Governorate)	___	___	___	___
Total Average	**1.5525**	**1.6002**	**1.5320**	**1.5960**

P= planning process. SP= sourcing process.

DS= Delivery system. RS= returns system.

Table2a. Textile Firms: Technical Efficiencies by Size

Size	**Small without SCV**				**Small with SCV**			
	Mean	Min	Max	St.Dev	Mean	Min	Max	St.Dev
2006	0.812	0.662	0.987	0.075	0.820	0.684	0.987	0.071
2007	0.812	0.664	0.987	0.075	0.820	0.680	0.987	0.071
2008	0.853	0.667	0.987	0.075	0.860	0.681	0.987	0.071
Average	**0.813**	**0.662**	**0.987**	**0.075**	**0.821**	**0.684**	**0.987**	**0.071**
Size	**Medium without SCV**				**Medium with SCV**			
	Mean	Min	Max	St.Dev	Mean	Min	Max	St.Dev
2006	0.816	0.604	0.968	0.075	0.824	0.657	0.968	0.071
2007	0.816	0.608	0.968	0.074	0.823	0.66	0.968	0.070
2008	0.816	0.612	0.968	0.073	0.824	0.662	0.968	0.070
Average	**0.816**	**0.604**	**0.968**	**0.074**	**0.823**	**0.657**	**0.968**	**0.070**
Size	**Large& Extra-large without SCV**				**Large& Extra-large with SCV**			
	Mean	Min	Max	St.Dev	Mean	Min	Max	St.Dev
2006	0.850	0.692	0.983	0.087	0.856	0.700	0.983	0.083
2007	0.851	0.692	0.984	0.087	0.856	0.702	0.984	0.083
2008	0.851	0.692	0.983	0.087	0.855	0.704	0.983	0.083
Average	**0.850**	**0.692**	**0.984**	**0.087**	**0.856**	**0.700**	**0.984**	**0.083**

Table2b. Textile Firms: Technical Efficiencies by Age

Age	**New without SCV**				**New with SCV**			
	Mean	Min	Max	St.Dev	Mean	Min	Max	St.Dev
2006	0.828	0.664	0.987	0.079	0.834	0.679	0.987	0.075
2007	0.829	0.667	0.987	0.078	0.835	0.681	0.987	0.075
2008	0.826	0.662	0.987	0.079	0.832	0.676	0.987	0.076
Average	**0.828**	**0.662**	**0.987**	**0.079**	**0.834**	**0.677**	**0.987**	**0.075**
Age	**Old without SCV**				**Old with SCV**			
	Mean	Min	Max	St.Dev	Mean	Min	Max	St.Dev
2006	0.828	0.611	0.979	0.082	0.834	0.662	0.980	0.078
2007	0.824	0.604	0.979	0.083	0.831	0.657	0.979	0.079
2008	0.826	0.608	0.979	0.083	0.833	0.660	0.980	0.079
Average	**0.826**	**0.604**	**0.979**	**0.082**	**0.833**	**0.657**	**0.980**	**0.078**

Table2c. Textile Firms: Technical Efficiencies by GB

GB	**GB do not affect without SCV**				**GB do not affect with SCV**			
	Mean	Min	Max	St.Dev	Mean	Min	Max	St.Dev
2006	0.824	0.608	0.987	0.075	0.831	0.660	0.987	0.072
2007	0.826	0.611	0.987	0.074	0.832	0.662	0.987	0.071
2008	0.823	0.604	0.987	0.076	0.830	0.657	0.986	0.073
Average	**0.825**	**0.604**	**0.987**	**0.075**	**0.833**	**0.657**	**0.987**	**0.071**
GB	**GB affect without SCV**				**GB affect with SCV**			
	Mean	Min	Max	St.Dev	Mean	Min	Max	St.Dev
2006	0.833	0.697	0.984	0.092	0.839	0.704	0.983	0.089
2007	0.830	0.692	0.983	0.094	0.836	0.700	0.983	0.091
2008	0.832	0.694	0.983	0.094	0.838	0.702	0.983	0.089
Average	**0.832**	**0.692**	**0.984**	**0.093**	**0.838**	**0.700**	**0.984**	**0.088**

Table2d. Textile Firms: Technical Efficiencies by B

B	**B affects without SCV**				**B affects with SCV**			
	Mean	Min	Max	St.Dev	Mean	Min	Max	St.Dev
2006	0.827	0.608	0.987	0.074	0.833	0.660	0.987	0.071
2007	0.828	0.611	0.987	0.074	0.835	0.662	0.987	0.070
2008	0.825	0.604	0.987	0.075	0.832	0.657	0.987	0.072
Average	**0.827**	**0.604**	**0.987**	**0.074**	**0.833**	**0.657**	**0.987**	**0.070**
B	**B does not affect without SCV**				**B does not affect with SCV**			
	Mean	Min	Max	St.Dev	Mean	Min	Max	St.Dev
2006	0.828	0.691	0.984	0.086	0.834	0.696	0.984	0.083
2007	0.825	0.685	0.983	0.088	0.832	0.692	0.983	0.084
2008	0.827	0.688	0.983	0.087	0.833	0.693	0.983	0.083
Average	**0.827**	**0.685**	**0.984**	**0.087**	**0.833**	**0.692**	**0.984**	**0.083**

Table2e. Textile Firms: Technical Efficiencies by EXR

EXR	**EXR do not affect without SCV**				**EXR do not affect with SCV**			
	Mean	Min	Max	St.Dev	Mean	Min	Max	St.Dev
2006	0.812	0.604	0.987	0.075	0.820	0.657	0.987	0.071
2007	0.814	0.608	0.987	0.074	0.821	0.660	0.987	0.071
2008	0.815	0.611	0.987	0.074	0.822	0.662	0.987	0.071
Average	**0.814**	**0.604**	**0.987**	**0.074**	**0.821**	**0.657**	**0.987**	**0.071**
EXR	**EXR affect without SCV**				**EXR affect with SCV**			
	Mean	Min	Max	St.Dev	Mean	Min	Max	St.Dev
2006	0.853	0.692	0.983	0.087	0.857	0.700	0.983	0.084
2007	0.854	0.694	0.983	0.087	0.859	0.702	0.983	0.0084
2008	0.856	0.697	0.984	0.086	0.860	0.704	0.983	0.084
Average	**0.854**	**0.692**	**0.984**	**0.087**	**0.859**	**0.700**	**0.984**	**0.084**

Table2f. Textile firms private sector Frequency Distribution of TE

	DEA				SFA	
	I-O	O-O	I-O SCV	O-O SCV	Without SCV	With SCV
$0 < TE \leq 0.5$	——	——	——	——	——	——
$0.5 < TE \leq 0.6$	——	——	——	——	——	——
$0.6 < TE \leq 0.7$	——	——	——	——	16	6
$0.7 < TE \leq 0.8$	12	4	——	——	142	121
$0.8 < TE \leq 0.9$	241	293	158	226	127	137
$0.9 < TE \leq 1.0$	126	82	221	135	94	95
Total	379	379	379	379	379	379

I-O=Input Orientation, O-O= output Orientation, I-OSCV, O-OSCV= with Supply chain variables.

The distribution of apparel private firms across zones

Apparel (Activity) / Zone	Underwear	Other types of apparel	Total
1-ALEX Zone	**21**	**97**	**118**
1-Alexandria (Governorate)	21	97	118
2- Delta Zone	**22**	**80**	**102**
2-Dakahlia (Governorate)	4	10	14
2-Gharbia (Governorate)	8	33	41
2-Minofia (Governorate)	___	6	6
2-Qalybia (Governorate)	10	31	41
3- Greater Cairo Zone	**37**	**160**	**197**
3-Cairo (Governorate)	32	122	154
3- Giza (Governorate)	5	38	43
4- Canal Zone	**4**	**38**	**42**
4-Sharkia (Governorate)	4	22	26
4-Ismaelia (Governorate)	___	7	7
4- Port Said (Governorate)	___	9	9
Total	**84**	**375**	**459**

The distribution of apparel sector firms for size and age variables.

Textile (Activity) / Zone	Underwear Size			Other types of apparel Size			Underwear Age		Other types of apparel Age	
	S*	M*	L*	S	M	L	O*	N*	O	N
1-ALEX Zone	**8**	**6**	**7**	**34**	**26**	**37**	**14**	**7**	**52**	**45**
Alexandria(Governorate)	8	6	7	34	26	37	14	7	52	45
2- Delta Zone	**6**	**7**	**9**	**16**	**26**	**38**	**12**	**10**	**42**	**38**
2-Dakahlia (Governorate)	3	0	1	1	7	2	2	2	4	6
2-Gharbia (Governorate)	1	4	3	10	9	14	5	3	20	13
2-Minofia (Governorate)	0	0	0	1	2	3	0	0	4	2
2-Qalybia (Governorate)	2	3	5	4	8	19	5	5	14	17
3- Greater Cairo Zone	**12**	**4**	**21**	**79**	**35**	**46**	**17**	**20**	**78**	**82**
3-Cairo (Governorate)	11	4	17	67	27	28	15	17	64	58
3- Giza (Governorate)	1	0	4	12	8	18	2	3	14	24
4- Canal Zone	**2**	**1**	**1**	**1**	**3**	**34**	**3**	**1**	**14**	**24**
4-Sharkia (Governorate)	2	1	1	0	2	20	3	1	6	16
4-Ismailia (Governorate)	0	0	0	1	1	5	0	0	4	3
4-Port Said (Governorate)	0	0	0	0	0	9	0	0	4	5
Total	**28**	**18**	**38**	**130**	**90**	**155**	**46**	**38**	**186**	**189**

S= small size firm, M= medium size firm, L= large and extra-large firms.

O= old firm, N= new firm.

The distribution of apparel sector firms for GB, B and EXR variables

Textile (Activity) / Zone	Underwear GB		Underwear B		Underwear EXR	
	Affect	Not affect	Affect	Not affect	Affect	Not affect
1-ALEX Zone	**9**	**12**	**14**	**7**	**9**	**12**
1-Alexandria(Governorate)	9	12	14	7	7	4
2- Delta Zone	**8**	**14**	**22**	**0**	**6**	**16**
2-Dakahlia (Governorate)	0	4	4	0	0	4
2-Gharbia (Governorate)	2	6	8	0	2	6
2-Minofia (Governorate)	0	0	0	0	0	0
2-Qalybia (Governorate)	6	4	10	0	4	6
3- Greater Cairo Zone	**25**	**12**	**29**	**8**	**12**	**25**
3-Cairo (Governorate)	21	11	24	8	11	21
3- Giza (Governorate)	4	1	5	0	1	4
4- Canal Zone	**1**	**3**	**4**	**0**	**1**	**3**
4-Sharkia (Governorate)	1	3	4	0	1	3
4-Ismailia (Governorate)	0	0	0	0	0	0
4- Port Said (Governorate)	0	0	0	0	0	0
Total	**43**	**41**	**69**	**15**	**28**	**56**

Affect= each factor has an impact on industry's competitiveness.

Not affect= there is no impact.

The distribution of apparel sector firms for GB, B and EXR variables

Textile (Activity) / Zone	Other types of apparel GB		Other types of apparel B		Other types of apparel EXR	
	Affect	Not affect	Affect	Not affect	Affect	Not affect
1-ALEX Zone	**37**	**60**	**95**	**2**	**19**	**78**
1-Alexandria(Governorate)	37	60	95	2	19	78
2- Delta Zone	**24**	**56**	**60**	**20**	**32**	**48**
2-Dakahlia (Governorate)	0	10	10	0	0	10
2-Gharbia (Governorate)	9	24	23	10	11	22
2-Minofia (Governorate)	3	3	3	3	3	3
2-Qalybia (Governorate)	12	19	24	7	18	13
3- Greater Cairo Zone	**142**	**18**	**157**	**3**	**31**	**1 29**
3-Cairo (Governorate)	121	1	121	1	20	102
3- Giza (Governorate)	21	17	36	2	11	27
4- Canal Zone	**34**	**4**	**37**	**1**	**33**	**5**
4-Sharkia (Governorate)	20	2	21	1	20	2
4-Ismailia (Governorate)	5	2	7	0	5	2
4- Port Said (Governorate)	9	0	9	0	8	1
Total	**237**	**138**	**349**	**26**	**115**	**260**

Affect= each factor has an impact on industry's competitiveness.

Not affect= there is no impact.

Apparel sector's P, SP, DS, RS average across regions

Textile (Activity) / Zone	Underwear P*	Underwear SP*	Underwear DS*	Underwear RS*
	Average	Average	Average	Average
1-ALEX Zone	**1.5063**	**1.5829**	**1.5230**	**1.6022**
1Alexandria(Governorate)	1.5063	1.5829	1.5230	1.6022
2- Delta Zone	**1.5179**	**1.5787**	**1.4914**	**1.5689**
2-Dakahlia (Governorate)	1.4567	1.4958	1.4150	1.4967
2-Gharbia (Governorate)	1.5608	1.6358	1.5363	1.6138
2-Minofia (Governorate)	____	____	____	____
2-Qalybia (Governorate)	1.5383	1.6080	1.5260	1.5980
3- Greater Cairo Zone	**1.5800**	**1.6187**	**1.5583**	**1.6068**
3-Cairo (Governorate)	1.5204	1.5548	1.5014	1.5621
3- Giza (Governorate)	1.642	1.6853	1.6173	1.6527
4- Canal Zone	**1.4050**	**1.5075**	**1.5133**	**1.5767**
4-Sharkia (Governorate)	1.4050	1.5075	1.5133	1.5767
4-Ismilia (Governorate)	0	0	0	0
4-Port Said (Governorate)	0	0	0	0
Total Average	**1.5010**	**1.5714**	**1.5213**	**1.5886**

P= planning process. SP= sourcing process.

DS= Delivery system. RS= returns system.

Apparel sector's P, SP, DS, RS average across regions

Textile (Activity) / Zone	Other types of apparel P*	Other types of apparel SP*	Other types of apparel DS*	Other types of apparel RS*
	Average	Average	Average	Average
1-ALEX Zone	**1.6169**	**1.6726**	**1.5905**	**1.6802**
Alexandria(Governorate)	1.6169	1.6726	1.5905	1.6802
2- Delta Zone	**1.5777**	**1.6349**	**1.5642**	**1.6385**
2-Dakahlia (Governorate)	1.5470	1.5970	1.5313	1.6243
2-Gharbia (Governorate)	1.5412	1.6098	1.5298	1.6018
2-Minofia (Governorate)	1.6033	1.6620	1.5861	1.6639
2-Qalybia (Governorate)	1.6210	1.6719	1.6110	1.6648
3- Greater Cairo Zone	**1.5649**	**1.6121**	**1.5531**	**1.6064**
3-Cairo (Governorate)	1.5290	1.5786	1.5304	1.5836
3- Giza (Governorate)	1.6016	1.6463	1.5761	1.6295
4- Canal Zone	**1.7479**	**1.7943**	**1.6977**	**1.7729**
4-Sharkia (Governorate)	1.7050	1.7592	1.6770	1.7400
4-Ismilia (Governorate)	1.7429	1.7833	1.6743	1.7600
4-Port Said (Governorate)	1.7970	1.8415	1.7426	1.8196
Total Average	**1.6253**	**1.6770**	**1.6004**	**1.6733**

P= planning process. SP= sourcing process.

DS= Delivery system. RS= returns system.

Table3a. Apparel Firms: Technical Efficiencies by Size

Size	**Small without SCV**				**Small with SCV**			
	Mean	Min	Max	St.Dev	Mean	Min	Max	St.Dev
2006	0.971	0.957	0.989	0.005	0.976	0.967	0.990	0.006
2007	0.978	0.966	0.993	0.004	0.986	0.978	0.995	0.003
2008	0.973	0.959	0.991	0.005	0.980	0.968	0.993	0.004
Average	**0. 974**	**0.957**	**0.993**	**0.006**	**0.981**	**0.967**	**0.995**	**0.006**
Size	**Medium without SCV**				**Medium with SCV**			
	Mean	Min	Max	St.Dev	Mean	Min	Max	St.Dev
2006	0.975	0.955	0.987	0.005	0.982	0.975	0.990	0.003
2007	0.970	0.946	0.984	0.006	0.974	0.963	0.985	0.004
2008	0.978	0.963	0.989	0.004	0.987	0.971	0.993	0.004
Average	**0.974**	**0.946**	**0.989**	**0.006**	**0.981**	**0.963**	**0.993**	**0.006**
Size	**Large& Extra-large without SCV**				**Large& Extra-large with SCV**			
	Mean	Min	Max	St.Dev	Mean	Min	Max	St.Dev
2006	0.979	0.970	0.987	0.003	0.987	0.984	0.991	0.001
2007	0.974	0.964	0.984	0.003	0.982	0.977	0.987	0.002
2008	0.969	0.956	0.981	0.004	0.973	0.966	0.982	0.003
Average	**0.974**	**0.956**	**0.987**	**0.005**	**0.981**	**0.966**	**0.991**	**0.006**

Table3b. Apparel Firms: Technical Efficiencies by Age

Age	**New without SCV**				**New with SCV**			
	Mean	Min	Max	St.Dev	Mean	Min	Max	St.Dev
2006	0.971	0.946	0.989	0.005	0.977	0.964	0.990	0.005
2007	0.975	0.961	0.993	0.006	0.982	0.968	0.995	0.007
2008	0.976	0.955	0.991	0.004	0.984	0.972	0.993	0.003
Average	**0.974**	**0.946**	**0.993**	**0.006**	**0.981**	**0.964**	**0.995**	**0.006**
Age	**Old without SCV**				**Old with SCV**			
	Mean	Min	Max	St.Dev	Mean	Min	Max	St.Dev
2006	0.972	0.955	0.983	0.005	0.978	0.966	0.986	0.005
2007	0.973	0.946	0.987	0.006	0.980	0.963	0.991	0.007
2008	0.977	0.963	0.986	0.004	0.985	0.977	0.990	0.003
Average	**0.974**	**0.946**	**0.987**	**0.005**	**0.981**	**0.963**	**0.991**	**0.006**

Table3c. Apparel Firms: Technical Efficiencies by GB

GB	**GB do not affect without SCV**				**GB do not affect with SCV**			
	Mean	Min	Max	St.Dev	Mean	Min	Max	St.Dev
2006	0.975	0.955	0.991	0.005	0.982	0.975	0.993	0.003
2007	0.969	0.946	0.989	0.005	0.973	0.963	0.990	0.004
2008	0.979	0.963	0.993	0.004	0.987	0.972	0.995	0.002
Average	**0.974**	**0.946**	**0.993**	**0.006**	**0.981**	**0.963**	**0.995**	**0.006**
GB	**GB affect without SCV**				**GB affect with SCV**			
	Mean	Min	Max	St.Dev	Mean	Min	Max	St.Dev
2006	0.969	0.956	0.981	0.004	0.973	0.966	0.987	0.003
2007	0.979	0.970	0.987	0.003	0.987	0.981	0.991	0.001
2008	0.974	0.964	0.984	0.003	0.981	0.972	0.987	0.002
Average	**0.974**	**0.956**	**0.987**	**0.005**	**0.981**	**0.966**	**0.991**	**0.006**

Table3d. Apparel Firms: Technical Efficiencies by B

B	**B affects without SCV**				**B affects with SCV**			
	Mean	Min	Max	St.Dev	Mean	Min	Max	St.Dev
2006	0.976	0.969	0.991	0.004	0.983	0.979	0.993	0.003
2007	0.971	0.962	0.989	0.005	0.975	0.969	0.990	0.004
2008	0.980	0.967	0.993	0.004	0.988	0.972	0.995	0.003
Average	**0.976**	**0.962**	**0.993**	**0.006**	**0.982**	**0.969**	**0.995**	**0.006**
B	**B does not affect without SCV**				**B does not affect with SCV**			
	Mean	Min	Max	St.Dev	Mean	Min	Max	St.Dev
2006	0.969	0.946	0.984	0.005	0.973	0.963	0.987	0.003
2007	0.979	0.963	0.989	0.003	0.987	0.974	0.993	0.002
2008	0.974	0.955	0.987	0.004	0.981	0.972	0.990	0.002
Average	**0.974**	**0.946**	**0.989**	**0.006**	**0.981**	**0.963**	**0.993**	**0.006**

Table3e. Apparel Firms: Technical Efficiencies by EXR

EXR	**EXR do not affect without SCV**				**EXR do not affect with SCV**			
	Mean	Min	Max	St.Dev	Mean	Min	Max	St.Dev
2006	0.974	0.955	0.991	0.004	0.982	0.975	0.993	0.002
2007	0.969	0.946	0.989	0.005	0.973	0.963	0.990	0.003
2008	0.978	0.963	0.993	0.003	0.987	0.971	0.995	0.002
Average	**0.974**	**0.946**	**0.993**	**0.006**	**0.981**	**0.963**	**0.995**	**0.006**
EXR	**EXR affect without SCV**				**EXR affect with SCV**			
	Mean	Min	Max	St.Dev	Mean	Min	Max	St.Dev
2006	0.969	0.957	0.981	0.004	0.974	0.966	0.987	0.003
2007	0.979	0.971	0.987	0.003	0.987	0.981	0.991	0.001
2008	0.975	0.965	0.984	0.004	0.982	0.972	0.987	0.002
Average	**0.974**	**0.957**	**0.987**	**0.005**	**0.981**	**0.966**	**0.991**	**0.006**

Table3f. Apparel firms private sector Frequency Distribution of TE

	DEA				SFA	
	I-O	O-O	I-O SCV	O-O SCV	Without SCV	With SCV
$0 < TE \leq 0.5$	——	——	——	——	——	——
$0.5 < TE \leq 0.6$	——	——	——	——	——	——
$0.6 < TE \leq 0.7$	——	——	——	——	——	——
$0.7 < TE \leq 0.8$	218	281	22	144	——	——
$0.8 < TE \leq 0.9$	210	153	279	250	——	——
$0.90 < TE \leq 0.95$	24	14	102	35	1	——
$0.95 < TE \leq 0.97$	3	4	14	9	245	112
$0.97 < TE \leq 1.0$	4	5	42	21	213	347
Total	459	459	459	459	459	459

I-O=Input Orientation, O-O= output Orientation, I-OSCV, O-OSCV= with Supply chain variables.

Public firms' distribution across the country

Zone	Number of firms
1-ALEX Zone	**8**
1-Alexandria(Governorate)	3
1-Behera (Governorate)	4
1-Port Said (Governorate)	1
2- Delta Zone	**8**
2-Dakahlia (Governorate)	2
2-Gharbia (Governorate)	3
2-Sharqia (Governorate)	2
2- Damietta (Governorate)	1
3- Greater Cairo and Upper Egypt	**9**
3-Cairo (Governorate)	1
3- Giza (Governorate)	2
3-Qalybia (Governorate)	2
3- Minia (Governorate)	1
3- Asyut (Governorate)	1
3- Suhag (Governorate)	1
3- Qena (Governorate)	1
Total	**25**

The distribution of size and age variables for public firms

Zone	Firm size		Firm age	
	Large	Extra-Large	Old	New
1-ALEX Zone	**6**	**2**	**6**	**2**
1-Alexandria(Governorate)	2	1	3	0
1-Behera (Governorate)	3	1	3	1
1-Port Said (Governorate)	1	0	0	1
2- Delta Zone	**6**	**2**	**3**	**5**
2-Dakahlia (Governorate)	2	0	0	2
2-Gharbia (Governorate)	1	2	2	1
2-Sharqia (Governorate)	2	0	1	1
2- Damietta (Governorate)	1	0	0	1
3- Greater Cairo and Upper Egypt	**6**	**3**	**3**	**6**
3-Cairo (Governorate)	0	1	1	0
3- Giza (Governorate)	1	1	1	1
3-Qalybia (Governorate)	1	1	1	1
3- Minia (Governorate)	1	0	0	1
3- Asyut (Governorate)	1	0	0	1
3- Suhag (Governorate)	1	0	0	1
3- Qena (Governorate)	1	0	0	1
Total	**18**	**7**	**12**	**13**

The distribution of GB, B and EXR variables for public firms

Zone	GB		B		EXR	
	Affect	Not affect	Affect	Not affect	Affect	Not affect
1-ALEX Zone	**4**	**4**	**7**	**1**	**6**	**2**
1-Alexandria(Governorate)	2	1	3	0	2	1
1-Behera (Governorate)	2	2	3	1	3	1
1-Port Said (Governorate)	0	1	1	0	1	0
2- Delta Zone	**3**	**5**	**6**	**2**	**5**	**3**
2-Dakahlia (Governorate)	1	1	2	0	1	1
2-Gharbia (Governorate)	1	2	2	1	2	1
2-Sharqia (Governorate)	1	1	1	1	1	1
2-Damietta (Governorate)	0	1	1	0	1	0
3- Greater Cairo and Upper Egypt	**7**	**9**	**7**	**2**	**5**	**4**
3-Cairo (Governorate)	0	1	1	0	0	1
3- Giza (Governorate)	1	1	1	1	2	0
3-Qalybia (Governorate)	2	0	1	1	1	1
3- Minia (Governorate)	1	0	1	0	0	1
3- Asyut (Governorate)	1	0	1	0	1	0
3- Suhag (Governorate)	1	0	1	0	1	0
3- Qena (Governorate)	1	0	1	0	0	1
Total	**14**	**11**	**20**	**5**	**16**	**9**

Public sector's P, SP, DS, RS average across regions

Zone	P	SP	DS	RS
1-ALEX Zone	**1.3255**	**1.4570**	**1.3919**	**1.5098**
1-Alexandria(Governorate)	1.3442	1.4679	1.3692	1.5183
1-Behera (Governorate)	1.3106	1.4500	1.4178	1.5034
1-Port Said (Governorate)	1.3288	1.4525	1.3563	1.5100
2- Delta Zone	**1.3890**	**1.4884**	**1.4653**	**1.5027**
2-Dakahlia (Governorate)	1.3125	1.4275	1.5031	1.4994
2-Gharbia (Governorate)	1.4554	1.5208	1.4996	1.4904
2-Sharqia (Governorate)	1.3950	1.5188	1.4306	1.5206
2-Damietta (Governorate)	1.3288	1.4525	1.3563	1.51
3- Greater Cairo and Upper Egypt	**1.3829**	**1.5068**	**1.4715**	**1.4036**
3-Cairo (Governorate)	1.2763	1.5250	1.5213	1.2225
3- Giza (Governorate)	1.3694	1.5325	1.5106	1.3550
3-Qalybia (Governorate)	1.3850	1.5188	1.5269	1.3988
3- Minia (Governorate)	1.4850	1.5238	1.4688	1.4100
3- Asyut (Governorate)	1.3288	1.4525	1.3563	1.51
3- Suhag (Governorate)	1.5188	1.5050	1.4663	1.4725
3- Qena (Governorate)	1.3288	1.4525	1.3563	1.5100
Total average	**1.3658**	**1.4841**	**1.4429**	**1.4720**

P= planning process. SP= sourcing process.

DS= Delivery system. RS= returns system.

Table1a. Public Firms: Technical Efficiencies by Size

Size	**Large without SCV**				**Large with SCV**			
	Mean	Min	Max	St.Dev	Mean	Min	Max	St.Dev
2001	0.869	0.685	0.985	0.094	0.978	0.880	0.999	0.038
2002	0.891	0.772	0.984	0.069	0.973	0.848	0.999	0.037
2003	0.906	0.709	0.989	0.071	0.931	0.837	0.999	0.068
2004	0.679	0.136	0.968	0.240	0.991	0.958	0.999	0.016
2005	0.768	0.256	0.978	0.199	0.962	0.832	0.999	0.064
2006	0.730	0.395	0.971	0.173	0.998	0.992	0.999	0.002
2007	0.806	0.530	0.980	0.134	0.995	0.968	0.999	0.010
2008	0.863	0.648	0.987	0.099	0.978	0.872	0.999	0.042
Average	**0.812**	**0.136**	**0.989**	**0.155**	**0.975**	**0.832**	**0.999**	**0.045**

Size	**Extra-Large without SCV**				**Extra- Large with SCV**			
	Mean	Min	Max	St.Dev	Mean	Min	Max	St.Dev
2001	0.753	0.426	0.945	0.195	0.998	0.990	0.999	0.003
2002	0.824	0.559	0.962	0.152	0.995	0.958	0.999	0.014
2003	0.876	0.672	0.974	0.114	0.977	0.834	0.999	0.054
2004	0.699	0.150	0.968	0.273	0.992	0.966	0.999	0.013
2005	0.783	0.274	0.978	0.231	0.968	0.863	0.999	0.054
2006	0.759	0.413	0.981	0.176	0.990	0.962	0.999	0.016
2007	0.840	0.547	0.987	0.140	0.954	0.847	0.999	0.063
2008	0.759	0.331	0.952	0.190	0.975	0.864	0.999	0.049
Average	**0.780**	**0.150**	**0.985**	**0.170**	**0.992**	**0.846**	**0.999**	**0.024**

Table1b. Public Firms: Technical Efficiencies by Age

Age	**New without SCV**				**New with SCV**			
	Mean	Min	Max	St.Dev	Mean	Min	Max	St.Dev
2001	0.635	0.136	0.932	0.257	0.997	0. 998	0.999	0.001
2002	0.719	0.256	0.951	0.220	0.999	0.992	0.999	0.002
2003	0.723	0. 395	0.966	0.198	0.999	0.992	0.999	0.002
2004	0.782	0.530	0.977	0.154	0.996	0.968	0.999	0.008
2005	0.792	0.452	0.984	0.145	0.996	0.961	0.999	0.001
2006	0.803	0.582	0.989	0.119	0.985	0.846	0.999	0.038
2007	0.836	0.691	0.977	0.081	0.981	0.883	0.999	0.034
2008	0.816	0.489	0.946	0.117	0.982	0.883	0.999	0.040
Average	**0.760**	**0.136**	**0.989**	**0.170**	**0.992**	**0.846**	**0.999**	**0.024**

Age	**Old without SCV**				**Old with SCV**			
	Mean	Min	Max	St.Dev	Mean	Min	Max	St.Dev
2001	0.883	0.670	0. 980	0.099	0.949	0.848	0.999	0.069
2002	0.840	0.426	0.987	0.180	0.974	0.877	0.999	0.039
2003	0.884	0.559	0.978	0.136	0.951	0.862	0.999	0.057
2004	0.910	0.672	0.985	0.096	0.952	0.871	0.999	0.057
2005	0.825	0.331	0.977	0.209	0.972	0.863	0.999	0.044
2006	0.872	0.471	0.974	0.164	0.945	0.834	0.999	0.067
2007	0.898	0.598	0.981	0.120	0.964	0.887	0.999	0.003
2008	0.922	0.704	0.987	0.082	0.914	0.832	0.999	0.074
Average	**0.878**	**0.331**	**0.987**	**0.136**	**0.951**	**0.832**	**0.999**	**0.024**

Table1c. Public Firms: Technical Efficiencies by GB

GB	**GB not affect without SCV**				**GB not affect with SCV**			
	Mean	Min	Max	St.Dev	Mean	Min	Max	St.Dev
2001	0.747	0.150	0.977	0.277	0.941	0. 848	0.999	0.060
2002	0.778	0.274	0.980	0.228	0.968	0.847	0.999	0.0555
2003	0.826	0.413	0.954	0.176	0.996	0.990	0.999	0.004
2004	0.883	0.547	0.968	0.130	0.985	0.959	0.999	0.014
2005	0.919	0.662	0.978	0.097	0.938	0.837	0.998	0.057
2006	0.871	0.663	0.985	0.126	0.933	0.834	0.999	0.062
2007	0.910	0.787	0.989	0.071	0.943	0.844	0.999	0.067
2008	0.876	0.489	0.987	0.148	0.952	0.832	0.999	0.061
Average	**0.852**	**0.15**	**0.989**	**0.165**	**0.955**	**0.832**	**0.999**	**0.055**

GB	**GB affect without SCV**				**GB affect with SCV**			
	Mean	Min	Max	St.Dev	Mean	Min	Max	St.Dev
2001	0.795	0.577	0. 951	0.107	0.996	0.971	0.999	0.008
2002	0.807	0.613	0.932	0.097	0.989	0.883	0.999	0.031
2003	0.736	0.331	0.942	0.167	0.990	0.864	0.999	0.035
2004	0.667	0.136	0.968	0.223	0.998	0.968	0.999	0.008
2005	0.766	0.256	0.978	0.186	0.989	0.872	0.999	0.034
2006	0.804	0.395	0.942	0.147	0.998	0.991	0.999	0.003
2007	0.804	0.452	0.961	0.149	0.995	0.971	0.999	0.008
2008	0.761	0.447	0.973	0.157	0.993	0.925	0.999	0.019
Average	**0.766**	**0.136**	**0.978**	**0.158**	**0.994**	**0.865**	**0.999**	**0.022**

Table1d. Public Firms: Technical Efficiencies by B

B	**B affects without SCV**				**B affects with SCV**			
	Mean	Min	Max	St.Dev	Mean	Min	Max	St.Dev
2001	0.824	0.426	0.974	0.159	0.977	0.862	0.999	0.046
2002	0.858	0.559	0.981	0.118	0.984	0.866	0.999	0.034
2003	0.898	0.672	0.987	0.085	0.971	0.851	0.999	0.038
2004	0.905	0.670	0.987	0.089	0.926	0.832	0.999	0.070
2005	0.836	0.547	0.968	0.129	0.976	0.848	0.999	0.046
2006	0.823	0.331	0.978	0.170	0.979	0.871	0.999	0.041
2007	0.865	0.471	0.984	0.130	0.983	0.959	0.999	0.015
2008	0.906	0.598	0.989	0.099	0.928	0.837	0.999	0.061
Average	**0.864**	**0.331**	**0.989**	**0.125**	**0.965**	**0.832**	**0.999**	**0.050**

B	**B does not affect without SCV**				**B does not affect with SCV**			
	Mean	Min	Max	St.Dev	Mean	Min	Max	St.Dev
2001	0.636	0.136	0.968	0.225	0.999	0.993	0.999	0.002
2002	0.734	0.256	0.978	0.198	0.997	0.970	0.999	0.009
2003	0.746	0.395	0.985	0.202	0.987	0.881	0.999	0.038
2004	0.774	0.530	0.943	0.149	0.999	0.999	0.999	0.000
2005	0.616	0.150	0.960	0.235	0.999	0.998	0.999	0.000
2006	0.716	0.274	0.942	0.198	0.998	0. 991	0.999	0.003
2007	0.765	0.413	0.960	0.179	0.996	0.961	0.999	0.012
2008	0.763	0.447	0.973	0.182	0.983	0.847	0.999	0.048
Average	**0.716**	**0.136**	**0.984**	**0.193**	**0.995**	**0.847**	**0.999**	**0.022**

Table1e. Public Firms: Technical Efficiencies by EXR

EXR	**EXR do not affect without SCV**				**EXR do not affect with SCV**			
	Mean	Min	Max	St.Dev	Mean	Min	Max	St.Dev
2001	0.772	0.489	0.984	0.157	0.995	0.961	0.999	0.009
2002	0.838	0.613	0.978	0.123	0.985	0.959	0.999	0.016
2003	0.896	0.715	0.985	0.091	0.948	0.871	0.999	0.057
2004	0.713	0.136	0.980	0.261	0.961	0.832	0.999	0.055
2005	0.641	0.150	0.987	0.272	0.969	0.847	0.999	0.055
2006	0.731	0.274	0.977	0.218	0.972	0.848	0.999	0.052
2007	0.780	0.413	0.981	0.153	0.987	0.957	0.999	0.018
2008	0.861	0.663	0.987	0.102	0.945	0.834	0.999	0.070
Average	**0.778**	**0.136**	**0.989**	**0.187**	**0.968**	**0.832**	**0.999**	**0.051**

EXR	**EXR affect without SCV**				**EXR affect with SCV**			
	Mean	Min	Max	St.Dev	Mean	Min	Max	St.Dev
2001	0.854	0.766	0.951	0.065	0.995	0.966	0.999	0.011
2002	0.898	0.833	0.967	0.046	0.979	0.865	0.999	0.045
2003	0.895	0.818	0.971	0.044	0.997	0.990	0.999	0.004
2004	0.910	0.861	0.951	0.031	0.993	0.958	0.999	0.014
2005	0.783	0.447	0.966	0.200	0.997	0.990	0.999	0.004
2006	0.761	0.530	0.977	0.153	0.998	0.991	0.999	0.003
2007	0.827	0.648	0.827	0.107	0.999	0.998	0.999	0.001
2008	0.863	0.744	0.961	0.081	0.996	0.990	0.999	0.004
Average	**0.849**	**0.447**	**0.977**	**0.112**	**0.994**	**0.865**	**0.999**	**0.018**

Table1f. Public sector Frequency Distribution of TE

	DEA				SFA	
	I-O	O-O	I-O SCV	O-O SCV	Without SCV	With SCV
$0 < TE \leq 0.5$	——	——	——	——	2	——
$0.5 < TE \leq 0.6$	——	——	——	——	1	——
$0.6 < TE \leq 0.7$	——	1	——	1	2	——
$0.7 < TE \leq 0.8$	——	2	——	1	2	——
$0.8 < TE \leq 0.9$	3	3	——	1	7	3
$0.9 < TE \leq 1.0$	22	19	25	22	11	22
Total	25	25	25	25	25	25

I-O=Input Orientation, O-O= output Orientation, I-OSCV, O-OSCV= with Supply chain variables.

Appendix 9

Chapter 5 tables

Table 5.1a Mean TE I-orientation and TGR for T&A different regions without SCV

Region	Criterion	Year				
		06-08	St.Dev.	06	07	08
ALEX	TE* I-O	0.8254	0.0552	0.8759	0.8727	0.8400
	R. TE I-O	0.8910	0.0480	0.8975	0.9050	0.9316
	TGR	0.9264		0.9759	0.9643	0.9017
	MIN TE	0.7633		0.7633	0.8074	0.8413
	% of Firms	22.32		22.32	22.32	22.32
DELTA	TE* I-O	0.8214	0.0441	0.8723	0.8772	0.8325
	R. TE I-O	0.8881	0.0477	0.9277	0.8960	0.9070
	TGR	0.9248		0.9403	0.9791	0.9179
	MIN TE	0.7525		0.8314	0.7527	0.7878
	% of Firms	37.70		37.70	37.70	37.70
G. CAIRO	TE* I-O	0.8258	0.0499	0.8731	0.8663	0.8455
	R. TE I-O	0.8750	0.046	0.9030	0.9225	0.9139
	TGR	0.9438		0.9670	0.9391	0.9251
	MIN TE	0.7462		0.8093	0.7820	0.8260
	% of Firms	30.67		30.67	30.67	30.67
Canal Zone	TE* I-O	0.8045	0.0398	0.8704	0.8563	0.8047
	R.TE I-O	0.8551	0.0488	0.9212	0.9053	0.8804
	TGR	0.9409		0.9448	0.9459	0.9140
	MIN TE	0.7645		0.8273	0.8519	0.7731
	% of Firms	9.31		9.31	9.31	9.31

Table 5.1b: Mean TE input-orientation and TGR for T&A different regions with SCV

Region	Criterion	Year				
		06-08	St.Dev.	06	07	08
ALEX	TE* I-O	0.8817	0.0525	0.9077	0.8985	0.8903
	R.TE I-O	0.9111	0.0455	0.9164	0.9235	0.9348
	TGR	0.9677		0.9905	0.9729	0.9523
	MIN TE	0.7945		0.8012	0.8313	0.8499
	% of Firms	22.32		22.32	22.32	22.32
DELTA	TE* I-O	0.8860	0.0457	0.9123	0.9034	0.8970
	R.TE I-O	0.9128	0.0470	0.9404	0.9265	0.9327
	TGR	0.9707		0.9702	0.9750	0.9617
	MIN TE	0.7783		0.8607	0.8188	0.8421
	% of Firms	37.70		37.70	37.70	37.70
G. CAIRO	TE I-O	0.8829	0.0501	0.9058	0.8993	0.8955
	R. TE I-O	0.9031	0.0438	0.9256	0.9329	0.9240
	TGR	0.9777		0.9786	0.9640	0.9692
	MIN TE	0.7906		0.8432	0.8161	0.8315
	% of Firms	30.67		30.67	30.67	30.67
Canal Zone	TE I-O	0.8708	0.0403	0.9096	0.8883	0.8816
	R.TE I-O	0.8999	0.0422	0.9400	0.9358	0.9127
	TGR	0.9676		0.9677	0.9492	0.9659
	MIN TE	0.8152		0.8787	0.8775	0.8163
	% of Firms	9.31		9.31	9.31	9.31

Table 5.1c: Mean TE output-orientation and TGR for T&A different regions without CSV

Region	Criterion	Year				
		06-08	St.Dev.	06	07	08
ALEX	TE* O-O	0.8137	0.0487	0.8584	0.8691	0.8208
	R. TEO-O	0.8968	0.0424	0.8974	0.9086	0.9277
	TGR	0.9074		0.9565	0.9565	0.8848
	MIN TE	0.8037		0.8037	0.8284	0.8532
	% of Firms	22.32		22.32	22.32	22.32
DELTA	TE* O-O	0.8303	0.0441	0.8699	0.8818	0.8361
	R. TE O-O	0.8668	0.0447	0.9230	0.8902	0.8832
	TGR	0.9579		0.9425	0.9906	0. 9467
	MIN TE	0.7547		0.8326	0.8053	0.7566
	% of Firms	37.70		37.70	37.70	37.70
G. CAIRO	TE O-O	0.7994	0.0399	0.8458	0.8539	0.8049
	R. TE O-O	0.8567	0.0397	0.8772	0.9216	0.9029
	TGR	0.9331		0.9641	0.9265	0.8914
	MIN TE	0.7479		0.8157	0.8223	0.8524
	% of Firms	30.67		30.67	30.67	30.67
Canal Zone	TE I-O	0.8497	0.0579	0.9004	0.8907	0.8265
	R. TE O-O	0.8905	0.0531	0.9343	0.9152	0.9123
	TGR	0.9541		0.9637	0.9732	0.9353
	MIN TE	0.7348		0.8578	0.8488	0.7485
	% of Firms	9.31		9.31	9.31	9.31

Table 5.1d: Mean TE output-orientation and TGR for T& A different regions with SCV

Region	Criterion	Year				
		06-08	St.Dev.	2006	2007	2008
ALEX	TE* O-O	0.8444	0.0634	0.8830	0.8806	0.8512
	G. TE O-O	0.9061	0.0444	0.9076	0.9183	0.9300
	TGR	0.9318		0.9729	0.9590	0.9153
	MIN TE	0.8152		0.8212	0.8313	0.8608
	% of Firms	22.32		22.32	22.32	22.32
DELTA	TE* O-O	0.8633	0.0509	0.8985	0.8952	0.8687
	G TE O-O	0.8843	0.0501	0.9294	0.9118	0.9023
	TGR	0.9762		0.9667	0.9817	0.9628
	MIN TE	0.7723		0.8467	0.8308	0.7752
	% of Firms	37.70		37.70	37.70	37.70
G. Cairo	TE* O-O	0.8319	0.0502	0.8725	0.8690	0.8375
	G. TE O-O	0.8763	0.0504	0.8987	0.9243	0.9097
	TGR	0.9494		0.9709	0.9401	0.9207
	MIN TE	0.7479		0.8260	0.8223	0.8524
	% of Firms	30.67		30.67	30.67	30.67
Canal Zone	TE O-O	0.8693	0.0569	0.9130	0.8976	0.8735
	G. TE O-O	0.9004	0.0508	0.9393	0.9255	0.9176
	TGR	0.9655		0.9719	0.9699	0.9519
	MIN TE	0.7539		0.8655	0.8606	0.7630
	% of Firms	9.31		9.31	9.31	9.31

Table 5.2a: Mean TE i-orientation and TGR for textile different regions without SCV

Region	Criterion	Year				
		06-08	St.Dev.	2006	2007	2008
ALEX	TE* I-O	0.8991	0.0516	0.9100	0.9071	0.9224
	R. TE I-O	0.9199	0.0430	0.9233	0.9246	0.9577
	TGR	0.9774		0.9856	0.9811	0.9632
	MIN TE	0.8163		0.8332	0.8163	0.8978
	% of Firms	18. 21		18. 21	18. 21	18. 21
DELTA	TE* I-O	0.8857	0.0420	0.8959	0.8999	0.9195
	R. TE I-O	0.9075		0.9353	0.9130	0.9301
	TGR	0.9760	0.0412	0.9578	0.9856	0.9886
	MIN TE	0.7755		0.8315	0.8124	0.8452
	% of Firms	56.46		56.46	56.46	56.46
G. Cairo	TE* I-O	0.8818	0.0470	0.8990	0.8882	0.9082
	R. TE I-O	0.9185	0.0351	0.9464	0.9512	0.9237
	TGR	0.9600		0.9500	0.9338	0.9832
	MIN TE	0.8550		0.8777	0.9030	0.8565
	% of Firms	15.83		15.83	15.83	15.83
Canal Zone	TE* I-O	0.8558	0.0383	0.9017	0.8691	0.8953
	R. TE I-O	0.8969	0.0345	0.9226	0.9148	0.9584
	TGR	0.9541		0.9774	0.9501	0.9342
	MIN TE	0.8296		0.8562	0.8572	0.9168
	% of Firms	9.50		9.50	9.50	9.50

Table 5.2b: Mean TE input-orientation and TGR for textile different regions with SCV

Region	Criterion	Year				
		06-08	St.Dev.	2006	2007	2008
ALEX	TE* I-O	0.9229	0.0489	0.9338	0.9277	0.9282
	R. TE I-O	0.9364	0.0435	0.9384	0.9405	0.9586
	TGR	0.9856		0.9951	0.9864	0.9682
	MIN TE	0.8223		0.8438	0.8485	0.8978
	% of Firms	18. 21		18. 21	18. 21	18. 21
DELTA	TE* I-O	0.9100	0.0390	0.9231	0.9180	0.9384
	R. TE I-O	0.9226	0.0371	0.9525	0.9230	0.9394
	TGR	0.9863		0.9691	0.9946	0.9989
	MIN TE	0.8244		0.8440	0.8243	0.8566
	% of Firms	56.46		56.46	56.46	56.46
G. CAIRO	TE* I-O	0.9070	0.0456	0.9287	0.9058	0.9215
	R. TE I-O	0.9331	0.0363	0.9538	0.9561	0.9308
	TGR	0.9721		0.9736	0.9474	0.9900
	MIN TE	0.8598		0.8966	0.9110	0.8598
	% of Firms	15.83		15.83	15.83	15.83
Canal Zone	TE* I-O	0.8930	0.0341	0.9197	0.9011	0.9120
	R.TE I-O	0.9284	0.0305	0.9378	0.9359	0.9658
	TGR	0.9619		0.9807	0.9629	0.9443
	MIN TE	0.8656		0.8852	0.8775	0.9267
	% of Firms	9.50		9.50	9.50	9.50

Table 5.2c: Mean TE output-orientation and TGR for textile different regions without SCV

Region	Criterion	Year				
		2006-08	St.Dev.	2006	2007	2008
ALEX	TE* O-O	0.8832	0.0478	0.8969	0.8921	0.9170
	R. TE O-O	0.9199	0.0378	0.9244	0.9318	0.9580
	TGR	0.9601		0.9703	0.9704	0.9573
	MIN TE	0.8305		0.8354	0.9704	0.9170
	% of Firms	18. 21		18. 21	18. 21	18. 21
DELTA	TE* O-O	0.8805	0.0379	0.8971	0.8930	0.9199
	R. TE O-O	0.8970	0.0369	0.9341	0.9040	0.9267
	TGR	0.9816		0.9605	.9878	0.9927
	MIN TE	0.8050		0.8610	0.8053	0.8274
	% of Firms	56.46		56.46	56.46	56.46
G. CAIRO	TE* O-O	0.8570	0.0365	0.8780	0.8657	0.8944
	R. TE O-O	0.9093	0.0303	0.9412	0.9476	0.9121
	TGR	0.9425		0.9328	0.9136	0.9806
	MIN TE	0.8517		0.8865	0.9078	0.8620
	% of Firms	15.83		15.83	15.83	15.83
Canal Zone	TE* O-O	0.8929	0.0455	0.9292	0.9009	0.9190
	R. TE O-O	0.9147	0.0401	0.9416	0.9211	0.9633
	TGR	0.9762		0.9868	0.9781	0.9540
	MIN TE	0.8471		0.8784	0.8548	0.9248
	% of Firms	9.50		9.50	9.50	9.50

Table 5.2d: Mean TE output-orientation and TGR for textile different regions with SCV

Region	Criterion	Year				
		06-08	St.Dev.	2006	2007	2008
ALEX	TE* O-O	0.9075	0.0506	0.9176	0.9132	0.9259
	R. TE O-O	0.9312		0.9373	0.9367	0.9581
	TGR	0.9746	0.0378	0.9789	0.9749	0.9664
	MIN TE	0.8495		0.8734	0.8653	0.9170
	% of Firms	18. 21		18. 21	18. 21	18. 21
DELTA	TE* O-O	0.8976	0.0414	0.9145	0.9073	0.9281
	R. TE O-O	0.9075	0.0389	0.9438	0.9125	0.9323
	TGR	0.9891		0.9690	0.9943	0.9955
	MIN TE	0.8050		0.8643	0.8053	0.8368
	% of Firms	56.46		56.46	56.46	56.46
G. CAIRO	TE* O-O	0.8777	0.0455	0.8984	0.8790	0.9021
	R. TE O-O	0.9203	0.0330	0.9449	0.9529	0.9219
	TGR	0.9536		0.9507	0.9225	0.9785
	MIN TE	0.8585		0.8893	0.9112	0.8625
Canal Zone	TE* O-O	0.9032	0.0432	0.9339	0.9094	0.9235
	R. TE O-O	0.9245	0.0386	0.9435	0.9301	0.9668
	TGR	0.9769		0.9898	0.9777	0.9551
	MIN TE	0.8501		0.8784	0.8741	0.9258

Table 5.3a: Mean TE input-orientation and TGR for apparel different regions without SCV

Region	Criterion	Year				
		2006-08	St.Dev.	2006	2007	2008
ALEX	TE* I-O	0.8192	0.0557	0.8701	0.8894	0.8413
	R. TE I-O	0.9000	0.0473	0.9031	0.9358	0.9401
	TGR	0.9104		0.9634	0.9505	0.8949
	MIN TE	0.7868		0.7871	0.8677	0.8649
	% of Firms	25. 71		25. 71	25. 71	25. 71
DELTA	TE* I-O	0.8045	0.0425	0.8688	0.8877	0.8208
	R. TE I-O	0.8890	0.0483	0.9369	0.9143	0.9041
	TGR	0.9049		0.9273	0.9710	0.9079
	MIN TE	0.8520		0.8598	0.8159	0.7955
	% of Firms	22.22		22.22	22.22	22.22
G. CAIRO	TE* I-O	0.8255	0.0495	0.8753	0.8865	0.8491
	R. TE I-O	0.8876	0.0485	0.9052	0.9211	0.9446
	TGR	0.9300		0.9669	0.9624	0.8990
	MIN TE	0.7555		0.8135	0.7846	0.8697
	% of Firms	42.92		42.92	42.92	42.92
Canal Zone	TE* I-O	0.8011	0.0433	0.8657	0.8977	0.8066
	R.TE I-O	0.8801	0.0562	0.9485	0.9561	0.8760
	TGR	0.9102		0.9127	0.9389	0.9208
	MIN TE	0.7656		0.8898	0.9151	0.7731
	% of Firms	9.15		9.15	9.15	9.15

Table 5.3b: Mean TE input-orientation and TGR for apparel different regions with SCV

Region	Criterion	Year				
		2006-08	St.Dev.	2006	2007	2008
ALEX	TE* I-O	0.8712	0.0462	0.9143	0.9076	0.8869
	R.TE I-O	0.9311	0.0324	0.9421	0.9463	0.9465
	TGR	0.9357		0.9705	0.9591	0.9370
	MIN TE	0.8459		0.8586	0.8909	0.8820
	% of Firms	25. 71		25. 71	25. 71	25. 71
DELTA	TE* I-O	0.8739	0.0451	0.9198	0.9077	0.8893
	R.TE I-O	0.9118	0.0390	0.9396	0.9334	0.9285
	TGR	0.9585		0.9790	0.9725	0.9578
	MIN TE	0.8175		0.8671	0.8648	0.8498
	% of Firms	22.22		22.22	22.22	22.22
G. CAIRO	TE* I-O	0.8842	0.0507	0.9217	0.9151	0.8991
	R. TE I-O	0.9134	0.0435	0.9332	0.9347	0.9527
	TGR	0.9680		0.9878	0.9791	0.9438
	MIN TE	0.7906		0.8515	0.8241	0.8726
	% of Firms	42.92		42.92	42.92	42.92
Canal Zone	TE* I-O	0.8715	0.0457	0.9158	0.9152	0.8867
	R.TE I-O	0.9082	0.0451	0.9611	0.9697	0.9074
	TGR	0.9596		0.9529	0.9438	0.9771
	MIN TE	0.8163		0.9058	0.9351	0.8163
	% of Firms	9.15		9.15	9.15	9.15

Table 5.3c: Mean TE o-orientation and TGR for apparel different regions without SCV

Region	Criterion	Year				
		2006-08	St.Dev.	2006	2007	2008
ALEX	TE* O-O R. TE O-O TGR MIN TE % of Firms	0.8047 0.9067 0.8876 0.8151 25. 71	0.0430 0.0421	0.8555 0.9056 0.9447 0.8165 25. 71	0.8958 0.9412 0.9518 0.8949 25. 71	0.8169 0.9397 0.8694 0.8697 25. 71
DELTA	TE* O-O R. TE O-O TGR MIN TE % of Firms	0.8078 0.8679 0.9307 0.7601 22.22	0.0357 0.0480	0.8571 0.9359 0.9158 0.8561 22.22	0.9046 0.9205 0.9827 0.8603 22.22	0.8144 0.8786 0.9269 0.7853 22.22
G. CAIRO	TE* O-O R. TE O-O TGR MIN TE % of Firms	0.7985 0.8598 0.9287 0.7503 42.92	0.0386 0.0438	0.8467 0.8801 0.9620 0.8157 42.92	0.8878 0.9194 0.9656 0.8223 42.92	0.8111 0.9398 0.8630 0.8825 42.92
Canal Zone	TE* O-O R.TE O-O TGR MIN TE	0.8435 0.9089 0.9280 0.7550	0.0624 0.0535	0.8927 0.9503 0.9394 0.8838	0.9227 0.9594 0.9617 0.9245	0.8468 0.9049 0.9357 0.7550

Table 5.3d: Mean TE output-orientation and TGR for apparel different regions with SCV

Region	Criterion	Year				
		2006-08	St.Dev.	2006	2007	2008
ALEX	TE* O-O R.TE O-O TGR MIN TE % of Firms	0.8254 0.9221 0.8951 0.8247 25. 71	0.0541 0.0372	0.8830 0.9237 0.9559 0.8290 25. 71	0.9012 0.9429 0.9558 0.8949 25. 71	0.8363 0.9413 0.8884 0.8697 25. 71
DELTA	TE* O-O R. TE O-O TGR MIN TE % of Firms	0.8435 0.8842 0.9540 0.7827 22.22	0.0493 0.0473	0.8970 0.9378 0.9565 0.8564 22.22	0.9116 0.9325 0.9776 0.8666 22.22	0.8516 0.8976 0.9488 0.7917 22.22
G. CAIRO	TE* O-O R.TE O-O TGR MIN TE % of Firms	0.8310 0.8839 0.9402 0.7503 42.92	0.0501 0.0454	0.8900 0.9045 0.9841 0.8260 42.92	0.9007 0.9252 0.9735 0.8223 42.92	0.8400 0.9460 0.8879 0.8825 42.92
Canal Zone	TE* O-O R. TE O-O TGR MIN TE % of Firms	0.8631 0.9118 0.9466 0.7624 9.15	0.0614 0.0523	0.9074 0.9564 0.9488 0.8838 9.15	0.9259 0.9640 0.9605 0.9256 9.15	0.8676 0.9080 0.9555 0.7655 9.15

Table 5.4a: Mean TE input-orientation and TGR for T&A public firms different regions Without SCV

Region	Criterion	Year				
		2001-08	St.Dev.	2001	2002	2003
ALEX&PS	TE* I-O	0.9375	0.0357	0.9357	0.9517	0.9435
	R.TE I-O	0.9566	0.0269	0.9626	0.9828	0.9701
	TGR	0.9801		0.9721	0.9684	0.9726
	MIN TE	0.8799		0.9113	0.9620	0.9382
	% of Firms	32		32	32	32
DELTA	TE* I-O	0.9532	0.0353	0.9442	0.9544	0.9559
	R. TE I-O	0.9652	0.0332	0.9539	0.9952	0.9815
	TGR	0.9875		0.9899	0.9590	0.9740
	MIN TE	0.8868		0.9240	0.9952	0.9593
	% of Firms	32		32	32	32
CAIRO&UP	TE* I-O	0.9525	0.0323	0.9549	0.9429	0.9676
	R.TE I-O	0.9603	0.0314	0.9549	0.9429	0.9817
	TGR	0.9919		1	1	0.9856
	MIN TE	0.8569		0.9043	0.9110	0.9726
	% of Firms	36		36	36	36

Region	Criterion	Year				
		2004	2005	2006	2007	2008
ALEX&P.S	TE* I-O	0.9876	0.9817	0.9849	0.9837	0.9691
	R.TE* I-O	0.9925	0.9817	0.9861	0.9838	0.974
	TGR	0.9950	1	0.9988	0.9998	0.9950
	MIN TE	0.9910	0.9719	0.9775	0.9777	0.9560
	% of Firms	32	32	32	32	32
DELTA	TE* I-O	0.9905	0.9906	0.9928	0.9945	0.9768
	R. TE I-O	0.9923	0.9921	1	0.9969	0.9973
	TGR	0.9981	0.9985	0.9928	0.9976	0.9794
	MIN TE	0.9845	0.9921	1	0.9969	0.9960
	% of Firms	32	32	32	32	32
CAIRO&UP	TE* I-O	0.9895	0.9868	0.9914	0.9867	0.9740
	R.TEI-O	0.9971	0.9907	0.9970	0.9872	0.9925
	TGR	0.9924	0.9960	0.9944	0.9995	0.9814
	MIN TE	0.9950	0.9873	0.9959	0.9733	0.9852
	% of Firms	36	36	36	36	36

Table 5.4b: Mean TE input-orientation and TGR for T&A public firms different regions with SCV

Region	Criterion	Year				
		2001-08	St.Dev.	2001	2002	2003
ALEX&PS	TE* I-O	0.9539	0.0261	0.9430	0.9720	0.9803
	R. TE I-O	0.9706	0.0178	0.9731	1	0.9978
	TGR	0.9827		0.9691	0.9720	0.9824
	MIN TE	0.9251		0.9731	1	0.9978
	% of Firms	32		32	32	32
DELTA	TE* I-O	0.9701	0.0177	0.9740	0.9721	0.9859
	R. TE I-O	0.9819	0.0147	0.9936	0.9952	0.9979
	TGR	0.9880		0.9803	0.9768	0.9879
	MIN TE	0.9290		0.9896	0.9952	0.9979
	% of Firms	32		32	32	32
CAIRO&UP	TE* I-O	0.9777	0.0141	0.9938	0.9924	0.9854
	R. TE I-O	0.9806	0.0121	0.9946	0.9925	0.9876
	TGR	0.9970		0.9993	0.9999	0.9977
	MIN TE	0.9504		0.9946	0.9925	0.9876
	% of Firms	36		36	36	36

Region	Criterion	Year				
		2004	2005	2006	2007	2008
ALEX&P.S	TE* I-O	0.9905	0.9895	0.9815	0.9777	0.9582
	R. TE I-O	0.9949	0.9986	0.9815	0.9777	0.9632
	TGR	0.9956	0.9908	1	1	0.9948
	MIN TE	0.9949	0.9986	0.9800	0.9777	0.9632
	% of Firms	32	32	32	32	32
DELTA	TE* I-O	0.9987	0.9930	0.9958	0.9970	0.9821
	R. TE I-O	0.9987	1	1	1	0.9986
	TGR	1	0.9930	0.9958	0.9970	0.9835
	MIN TE	0.9987	1	1	1	0.9986
	% of Firms	32	32	32	32	32
CAIRO&UP	TE* I-O	0.9956	0.9933	0.9974	0.9926	0.9887
	R. TEI-O	0.9974	0.9947	0.9979	0.9973	1
	TGR	0.9983	0.9986	0.9995	0.9953	0.9887
	MIN TE	0.9950	0.9942	0.9977	0.9969	1
	% of Firms	36	36	36	36	36

Table 5.4c: Mean TE output-orientation and TGR for T&A public firms in different regions without SCV

Region	Criterion	Year				
		2001-08	St.Dev.	2001	2002	2003
ALEX&PS	TE* O-O	0.8969	0.1156	0.7747	0.8492	0.9127
	R. TE O-O	0.9144	0.1039	0.8660	0.9904	0.9760
	TGR	0.9809		0.8946	0.8574	0.9352
	MIN TE	0.4079		0.4609	0.9729	0.9360
	% of Firms	32		32	32	32
DELTA	TE* O-O	0.9318	0.0816	0.8932	0.8913	0.8674
	R. TE O-O	0.9414	0.0813	0.9	0.9928	0.9070
	TGR	0.9899		0.9924	0.8977	0.9564
	MIN TE	0.6687		0.7344	0.9858	0.7686
	% of Firms	32		32	32	32
CAIRO&UP	TE* O-O	0.8980	0.0831	0.9334	0.9190	0.9099
	R. TE O-O	0.9102	0.0823	0.9334	0.9590	0.9629
	TGR	0.9866		1	0.9583	0.9450
	MIN TE	0.6463		0.8447	0.8605	0.9499
	% of Firms	36		36	36	36

Region	Criterion	Year				
		2004	2005	2006	2007	2008
ALEX&P.S	TE* O-O	0.9871	0.9836	0.9828	0.9837	0.9731
	R. TE O-O	0.9891	0.9837	0.9828	0.9846	0.9732
	TGR	0.9980	0.9999	1	0.9992	0.9999
	MIN TE	0.9868	0.9744	0.9721	0.9760	0.9582
	% of Firms	32	32	32	32	32
DELTA	TE* O-O	0.9803	0.9904	0.9919	0.9948	0.9780
	R.TE O-O	0.9923	0.9904	1	0.9976	0.9970
	TGR	0.9879	1	0.9919	0.9973	0.9810
	MIN TE	0.9845	0.9904	1	0.9976	0.9956
	% of Firms	32	32	32	32	32
CAIRO&UP	TE* O-O	0.9867	0.9848	0.9899	0.9816	0.9607
	R. TEO-O	0.9968	0.9909	0.9907	0.9918	0.9892
	TGR	0.9898	0.9938	0.9992	0.9897	0.9713
	MIN TE	0.9947	0.9874	0.9835	0.9839	0.9795
	% of Firms	36	36	36	36	36

Table 5.4d: Mean TE output-orientation and TGR for T&A public firms different regions with SCV

Region	Criterion	Year				
		2001-08	St.Dev.	2001	2002	2003
ALEX&PS	TE* O-O R. TE O-O TGR MIN TE % of Firms	0.9034 0.9346 0.9667 0.4320 32	0.1135 0.0938	0.7920 0.7920 1 0.4968 32	0.8638 0.9999 0.8638 0.9999 32	0.9281 0.9954 0.9324 0.9909 32
DELTA	TE* O-O R. TE O-O TGR MIN TE % of Firms	0.9412 0.9576 0.9829 0.7005 32	0.0699 0.0606	0.9453 0.9763 0.9683 0.9632 32	0.8987 0.9929 0.9052 0.9858 32	0.9221 0.9949 0.9268 0.9898 32
CAIRO&UP	TE* O-O R. TE O-O TGR MIN TE % of Firms	0.9292 0.9426 0.9858 0.6463 36	0.0613 0.0634	0.9566 0.9650 0.9912 0.9226 36	0.9907 0.9946 0.9961 0.9839 36	0.9357 0.9568 0.9779 0.9499 36

Region	Criterion	Year				
		2004	2005	2006	2007	2008
ALEX&P.S	TE* O-O R. TE O-O TGR MIN TE % of Firms	0.9899 0.9922 0.9976 0.9922 32	0.9912 0.9912 1 0.9912 32	0.9776 0.9776 1 0.9764 32	0.9760 0.9760 1 0.976 32	0.9582 0.9582 1 0.9582 32
DELTA	TE* O-O R. TE O-O TGR MIN TE % of Firms	0.9906 0.9993 0.9912 0.9987 32	1 1 1 1 32	0.9946 1 0.9946 1 32	0.9967 1 0.9967 1 32	0.9777 0.9984 0.9793 0.9984 32
CAIRO&UP	TE* O-O R. TE O-O TGR MIN TE % of Firms	0.9937 0.997 0.9967 0.9947 36	0.9867 0.9909 0.9958 0.9874 36	0.9897 0.9907 0.9990 0.9835 36	0.9792 0.9878 0.9913 0.9839 36	0.9781 1 0.9781 1 36

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