COMPETITIVENESS INDICES AND THE TRADE PERFORMANCE OF THE AUSTRALIAN MANUFACTURING SECTOR

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Competitiveness Indices and the Trade Performance of the Australian Manufacturing Sector

The relationship between competitiveness and trade has been the subject of much debate. However Whitelaw (1983) and Dixon and Johnson (1986) found no clear relationship. For this study, competitiveness indices were created separately for imports and exports, based on three price measures (consumer prices, wholesale prices and export unit values) and two weighting systems whereby the price indices of various countries were weighted firstly by each country's volume of trade with Australia alone and secondly by the worldwide trade volumes of Australia's major competitors in manufactured goods markets. The indices are analysed using a fully specified economic model. While a trade-weighted CPI based index is acceptable in explaining imports, competitor-weighted indices are found to be preferable for exports.

120 words

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1. Introduction

Since Australia adopted a floating exchange rate regime in 1983, there have been periods of substantial real depreciation of the Australian dollar. There has been much discussion about the possibilities of export and import-competing industries taking advantage of this improvement in competitiveness and improving Australia's economic position (see for example EPAC, 1986).

From 1970 to 1986, manufactured goods accounted for an average of 22% of Australia's exports. Export growth in Australian manufactures is seen as essential to Australia's continued economic growth. But while exports of all goods and services rose by an average 4.4% per annum over this period, manufactured goods exports only averaged 3.8%; over the last few years the difference between the growth rates rose to an average of 2%. While world demand for Australian raw materials is maintained, Australia should in the long run increase its exports of manufactured goods. To do this, Australian manufactured goods must be competitive on the world market.

Indices of competitiveness are often used when analysing or modelling the economy as in the import and export equations of the Treasury's NIF88 model of the Australian macro-economy. However there has been some debate on the appropriate way to measure competitiveness. This study comments on the standard index (based on trade-weighted relative consumer price indices) and assesses the relative usefulness of a number of different indices of competitiveness over a common period. For the first time this is done within a fully specified econometric model leading to some useful results.

2. Previous Studies of Competitiveness

Australia's competitiveness has often been assessed using indices of the real effective exchange rate. These are broad indicators of changes in the international price and cost competitiveness of domestically produced goods. If the real cost of Australian goods abroad falls relative to other countries' goods, one would expect an increase in Australian exports. Such indices of **external** competitiveness can be found in a number of studies though few studies assess how well they explain Australia's trade performance. The studies by O'Mara, Carland and Campbell (1980), Treasury (1983), Pitchford (1986) and McKenzie (1986) just present a competitiveness index as part of an examination of the Australian economy's performance. There are various comments on the possible deficiencies of real exchange rate indices as indicators of competitiveness, and a recognition that one needs to be careful when using such indices to explain changes in trade performance.

The studies by the Confederation of Western Australian Industry (CWAI, 1981, 1987) , and Dwyer and O'Mara (1988) analyse the indices themselves. The concern of the CWAI (1981) study is that conventional indices of competitiveness use a trade-based weighting scheme. This method of weighting is questioned given that the major competitors for our exports on the international market are not necessarily going to be those countries with whom we share a large trade relationship.

Pitchford (1986) criticises the use of CPI based indices as these also reflect the prices of non-traded goods, from haircuts to mortgages. Dwyer and O'Mara (1988) focus on the concept of **internal** competitiveness, that is the ability of the traded goods sector of the economy to attract resources from the non-traded goods sector. The argument is that even given an apparent improvement in external competitiveness, as indicated by a conventional competitiveness index, internal competitiveness is necessary for the growth of the traded goods sector. This supply side argument assumes that a change in relative prices is reflected in a change in relative profitability of production. Using an index of export prices (PX) and a price index of gross non-farm product (PGNM), one measure of internal competitiveness is PX/PGNM, which is really quite different from external competitiveness as shown in Figure 1. The measure of external competitiveness used here (PCOM) is an import trade-weighted index of real effective exchange rates using consumer price indices. Expressed this way, a rise in either these indices should improve the trade balance.

[Figure 1 about here]

Whitelaw (1983) and Dixon and Johnson (1986) deal explicitly with the issue of how well competitiveness indices (using the standard real effective exchange rate approach) relate to changes in Australia's trade performance. Whitelaw plots movements in a real effective exchange rate index, based on wholesale prices, against imports as a ratio of gross national expenditure. His descriptive analysis concludes that the fluctuation in import volumes in the periods 1973-77 and 1980-83 appear to correlate sensibly with movements in the competitiveness index of about one year earlier. He suggests however that the significance of competitiveness as described by the index is misleading, and that the swings in import volumes were due primarily to other factors such as the level of domestic activity. Whitelaw focusses on imports, as, in his opinion, the indices of competitiveness based on trade weights are inappropriate for assessing the competitiveness of Australian exports.

Dixon and Johnson regress a measure of trade performance on a variety of indices, incorporating various lag structures. 'The results were uniformly disappointing' (op. cit., p.6). They conclude that the reason why their index cannot explain Australia's trading behaviour satisfactorily is that some shocks to the Australian economy can generate a worsening in competitiveness as measured by the indices, yet improve trade performance and vice versa. However after ORANI model simulations are undertaken to illustrate various scenarios, their conclusion remains that there is no systematic relationship between competitiveness indices and trade performance. This strange result may be a function of the ORANI model and its Walrasian nature. In contrast a time-series macroeconometric model is used here to assess the effect of competitiveness.

3. The Usefulness of Competitiveness Indices

Various forms of competitiveness indices in terms of real effective exchange rates have been proposed. The Bureau of Industry Economics (Lattimore, 1988) used import trade weighted real exchange rates, the OECD(1986) calculated export competitor weighted real exchange rates and the CWAI (1987) used import competitor weights. The Bureau of Industry Economics used consumer prices, the OECD an elaborate scheme using consumer prices, unit labour costs and export unit values, and the CWAI used consumer prices and real unit labour costs. The main thrust of this paper is not to create yet another index but rather to calculate separate indices using trade-weighting and competitor weighting schemes and using various price indices, all on a common data period, and then evaluate the relative usefulness in explaining imports and exports using a reasonable economic model.

As opposed to a full structural model, we did also analyse the one-to-one relationships between the indices constructed and a measure of the Australian manufacturing sector's trade performance. Although various lag structures were used, the results were similarly unimpressive and so are not worth reporting. A major problem with this approach is specification error in that other variables may be important in explaining imports and exports and without these in the specification one may obtain quite erroneous results.

Various specifications have been used in macroeconometric models of Australia. Much work has already been put into finding equations that fit Australian data well. The AMPS (1989) and Murphy (1988) models used inverted demand equations but the Treasury's NIF model (Simes et al, 1988) used fairly straightforward specifications which were considered suitable for testing the usefulness of various indices. In other current models (ORANI, (Dixon et al, 1982), IMP (Brain, 1986) and MSG (McKibbin, 1989)) the equations are either disaggregated by industry or not estimated.

3.1 An Economic Framework

In NIF , the demand for manufactured exports (XMAN) is essentially explained by domestic product (GNX) (non-rural, non-oil, non-export and before all indirect taxes), the ratio of domestic product to exports (XMAN), a trade-weighted measure of competitiveness (PCOM) and a time trend (QTIM). The dependent variable is the growth of exports in the form of the first difference of the log; Almon polynomial lags apply to GNX and PCOM. Coppel et al (1988) explain the NIF88 exports equation as a supply function and yet they use an external measure of competitiveness (PCOM) instead of an internal measure; figure 1 showed that these are not as 'closely related' as Coppel et al probably thought. They assume that Australia is a 'small' country, implying an equality of Australian export prices with world prices and hence a dominance of internal competitiveness.

However since manufactured goods are highly differentiated and a large proportion of Australian exports are to New Zealand, the small country assumption may not be so valid. Given that Australia has few solely export-oriented manufacturing companies and that exports are only about an eighth of total manufacturing production, the elasticity of supply of exports is possibly very high if not perfectly elastic, in which case domestic prices should equal export prices and external competitiveness would dominate. This would mean that PCOM is in fact an appropriate measure after all. This approach is taken in this paper but alternative measures of external competitiveness are considered. The exports specification is -

$$\ln(XMAN/XMAN_{-1}) = a_0 + a_1\,QTIM + \Sigma\,\alpha(L)\,\ln(PCOM(L)) + \Sigma\,\beta(L)\,\ln(GNX(L)/GNX(L-1)) + a_2\,\ln(GNX_{-1}/XMAN_{-1})$$

For imports, there is no equation just for manufactured goods in NIF88 but instead a single equation for all imports (more specifically imports endogenous to the model, not imports such as passenger aeroplanes). In 1984-5 about a quarter of endogenous imports were consumer goods, another quarter were investment goods and the rest were inputs into production. 'The imports equation is a demand schedule', explained by 'aggregate demand, competitiveness and the state of the cycles in the labour and goods markets' (Coppell et al, p12). The dependent variable is endogenous imports (MEG) adjusted for a dock strike by a dummy variable (QDOK). The explanatory variables are the ratio of manufactured sales (DSALM) to gross non-farm product (GNM), overtime hours per head (ROT), the ratio of 'intended' production (GSUP) to expenditure on home-produced non-inventory goods (DSAL), the stocks to sales ratio adjusted for compositional changes (RSS-RTSSC), the competitiveness index (PCOM) and the level and growth of a specially weighted measure of demand (DMEG), created just for this equation. The manufacturing sales-to-output ratio is a proxy for 'the decline in the Australian manufactured sector, reducing the capacity for sourcing goods domestically' (Coppel et al, p35). The final specification is -

$$\ln(MEG-QDOK) = a_0 + a_1 \ln(MEG_{-1} - QDOK_{-1}) - a_2\, DSALM/GNM + a_3\, ROT$$
$$+ a_4 \ln(GSUP/DSAL) - a_5\,(RSS-RTSSC) + \Sigma\alpha(L) \ln(PCOM(L))$$
$$+ \Sigma\, \beta(L) \ln(DMEG(L)/DMEG(L-1)) + a_6 \ln(DMEG_{-1})$$

The imports equation has an adjusted R^2 of 0.96 and the exports equation in difference form has an adjusted R^2 of 0.2. Both equations passed tests for heteroscedasticity, normality and structural change though the exports function was estimated accounting for autocorrelated error. Further explanation of the derivation of these equations can be found in Coppel et al (1988). Since these specifications have already been shown to perform fairly well, they were considered appropriate vehicles to assess alternative indices of competitiveness to the trade-weighted PCOM index used.

In NIF, Coppel et al fit the PCOM index in both the imports and the exports equation using a third-degree Almon polynomial with a tail constraint, using the contemporaneous value plus 7 and 11 lags in the export and import equations respectively. In the exports equation, none of the individual coefficients on the lags are significant at the 5% level, only the sum of them (appropriately positive) is significant with a t-value of 2.04; the long run form of the equation implies a near unit long-run elasticity between exports and competitiveness. In the imports equation a further constraint is imposed that the sum of the lags minus the coefficient of the lagged dependent variable must equal minus one, which amounts to imposing a unit long-run elasticity. Here the majority of the coefficients are negative and significant and the equally appropriately negative sum has a t-value of 6.333.

The distinction between internal and external competitiveness does not arise for imports. Except for a few commodities most imports are also produced domestically. Since imports range widely from consumables to durables a broad CPI based index may be the most relevant one for imports. PCOM is a real effective exchange rate with the nominal exchange rate adjusted for Australian customs duties and relative prices. Domestic prices are measured in relation to private consumption, excluding changes in taxes. Given the use of a general consumption price index and customs duties, this index is clearly far more related to domestic demand for imports than foreign demand for Australian exports. This may explain why it is so much more effective in the imports equation.

3.2 Alternative Competitiveness Indices to PCOM

This study tests whether a true competitor weighted index would be more useful in explaining both imports and exports but exports in particular, and whether different indices of prices/costs might be more useful. The various competitiveness indices constructed here are all related to the assumption of purchasing power parity (PPP). The PPP relationship can be written as

$$\frac{P^*}{E.P} = 1 \qquad (1)$$

where E is the nominal exchange rate in terms of a unit of a weighted basket of foreign currency per units of domestic currency, P is a domestic price index and P^* is a weighted basket of the equivalent price indices of the foreign countries considered.

Departures from PPP are said to be because of real changes in the economy that alter the competitiveness of the export and import-competing sectors of the economy. Hence a form of real exchange rate which attempts to measure departures from purchasing power parity will be an index of international competitiveness (CI). That is -

$$CI = \frac{P^*}{E.P} \qquad (2)$$

A rise in this competitiveness index represents a decrease in the exchange rate adjusted relative price of domestic goods, that is, an increase in competitiveness. Therefore one would expect such an index to be positively related to Australian exports and negatively related to imports.

For such an aggregate index, there are clear index number problems not only in respect to goods but also over different countries' exchange rates. The exact form of the indices constructed for this study is

$$CI = \frac{\Sigma\ (P_j E_j)\ W_j}{P_a E_a} \tag{3}$$

where E_a and E_j are the nominal exchange rates for Australia and country 'j' respectively, in terms of SDR's per unit of currency, P_a and P_j are the equivalent price (or cost) index for Australia and country 'j' respectively and W_j is the weight assigned to country 'j'.

The question now arises as to which price series to use (export unit value, wholesale, etc) and what country weights are used; the exchange rates are always fixed over all forms of the measure and the index number problem of goods within the price indices is not considered here.

3.3 Price Indices used within the Indices of Competitiveness

The measurement of competitiveness by equation 3 should use price indices which reflect delivered prices. These indices would measure changes in transportation and distribution costs and tariffs as well as changes in basic prices. Unfortunately no such price index is available. The use of existing price indices in the construction of competitiveness indices poses various problems.

a) Export Unit Value (XUV) of Manufactures Index.

These are perhaps the closest approximation to an export price series. However, the export price index is based on a country's f.o.b. exports to all regions, and so does not reflect differences in prices to ultimate purchasers (Junz and Rhomberg, 1965, p.232). For countries such as Australia whose main markets for manufactured goods are industrialised nations, an export price index will represent at least a reasonable average indicator of price, as pricing policies should not differ greatly between markets. Indices of unit value may involve an averaging across trade categories so they will change with price changes and also change with the composition of the goods involved with the index. Junz and Rhomberg point out that an export price index which only involves goods actually exported can be a misleading index of competitiveness. If certain goods cease to be exported because they are overpriced and therefore not competitive, then these goods will cease to be included in the export price index. So, a country could conceivably price itself out of the market, suffering a loss of market shares, but still appear to have a stable or perhaps even declining export price index. The result would be that the loss in exports would be wrongly attributed to factors other than prices.

b) Wholesale (Producer) Price Index (WPI).

With respect to this last point, a wholesale price index can be argued to give a better indication of changes in the general price competitiveness of a 'country' as opposed to 'goods exported' since it measures the price changes of potential exports as well as of goods actually exported. A problem with the wholesale index is that it also reflects changes in the price of imported goods. To the extent that these imports may re-enter the international trade of the country in question as component parts or as re-exports, then the inclusion of their price in a measure of export-price competitiveness may be quite appropriate. However, if these imports are only destined for domestic use, a wholesale price index may not be useful as an indicator of external price competitiveness. Another shortcoming of this index is that it will not reflect the price changes of export goods brought about by changes in export subsidies and tax rebates.

c) Consumer Price Index (CPI).

A consumer price index may have the same short-comings as the wholesale price index but perhaps to a greater extent as it reflects changes in other factors. Thus one might expect that a comparison of CPI's would not provide a good indication of price competitiveness, particularly of manufactured exports.

d) Unit Labour Cost in Manufacturing.

International competitiveness may include other factors than price competitiveness and hence a direct comparison of unit costs may be a more reliable guide. Unfortunately costs are difficult to measure. Generally, only unit labour costs are available. But these are not necessarily a good indicator of overall unit costs. Differences between countries in the cost contribution of different factor inputs mean that changes in labour costs do not necessarily indicate similar changes in total unit costs. Furthermore there are problems comparing unit labour costs between countries, since one would like to include also non-wage costs such as social security contributions paid by employers. These factors may vary widely between countries.

It should be noted that these indices also use different industry classifications. For instance, export price series derived from export unit values are based on the Standard International Trade Classification while wholesale price indices and the information underlying unit labour cost indices are generally based on the International Standard Industry Classification.

3.4 The Inter-Country Weighting Method Used

Rather than the price indices used, the major emphasis in this study is upon the inter-country weights, the question being whether these weights reflect the importance of each country in terms of trade with Australia alone ('Trade Weighted') or the importance of each country on the world market of these goods for exports and on the domestic market for imports ('Competitor Weighted'). As sets of both competitor and trade weights are found separately for imports versus exports, this leads to deriving four different weighting systems. The trade-weighted indices are fairly simple to create and hence are more commonly used. The competitor-weighted indices require detailed analyses of separate categories of manufactured goods to detect competitors in the relevant markets.

a) A Trade Weighting System for Imports

This system is based on the major countries from whom Australia imports. It is used in the indices constructed by the

Treasury and is therefore often referred to in articles assessing Australia's possible trade prospects. The weight, WM_j, assigned to a country 'j', is the volume of manufactures imported from country 'j' into Australia (M_j), as a proportion of the total volume of manufactures imported into Australia from the most important six countries (ΣM_j), in the five years 1982-83 to 1986-87. That is

$$WM_j = \frac{M_j}{\Sigma M_j}$$

The countries selected were Japan, United States of America, United Kingdom, Federal Republic of Germany, New Zealand and Italy.

The choice of New Zealand was partly because New Zealand appeared in the weighting system for major export markets, reflecting its importance as a trading partner. Taiwan and China were two of the more important markets from whom Australia imported manufactures but there were problems in obtaining price and exchange rate data for either of them. Hence Italy, the next country in line, was chosen.

b) A Trade Weighting System for Exports

This considers the major countries to whom Australia exports. The weight, WX_j, assigned to a country 'j', is the volume of manufactures exported to country 'j' from Australia (X_j), as a proportion of the total volume of manufactures exported from Australia to a selected six countries (ΣX_j), in the five years 1982-83 to 1986-87. That is

$$WX_j = \frac{X_j}{\Sigma X_j}$$

The selected countries were New Zealand, United States of America, Japan, United Kingdom, Singapore, and Papua New Guinea. Again, the first four countries were clear choices. The choice of Singapore and Papua New Guinea over a number of other countries with fairly similar export shares, was due to the greater consistency of Singapore and Papua New Guinea as export markets for Australian manufactures over a longer period of time.

c) A Competitor Weighting System for Imports

Instead of all import trade, attention here was concentrated only on those imported goods which competed directly with domestic production, specifically the major ten manufactured imports for which there was significant domestic production. These ten goods were responsible for over 70% of all manufactured imports and their domestic production was responsible for over 45% of the value added of all domestically produced manufactures in Australia. A weight $(VA_i/\Sigma_i VA_i)$ was assigned to each commodity on the basis of its share in the total domestic value added by the ten commodities. For each commodity a weight $(Q^M_{ij}/\Sigma_i Q^M_{ij})$ was assigned to each of the top five countries from whom Australia imported according to its share in the total value of imports of the commodity for the years 1982-83 to 1986-87. The final weights for the countries against whom domestic manufacturers compete on the domestic market (WCM_j) is then the product of these two weights summed over the commodities. That is,

$$WCM_j = \sum_i \left[\frac{VA_i}{\sum_i VA_i} \cdot \frac{Q^M_{ij}}{\sum_i Q^M_{ij}} \right]$$

The five countries selected were Japan, United States of America, United Kingdom, Federal Republic of Germany and France. forming a fairly clear group. Taiwan, at a weighting of nearly two percent, was close to being included as a sixth country, but, once again, lack of information on economic variables precluded its inclusion.

d) A Competitor Weighting System for Exports

The top fifteen commodities of manufactured exports were identified for 1982-83 to 1986-87. These accounted for 55% of total manufactured exports and were thus thought to be representative of the manufactured exports sector. Each commodity was then assigned a weight $(X_i/\Sigma X_i)$ according to its share in total world exports of the selected manufactured commodities. The five leading exporters of each commodity, apart from Australia, were found and a weight $(Q^E_{ij}/\Sigma Q^E_{ij})$ assigned to each country on the basis of its share in the total exports of the commodity from the selected countries. The weight for each country, as a major competitor against Australian manufactured exports, was the product of these two weights summed over the commodities. That is,

$$WCX_j = \sum_i \left[\frac{X_i}{\sum_i X_i} \cdot \frac{Q^E{}_{ij}}{\sum_i Q^E{}_{ij}} \right]$$

The countries selected were Federal Republic of Germany, United States of America, Canada, Japan, France and Belgium. Again, these countries were a fairly clear choice, with the next country in line being the United Kingdom.

3.6 Comparison of the resulting Competitiveness Indices

The final country weights are given in Table 1. For the import indices the most important four countries (Japan, USA, UK and West Germany) had essentially identical weights accounting for 91% of the total on both the trade weighted and competitors weighted indices. Hence the competitor weighted indices were essentially identical to their trade weighted indices with correlations of 0.997 or more. Given this, only one weighting system was used (competitor weighted) when the indices were used in the NIF88 Imports equation. The arguments for distinguishing between traders and competitors do not apply so strongly to imports.

[Table 1 about here]

The picture was quite different for exports. Here, while the USA and Japan feature similarly in both the trade-weighted and the competitor-weighted indices, the other four countries differ completely; the trade weights select, not surprisingly, Australia's major trading partners, namely New Zealand, the UK and south-east Asia while the competitor weights select competing producers of manufactured goods, namely West Germany, Canada, France and Belgium.

While the correlations with PCOM for the import indices were all above 0.89, for exports, these correlations ranged from 0.52 to 0.83. The cross-correlations between indices using the same price indices but different weightings varied from 0.64 to 0.83. The trade weighted indices were much more highly correlated with each other than the competitor weighted indices.

The competitor weighting accentuated the differences between consumer prices, wholesale prices or export unit values being used. These correlations clearly show the weighting made a definite difference.

Space limitations prevent the inclusion of all the possible graphical comparisons but Figure 2 shows the CPI based indices for import and export competitiveness. The import trade-weighted index (CPIM) is not graphed separately as it lies almost on top of the CPIMC line given the other variation in the graph. For exports, the trade-weighted index (CPIX) clearly falls much further over the sample than the competitor-weighted index (CPIXC), the correlation between these two being 0.71 while that between CPIM and CPIMC is 0.998.

3.6 Econometric results with the new indices

3.6.1 Imports

For the NIF88 equation comparison, the sample size was ten less than the Treasury's sample because of missing early data for some of our new indices, but this hardly changed the estimates for the NIF imports equation. The results (see Table 2) show that none of the indices were an improvement upon PCOM. All were statistically significant but the Adjusted R^2's were all slightly (up to 0.03) lower on an original value of 0.9595 for PCOM. J-tests were carried out comparing the PCOM specification with each of the others and in all cases the non-PCOM specifications were rejected.

[Table 2 about here]

For imports, none of these newly created indices was an improvement over PCOM. This may be because our new indices related specifically to manufactured goods while the NIF88 imports equation relates to all imports endogenously determined within the NIF88 model.

3.6.2 Exports

When placed into the NIF manufactured exports equation, all but one of the alternative indices created an increase in the Adjusted R^2. Also all the competitor weighted indices led to higher Adjusted R^2's than the trade weighted indices. The best was the competitor-weighted consumer-price competitiveness index which raised the Adjusted R^2 from 0.24 to 0.32. These Adjusted R^2 values are much lower than those for imports as the dependent variable is a first difference in the logs rather then a log level.

[Table 3 about here]

In the original NIF exports equation, the sum of the PCOM coefficients was only just significant (at the 5% level with 49 d.f.) with a t-value of 2.0369 and none of the individual lag coefficients were significant. With our slightly smaller data set (only 4 observations less for exports), PCOM became insignificant in every way. However the export competitor weighted CPI based index (CPIXC) had some statistically significant lags and a significant sum on a one-tailed test on the expected positive side. Table 3 gives the full results. Unlike for imports, the J-tests are now all statistically insignificant; they cannot differentiate between PCOM and the other indices. The sums of the trade weighted indices' coefficients are inappropriately negative and insignificant in every case. Amongst the competitor weighted indices, CPIXC had a significant sum and a long-run elasticity of about 1.5 with respect to exports; the elasticity reported by Coppel et al was 1.15. Another factor arguably an advantage of the competitor weighted specification is that the time trend effect is much smaller in these regressions. Hence, overall, we feel that for exports the competitor weighted indices are better than the trade weighted indices and a slight improvement statistically over the PCOM index.

4. Conclusion

The manufacturing sector plays a leading role in Australia's current economic performance and its future prospects. The ability of the manufacturing sector to supply an increased share of the domestic demand for manufactures and maintain a strong position in the export market is important for the Australian economy.

One aspect of this ability is competitiveness. Usually a single competitiveness index is used to show changes in competitiveness against imported goods on the domestic market and changes in competitiveness for exported goods on the world market. Such an index can only be either a very broad indicator of competitiveness or just a reflection of competitiveness on one market, domestic or foreign. The aim of this study was to see whether distinct indices of exports and imports are merited and whether in constructing the indices the price indices chosen (CPI, wholesale price index, or unit value) and/or the country weighting chosen (trade weighted or competitor weighted) is important.

Although the indices are of little value in simple regressions whatever lag structure is used, they become relevant when a reasonably well specified equation is adopted. Thus graphical analysis will not show the relationship between competitiveness and either imports or exports. Other shocks to the economy may make exports fall and imports rise even though the competitiveness index may be rising. Hence this analysis uses a full specification accounting for other causal variables to show the true effects of competitiveness.

The results show that it may be worth having distinct indices for imports and exports. With respect to imports, neither the price index used nor the weighting system made much difference and none of the indices created in this study explained imports better than the PCOM index used by the Treasury in the NIF88 model. With respect to exports, the weighting system made a distinct difference while the price index chosen was not so important. The competitor weighted indices were markedly better at explaining exports than all the trade weighted indices including PCOM which is really an index for import competitiveness.

Overall the CPI proved to be the best price index to use. This may imply that the general price level is more important than specific unit labour costs and hence that the Australian government should aim at decreasing overall inflation to help reduce imports rather than just inflation in unit labour costs.

The weighting system chosen is important for exports but not imports. For imports, this is simply because the countries with whom there is competition with respect to domestically produced goods are essentially the same as those with whom there is trade in all goods. The weighting systems are similar for imports. On the export side, competitor weighting is important and hence the real effective exchange rates of countries that compete in the same goods are more important than the rates of the countries to whom Australia exports.

A major economic problem for Australia is the deficit. One therefore needs to know how imports and exports are determined, the size of the response to competitiveness and which countries' exchange rates are important. Our analysis has confirmed that both relative prices and exchange rates are important. The large inflation differential with Germany implies that severe devaluation of the Australian dollar versus the Deutschmark is required to maintain Australian competitiveness in manufactured goods. It would be much better however if Australian inflation could be reduced.

The need to improve Australian competitiveness has often been emphasised in the belief that there is a high elasticity between the real effective exchange rate and trade. Our results confirm this and imply that the effect of competitiveness is more evident when one uses a competitor-weighted measure for exports as opposed to a trade-weighted measure. The elasticity of 1.54 is higher than the average of 1.25 reported by Gordon (1986). We also believe that the competitor-weighted indices are more valid for exports in terms of economic theory. This implies that the role of competitiveness has been underestimated and that further efforts should be made to increase Australian competitiveness. Exchange rate policy and domestic inflation are important for the trade balance.

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Table 1: Weights Applied to Foreign Price Series

Exports

Trade-Weighted		Competitor Weighted	
New Zealand	0.305	West Germany	0.297
USA	0.205	USA	0.205
UK	0.172	Canada	0.169
Japan	0.152	Japan	0.127
P.N.G.	0.084	France	0.112
Singapore	0.082	Belgium	0.090

Imports

Trade-Weighted		Competitor Weighted	
Japan	0.375	Japan	0.391
USA	0.313	USA	0.367
UK	0.112	UK	0.111
West Germany	0.110	West Germany	0.106
Italy	0.048	France	0.025
New Zealand	0.042		

Table 2: Imports Equation Results

	PCOM	CPIMC	WPIMC	RWXMC
Constant	-2.3152	-1.2689	-1.9028	-1.6665
	(-6.678)	(-5.162)	(-5.692)	(-4.796)
Y_{-1}	0.23700	0.39408	0.23294	0.31458
	(2.2715)	(3.6135)	(1.8152)	(2.3359)
DSALM/GNM	-1.3546	-1.9067	-1.7765	-1.7319
	(-4.108)	(-3.832)	(-4.108)	(-3.664)
ROT	0.39067	0.34010	0.43655	0.43585
	(5.0718)	(4.2348)	(5.2346)	(4.5459)
ln(GSUP/DSAL)	2.2167	2.2445	1.9436	1.6084
	(3.3341)	(2.9041)	(2.7205)	(2.2256)
RSS-RTSSC	-1.1233	-1.4486	-1.1279	-1.0476
	(-3.915)	(-4.354)	(-3.643)	(-3.304)
CI	-0.15932	-0.17435	-0.16198	-0.19315
	(-2.211)	(-2.603)	(-2.353)	(-3.095)
CI_{-1}	-0.09532	-0.08434	-0.10040	-0.10092
	(-3.230)	(-2.309)	(-2.978)	(-3.223)
CI_{-2}	-0.05518	-0.02813	-0.06104	-0.04225
	(-1.880)	(-0.897)	(-1.963)	(-1.490)
CI_{-3}	-0.03450	0.00032	-0.03988	-0.01122
	(-0.852)	(0.0090)	(-1.035)	(-0.324)
CI_{-4}	-0.02889	0.00700	-0.03285	-0.00191
	(-0.669)	(0.1984)	(-0.813)	(-0.052)
CI_{-5}	-0.03397	-0.00204	-0.03591	-0.00842
	(-0.899)	(-0.066)	(-0.988)	(-0.253)
CI_{-6}	-0.04535	-0.02080	-0.04501	-0.02482
	(-1.637)	(-0.836)	(-1.530)	(-0.890)
CI_{-7}	-0.05863	-0.04324	-0.05612	-0.04521
	(-3.178)	(-2.002)	(-2.308)	(-1.873)
CI_{-8}	-0.06943	-0.06334	-0.06518	-0.06368
	(-3.788)	(-2.677)	(-2.633)	(-2.592)
CI_{-9}	-0.07336	-0.07509	-0.06814	-0.07430
	(-3.023)	(-2.766)	(-2.447)	(-2.781)
CI_{-10}	-0.06602	-0.07247	-0.06096	-0.07117
	(-2.489)	(-2.703)	(-2.207)	(-2.754)
CI_{-11}	-0.04303	-0.04944	-0.03960	-0.04838
	(-2.183)	(-2.630)	(-2.028)	(-2.688)
ΣCI_{-i}	-0.76300	-0.60592	-0.76706	-0.68542
	(-7.310)	(-5.556)	(-5.977)	(-5.089)
$\ln(\delta DMEG)$	0.64193	0.41258	0.45714	0.33833
	(1.6872)	(0.9645)	(1.1091)	(0.7888)
$\ln(\delta DMEG)_{-1}$	0.22745	0.15797	0.16201	0.13450
	(0.6395)	(0.3883)	(0.4126)	(0.3277)
$\ln(\delta DMEG)_{-2}$	-0.0136	0.04152	0.11146	0.11665
	(-0.039)	(0.1031)	(0.2861)	(0.2862)
$\ln(\delta DMEG)_{-3}$	-0.0928	-0.06150	0.03644	0.09594
	(-0.242)	(-0.014)	(0.0860)	(0.2149)
$\Sigma \ln(\delta DMEG)_{-i}$	0.76300	-0.60592	-0.76706	-0.68542
	(7.3130)	(-5.556)	(-5.977)	(-5.089)
$\ln(DMEG)_{-1}$	0.76300	0.60592	0.76706	0.68542
	(7.3130)	(5.5561)	(5.9771)	(5.0895)
Adj. R^2	0.9595	0.9471	0.9507	0.9464
sse(df=38)	0.056066	0.073170	0.068263	0.074201
J test t value (df=37)				
Ho:Pcom Spec.		0.65179	0.29723	1.3283
Ho:non pcom spec.		3.0559	2.8985	2.7179

The variables in the imports equation are -

y = the dependent variable = ln(MEG-QDOK) where

MEG = Imports of Endogenous Goods to the NIF88 Model

QDOK = a dummy variable representing the UK and US Dock Strikes.

y_{-1} = lagged dependent variable.

DSALM= Demand; Sales of Manufactures.

GNM = Real Gross Non-Farm Product measured at Market Prices.

ROT = Overtime Hours per Head.

GSUPS= Intended Aggregate Production - Short Run Concept.

DSAL = Expenditure on Home-Produced Non-Inventory Goods.

RSS = Ratio of Stocks to Sales.

RTSSC= RSS adjusted for compositional changes to sales.

CI = the competitiveness index defined by the column heading.

DMEG = Weighted Demand created just for this equation (see NIF88 paper No 13).

δDMEG= $DMEG/DMEG_{-1}$

t values are given in brackets.

Identification of the Competitiveness Indices for Imports

Index (CI)	Australian Prices	Foreign Prices	Weighting Scheme
CPIMC	CPI	CPI	Competitors
WPIMC	Wholesale PI	Wholesale PI	"
RWXMC	"	Export U.V.	"

Table 3: Exports Equation Results

	Trade Weighted				Competitor Weighted		
	PCOM	CPIX	WPIX	XUVX	CPIXC	WPIXC	XUVXC
Const	-0.8463	-2.2761	-2.5069	-1.6913	-0.0403	-0.4125	-0.4316
	(-2.3182)	(-1.9561)	(-2.2860)	(-1.8454)	(-0.0737)	(-0.6391)	(-0.8850)
QTIM	0.0010	0.0026	0.0027	0.0021	0.0007	0.0010	0.0007
	(2.0244)	(2.1701)	(2.4933)	(1.9611)	(1.4749)	(2.2832)	(1.1896)
GM_{-1}	0.2549	0.3383	0.3941	0.3160	0.3394	0.3022	0.3056
	(2.2968)	(2.4885)	(2.6419)	(2.5008)	(2.8322)	(2.5891)	(2.6477)
CI	0.1689	0.0001	-0.0040	0.1028	0.2524	0.2301	0.1621
	(1.5970)	(0.0007)	(-0.0440)	(0.8844)	(2.7579)	(2.5348)	(1.9196)
CI_{-1}	-0.0050	-0.0331	-0.0233	-0.0149	0.0330	0.0394	0.0188
	(-0.1757)	(-1.2331)	(-0.8732)	(-0.4952)	(1.0766)	(1.2575)	(1.0611)
CI_{-2}	-0.0813	-0.0472	-0.0348	-0.0696	-0.0690	-0.0557	-0.0481
	(-1.5276)	(-1.1176)	(-0.7787)	(-1.2835)	(-1.4761)	(-1.1762)	(-1.3342)
CI_{-3}	-0.0869	-0.0472	-0.0394	-0.0779	-0.0854	-0.0799	-0.0594
	(-1.6144)	(-1.0877)	(-0.8599)	(-1.3463)	(-1.8381)	(-1.7441)	(-1.5525)
CI_{-4}	-0.0489	-0.0376	-0.0385	-0.0562	-0.0481	-0.0579	-0.0355
	(-1.4272)	(-1.2168)	(-1.1865)	(-1.4251)	(-1.5155)	(-1.8597)	(-1.5071)
CI_{-5}	0.0057	-0.0234	-0.0329	-0.0210	0.0110	-0.0142	0.0030
	(0.2049)	(-0.7805)	(-1.1139)	(-0.7687)	(0.3767)	(-0.4403)	(0.1836)
CI_{-6}	0.0501	-0.0092	-0.0239	0.0111	0.0599	0.0265	0.0354
	(1.1411)	(-0.2239)	(-0.5924)	(0.2787)	(1.4639)	(0.5820)	(1.2258)
CI_{-7}	0.0572	0.0002	-0.0126	0.0236	0.0669	0.0394	0.0413
	(1.3570)	(0.0056)	(-0.3413)	(0.6051)	(1.7793)	(0.9598)	(1.4205)
ΣCI_{-i}	0.0598	-0.1974	-0.2095	-0.1022	0.2206	0.1277	0.1175
	(0.4777)	(-1.2833)	(-1.5976)	(-0.8830)	(1.7995)	(1.0617)	(1.5049)
GXX	0.7257	0.7885	0.8303	0.7325	0.7439	0.7395	0.6966
	(2.6832)	(2.8275)	(2.9162)	(2.5913)	(2.8535)	(2.7844)	(2.5942)
GXX_{-1}	-0.3411	-0.3233	-0.3098	-0.3149	-0.3173	-0.3329	-0.2765
	(-1.3409)	(-1.2796)	(-1.2481)	(-1.2441)	(-1.3064)	(-1.3374)	(-1.1003)
GXX_{-2}	0.6154	0.5348	0.4796	0.5825	0.5733	0.5934	0.5798
	(2.3134)	(1.9565)	(1.7257)	(2.1125)	(2.2428)	(2.2821)	(2.2016)
e_{-1}	-0.4436	-0.4331	-0.4069	-0.4328	-0.4586	-0.4793	-0.4383
	(-3.6030)	(-3.4981)	(-3.2430)	(-3.4952)	(-3.7567)	(-3.9756)	(-3.5499)
Adj R2	0.2388	0.2396	0.2432	0.2355	0.3166	0.2986	0.2569
sse	0.1304	0.1302	0.1296	0.1309	0.1170	0.1201	0.1273
df	45						

J test t values (df=44)

	CPIX	WPIX	XUVX	CPIXC	WPIXC	XUVXC
Ho: Pcom Spec	-0.3697	-0.0676	-0.8477	0.9132	0.5478	-0.3060
Ho: Non-Pcom Spec	-0.4927	-0.6912	-0.5989	-1.0582	-1.7725	-0.8750

The dependent variable is $\ln(XMAN/XMAN_{-1})$. The variables above are -

XMAN = Exports of Manufactured Goods.

CONST = Unit Constant Term.

QTIM = linear time trend, equals 100 in 1966, Quarter 2.

GM = ln(GNX/XMAN) where
GNX = Non-Farm, Non-Export, Non-Oil, Domestically Produced Goods, Excluding Current Purchases and Before all Indirect Taxes.
XMAN = Exports of Manufactured Goods.

CI = the Competitiveness index defined by the column heading

GXX = $\ln(GNX/GNX_{-1})$ where GNX is as defined above.

e_{-1} is an autoregressive error term.

Identification of the Competitiveness Indices for Exports

Index (CI)	Australian Prices	Foreign Prices	Weighting Scheme
CPIX	CPI	CPI	Traders
CPIXC	"	"	Competitors
WPIX	Wholesale PI	Wholesale PI	Traders
WPIXC	"	"	Competitors
XUVX	Export U.V.	Export U.V.	Traders
XUVXC	"	"	Competitors

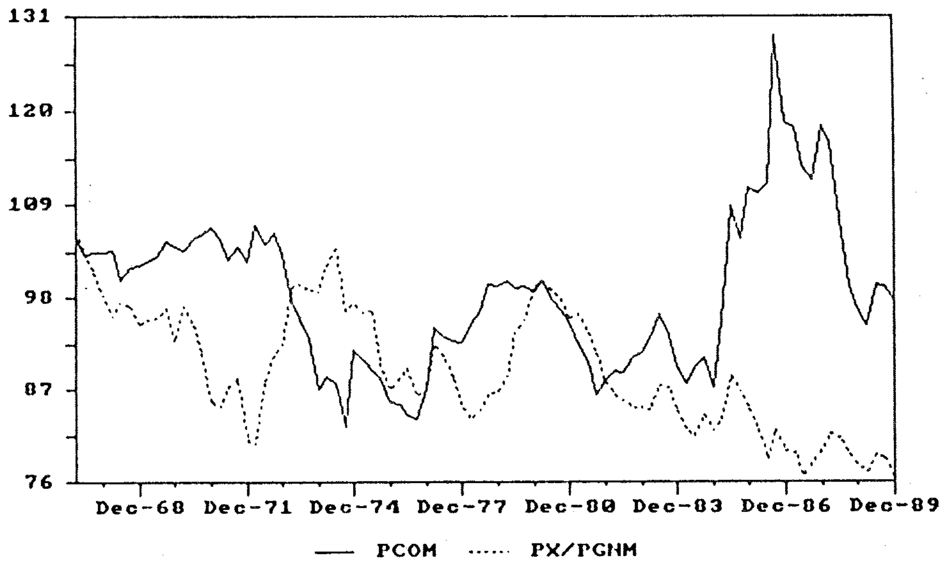

Figure 1. Indices of Internal (PCOM) and External (PX/PGNM) Competitiveness

(March 1980 = 100)

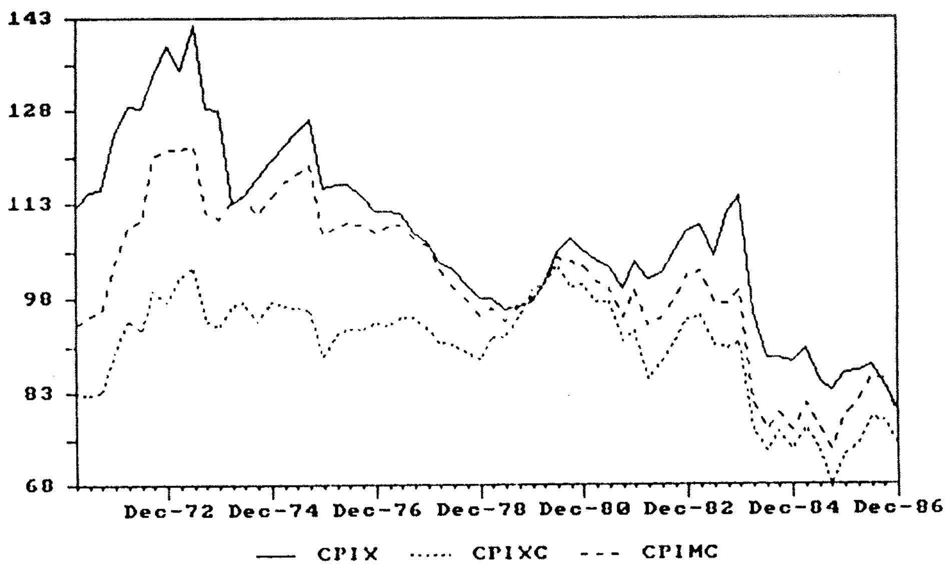

Figure 2. CPI based Indices of Import and Export Competitiveness

(March 1980 = 100)

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