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## Abstract

*This paper briefly describes the major reforms to Australian trade policy over the last 30 years and then explores whether these reforms have increased manufactured exports across 141 manufacturing branches over the period 1989/90 to 2000/01. We find that the declining level of protection over this period is associated with increased exports.*

## 1. Introduction

Since the late 1980's successive Australian governments have continued to reduce restrictions on foreign trade and to implement microeconomic reforms in the areas of infrastructure services, industrial and workplace relations, taxation, and consumer and competition regulations. These changes have been significant for the manufacturing sector as a whole and particularly so for the two industries that have in the past enjoyed substantial levels of protection, the textiles, clothing and footwear (TCF), and the automobile industries. Empirical studies to date have tended to focus on the relationship between these reforms and labour productivity, with the general finding that the resultant increased competition from imports has increased manufacturing labour productivity (Oczkowski and Sharma 1999, Bloch and McDonald 2001, Jayanthakumaran 2002 and Mahadevan, 2002). However, an alternative measure of the response of the Australian manufacturing sector to the trade reforms is the trend in manufactured exports. To date, this has been subjected to little empirical scrutiny.

In this paper we test the hypothesis that trade reforms have had a positive impact on manufactured exports, using both time series and cross-sectional data. A variable that represents the extent of the trade reforms is used to explain aggregate Australian manufactured exports in a time series regression for the period 1968/69 to 2002/03. We also investigate the impact of the trade reforms at the individual manufacturing industry level via a set of variables that represent changes in the degree of competition faced by the Australian manufacturing sector, in the number of major destinations for Australian manufactured exports, and in domestic economic conditions. These are used to explain changes in manufactured exports in a cross-sectional regression analysis for the period 1989/90 to 2000/01[1]. In general we find that falling protection has encouraged increased manufactured exports.

This paper is organized as follows. In the next section we briefly outline the thrust of trade policy reforms over the last 30 years and then conduct a time series analysis of aggregate manufactured exports over the period 1968/69 to 2002/03. In section 3 we

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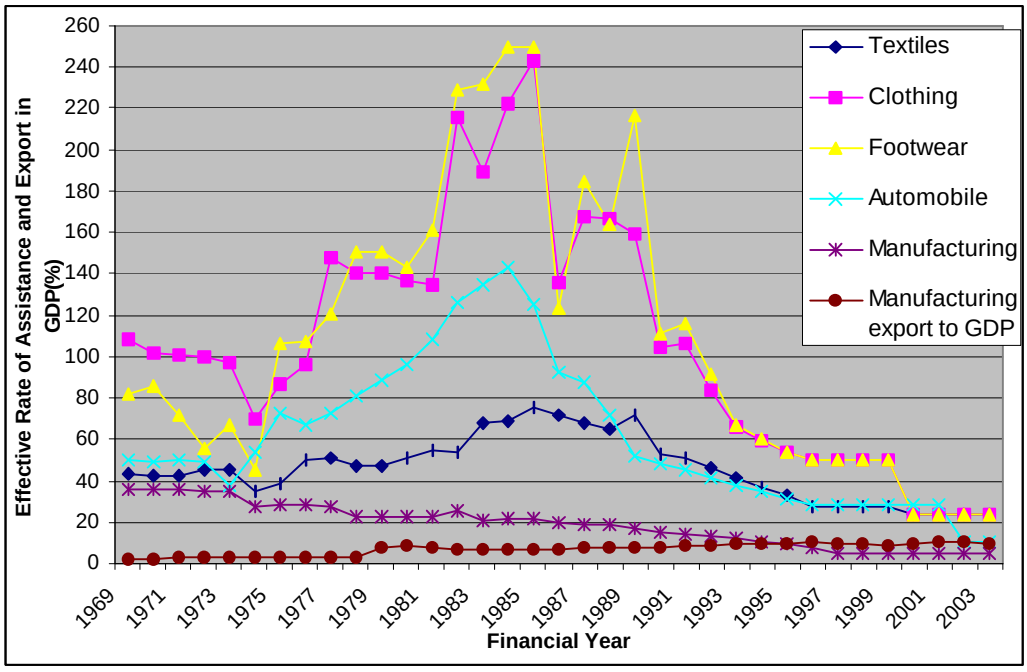
[1] Detailed data on manufactured exports by state and at the ANZSIC 4-digit level is currently available to from 1989/90 to 2000/01 only.

conduct the cross sectional regression analysis by industry branch for the period 1989/90 to 2000/01. Finally section 4 concludes.

## 2. Trade policy reforms and manufactured exports: 1968/69-2002/03

From the early 1970's to the late 1980's Australian governments progressively reduced protection levels for the domestic manufacturing sector. This resulted in the average effective rate of protection[2] falling from 35% in 1971 to approximately 17% in 1989/90. However, partly as a response to specific periods of balance of payments difficulties but also in order to soften the impact of these reforms on two of the traditionally more heavily protected industries, the average effective rate of protection for the TCF industry and for the automobile industry, though experiencing considerable volatility, actually increased sharply so that by the end of the 1980's they were 113% and 52% respectively (see Figure 1.).

**Figure 1: Average effective rates of protection and manufactured exports as a share of GDP: 1968/69 to 2002/03**




Source: Industry Commission (1995) and NOIE (2004)

In order to re-invigorate the reform process, in the late 1980's a general program of phased reductions in nominal tariffs for all imports was announced. Initially, tariffs

[2] In general, the effective rate of protection (erp) may be defined as the ratio of domestic price value-added to world price value-added. Hence changes in the erp will reflect changes in levels of protection and changes in the exchange rate. The data post 1996 is from NOIE (2004) and is slightly different to that from the Industry Commission (1995). NOIE (p.45, footnote 1) refer to the effective rate of tariff assistance, defined as the percentage change in the returns per unit of output to an activity's value-adding factors due to the tariff assistance structure.

above 15% were to be lowered to 15% and then to 10% by 1992. Import quotas were eliminated, terminating for the automobile industry in 1988 and for the TCF industry in 1993. Tariffs protecting these two industries were thus the only instrumentality of protection and these have been further reduced since then. Simultaneously, microeconomic reforms were on-going and aimed at further enhancing the aggregate benefits from trade reforms.[3] The upshot of this is that the effective rate of protection for the manufacturing sector as a whole fell from 17% in 1989/90 to just 4.8% in 2000/01.

One of the expected outcomes of this policy was the promotion of Australian manufactured exports by allowing firms to use cheaper intermediate inputs, by encouraging them to use more efficient operating processes and by encouraging domestic competition and thus increased efficiencies. These policies have certainly increased the exposure of the domestic manufacturing industry to the forces of global competition. This increased exposure is reflected in the substantial increases in manufactured imports for most industries as highlighted in Table 1. Six of the nine industry classifications experienced annual import growth rates in excess of 4% over the 11-year period. How did the sector respond to this challenge from abroad?

**Table 1. Growth rates of manufactured imports by ANZSIC sector: 1989/90 - 2000/01**

| ANZSIC Code | Industry descriptor | Annual % growth rates |
|---|---|---|
| 21 | Food and beverages | 5.5 |
| 22 | Textiles and clothing | 3.6 |
| 23 | Wood & paper products | 0.9 |
| 24 | Printing and publishing | 2.8 |
| 25 | Petroleum and coal products | 5.2 |
| 26 | Non-metallic products | 1.5 |
| 27 | Metal products | 5.4 |
| 28 | Machinery | 4.6 |
| 29 | Other | 5.5 |
| 21-29 | All | 4.6 |

Notes: Constant 1989/90 prices have been used.
Data source: see text.

In proportionate terms, the ratio of current manufactured exports to GDP, which was 2% to 3% until the late 1970's, increased to 6% to 8% by the late 1980's and then to nearly 10% by 2003. The share of manufactured exports to aggregate exports has also increased, from 25.4% in 1989/90 to 31.3% in 2000/01. So it certainly appears on a *prima facie* basis that the trade reforms of the last 30 years have at least contributed to the desired outcome.

We confirm this by using a time-series approach for the period 1968/69 to

[3] Public sector reforms related to pricing, structure and ownership, labour market arrangements including restructuring the industrial relations system, enterprise bargaining and vocational education and training programs, environmental management reforms related to implementing economic instruments for achieving environmental goals, industry specific reforms and tax reforms (Industry Commission 1996/97).

2002/03[4]. We attempt to explain changes in real manufactured exports by changes in the mean effective rate of protection for the sector as a whole. We also investigate whether manufactured exports expand more rapidly in a period of more active trade reform by disaggregating the sample into two periods. The first period from 1968/69 to 1987/88 we define as one of moderate reform because, whilst protection levels for the industry as a whole fell, the TCF and automobile industries actually enjoyed increased protection. On the other hand the second period, from 1989/90 to 2002/03, we define as one of accelerated reform as all sectors felt the effects of further reductions in levels of protection. Our results are summarized in Table 2.[5]

**Table 2: Manufactured exports and the mean effective rate of protection: 1968/69-2002/03**

| Equation | sample size | Constant | ERP | $R^2$ | DW |
|---|---|---|---|---|---|
| 1 | 34 (1968/69-2002/03) | 11882*** | -0.958*** | 0.91 | 0.51 |
| 2 | 14 (1989/90-2002/03) | 13761*** | -0.983*** | 0.96 | 1.35 |
| 3 | 19 (1968/69 to 1987/88) | 7458*** | -0.846*** | 0.69 | 0.75 |

Note: *** signifies statistical significance at the 1% level. ERP stands for the mean effective rate of protection. Exports are calculated at constant 1968/69 prices. There is no autocorrelation in equation 2.

The equation for the entire sample (line 1) shows the expected negative sign for the coefficient on the explanatory variable (significant at the 1% level). Our regressions on the two sub-samples indicate that the association between these two variables is stronger for the period of accelerated reform (the coefficient is larger and more of the variation in manufactured exports is explained by changes in the effective rate of protection). The Chow test suggests that there is a statistically significant difference (at the 1% level) between the two sub-samples.[6] Overall our results tend to support the conclusion that the declining levels of effective protection in Australia have been important determinants of the substantial increases in manufactured exports over the last 30 years.

However, other possible explanatory variables exist. Of course favorable movements in the exchange rate have probably helped. Since the early 1970's the Australian dollar has lost a substantial proportion of its initial value measured against a basket of the currencies of our major trading partners. Large domestic currency depreciations such as this would be expected to result in an increase in the competitiveness of Australian manufactures on world markets, *ceteris paribus.* However, the notion of effective rate of protection already incorporates movements in the exchange

[4] Whilst correlation does not establish causation, in our view it would be hard to argue that increased manufactured exports resulted in the policy reforms that we have documented, or that some other factor caused both of these changes simultaneously. Hence we interpret correlation here as evidence of causation running from policy reform to changes in exports.

[5] Correlations between import and effective protection and import and export are –0.884 and 0.946 respectively. Both were significant at 1% level. We have also related annual growth rates of exports and imports for the period 1968/69 and 2002/03 and found no significant relationship among them.

[6] For this purpose the null hypothesis that there is no difference between the sub-samples and an alternative hypothesis that there is difference between sub-samples was tested. The null hypothesis is rejected. The calculated F statistics (calculated using residual errors of the total sample and sub-samples) is above the critical value at 1%. The observed F value for this test is 29.6 and is significant at the 1% level (critical $F_{2,30} = 4.51$).

rate and so we now consider other plausible explanatory variables. Potentially important factors are domestic economic conditions and the concentration of our manufactured export destinations. When the domestic economy is in recession, other things equal, one would expect an increase in the volume of goods and services freed up for potential export, and vice versa. Finally, the number of major trading partners may also impact on manufactured exports by impacting on our vulnerability to international shocks. So we next investigate whether trade reforms are positively related to changes in exports controlling for these other variables across industry branches for the period 1989/90 to 2000/01.

## 3. Explaining disparities in the growth of manufactured exports across industry branches: 1989/90 – 2000/01.

The impressive overall performance of Australian manufactured exports documented above masks substantial disparities across manufacturing industry branches. Table 2 presents data on manufactured export growth rates by two-digit ANZSIC codes for the period 1989/90 to 2000/01. We note that exports of wood and paper based products (ANZSIC 23) enjoyed the highest growth rate (14%) over this period. Exports of machinery (ANZSIC 28) enjoyed the second highest growth rate (10.4%) such that by 2000/01 this industry had almost caught up to metal products (ANZSIC 27) as the second largest national exporter. As we noted earlier the automobile industry (included in ANZSIC 28) was subjected to increased international competition over this period and has also shown a strong positive growth rate. Interestingly, whilst metal products (ANZSIC 27) and food and beverages (ANZSIC 21) both experienced solid growth rates, each of these industry's share of national exports actually declined over the period because they did not keep pace with the national average, spurred on by the even higher growth rates of machinery, petroleum and coal (ANZSIC 25) and wood and paper (ANZSIC 23).

**Table 3. Manufactured export growth rates by two-digit ANZSIC code: 1989/90 - 2000/01**

| ANZSIC code | Industry descriptor | Annual Average Growth (%) | Share of national manufactured exports (%) | |
|---|---|---|---|---|
| | | | 1989/90 | 2001/02 |
| 21 | Food and beverages | 5.6 | 32.3 | 29.2 |
| 22 | Textiles and clothing | 2.9 | 5.2 | 3.4 |
| 23 | Wood & paper products | 14.0 | 0.9 | 2.2 |
| 24 | Printing and publishing | 6.9 | 0.8 | 0.9 |
| 25 | Petroleum and coal products | 8.0 | 10.6 | 12.8 |
| 26 | Non-metallic products | 6.4 | 0.5 | 0.5 |
| 27 | Metal products | 4.9 | 33.9 | 28.4 |
| 28 | Machinery | 10.4 | 13.3 | 21.3 |
| 29 | Other | 1.6 | 2.5 | 1.4 |
| 21-29 | All | 6.45 | 100 | 100 |

Notes: Constant 1989/90 prices have been used. Re-exports were omitted.
Data source: see footnote 8.

As noted earlier, we now investigate whether the trade reforms are still important

in explaining changes in manufactured exports at the 4-digit branch level controlling for changes in internal and external economic conditions, over the period 1989/90 to 2000/01. We estimate an equation for export growth (GEXP, in natural logarithms) at the 4-digit branch level as a function of proxies for changes in trade policy and changes in internal demand and external demand conditions. We have used Ordinary Least Squares (OLS) cross-sectional regression analysis across branches to estimate the following model.

$$GEXP = f(\overset{+}{CMS}, \overset{+}{CIM}, \overset{-}{CTP}, \overset{-}{CIND}, \overset{+}{MIIT})$$

The variables are defined for each of 141 manufacturing branches as follows:

| | |
|---|---|
| GEXP | export growth |
| CMS | change in branch imports[7] |
| CIM | change in industry mix |
| CTP | change in trading partner concentration |
| CIND | change in internal demand |
| MIIT | marginal intra-industry trade |

We do not have data on effective rate of protection across the 14 branches and so we use proxies for the impact of trade reforms. Trade liberalisation reduces market distortions and restrictions, allows domestic producers to access cheaper inputs and hence should promote an increase in the competitiveness of the domestic firms that survive. We attempt to capture this effect of trade reforms by including as an explanatory variable the change in the share of branch imports out of total manufacturing imports (CMS). CMS is a proxy for the change in the degree of domestic competition as a result of the declining level of protection. We expect a positive association between manufactured export growth (GEXP) and CMS. If CMS is significantly associated with GEXP with the expected sign then our hypothesis is supported.

The change in industry mix (CIM) by branch is defined as the change in the share of branch value-added in total manufacturing value-added over the study period. Declining protection typically results in the expansion of some industries and the contraction of others and this will certainly have an impact on the value-added mix across branches. This variable is expected to capture the effects of trade and microeconomic reforms. Hence CIM can be thought of as another proxy for the trade reforms. We expect a positive association between GEXP and CIM if increased specialization and hence a higher value-added mix is accompanied by an increase in manufactured exports.

CTP (the change in our trading partners) is our proxy for changes in the concentration of our major trading partners. We constructed this variable by calculating, for each 4-digit manufacturing branch and for the export share of 14 important destinations in 1989/90, the change in share in exports over the study period. The top 14 export destinations received 74% of total Australian manufactured exports in 1989/90

[7] The estimates for ERP are not available across industries for the period 1997/98 and 2000/01. The change in import share is used as alternative measure for trade 'openings'.

with this increasing to 79% by 1996/97.[8] The aggregate change in this case is 5 percent. If increased concentration means that we are less susceptible to external shocks then we would expect a negative association between GEXP and CTP. On the other hand if greater diversification in the number of major export destination reduces the domestic impact of volatility in any individual destination then we would expect a positive coefficient on CTP.[9]

CIND is defined as the change in the internal demand component of total sales for each branch and reflects domestic economic conditions. We expect a negative association between CIND and export growth (GEXP) if rising internal aggregate demand diverts manufactured goods from the export market.

Finally, we include in our model a measure of marginal intra-industry trade (MIIT) that may be defined as the difference between total trade flows and changes in net trade.[10] Reduced protection levels often have the usual inter-industry trade impact on the basis of comparative advantage. However, a growing body of research has focused on the rise of intra-industry trade in response to trade reforms. The typical argument here is that trade reforms may stimulate increased exports and imports in the same product category for reasons to do with product differentiation, transport costs, dynamic learning by doing, and differences in the distribution of incomes across trading partners. Of particular interest to us is the finding that greater 'openness' has been positively associated with greater intra-industry trade[11]. Hence we test whether this result also applies to Australia. If so, we expect a positive association between intra-industry trade (MIIT) and growth in exports[12].

The data on manufactured exports, imports and export destinations at the ANZSIC 4-digit branch level were obtained from the ABS on request. Data on value-

[8] Countries considered are Canada, China, Hong Kong, Indonesia, Japan, Korea, Malaysia, New Zealand, the Philippines, Singapore, Taiwan, Thailand, United Kingdom and United States. ANZSIC 4-digit data is available during the period 1989/90 and 1996/97.

[9] Structuralists prescribe commodity and market diversification to reduce domestic exposure to external shocks.

[10] For example, the Brulhart (1994) index is defined as,

$$MIIT_j = 1 - \frac{\left|\Delta X_j - \Delta M_j\right|}{\left|\Delta X_j\right| + \left|\Delta M_j\right|} \qquad (2)$$

$MIIT_j$ is defined as the proportion of changes in total trade flows in industry $_j$ caused by IIT. If $MIIT_j$ is close to unity then it indicates the higher intensity of MIIT in the adjustment process. Zero values indicate diverging trends in sectoral trade flows and resulting in higher adjustment costs. Zero value shows all trade is inter-industry trade. The extent of inter-industry trade is given by (1- $MIIT_j$ ) .

[11] See, for instance, Balassa 1986.

[12] The simple correlation matrix for our set of explanatory variables is as follows:

| Variable | CMS | CIM | CTP | CIND | MIIT | GEXP |
|---|---|---|---|---|---|---|
| CMS | 1 | | | | | |
| CIM | 0.063 | 1 | | | | |
| CTP | -0.005 | -0.086 | 1 | | | |
| CIND | 0.486** | 0.139 | 0.001 | 1 | | |
| MIIT | 0.023 | 0.062 | 0.041 | 0.232** | 1 | |
| GEXP | 0.138 | 0.266** | -0.088 | 0.157 | 0.211** | 1 |

Note: ** Correlation is significant at the 0.05 level (2-tailed)

added and sales at the 4-digit branch level were obtained from ABS annual surveys. The surveys cover all manufacturing establishments in government-owned business undertakings and private establishments. We thus compiled data across 141 industry branches over a 10-year period. Our results are presented in Table 4.

**TABLE 4: A model of Australian manufactured export growth: 1989/90 – 2000/01**

| Equation | Sample size | Constant | CMS | CIM | CTP | CIND | MIIT | $\overline{R^2}$ | F |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 141 (All) | 0.824*** (7.140) | 0.104 (1.124) | 0.237*** (2.914) | -0.075 (-0.930) | 0.030 (0.313) | 0.190** (2.289) | 0.09 | 4.0** |
| 2 | 62 (branches with positive CMS) | 0.326* (1.766) | 0.456** (2.569) | 0.279** (2.680) | -0.294*** (-2.806) | -0.317* (-1.771) | 0.469*** (4.363) | 0.36 | 7.7*** |
| 3 | 79 (branches with negative CMS) | 1.029*** (6.735) | -0.060 (-0.510) | 0.343*** (2.745) | 0.221** (2.014) | 0.093 (0.797) | -0.013 (-0.120) | 0.09 | 2.6 |

Note: *** 1% significant level, ** 5% significant level, * 10% significant level. Number sin parentheses are t-statistics.
GEXP = export growth, CMS = change in import share, CIM = change in industry mix, CTP = change in trading partners, MIIT = marginal intra-industry trade and CIND = change in internal demand.

The results across all 141 branches are presented in equation 1. The positive and significant relationship between GEXP and CIM suggests that branches that specialized so as to produce goods with increased value added experienced higher growth in exports. The positive and significant coefficient on MIIT confirms the finding of others that increased 'openness' is associated with increased intra-industry trade. Apart from these two results, however, our model does poorly with low explanatory power. Clearly many important explanatory variables are missing (the constant is highly statistically significant).

We then disaggregated the sample into (a) those branches that experienced a rise in the import share (62 branches) and (b) those branches that experienced a fall in the import share (79 branches) and re-estimated separately for each sub-group. The best performing equation is that for the branches that experienced an increase in import share, with $\overline{R^2}$ of 36% (equation 2). Our hypothesis that trade reforms have had a positive impact on manufactured exports is supported by improvements to the overall fit of the equation for this sample and the significant results with the expected signs between the dependent variable (GEXP) and the explanatory variables. CMS is positively and significantly (at 5% level) related to export growth, reflecting the importance of trade 'openings'. CIM is positively and significantly associated with export growth, implying a greater growth of exports for a given increase in the share of value-added. CTP is negatively and significantly related with export growth, indicating a lower growth in exports for a given increase in the concentration of our trading partners. This suggests that the higher the diversification in our trading partners the less susceptible will we be to external shocks and so the greater will exports be. Finally MIIT is again positively and significantly (at 1% level) related with export growth as expected, again suggesting that trade reforms have encouraged trade flows that are intra-industry in nature.

We did not find support for our hypothesis that trade reforms have had a positive impact on manufactured exports in the rest of the branches with negative import growth, in that overall fit of the equation is poor ($\overline{R^2}$ = 0.09 in equation 3). CIM is positively and significantly related with GEXP as found in equations 1 & 2. CTP is positively and

significantly associated with GEXP but this is contrary to our results in the first two equations.

The Chow test was used to establish whether there is any statistically significant difference in the coefficients obtained for the two sub-samples, based on rise and fall in imports[13]. The results obtained indicate that there is significant (at 1% level) difference between the sub-samples.

## 4. Conclusions

This paper has briefly documented the trade reforms in Australia and the trends in manufacturing exports with time series data for the period 1968/69 to 2002/03 and has found a link between falling protections and increased manufacturing exports. Intensive reforms and associated growth in manufacturing sector exports has further been documented during the period 1989/90 and 2001/02.

We also investigated whether the trade reforms are still important in explaining changes in manufactured exports but at the 4-digit branch level and controlling for changes in internal economic conditions and the degree of concentration of our major trading partners, over the period 1989/90 to 2000/01. We find a link between declines in protection and export growth among the branches where there are growing imports and this tends to indicate that declining protection is associated with rising exports. Our results also shows that the association between export growth (GEXP) and intra-industry trade is stronger among the branches where imports increased and this seems to reveal the importance of intra-industry trade in promoting export growth. Increased competitiveness that has been acquired through increases in the ability to add value and through increased intra-industry trade has contributed to export growth in the branches where there are growing imports. This sort of analysis is exploratory but the results support the proposition that the trade reforms of the last 15 years in particular have positively impacted on Australia's manufacturing trade performance.

[13] For this purpose, a null hypothesis that there is no difference between the sub-samples and an alternative hypothesis that there is difference between sub-samples were formed. The null hypothesis is rejected if calculated F statistics (calculated using residual errors of the total sample and sub-samples), is above the critical value at 1% level. F statistic is 5.565 which is significant at 1% level (critical F value is 3.17).

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