DPRU INDUSTRIAL STRATEGY PROJECT: PHASE TWO

WORKING PAPER 13

Income and price elasticities in manufacturing exports

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FOREWORD

The first phase of the Industrial Strategy Project commenced in 1992. The Project has its origins in the Congress of South African Trade Union's (COSATU) efforts to develop policy responses to the malaise afflicting South African manufacturing.

The first phase of the ISP submitted its final report in 1995. This comprised 11 sectoral studies, a number of cross-sectoral studies, and a synthesis volume that proposed an overall industrial strategy for South Africa.

The ISP is now in its second phase and comprises four research themes. One of these examines the relationship between industrial development and the environment, a second focuses on firm-level innovation, a third examines issues in human resource development, and the fourth is concerned with identifying mechanisms to strengthen manufacturing competitiveness at regional and local levels. Examination of the export performance of South Africa's manufacturing sector has been a persistent theme running through the work of the Industrial Strategy Project, and this concern is taken up in this contribution to our series of working papers.

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These are working papers intended to catalyse policy debate. They express the views of their respective authors and not necessarily those of the Industrial Strategy Project.

David Lewis - Director: Industrial Strategy Project

1. INTRODUCTION

The cornerstone of the South African government's economic policy lies in the Growth Employment and Redistribution (GEAR) programme. The GEAR strategy commits government to increasing economic growth via a macroeconomic environment built on prudent monetary and fiscal management. There are two variables, however, in the GEAR programme that are important for this study, namely the real exchange rate and export supply. GEAR speaks of the need for a stable and competitive real exchange rate combined with trade policy directed at export promotion. Understanding the relationship between these two variables is one key aim of this study. Hence, the response of manufacturing exports to changes in relative prices, is essential in ensuring an optimal growth path. The study therefore intends to estimate export price elasticities for a set of manufacturing sub-sectors. The broad goal of higher national output levels will be partly driven by the response of exports to increased production levels. This is the domain of income elasticities of export supply. Again, the intention is to estimate these income elasticities of exports for a set of manufacturing sub-sectors, given the central aim of the GEAR programme to raise economic growth rates.

Cointegration analysis will be used in the estimation procedure. In this vein, both short-run and long-run elasticities will be derived. It is not clear *a priori* what response there will be by producers, to these price and income changes. Exporters may thus respond strongly, weakly or indeed not at all, to both short-run and long-run price and income changes. The results, as the paper will show, are not immediately appealing in terms of economic theory, but do make intuitive sense given South Africa's present position in the world economy. The results will thus cast significant light on the performance and potential of export supply in the South African Manufacturing industry. In addition, the study hopes to provide important information for policy formulation intended to increase the quantum of manufactured exports.

2. BACKGROUND

Very few export supply, or even export demand elasticities, outside the realm of Computable General Equilibrium (CGE) and macroeconometric models, exist for Manufacturing as a whole. The information on elasticities by sectors within Manufacturing, is even more scant. The CGE and macroeconometric models for South Africa have invariably included total exports (Gibson & van Seventer,1996) or only exports by major sectoral division (Fallon & Pereira da Silva,1994). In addition export elasticity values in these models have often been assumed *ex ante*. Studies outside the CGE framework on export elasticities for South Africa have either been for total exports or for exports at the main industry level, such as non-gold exports or Manufacturing exports (Kahn,Senhadji & Walton,1992; Smal,1996;Khan,1992). Estimates on export supply elasticities by sectors within Manufacturing, as far as can be determined, do not exist for South Africa.

The South African literature has focused on the calculation of import demand elasticities. In addition though, most estimates of import and export elasticities have primarily been derived for the demand side (Courtney,1976; Kahn,1987; Kahn,Senhadji & Walton,1992; Smal,1996). Hence while export and import demand elasticities abound, very few studies have sought to estimate export supply elasticities[1]. The theoretical justification, in demand-side studies, is to assume that the supply of exports is perfectly elastic. In a two-country world, where the rest of the world is the first country and supplies all the exports, this implies that should the single country demand more exports, the supply response would be immediate, with no price effects.

Before proceeding to the model specification and estimation, it is important to generate a few basic figures, to understand the export performance of the sectors chosen. Table 1 below presents the annual growth rates for the period 1990 to 1995 of the seven chosen sectors, and Manufacturing as a whole[2]. The mean growth rates show that all sectors reported positive export growth for the period, with the highest rate being for Paper and Paper products. It is also true though that this sector has the most volatile export supply growth.

Total Manufacturing growth though, surpasses that of overall GDP growth for the period, indicating a strong export performance relative to growth in national income.

[1] The exception here is an estimate by Fallon and Pereira da Silva (1994) of the Manufacturing sector as a whole.
[2] An overview of the data used for these tables and the econometric work, is provided below.

Table 1: Average Export Growth rates by Manufacturing sub-sector (RSA, various issues)

Sector	1990	1991	1992	1993	1994	1995	Mean
Food,Beverages,Tobacco	2.3	3.2	1.1	3.8	3.9	2.7	2.8
Clothing,Textiles,Leather	7.9	4.7	1.6	4.7	3.1	6.5	4.8
Paper	11.5	-1.0	4.1	6.1	1.8	27.1	8.3
Chemical Products	4.1	2.5	3.0	6.2	3.4	2.1	3.6
Basic Metals	2.5	1.2	4.1	1.3	10.7	-1.1	3.1
Metal Products	5.0	2.4	9.1	na	na	na	5.5
Other Manuf	3.3	1.0	4.2	4.3	4.1	6.3	3.9
Manuf Total	2.9	0.6	2.3	3.1	3.2	0.2	2.1
GDP	-0.3	-1.0	-2.2	1.3	2.7	3.4	0.7

Table 2: Sectoral Export Shares as a Percentage of Total Manufacturing Exports, 1990.01-1995.15 (RSA, various issues)

Sector	% Share	Rank
Food,Beverages,Tobacco	10.77	4
Clothing,Textiles,Leather	7.11	6
Paper	7.25	5
Chemical Products	17.28	2
Basic Metal	34.85	1
Metal Products	16.38	3
Other	6.36	7

The table below presents export shares as a percentage of total Manufacturing exports. Basic Metal industries clearly account for over a third of manufactured exports, followed by Chemicals. These two sectors together, account for over half of the economy's Manufacturing exports. The large number of existing Manufacturing sectors suggests a highly diversified production structure for the domestic market. The dominance of a few industries in export supply though, suggests that the industry has an undeveloped and narrow export base.

This lack of diversification in Manufacturing exports makes the associated external balance extremely vulnerable to the fortunes of a select few Manufacturing industries. The low levels of exports, as will be seen below, also have important implications for how these industries respond to export prices and domestic production.

3. THE MODEL

To understand and estimate export supply elasticities for prices and income, the following model is utilised, drawing on Goldstein and Khan (1978):

$$X^d_{tj} = \alpha_d \bullet (P^X / P^{XW})^{\beta 1}_{tj} \bullet (Y^W)^{\beta 2}_{tj} \quad (1)$$

$$X^s_{tj} = \alpha_s \bullet (P^X / P)^{\beta 3}_{tj} \bullet Y^{\beta 4}_{tj} \quad (2)$$

where (1) and (2) represent the export demand and export supply functions respectively, in time t for sector j. The price variable, $(P^X/P^{XW})_{tj}$, is the price of exports relative to the weighted average of export prices of South Africa's major trading partners at time t for sector j. (Y^W_{tj}) is the weighted average of real incomes of South Africa's major trading partners. P_{tj} is the aggregate domestic price level and Y_{tj} is an index for domestic productive capacity.

Given that South Africa is a small, open economy though, it is assumed that the export demand function is perfectly elastic. South Africa is therefore a price taker in the export market and is unable to influence the price of its exported commodity. In econometric terms, this assumption avoids any simultaneity problems as the estimation procedure is only on shifts in the supply function for any given demand curve.

Equation (2), in log-linear form, represents the income and price elasticities to be estimated. β_3 and β_4 represent the relative price and real income elasticities of export supply. The expected signs are:

$\beta_3 > 0$ and $\beta_4 < 0$

For b_3, as relative export prices rise, firms will be induced to supply more exports. However, should domestic prices rise faster than export prices, export supply falls. The reasoning here is that a rise in domestic prices can be taken as a proxy for factor costs (Goldstein & Khan, 1985:1048). Should domestic prices rise, in all likelihood so would factor costs have increased. This reduces the profitability of firms and hence reduces the return on exports. The outcome of domestic prices rising faster than export prices then, is lower export supply. The domestic capacity coefficient (β_4) is

assumed to be negatively correlated with export supply for three reasons. Firstly, increased capacity utilisation will divert production away from foreign towards domestic markets. Secondly, for some sectors, the domestic market may be more profitable than the foreign, and hence export supply will drop (Zilferbarb,1980:446). Finally, there is also in South Africa the argument that domestic industries export only that output which they cannot sell on the domestic market - a 'residual export' or 'vent for surplus'. Hence, should domestic demand rise, so would export supply drop. It should be remembered though, that income elasticities here are more often than not, positive. Most developed country industries, which are outward-oriented, will raise exports when production levels increase. While β_4 is predicted to be negative, trade and industrial policy, should be attempting to convert this coefficient to a positive value. One would expect though, that countries with inward-oriented industries are likely to increase domestic supply, to the detriment of foreign markets, should production levels rise. For in these industries, domestic production levels are driven by the level of domestic consumption.

4. ESTIMATION PROCEDURE

The econometric methodology employed here makes use of cointegration analysis. Hence the procedure will be to test for stationarity in each of the variables in the export supply equation. A stationary data series is said to display an underlying stability and will move around a constant mean. A non-stationary data series does not have any predictable patterns, and very often has different mean values at different points in the series. One is likely to find that most time series data is non-stationary or follows a random walk (Pindyck & Rubinfeld,1991:449). It is argued then, that if two non-stationary series are regressed on each other, the coefficients in the estimation procedure will not reflect causality, but rather incidental correlations and hence a spurious regression. The result is that the coefficients cannot be interpreted. Cointegration analysis is therefore used to test whether non-stationary data series are combined in a linear regression, to form a stable relationship. If this is true, and the different variables are cointegrated, then causality can be inferred in the regression, even though the individual series may be unstable.

Testing for stationarity is effectively a test of the null that a data series has a unit root and hence is non-stationary[3], against the alternative of stationarity. If the null is accepted and the data series are non-stationary, we can however test instead whether linear combinations of the variables are stationary. We could of course induce stationarity by differencing each of the variables, and then running an OLS on the differenced variables. This takes us into the terrain of ARIMA models. However, this form of estimation results in a loss of information about the true long-run relationship between the variables (Pindyck & Rubinfeld,1991:465-6) In order to determine whether linear combinations of the unstable individual series are stationary, the Johansen Cointegration Test is utilised. This Test will determine the number of cointegrating equations in the model[4]. If the relevant series are cointegrated, then we can infer causality in the regression, and allows for usual OLS estimation. In addition, the estimates of the coefficients take on a 'super-consistency' property (Harris,1995:53).

The OLS estimates though are long-run results, and in order to obtain information on the speed of adjustment to equilibrium, we need to run a short-run error correction model (ECM). The reasoning here is that the theoretical models estimated, represent long-run equilibrium positions. Indeed, the export supply function in equation (2) above represents firms being on their supply function at all times, and therefore in an equilibrium position. The ECM would estimate their response to price and income changes in disequilibrium positions. The purpose of the ECM, is to estimate adjustments to the long-run equilibrium, and the estimation is in effect of the short-run disequilibrium position, when firms may in fact be off their export supply functions.

5. ESTIMATION RESULTS

Equation (2) was log-linearised in the estimation procedure in the form:

$$lnX^s_i = \alpha_s + \beta_3(lnP^X_i - lnP_i) + \beta_4 lnY_i + u_i \qquad (2a)$$

Given that eight sectors, each with four variables are part of the estimation, the test for stationarity was completed in all, on 32 variables. The Augmented Dicker-Fuller (ADF)

[3] It is recognised though that unit root tests, because the sample size is finite, may yield incorrect results. However the test is adequate at revealing whether a series has stationary or non-stationary *properties* (Harris,1995:47).

[4] We are driven here primarily, by the usage of computer software, which forces the cointegration analysis through the Johansen technique, as opposed to the standard two-step Engle-Granger approach. It therefore becomes more cumbersome and perhaps less accurate to pursue the latter approach given the software available, despite the possible greater preference of the Engle-Granger approach in the cointegration literature.

Unit Root Test is a test of the null hypothesis that the series contains a unit root, and hence is non-stationary, against the alternative of stationarity. Put differently, it is a test that the series is I(0) versus that it is I(1) or more. In the test, an intercept term and a constant was imposed on all variables. Eight lags were used for each sector, except that of Metal Products where four lags were utilised. The choice of lags was based on the method of the lag number being associated with the highest R^2, which is often claimed to be an acceptable, though not ideal decision rule (Harris, 1995:36). As the table below illustrates, all series across all sectors were non-stationary when tested in levels. When the series were first or second differenced though, we tended to induce stationarity for all variables except that of domestic prices in Metal Products, where even second-differencing did not induce stationarity. Hence for all series, barring one, the variables reported as either I(1) or I(2), and hence had one or two unit roots.

What the ADF test results suggest is that performing an ordinary OLS regression, using these variables, would in most cases yield spurious results, and hence render the coefficients meaningless. It is possible though that a linear combination of the chosen variables, may be stationary, yielding interpretable coefficients. Hence a cointegration test was undertaken using the Johansen Cointegration Test. The results from this cointegration test show that the null of no cointegration cannot be accepted for all eight sectors. In other words export supply is cointegrated with export prices, domestic prices and output for all sectors in the sample. The estimation equation includes a constant, hence when testing for cointegration, we did not include a constant. Also, no time trend was included, as this tends to results in a loss of power manifest in an under-rejection of the null of no cointegration when it is actually false (Harris,1995:53-4).

Given the results in favour of cointegration, we can be confident that the normal OLS estimation will yield robust and interpretable coefficients. The OLS estimates are provided in table 4 below, for the long-run equilibrium position. Note that a time trend was included, to soak up any drift that may have been present in the data. The significant results for many of the coefficients on this variable bear testimony to this fact.

The results show that the coefficients on output were significant for all sectors, barring that of Clothing, Textiles and Leather. Indeed, all sectors reported significance at the 1% level, except for Total Manufacturing, which was significant at the 5% level. In addition, all these income elasticities are negative, as predicted. The export price and domestic price elasticities have been reported separately here. As is clear the results were not as predicted for certain sectors, and generally weaker than the coefficients on output. For example, the export and domestic price coefficients for Food,Beverages & Tobacco and Other Manufacturing are both wrong-signed, while Metal Products and Chemicals also report positive rather than negative domestic price elasticities. There are though two significant and correctly signed export price elasticities and three correctly signed and significant domestic price elasticities in the sample.

Given that the above provides a long-run stable estimation of the export supply function, it is necessary to investigate what short-run dynamics may be at work. To achieve this an error correction model (ECM) was utilised. Hence the long-run equation was over-parameterised to yield:

$$\Delta lnX^s_{ij} = \beta_1\Delta lnX^s_{t-1j} + \beta_2\Delta lnX^s_{t-2j} + \beta_3\Delta lnX^s_{t-3j}\ \beta_4\Delta lnX^s_{t-4}\ \beta_5\Delta lnX^s_{t-5j}\ \beta_6\Delta lnX^s_{t-6j}\ \beta_7\Delta lnX^s_{t-7j}\ \beta_8\Delta lnX^s_{t-8j}\ \beta_9\Delta\ (lnP^x - lnP)_{t-1j} + \beta_{10}\Delta\ (lnP^x - lnP)_{t-2j} + \beta_{11}\Delta\ (lnP^x - lnP)_{t-3j} + \beta_{12}\Delta\ (lnP^x - lnP)_{t-4j} + \beta_{13}\Delta\ (lnP^x - lnP)_{t-5j} + \beta_{14}\Delta\ (lnP^x - lnP)_{t-6j} + \beta_{15}\Delta\ (lnP^x - lnP)_{t-7j} + \beta_{16}\Delta\ (lnP^x - lnP)_{t-8j} + \beta_{17}\Delta lnY_{t-1j} + \beta_{18}\Delta lnY_{t-2j} + \beta_{19}\Delta lnY_{t-3j} + \beta_{20}\Delta lnY_{t-4j} + \beta_{21}\Delta lnY_{t-5j} + \beta_{22}\Delta lnY_{t-6j} + \beta_{23}\Delta lnY_{t-7j} + \beta_{24}\Delta lnY_{t-8j} + \beta_{25}u^*_{t-1j} + \varepsilon_{ij} \qquad (3)$$

Table 3: ADF Unit Root Test Results

(H_0: Presence of Unit Root)

Sectr./Variab.	Export Supply (lnX^s_{ij})			Domestic Prices (lnP_{ij})			Export Prices (lnP^x_{ij})			Income (lnY_{ij})		
Order of Integ.	I(0)	I(1)	I(2)	I(0)	I(1)	I(2)	I(0)	I(1)	I(2)	I(0)	I(1)	I(2)
Total Manuf.	-2.85	-4.53*	n.a.	-1.08	-2.35	-5.95*	1.23	3.67**	n.a.	-0.82	-2.62	-5.04*
Food,Bev,Tob	-2.12	-4.19*	n.a.	-1.94	-2.73	-4.44*	-1.99	-3.20	-4.08*	-0.03	-4.50*	n.a
Clothing,Tex,Le	-2.71	-2.97	-5.72*	-1.39	-2.21	-3.89**	-2.94	-2.91	-4.03*	-1.31	-3.14	-4.37*
Paper & paper prods.	-3.37	-3.81*	n.a.	-1.49	-1.50	-3.70**	-0.87	-3.04	-4.69*	-1.08	-1.58	-5.73*
Chemical Prods.	-2.69	-4.04**	n.a.	-1.98	-1.81	-5.56*	-1.13	-5.15*	n.a.	-1.00	-3.19**	n.a.
Basic Metal	-3.06	-4.44*	n.a.	-1.33	-2.77	-4.99*	1.23	-3.87**	n.a.	1.32	-2.66	-4.79*
Metal Prods.	-2.89	-3.15	-3.93**	-1.68	-2.78	-2.94	-2.92	-4.27*	n.a.	-2.73	-2.79	-4.20**
Other Industries	-2.89	-4.08**	n.a	-1.94	-4.23*	n.a	-2.68	-3.50**	n.a.	-1.82	-1.92	-4.37*

*: Significant at the 1% level.
**: Significant at the 5% level.

Table 4: Long-Run OLS Elasticity Estimates

Period 1990.02:1995.12
n=71[5]

Sector	C	Trend	$\ln P_g^X$	$\ln P_{gf}$	$\ln Y_g$
Food, Beverages, Tobacco	-13.7	-0.04*	-1.05**	4.39*	-1.57*
Clothing, Textiles, Leather	17.81	0.02	2.69	-7.40*	0.25
Paper & paper products	-3.10	-0.01**	0.45*	-0.03	-0.70*
Chemicals	30.27	-0.01**	-1.67	2.30**	-8.78*
Basic Metals	1.01	0.01*	0.18	-1.05*	-0 69*
Metal Products	-22.19	-0.06*	1.04*	4.40*	-2.09*
Other Manufacturing	-13.01	-0.02*	-1.48*	4.11*	-0.64*
Total Manufacturing	17.74	0.02**	1.28	-4.70*	-1.78**

*: significant at the 1% level
**: significant at the 5% level

Table 5a: Short-Run Error Correction Model Estimates: Export Supply

Variable	Food, Beverages, Tobacco	Clothing, Textiles, Leather	Paper & Paper products	Chemicals	Basic Metals	Metal Products	Other	Total Manu-facturing
Constant	-0.57*	-0.19	-0.12	0.02	0.08	0.02	-0.04	0.01
EC Term	-1.84*	0.30	-1.64*	-0.02	-2.15*	0.51	0.48	-1.15*
Export Supply ($\Delta ln\ X^s_{t-1}$)	0.75*	-1.09*	0.58	-0.38	0.94	-1.13**	-1.26	0 16
$\Delta ln\ X^s_{t-2}$	0.73*	-1.27*	0.96	-0.02	0.99	-1.10**	-0.88	0.41
$\Delta ln\ X^s_{t-3}$	0.66*	-1.18*	0.56	-0.30	0.76	-0.73	-0.57	0.44
$\Delta ln\ X^s_{t-4}$	0.75*	-0.95*	0.33	-0.34	0.52	-0.24	-0.75	0.23
$\Delta ln\ X^s_{t-5}$	0.61*	-0.84*	0.66	0.01	0.21	n.a.	-0.65	0.23
$\Delta ln\ X^s_{t-6}$	0.18	-0.78*	0.59	0.11	0.04	n.a.	-0.37	0.29
$\Delta ln\ X^s_{t-7}$	-0.29	-0.30	0.55	-0.44*	0.35	n.a.	-0.13	0.17
$\Delta ln\ X^s_{t-8}$	-0.02	-0.12	0.40	0.02	0.22	n.a.	0.26	0.11

Table 5b: Short-Run Error Correction Model Estimates: Export Prices

Variable	Food, Beverages, Tobacco	Clothing, Textiles, Leather	Paper & Paper products	Chemicals	Basic Metals	Metal Products	Other	Total Manu-facturing
Export Prices ($\Delta ln\ P^x_{t-1}$)	-2.00*	-1.17	1.38**	0.69	0.79	-0.02	-0.40	0.49
$\Delta ln\ P^x_{t-2}$	-1.40**	-0.74	1.26**	0.48	-0.37	0.21	0.45	1.54
$\Delta ln\ P^x_{t-3}$	-0.74	-0.16	0.68	-0.20	-0.33	0.76	0.73	1.07
$\Delta ln\ P^x_{t-4}$	-0.79	-0.40	0.37	1.74**	0.68	1.58	0.59	-0.22
$\Delta ln\ P^x_{t-5}$	-0.89	-0.45	1.43*	0.38	-0.22	n.a.	-0.14	-1.03
$\Delta ln\ P^x_{t-6}$	-1.24**	-0.11	1.19	0.72	-0.80	n.a.	-0.14	-0.98
$\Delta ln\ P^x_{t-7}$	-1.56*	0.15	0.12	0.30	0.02	n.a.	0.41	-1.61
$\Delta ln\ P^x_{t-8}$	-1.43*	-0.77	0.58	1.15	-1.01	n.a.	0.60	-1.86

The results of equation (3) are presented in tables 5a, 5b and 5c. Eight lags were introduced for each equation, except that of Metal Products, where the sample size was smaller. The large number of lags is due to the frequency of the data, meaning that one or two lags are unlikely to yield any price or income effects when using monthly data. It is more likely then, that export supply will adjust to prices and income over a period of 6 to 8 months, rather than 1 or 2, given the time required to produce goods, deliver to export markets and so on.

[5] It is recognised that sample sizes with cointegration analysis are ideally much larger than the one utilised here. However, given the difficulties in obtaining a longer time-series with an identical industrial classification system across all the data points, this sample was the best available.

Table 5c: Short-Run Error Correction Model Estimates: Domestic Prices

Variable	Food, Beverages, Tobacco	Clothing, Textiles, Leather	Paper & Paper products	Chemicals	Basic Metals	Metal Products	Other	Total Manu-facturing
Domestic Prices ($\Delta ln\ P_{t-1}$)	9.75*	11.67*	1.99	-2.58	-1.80	1.22	1.82	-2.84
$\Delta ln\ P_{t-2}$	7.23*	7.39	-2.03	0.33	-1.26	5.26	0.39	0.94
$\Delta ln\ P_{t-3}$	3.41	6.74	0.97	-1.32	-1.65	2.81	0.50	-1.54
$\Delta ln\ P_{t-4}$	4.88	-0.85	-3.66	3.71	-0.96	3.58	4.37*	-1.05
$\Delta ln\ P_{t-5}$	10.84*	13.22*	2.59	0.57	-0.98	n.a.	0.77	-2.25
$\Delta ln\ P_{t-6}$	8.90*	-0.32	2.74	-1.75	-1.39	n.a.	1.77	4.17
$\Delta ln\ P_{t-7}$	8.24*	-1.12	2.63	0.69	3.59**	n.a.	0.50	2.38
$\Delta ln\ P_{t-8}$	5.35*	3.74	-3.90	-1.75	-0.22	n.a.	0.90	0.77

Table 5d: Short-Run Error Correction Model Estimates: Output and Select Test Statistics.

Variable	Food, Beverages, Tobacco	Clothing, Textiles, Leather	Paper & Paper products	Chemicals	Basic Metals	Metal Products	Other	Total Manu-facturing
Volume of Production ($\Delta ln\ Y_{t-1}$)	-3.21*	-1.09	-1.16	0.04	-1.97*	2.02	1.01	-2.52**
$\Delta ln\ Y_{t-2}$	4.04*	-1.68**	-1.32	-0.70	-1.53**	2.95	.0.68	-1.93
$\Delta ln\ Y_{t-3}$	-2.90*	-1.34	0.63	-0.08	-1.99*	2.85	0.45	-2.97*
$\Delta ln\ Y_{t-4}$	-2.52*	-1.84	1.24	0.91	-1.15	3.45**	0.74	-1.98**
$\Delta ln\ Y_{t-5}$	-0.95	-0.31	0.02	-0.12	0.09	n.a.	0.74	-0.35
$\Delta ln\ Y_{t-6}$	-0.01	-1.27	0.38	0.88	-0.87	n.a.	0.87	-0.62
$\Delta ln\ Y_{t-7}$	0.50	-0.60	1.10	0.70	-0.86	n.a.	-0.27	-2.38*
$\Delta ln\ Y_{t-8}$	0.09	0.14	0.30	-0.11	-0.07	n.a.	-0.22	-2.53*
R^2	0.81	0.70	0.84	0.59	0.83	0.64	0.73	0.70
Adj. R^2	0.59	0.37	0.65	0.13	0.64	0.16	0.42	0.35
A.I.C.	-3.55	-2.84	-2.73	-3.05	-3.51	-2.51	-3.06	-3.75
Schwartz Crit.	-2.40	-1.68	-1.57	-1.89	-2.36	-1.68	-1.91	-2.60
Log Likelihood	56.51	34.07	30.53	40.71	55.29	12.89	41.25	62.82

*: significant at the 1% level
**: significant at the 5% level

The significant Error Correction Term in four of the sectors, including Total Manufacturing, illustrate that there were strong feedback effects into the dynamic process. The high R^2 for all equations suggests an adequate level of goodness of fit, although this is to be expected, given the lag structure of the model. The strongest results are for the Food,Beverages & Tobacco and Clothing,Textiles & Leather sectors. Generally, the other sectors report poor results, with the exception being for Total Manufacturing, where lagged output is fairly significant.

6. INTERPRETATION

The results obtained above indicate that the long-run OLS estimates provide the more complete picture of export supply in manufacturing. Hence, the long-run coefficients show fairly significant price and income elasticities across most sectors. The strongest result though, is that of output elasticity, where the coefficients are all negative and significant except for one sector. What this indicates is that firms in manufacturing are essentially 'residual exporters' – what cannot be sold on domestic markets, is exported. Volume of production here is a proxy for domestic demand, and hence when domestic demand falls, export supply rise. In Total Manufacturing this response is elastic: a 1% drop in manufacturing output will induce a 1.78% rise in export supply. The only sector with an insignificant income elasticity is Clothing,Textiles & Leather. This is indicative possibly of an extremely uncompetitive industry that is consistently unable, even at the margin, to export

significant shares of its production. The income elasticity values, the results show, is fairly mixed as some sectors are elastic and others inelastic with respect to export supply.

The price elasticity results however, are relatively poor. For a number of sectors, the coefficients are wrong-signed although in some cases these are readily explained. For example, the negative export price elasticity for Food,Beverages & Tobacco could be because this sub-sector contains a set of industries that rely at the source, on production levels in agriculture. A rise in production levels in these industries, will saturate the world market, as most other countries with similar weather patterns are likely to also have higher production levels. This forces the prices down, while countries would still export the surplus, even though export prices have dropped. In other sectors though, this perverse response is not easily explained. The wrong-signed coefficients though, are notably more prevalent for domestic prices, suggesting that the negative relationship here is perhaps an extension of the residual export argument. In other words, rising domestic demand is a predictor of rising domestic prices and hence, in this environment, export supply falls. If we examine Total Manufacturing however, the classic domestic price response is reported, as the coefficient is negative, despite the fact that the output response is negative.

For the error correction model, lagged export supply is significant for Food,Beverages & Tobacco and Clothing,Textiles & Leather, as at least 5 lagged periods are significant. Indeed, these two sectors probably report the strongest set of short-run results, with the rest of the sectors revealing relatively weak results. Most of the coefficients for the remaining six sectors in the short-run model, are not significantly different from zero. What this suggests is that very little export supply activity occurs in the short-run, as firms have already established their orders and supply lines to foreign markets.

The long-run model makes it plain that while the output elasticity results are generally significant, they are negative, and thus point to an industry that exports only what it cannot sell on the domestic market. In addition, the short-run results suggest that these export markets, despite being residual markets, are fairly established and unchanging. Very little, in terms of short-term experimental export supply to new and undeveloped markets, is occurring. A fast growing and dynamic exporting industry, would show up in high levels of response in the short-run model, as firms are rapidly trying to access new foreign markets[6]. Hence the results obtained are strongly indicative of an, as yet, uncompetitive Manufacturing industry that only reacts to price and income changes, once the domestic market has been saturated. The strong long-run output response speaks of a Manufacturing industry that has potential, but one that still needs to increase its share of world exports, before export price and income effects have any positive long-term bearing on its performance. This would not seem to have been happening over the period covered, given the tepid short-term responses. High levels of short-run activity in export supply, would suggest that new markets and new products are being tested with initial small runs and small orders, but with the possibility of long-term commitments from foreign buyers.

The policy implications of this responsiveness by Manufacturing exporters to prices and income, are important. The above analysis suggests that trade policy needs to be geared towards developing existing markets and encouraging new destinations for manufactured goods. The reasoning here is that the insignificant short-run results, combined with the negative long-run income elasticities, reflect industries that have not tried to capture new markets, nor convert small, established markets into much larger export volume destinations. Trade policy would thus need to focus on improving the reputation, and promoting the products, of local Manufacturing industries. In such a way, firms will begin to respond to price and income changes, not only in the short-run, but eventually in a coherent and predictable manner in the long-run as well. The problem with many of the Manufacturing firms then, is not poor quality or high prices, but rather poor knowledge on the part of international buyers, regarding most South African manufactured products. When Manufacturing producers cease to be residual exporters, only then can it be claimed that the industry is becoming more globally competitive. Recent trade policy initiatives seem to reflect some of these needs for greater market penetration and awareness, although they remain in their infancy. Hence, the Department of Trade and Industry (DTI) intends to set up Export Councils, aimed at instilling a sustainable export culture within the manufacturing industry. These Councils will be buttressed by seminars, trade missions and industry-specific exhibitions - all

[6] The Clothing,Textiles & Leather results are more reflective of an industry that collectively is a very poor exporter and globally uncompetitive across most product categories. Hence the short-run activity reflects small markets with small orders, that would seem to promise little by way of long-term export growth.

intended to develop foreign markets at the industry level. The implementation of these policies remains largely untested, and hence their effectiveness would need to be evaluated in the future.

The other problem facing policymakers is of course, that manufacturers are low-volume producers, making them price takers in export markets. This is particularly true in established export markets for South African manufactured goods. Policy should focus on increasing the quantum of goods produced by these firms, if only to allow them to determine their own prices. Realising these economies of scale, not only means lower unit costs, but will also yield significant and positive responses by these firms to export price and income changes. It is also true that, together with increasing production levels to access export markets, manufacturers need to raise the proportion of output exported. In this way also, the vent for surplus will fall away, as output and exports will be positively correlated.

7. CONCLUSION

The study has attempted to provide estimates of price and income elasticities for export supply in Manufacturing. There was an explicit attempt to achieve this using the econometric techniques of cointegration analysis. The results therefore provided for short-run and long-run elasticity estimates. The long-run results indicate that firms in the manufacturing industry can be primarily characterised as residual exporters: what these firms cannot sell on the domestic market is then sold abroad. Export supply is clearly a second-best option in the decision-making environment for these firms. In the short-run, these firms do not report any significant export supply responses to prices and output. This suggests that new untried and untested markets, are generally not being sought by manufacturers. The central aim of policymakers in this industrial environment, would seem to be to encourage the expansion of export volumes to existing markets in a manner that is not related to residual exporting, while simultaneously encouraging greater short-run export supply into new, non-traditional markets.

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Data

The data was gathered from the Quarterly Bulletin of Statistics (various issues) published by the Central Statistical Services (CSS). This source was chosen given that a long time series, comparable across the data points, was available on a monthly basis, and according to a fairly large number of Manufacturing sub-sectors. The period covered in the data is from January 1990 to December 1995. The sectors included in the analysis are: Food,Beverages & Tobacco; Textile,Clothing & Leather; Paper, Chemicals, Basic Metal Industries, Metal Products, Other Manufacturing, and Total Manufacturing. The sectors are defined according to the Standard International Trade Classification (SITC) Revision 3. For the income variable, an index of the physical volume of production was used, while the PPI by each sector, was used for the domestic price variable. The base year is 1988 for all variables. The real values of export supply were used for the dependent variable, while the unit value index of export prices was the corresponding price variable.

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