AN EMPIRICAL ANALYSIS OF THE IMPACT OF TRADE ON PRODUCTIVITY IN SOUTH AFRICA'S MANUFACTURING SECTOR

by

CHARLES AUGUSTINE ABUKA

Submitted in partial fulfilment of the requirements for the degree of

PhD (ECONOMICS)

in the

Faculty of Economic and Management Sciences

at the

University of Pretoria

PRETORIA MARCH 2005

ACKNOWLEDGEMENTS

It is with great pleasure that I thank my supervisors, Prof. Chris Harmse and Prof. Steven F. Koch for guiding me through the analysis of trade and productivity in manufacturing, for their enthusiastic supervision and for their interest in the issues addressed in this thesis. The study leaders are especially thanked for the stimulating discussions and helpful suggestions on several issues that arose during the preparation and writing up of the thesis.

I am most grateful for and acknowledge the support, material or otherwise, provided by the Department of Economics at the University of Pretoria and the conducive environment extended by its staff.

The moral support and constant encouragement by my wife Slyvia and children (Tony, Kevin and Keith) has been priceless, and I am heavily indebted to them.

I acknowledge, with gratitude, the generous financial support from the Bank of Uganda and the AERC scholarship award, without which this end product would not have seen the light of the day.

Charles Augustine Abuka

SUMMARY

AN EMPIRICAL ANALYSIS OF THE IMPACT OF TRADE ON PRODUCTIVITY IN SOUTH AFRICA'S MANUFACTURING SECTOR

by

CHARLES AUGUSTINE ABUKA

SUPERVISOR:	**PROF. CHRIS HARMSE**
CO-SUPERVISOR:	**PROF. STEVEN F. KOCH**
DEPARTMENT:	**ECONOMICS**
DEGREE:	**PhD (ECONOMICS)**

This study contributes to the debate regarding the impact of trade on manufacturing productivity and labour demand over the period 1980 to 2002. The analysis extends existing work in a number of ways. First, total factor productivity is decomposed into efficiency and technical change in order to provide more directions to policy makers. Second, an industry specific time varying measure of total factor productivity is estimated from an underlying production function using panel data of South African industrial sectors. Third, total factor productivity is interacted with trade measures, industry characteristics and macroeconomic factors to determine its key drivers. Finally, the impact of trade on derived labour demand is examined.

Panel data econometric techniques are applied to estimate productivity loss due to technical inefficiency in South African manufacturing industries. Technical

change and efficiency are estimated using stochastic frontier approaches that allow inefficiency to be either time invariant, or to evolve in a time varying decay mode. A generalised time index is employed to introduce more flexibility on the measurement of technical change. The results account for periods of technical progress as well as regress and indicate the presence of significant room for efficiency improvement, while the pattern of technical change was found to have been particularly slow over the period. The fact that a substantial amount of intermediate inputs into South African manufacturing are imported implies that significant improvement in industry efficiency will be related to the openness of trade policy in South Africa. More importantly, efficiency scores are also likely to be related to how labour force adjusts to these imported inputs. Skill improvements for the labour force are, therefore, fundamental, because the mix of goods manufactured and the factor proportions used to produce them depend on the skill competencies of local technicians. Skills are important for the labour force to produce at its full potential, avoiding waste in inputs and time.

The estimation of the determinants of total factor productivity is able to account, in a simultaneous context, for the impact of trade policy, industry level characteristics and the role of macroeconomic factors. The results suggest positive payoffs for industrial productivity of an appropriately managed liberalisation of the external sector. Liberalisation of the external sector is good for competition and learning. Learning is available through increased access to world class intermediate inputs and technology.

The evolution of derived labour demand in manufacturing is investigated using the dynamic Generalised Method of Moments estimator (GMM). The results indicate greater induced efficiency effects from some products entering South Africa that are produced at lower cost abroad than obtain for similar products in South Africa; such commodities have tended to displace South African products

and labour. Increased import penetration serves to reduce inefficiency and encourages the use of new technology. The positive impact of export expansion on derived labour demand supports results from efficiency estimates that indicate the importance of skilled labour. Increased trade requires emphasis on skill development for the labour force, because intra-industry trade benefits can only arise in an environment in which the skill competencies of labour are improved. In a nutshell, trade has the potential to exact factor adjustment. It is therefore, important to identify the product specific effects that are inimical to some manufacturing sectors and which effects serve to reduce the level of employment in manufacturing for the sake of policy intervention.

Increased trade with developed countries is found to provide South Africa with global production networks, where it supplies to the world market. In this arrangement, South Africa benefits from the use of the latest internationally available production and marketing techniques. These networks are important for accelerating the country's development by transferring technology and innovation, as well as bringing new ideas, to increase its competitive advantage. This comparative advantage should be used to expand the untapped trade potential, particularly with the rest of Africa. However, more needs to be done to improve the technical competencies of industrial labour. Policies are also still required to significantly improve the speed of labour market adjustment.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

Notation and Used

This part of the thesis lists the symbols and abbreviations used in the main text. The symbols that are not standard, if not explained here will be explained in areas where they first emerge in the text.

Symbol	**Interpretation**
N	Number of observations or firms
T	Number of time points
$\hat{\beta}$	Estimate of β
ΔY	Change in Y
∞	Infinity
E	Expectation operator

Acronym	Meaning
DEA	Data Envelopment Analysis
EU	European Union
EU-SAFTA	European Union-South Africa Free Trade Agreement
et al	et alii – and others
GATT	General Agreement on Trade and Tariffs
GEIS	Generalised Export Incentive Scheme
GLS	Generalised Least Squares
GMM	Generalised Method of Moments
ISIC	International Standard Industrial Classification
LP	Linear Programming
LSDV	Least Squares Dummy Variables
MC	Marginal Cost
MLE	Maximum Likelihood Estimation

OLS	Ordinary Least Squares
SADC	Southern Africa Development Community
SARB	South African Reserve Bank
STATSSA	Statistics South Africa
TC	Technical Change
TE	Technical Efficiency
TFP	Total Factor Productivity
TIPS	Trade and Industrial Policy Strategies Secretariat
VCM	Varying-Coefficient Model