REFORMING TRANS-TASMAN SHIPPING:

AN INTERNATIONAL GENERAL

EQUILIBRIUM ANALYSIS

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1. Introduction

Trade routes between Australia and New Zealand are, and have long been, the almost exclusive preserve of New Zealand and Australian ship operators. That exclusivity has been preserved for those ship operators not by the merits of their commercial performance, nor by past time legislation, but by the power of the union movement.[1]

This paper examines the effects of opening trans-Tasman trade to ships and crews of all countries. It takes account both of the adverse effects of loss of shipping revenue to the New Zealand and Australian shipping industry, and the beneficial effects of access by Australasian shippers to cheaper trans-Tasman freight. It examines both the sectoral and the macroeconomic effects of such a reform.

The main instrument of this analysis is a linked general equilibrium model of the Australian and New Zealand economies. The underlying data base and specification of the model draw very heavily on the WALRAS model developed by the Growth Studies Division of the Secretariat to the Organization for Economic Co-operation and Development (OECD).[2] We should like

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1 Ref. Federal Bureau of Transport Economics, Australia, and Ministry of Transport, New Zealand, Review of Trans-Tasman Shipping, AGPS, Canberra, 1987 (herafter cited as 'Review'). In particular, p. 144:

> "... foreign vessels are in fact excluded by trade union policy and practice."

and p. 217:

> "It seems clear from these relative costs and freight rates that locally crewed vessels would generally find it difficult to compete in the dry bulk trades if foreign crewed vessels were permitted to operate."

2 Full details on the specification of the WALRAS model and some preliminary simulation results are contained in Burniaux, J.-M., F. Delorme, I. Lienert, J.P. Martin and P. Hoeller, 'Quantifying the Economy-Wide Effects of Agricultural Policies: A General Equilibrium Approach,' OECD Department of Economics and Statistics Working Paper

to express our appreciation of the co-operation of the Secretariat in this task. The Secretariat is not however responsible for the particular model employed here, nor for our analyses or interpretation of results.

Section 2 of the paper presents data on Australian and New Zealand shipping, and Section 3 discusses the industry structure of trans-Tasman trade, the union agreements which have excluded third country ship operators from the trade, and the scope for freight cost savings if that exclusion were lifted. Section 4 outlines the version of WALRAS developed by staff of the Industries Assistance Commission (IAC). Section 5 describes the reform scenario and Section 6 presents the simulation results. A summary and conclusions are provided in Section 7.

2. Trans-Tasman Trade

The value of trans-Tasman trade is split roughly equally between Australia and New Zealand. In 1987 exports from Australia to New Zealand (eastbound trade) accounted for 57 per cent of the total value of trans-Tasman trade, which amounted to $A 3400 million.[3]

Australia is a far more important trading partner to New Zealand, than New Zealand is to Australia. During 1987, Australia absorbed 12 per cent of New Zealand exports, and supplied 17 per of her imports. In the same year, New Zealand accounted for only 4 per cent of total Australian exports and imports.[4]

Trade between Australia and New Zealand is concentrated in manufactured goods. Each country is the other's largest single export market for manufactured goods. Although Australia and New Zealand are both large exporters of rural based products, trade across the Tasman of these goods is relatively low. The important goods in eastbound trade are

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3 United Nations(1987) Commodity Trade Statistics. The total value of trans-Tasman trade is at FOB values.

4 Trade statistics are based on data at FOB values from the United Nations(1987) and freight information from the Review.

machinery and transport equipment; iron, steel and metal products; petroleum products; textiles; and medicines. The important goods in westbound trade are wood and wood products; machinery; livestock; raw textiles; and textile products.[5]

Australian and New Zealand exports and imports across the Tasman and to all other countries are presented in Tables 1 and 2. The information on exports indicates the important difference between trans-Tasman export patterns and exports to the rest of the world. The imports data also indicate the large share of manufactures in both countries' imports from all sources, and their importance in trans-Tasman trade.

3. The Trans-Tasman Water Transport Industry

3.1. Overview of the Industry

Most cargo traded between Australia and New Zealand is transported by sea. Although water transport accounted for 98 per cent of the total weight of goods traded between Australia and New Zealand in 1986-87, it accounted for only 68 per cent of the total value of trans-Tasman trade. Trans-Tasman air cargo consists mostly of manufactures, but also includes livestock and fresh food.[6]

The trans-Tasman shipping market can be divided into bulk and non-bulk components.[7] The major goods shipped in bulk are raw minerals, grains, petroleum, and coal. Non-bulk cargo is generally shipped in containers, and includes food products, chemicals and most other manufactures. Non-bulk cargo made up 30 per cent of total tonnage in the trans-Tasman shipping market in 1985-86. 43 per cent of this was exports from Australia to New Zealand. In the same year, eastbound freight accounted for 70 per cent of bulk freight tonnage. Overall,

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5 Australian Bureau of Statistics, Foreign Trade Australia, Imports (Catalogue No. 5437.0) and Foreign Trade Australia, Exports (Catalogue No. 5436.0).

6 Australian Bureau of Statistics, Sea and Air Cargo Commodity Statistics (Catalouge No. 9206.0).

7 The non-bulk classification used includes both liner and semi-bulk shipping.

60 per cent of all trans-Tasman trade by weight was eastbound.[8]

The trans-Tasman shipping market is supplied almost entirely by New Zealand and Australian ship operators. Two alternative measures can be used to describe the division of the market between Australia and New Zealand. The first is based on the nationality of crews, and the second is based on company ownership. By the first criterion of crew nationality, New Zealand supplies 80 per cent of the non-bulk shipping market, and 30 per cent of the bulk market. On the basis of company ownership, the non-bulk market is split equally beween Australian and New Zealand, and New Zealand supplies only 15 per cent of the bulk market.[9] The major reason why the two measures differ is that the largest liner service operator, Union Shipping, operates only New Zealand crewed ships, but is half Australian owned (by TNT).

The trans-Tasman shipping market represents only a small share of the total revenue of Australian and New Zealand ship operators. For example, the two largest liner service operators (Union Shipping and the Australian National Line, which between them hold 85 per cent of the trans-Tasman liner market) raised only 85 per cent of their collective revenue from trans-Tasman shipping.[10]

3.2. The Exclusion by Maritime Unions of Foreign Crewed Vessels from Trans-Tasman Trade

As shown in Section 3.3 below, the dominance of trans-Tasman trade by New Zealand and Australian operators does not appear to be the result simply of the price and quality of their service. Rather it is maintained by a power of veto which New Zealand and Australian maritime unions have long exercised over the entry of ship operators into trans-Tasman trade. As early as 1931 New Zealand unions succeeded in preventing a Japanese crewed ship from unloading, thereby deterring other

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8 Review, pp. 11-12.

9 Shippping shares are largely derived from 1985-86 data from the Review (pp. 29-47). More recent information on the shipment of goods in liquid bulk form was supplied by the Business Council of Australia (pers. comm. 1988).

10 Review, pp. 32.

foreign ship operators from entering the trans-Tasman trade. For many years afterwards, the trade was dominated by the Union Steam Ship Company, a British-owned (later New Zealand and Australian owned) firm employing New Zealand crews.

In 1973, dissatisfaction with the performance of Union Steam Ship led the governments of Australia and New Zealand to seek the entry of new (Australian and New Zealand) operators into the trade. In 1974, apparently after some friction concerning the treatment by New Zealand waterside unions of Australian crewed ships, the Australian and New Zealand maritime unions recorded a memorandum of agreement, under which the use of foreign manned vessels in the Tasman trade would be permitted only when Australian or New Zealand manned vessels were not available.[11] The object of the agreement was to ensure "the development of shipping services affecting Australia and New Zealand ... on a basis which will protect the wages, conditions and rights of seaman and waterside workers of both countries and the general community interest."[12] Though without legislative backing, the policy of exclusion has successfully been maintained by the industrial power of the maritime unions.[13]

3.3. The Potential for Cost Savings from Competition from Foreign Crewed Ships

The exclusion of foreign crewed vessels from trans-Tasman trade has forced shippers to forego three main sources of cost savings. First, it excludes cross-over vessels from the trade. Cross-over vessels are ships which sail with empty space between Australia and New Zealand, as a leg in the trade to some third country area such as Europe or North America.

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11 This agreement was reaffirmed in 1988 (Seamen's Journal, April 1988). The original agreement is reproduced in the Review, Appendix III.

12 Review, p. 243.

13 An illustration of this industrial power is provided by the recent union response to the re-flagging of three ships of the New Zealand Line (see Australian Financial Review, 13 January 1989, p. 5). The Business Council of Australia has suggested the continued existance of the agreement is also attributable to the support provided by ship operators (Business Council Bulletin, October 1988, p. 13).

To avoid sailing with unused space, cross-over vessel operators may be willing to provide a trans-Tasman freight service at marginal cost.[14]

The second source of cost savings relates to seasonal peaks in demand for shipping capacity. If trade in trans-Tasman sea freight were free of union restrictions, carriers could charter vessels with crews for short periods in order to meet those peaks. The present restrictions encourage operators to maintain capacity which is unused for much of the year. The maintenance of this excess capacity is an unnecessary cost to ship operators and to the general community.[15]

Although Australian and New Zealand crews are more expensive to employ than foreign crews, access to cheaper crews is an important source of shipping cost reductions for bulk cargo only. Crew costs represent only 10 per cent of total freight costs for non-bulk cargo, so the cost savings from employing foreign crews in liner services are low.[16] For bulk shipping however, crew costs are a much larger share of total costs, because the shore based costs of bulk transport are lower. Access to cheaper foreign crews will in itself have a major impact only in the bulk market.[17]

In the Review of Trans-Tasman Shipping (1987), conducted jointly by the Australian Federal Bureau of Transport Economics and the New Zealand Ministry of Transport, access to cross-over vessels is estimated to offer freight rate reductions for non-bulk cargo of 20 to 25 per cent. But use of cross-over vessels is likely to involve the acceptance of lower service standards, such as less frequent and predictable shipping timetables. Some shippers would accept these lower standards in return for lower freight rates, while others, to whom service levels are more important, would continue to support dedicated operators.

Sufficient cross-over capacity is available to lift all eastbound cargo, but only about 50 per cent of westbound cargo. This imbalance between cross-over capacity and cargo

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14 Review, pp. 204-216, 224.

15 Review, pp. 225, 228-229.

16 Review, pp. 224-225.

17 Review, pp. 228-229.

is another factor which would operate to preserve a substantial share of the liner shipping market for dedicated operators.[18]

The Review also estimates that access to foreign crewed vessels would reduce bulk freight rates by an average of 50 per cent. Unlike liner shipping, cross-over operators in the bulk shipping market are likely to offer a higher standard of service than that now provided by Australian and New Zealand ship operators.[19] For example, by providing a wider range of vessels, they would give shippers a better chance of securing a good match between cargo type and vessel configuration. Sufficient foreign crewed cross-over capacity is available to lift all eastbound and westbound bulk cargo. It seems clear therefore that locally crewed bulk carriers would find it difficult to compete against foreign crewed carriers in a derestricted market.

Because trans-Tasman freight yields only a small part of the total revenue of the Australian and New Zealand shipping industries, removal of the existing restrictions on foreign crews is unlikely to have any great effect on the industries' overall performance. It may however affect some individual operators more severely.

To investigate the effects of derestricting competition in the trans-Tasman trade, a linked general equilibrium model of Australia and New Zealand is employed. The model is outlined in the following section.

4. A Linked General Equilibrium Model of Australia and New Zealand

WALRAS was originally developed by staff of the Growth Studies Division of the Secretariat to the OECD to analyse the effects of agricultural trade policies in OECD countries. As originally developed by them it is a non-linear model, comprising six separate models of OECD countries or groups of countries ('regions'), not linked together by trade flows into

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18 Review, pp. 204-214.

19 Review, pp. 215-218.

an integrated international model. A linked version of the model is now operational.

The data base which they developed comprises an input-output data base and a file of behavioural parameters for each region in the model. The data base distinguishes thirteen commodities in production and trade and ten in consumption. Lists of the regions in the model and of the production and consumption commodities are provided in Tables 3 to 5. The model distinguishes three factors of production, labour, capital and land. In the original specification, all factors were perfectly mobile between industries. The model is therefore inherently medium to long run in orientation.

Having been granted access to the data base and specification of WALRAS, IAC staff are engaged in implementing the model as an integrated international model, in which each regional economy is linked to the other regions through trade flows. It is being implemented as a linearised model, using technology developed by the IMPACT Project. As a prototype of the linked six region model, we have built a model of Australia and New Zealand, which provides the instrument of analysis for the present paper. Besides incorporating international linkages, the present model differs in many details from OECD WALRAS. The following description applies to the IAC version only.20

The equation system of the model resembles that of other well known general equilibrium models in many ways, and is described here only briefly. Each economy has a fixed endowment of the three primary factors, and contains thirteen single product industries, each with a production function Leontief in each commodity and value added. Value added is a constant-elasticity-of-substitution (CES) function of a labour-capital bundle and land, and the labour-capital bundle is a CES function of labour and capital. Effective input of each commodity is CES in a domestically produced and an imported variety.

Investment demand is Leontief over production commodities.

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20 The model is described in McDougall, R. and C. Sugden, 'Implementation of the WALRAS Model of the Australian Economy,' IAC draft Research Memorandum, and McDougall, R., 'Linking Regional Models in WALRAS,' IAC draft Research Memorandum.

Consumption demands and saving are described by an linear expenditure system (LES), defined over the ten consumption commodities. Each consumption commodity is Leontief over production commodities.

Government demands labour, capital services and a bundle of commodities in accordance with a CES utility function. The composition of the commodity bundle is fixed.

Modelling of import demands follows the standard Armington treatment. In each region we distinguish a domestically produced and an imported variety of each production commodity. In intermediate usage and consumption, effective usage of each production commodity is CES in the domestically produced and imported varieties. No substitution between the two varieties is allowed in investment or government usage.

For the linked model, we further distinguish the imported variety of a commodity into a variety imported from each of the other regions represented in the model, and a variety imported from the rest of the world. In intermediate usage and consumption the composite imported variety is CES in the source-specific varieties. No sustitution between imports from different sources is allowed in investment or government usage.

Demand for exports of each commodity from each region is determined as the sum of import demands in each other region, and import demand in the rest of the world. The rest of the world is assumed to have some elasticity of demand for a composite imported variety, which in turn is CES in imports from each region represented in the model. We have found it expedient to allow for imports into the rest of the world from itself, and to include these imports in the CES nest of source-specific imports. Failure to do this may lead to unreasonably large differences in the implicit elasticities of demand by the rest of the world between imports from different regions.

Private consumption expenditure is determined in the model as a fixed proportion of private disposable income. Real investment is fixed. Government spending is held at a fixed ratio to private consumption expenditure, and transfer payments are indexed to factor income. The marginal income tax rate adjusts so as to maintain a fixed real budget deficit. No balance of payments constraint is imposed, but

because of the way in which private and public consumption is determined, changes in the ratio of the balance of trade to net domestic product (NDP) are typically small.

The data base for this model includes the input-output data bases for Australia and New Zealand provided by the OECD Secretariat, and data on Australian and New Zealand trade prepared by IAC staff. The behavioural parameters are derived largely from the OECD data model, the main new parameters required being the elasticities of substitution between imports from different sources. These were set arbitrarily at twice the values of the corresponding elasticities of substitution between domestically produced and imported goods.

The data base is still in an early stage of development, especially with regard to trade data. This applies especially to the disaggregation of the imports flows in the input-output data base into imports from the trans-Tasman trading partner and imports from the rest of the world. To perform this disaggregation requires information on the share of imports from each source in total imports, for each commodity and each usage category (ie intermediate usage by each industry, and investment, consumption, and government usage). We have so far been able to compile such information only for total usage of each commodity. In performing the disaggregation we have therefore had to assume that shares of imports from each source in total imports are constant across usage categories. It would clearly be desirable to revise the disaggregation, using information on import shares for each usage category.

The original input-output data relates to 1980-81 for Australia, and 1981-82 for New Zealand. The trade data does not represent any single year, but is based on information relating to the years 1984-85 to 1986-87. Ideally one would use data representing long run equilibrium at some future date selected as the time horizon of the scenario. Such a data base would take account, as our historical data does not, of the effects of structural change in the two economies since the beginning of the 1980's, and of the future effects of closer economic relations (CER) between Australia and New Zealand. Such a data base might show a higher proportion of both countries' exports being directed across the Tasman, and generate larger estimates of the effects of trans-Tasman shipping reform.

3. The Trans-Tasman Shipping Reform Scenario

The scenario considered here has two main elements: a reduction in freight costs in trans-Tasman trade, and a reduction in the freight revenue of Australian and New Zealand ship operators. In the model a reduction in freight revenue is equivalent to a reduction in exports of 'other' services, which includes transport activities.

Opening trans-Tasman trade to crews of all nationalities is assumed to lead to freight reductions of 50 per cent for bulk cargo, and 20 per cent for non-bulk. Table 6 presents a summary of the initial freight savings by the direction and type of trade. The majority of freight savings will be realised in the shipment of non-bulk goods, because of the importance of the non-bulk market. By direction, the value of savings on eastbound trade is almost double the savings on westbound trade. Tables 7 and 8 show the importance of the freight savings to each commodity in Australia and New Zealand.

The change in freight revenue of Australian and New Zealand ship operators is presented in Tables 9 and 10. As stated in Section 3.3, it seems likely that dedicated operators would retain a substantial share of the liner shipping market. We assume that cross-over vessels will take only 20 per cent of the market, and that demand for dedicated capacity will continue to be met entirely by Australian and New Zealand operators.

In the bulk market Australian and New Zealand ship operators are at a significant price disadvantage, and as discussed are expected to loose a large share of the market. We assume that foreign competition will displace all ships but those operated by the producers of traded items (eg BHP,CSR). This will leave only 20 per cent of the market to Australian ship operators, and force New Zealand ships completely out of the market.

In allocating the loss in freight revenue between New Zealand and Australia, crew nationalities have been used to identify the country to which freight revenue is to be attributed. By this measure New Zealand has the much larger share of the trans-Tasman non-bulk market, and because of the importance of this market, the largest share of the trans-Tasman shipping

revenue. Consequently New Zealand loses the greater amount of shipping revenue.

The decline in water transport exports has been represented in the scenario by exogenous shifts in variables affecting demand by the rest of the world for Australian and New Zealand exports of 'other' private services.

The scenario could more correctly but more awkwardly be described as a shipping derestriction than a shipping reform scenario. Use of the term 'reform' is not intended to prejudge the question of whether derestriction of trans-Tasman shipping is advisable.

6. Simulation Results

6.1. Introduction

Before presenting the simulation results it must be stressed that they are derived from a model which is still under development, especially with regard to its data base. In view of this, and also considering the very high level of aggregation in the model's sectoral classification, it would be rash to draw policy conclusions from the results. While caution must therefore be exercised in interpreting the results, we believe that they display an internal consistency and empirical plausibility which make them worthy of attention.

It must also be stressed that these results cannot be regarded as indicative of the properties of the OECD version of WALRAS, which differs from the present model very considerably in equation system, closure and data base.

6.2. Macroeconomic Results

Macroeconomic results from the simulation are presented in Table 11. Net domestic product (defined as gross domestic product, less depreciation of fixed capital) shows very little change in either country, as is predictable given the assumption of fixed factor endowments. Nevertheless access by

each country to cheaper imports from its trans-Tasman trading partner allows real consumption to grow, by 0.04 per cent in Australia and 0.16 per cent in New Zealand, with little change in the balance of trade.

(In fact the balance of trade moves slightly into surplus in each country. The reason is that private saving grows in proportion to private disposable income, but investment and public saving remain constant in real terms; so with growth in real private disposable income, the balance of total saving over investment grows, entailing a movement into deficit on capital account, and into current account surplus. In this model no account is taken of international interest and dividend or transfer payment flows, so that the balance of trade is not distinguished from the balance on current account.)

Aggregate nominal exports and imports grow at similar rates in both countries, but with import prices falling because of cheaper trans-Tasman freight, import volumes grow more rapidly than export volumes. The productive capacity required to support higher export levels is found in that displaced from domestically oriented activities by deeper import penetration. Trans-Tasman trade volumes expand sharply. Real imports from and exports to the rest of the world decline; but export volumes decline more than import volumes.

The results for imports from the rest of the world may be considered as the sum of an income effect and a substitution effect. Growth in income leads to a positive income effect, while decline in trans-Tasman relative to other freight costs leads to a negative substitution effect. Clearly in this simulation the substitution effect wins out.

It is assumed in the specification of the model that demand by the rest of the world for Australian and New Zealand imports is not perfectly elastic. As Australia and New Zealand jointly reduce their imports from the rest of the world, they are able to reduce their joint exports also without running into trade deficit. The reduction in export volumes leads to a rise in export prices. By reducing the level of their trade with the rest of the world, they thus obtain a small improvement in their terms of trade, which contributes to the overall improvement in their living standards.

6.3. Sectoral Results

The sectoral results from the simulation are shown in Tables 12 (for Australia) and 13 (for New Zealand), where changes in total sales of each commodity are disaggregated over demand categories. In Tables 14 and 15 the export results are further disaggregated into exports across the Tasman and to the rest of the world.

In absolute terms the greatest increases in Australian exports to New Zealand are in 'other' manufactures (A$30 million on a 1980-81 base), petroleum and coal products ($21 million) and chemicals ($9 million). Though small in absolute terms these increases are large when measured as percentages of base values, with petroleum and coal products recording the highest growth rate of almost 40 per cent. This is the only purely bulk cargo commodity in the data base, all the others being either non-bulk or aggregates of bulk and non-bulk commodities. Petroleum and coal products therefore receives the greatest proportional freight cost reduction, 50 per cent of the initial freight cost. The relatively large absolute increase in exports of 'other' manufactures reflects the large share of this commodity in eastbound trans-Tasman trade.

The greatest absolute increases in New Zealand exports to Australia are in 'other' manufactures (A$34 million), petroleum and coal products ($8 million) and 'other' food products ($8 million). Again 'other' manufactures is the largest export commodity, and petroleum and coal products receives the largest proportional freight reduction.

Both the Australian and New Zealand petroleum and coal products and 'other' manufacturing industries increase their trans-Tasman exports, and suffer a loss of domestic sales due to trans-Tasman imports. The results illustrate how the Armington treatment of import demand accomodates cross-hauling, although unlike the 'new trade theory' it does not explain its causes.

The shipping reform reorients both economies towards commodities for which trans-Tasman exports represent a relatively high proportion of total sales, and away from commodities which are not much traded across the Tasman. Thus petroleum and coal products, chemicals and 'other' manufactures are among the expanding industries in Australia,

and 'other' agriculture, 'other' food products and beverages in New Zealand.

The service industries benefit indirectly from the reform, as they attract a large share of the increase in real consumption. But in neither country is the increase in consumption expenditure on services sufficient to offset the decline in purchases of trans-Tasman freight, which forms part of services output in both countries. In both countries therefore services output declines.

As the industries most favoured by the reform expand, they bid up prices of factor and materials inputs. In both countries the price level rises, leading to a reduction in exports to the rest of the world. Industries oriented towards exporting to the rest of the world therefore tend to contract as a result of the reform.

Among the greatest losers from declining competitiveness relative to the rest of the world are the New Zealand meat products and dairy products industries. These industries sell most of their exports in markets other than Australia, so they obtain very little direct benefit from the reform, but suffer considerable indirect harm (for the dairy products industry, this result might be quite different if one incorporated in the data base a significant quantity of exports to Australia, in anticipation of improved market access under CER).

The Australian meat and dairy products industries suffer similar ill effects, but to a lesser degree, as the effect of shipping reform on the price level is smaller in Australia than in New Zealand, and as the Australian industries are less export oriented than the New Zealand.

The decline in exports of meat products is the main cause of the contraction in output of the livestock and livestock products industry in both countries. The contraction in output of other agricultural products in Australia is however due mostly to loss of domestic market share to New Zealand imports.

The only industries to achieve an increase in exports to the rest of the world are the New Zealand petroleum and coal products and chemicals industries. These industries enjoy reductions in costs of inputs of 'other' primary products (crude oil) and petroleum and coal products imported from

Australia. This allows them to lower their own output prices (by 0.3 and 0.2 per cent respectively) and expand their exports to the rest of the world. Most of the expansion of these industries is however due to an increase in exports to Australia.

In both Australia and New Zealand the shift in the composition of output away from agriculture is reflected in falls in the rental price of land, while the wage rate and the rental price of capital rise.

6.4. Welfare Gains from the Reform

The value of the reductions in freight costs under the shipping reform simulation are estimated from the data base at A$33 million. Scaling this up from the 1980-81 figures in the data base to 1987-88 values (using the ratio of Australian GDP in 1987-88 to 1980-81 as the scaling factor) we obtain a value for the freight savings of $70 million. Of this total, $43 million is saved on eastbound trade, and $26 million on westbound.

On the other hand, the loss of sea transport export revenue under the scenario is estimated at $82 million (again in 1987-88 terms), with $52 million of this loss being incurred by New Zealand ship operators, and $30 million by Australian.

The increase in real net domestic product from the reform is estimated at $26 million for Australia, and $340 thousand for New Zealand. The increase in real private public and private consumption is estimated at $76 million for Australia, and $53 million for New Zealand. Clearly the increase in consumption is supported not by an increase in the level of productive activity, but by a reallocation of resources away from trans-Tasman shipping into industries in which their output has a higher value at world prices.

We now attempt to explain the size of the increase in real consumption, and its distribution between Australia and New Zealand, by some partial equilibrium calculations.

Reductions in freight costs may benefit the exporter of the goods, by raising the ex-factory price he can charge for the goods, or the importer, by lowering the free-into-store price

he need pay for them. A result from elementary microeconomics shows that in general the benefits are divided between the exporter and the importer, in inverse proportion to their elasticities of supply (for the exporter) and demand (for the importer). If supply is much more elastic than demand, then most of the benefits accrue to the importer; if demand is much more elastic than supply, then most of the benefits accrue to the exporter.

In the present model, supply is in general much more elastic than demand. The Armington treatment of import demand means that demand elasticities are only moderately high (with the parameters used in this model, generally of the order of five to ten); but elasticities of supply of exports by Australia to New Zealand, and vice versa, are very highly elastic. This is because exports to New Zealand are treated in the model as perfect substitutes in production for exports to the rest of the world. Since they represent only a small fraction of total Australian exports, even a slight fall in export prices to New Zealand will lead to a redirection to the rest of the world of a quantity of exports which, though only a small fraction of the base level of exports to the rest of the world, is large relative to the base level of exports to New Zealand. The same applies mutatis mutandis to exports from New Zealand to Australia. So in this model freight savings in trans-Tasman trade accrue almost entirely to importers.

This conclusion requires qualification for exports of 'other' agricultural products from New Zealand to Australia. For this commodity exports to Australia represent a considerable fraction of total exports, and the overall supply elasticity is dampened by the fixed supply and limited mobility between industries of agricultural land. But exports of 'other' agricultural products account for only a small part of the total freight cost savings. So the conclusion stated above is essentially correct.

We may therefore conclude that from a partial equilibrium perspective the $43 million cost reductions on eastbound trade may be expected to accrue to New Zealand, and the $26 million saving on westbound trade to Australians.

Against this must be offset the economic costs of the loss of exports of water transport freight services. In the model the social cost of the loss of these exports is not the amount by which trans-Tasman freight revenue is reduced. For the

productive factors which had been used to generate that revenue are not lost, but are assumed to be reallocated to other industries (we leave to readers the pleasure of remarking upon that assumption).

Nevertheless it is not correct to infer that the economic cost of the loss of part of the trans-Tasman shipping market is zero. In the model the industry, 'other' private services, which produces the freight, faces an upward sloping export demand curve. The loss of part of the trans-Tasman trade is naturally thought of as a leftwards shift in that demand curve. But to calculate the loss of producer surplus resulting from that shift, it is necessary to consider the shift as a downwards shift. In other words, one should consider not the reduction in the quantity of exports demanded at a given price, but the reduction in the price at which the rest of the world is prepared to demand a given quantity. The loss of part of the market is then seen to be analytically equivalent to a terms of trade decline. The loss of producer surplus can be estimated (assuming that the supply elasticity greatly exceeds the demand elasticity) as the percentage vertical shift in the demand curve, multiplied by the initial value of exports.

It may seem strange to suggest that the costs of loss of part of the trans-Tasman shipping market depend upon the elasticity of demand for something quite different, namely exports of 'other' private services to the rest of the world. The validity of the conclusion hinges in a partial eqilibrium analysis on the assumption that trans-Tasman freight services are a perfect substitute in production for 'other' private services exported to the rest of the world.

In the model the elasticity of demand by the rest of the world for exports of 'other' private services from Australia or New Zealand is set implicitly at about three. So in a partial equilibrium analysis the economic cost of the loss of part of the trans-Tasman shipping market is one third of the revenue loss, or $17 million for New Zealand and $10 million for Australia.

This analysis requires to be corrected by general equilibrium considerations (in general equilibrium the relevant export demand elasticity is the aggregate elasticity, not the elasticity of demand for the individual commodity), and supplemented by consideration of the improvement in the terms

of trade with the rest of the world which, as noted in Section 6.2 above, results from the fall in supply by Australia and New Zealand of exports to the rest of the world. The required correction can be found simply by calculating the effect on export values of the changes in export prices observed in the results. This yields a correction of $31 million for New Zealand and $28 million for Australia.

The position may be summarised as follows.

Improvement in welfare from trans-Tasman shipping reform (1987-88 $ million)

Source	Australia	New Zealand
Freight savings	26	43
Loss of trans-Tasman shipping market	-10	-17
Endogenous improvement in terms of trade with the rest of the world	28	31
Unexplained residual	32	-4
Total	76	53

It will be seen that the foregoing considerations account almost exactly for the welfare gains estimated for New Zealand, but leave unaccounted welfare gains of $32 million for Australia. It may also be noted from Table 11 that real Australian NDP increases slightly, in fact by 26 million. An explanation of at least part of these increases lies in distortions created by the indirect tax system in the model Australian economy.

The most important of these distortionary taxes is probably the tax on output of petroleum products. With petroleum a highly taxed commodity, any change, such as the trans-Tasman shipping reform, which increases output of petroleum thereby enhances allocative efficiency (if this were the only distortion in the economy, then in a small economy the marginal net social benefit of petroleum would be equal to the tax rate). As petroleum and coal products are not only consumed as final products but are also important as intermediate inputs, allocative efficiency improvements are realised in both production and consumption.

Since the New Zealand data base contains little indirect tax data, such effects are not present in the New Zealand results.

The preceding analysis helps to reveal the roles played by some key behavioural parameters in estimating the overall welfare gains. Only the direct gains from freight cost savings do not depend on behavioural parameters. The economic cost of the decline in exports of water transport depends upon the elasticity of demand by the rest of the world for aggregate exports from each country: the more elastic is rest-of-the-world demand, the lower is the cost of the export decline.

The gains from endogenous improvements in the terms of trade depend both on the elasticity of substitution between trans-Tasman imports and imports from the rest of the world, and on the rest of the world export demand elasticity. High substitution elasticities lead to greater declines in trade with the rest of the world, and stronger terms of trade effects. Lower rest of the world export demand elasticities also lead to stronger terms of trade effects.

7. Summary and Conclusions

This paper has presented estimates of the effects of removing union restrictions on the use of foreign shipping in trans-Tasman trade. Reform of the trade is estimated to lead to a slight expansion in aggregate output in Australia, and more considerable increases in real consumption in Australia and New Zealand. Real consumption in Australia and New Zealand is estimated to increase by A$130 million, divided fairly evenly between the two countries.

The reform leads to a reallocation of resources into industries oriented towards trans-Tasman exporting, and away from the water transport industry and industries oriented towards exporting to the rest of the world. In terms of broad economic sectors, this means an expansion in manufacturing, and a contraction in agriculture and services output.

The volume of trans-Tasman trade increases sharply, but there is a slight contraction in trade by Australia and New Zealand with the rest of the world. This leads to terms of trade

effects which are favourable to Australia and New Zealand, and unfavourable to the rest of the world. For the world as a whole the reform leads to a net welfare improvement, composed of an improvement for Australia and New Zealand and a smaller deterioration for the rest of the world.

TABLE 1 : AUSTRALIAN EXPORTS AND IMPORTS (1987)

Commodity	Exports ($A million)		Imports ($A million)	
	New Zealand	ROW[a]	New Zealand	ROW[a]
Livestock and livestock products	21	4 497	169	51
Other agriculture	67	3 565	89	581
Other primary industries	184	11 442	14	427
Meat products	23	3 139	1[illegible]	110
Dairy products	1	455	29	62
Other food products	98	2 118	154	1 174
Beverages	37	294	38	243
Chemicals	196	2 231	63	100
Petroleum and coal products	86	915	45	842
Other manufacturing	1 228	16 617	1 044	29 049
Construction	0	0	0	0
Wholesale and retail trade	0	0	0	0
Other private services	2	10	1	125
All commodities	1 943	45 283	1 616	31 922

a ROW stands for the 'Rest of the World'.

SOURCE: United Nations (1987) and the Review (1987).

TABLE 2 : NEW ZEALAND EXPORTS AND IMPORTS (1987)

Commodity	Exports ($NZ million)		Imports ($NZ million)	
	Australia	ROW[a]	Australia	ROW[a]
Livestock and livestock products	182	1 528	27	73
Other agriculture	92	1 229	91	271
Other primary industries	13	284	262	639
Meat products	16	2 865	30	69
Dairy products	31	1 338	2	7
Other food products	166	1 230	128	339
Beverages	41	36	48	78
Chemicals	2	512	268	1 359
Petroleum and coal products	27	81	122	279
Other manufacturing	1 124	4 162	1 615	8 002
Construction	0	0	0	0
Wholesale and retail trade	0	0	0	0
Other private services	1	2	3	19
All commodities	1 728	13 266	2 593	11 134

a ROW stands for the 'Rest of the World'.

SOURCE: United Nations (1987) and the Review (1987).

TABLE 3 : REGIONS REPRESENTED IN THE OECD VERSION OF WALRAS

Australia[a]
Canada
European Economic Community
Japan
United States of America
New Zealand[a]

a These regions are represented in the IAC version of WALRAS.

TABLE 4 : PRODUCTION COMMODITIES IN WALRAS

Livestock and livestock products
Other agricultural products
Other primary products
Meat products
Dairy products
Other food products
Beverages
Chemicals
Petroleum and coal products
Other manufactures
Construction
Wholesale and retail trade
Other private services

TABLE 5 : CONSUMPTION COMMODITIES IN WALRAS

Food and non-alcoholic beverages
Alcoholic beverages
Tobacco
Clothing and footwear
Gross rents, fuel and power
Household equipment and operation
Medical care
Transport and communication
Education and recreation
Miscellaneous goods and services

TABLE 6 : FREIGHT SAVINGS ON AUSTRALIA-NEW ZEALAND TRADE

Freight Type	Freight Savings ($A million)		
	Eastbound	Westbound	All Trade
Bulk	6.4	2.2	8.6
Non-bulk	14.1	10.2	24.3
All freight	20.5	12.4	32.9

SOURCE : WALRAS database.

TABLE 7 : FREIGHT SAVINGS UNDER THE TRANS-TASMAN SHIPPING REFORM SCENARIO BY COMMODITY: EASTBOUND TRADE

	Share of sea cargo in Trans-Tasman exports by value (per cent)	Ratio of freight cost to FOB value of Trans-Tasman sea cargo (per cent)	Change in freight rate (per cent)	Ratio of change in freight cost to CIF value of all Trans-Tasman exports (per cent)
Livestock and livestock products	0	0	0	0
Other agriculture	100	15	-30	3.9
Other primary industries	100	20	-20	3.3
Meat products	100	10	-20	1.8
Dairy products	100	10	-20	1.8
Other food products	100	10	-23	2.1
Beverages	100	10	-20	1.8
Chemicals	100	15	-20	2.6
Petroleum and coal products	100	20	-50	8.3
Other manufacturing	55	11	-22	1.2
Construction	0	0	0	0
Wholesale and retail trade	0	0	0	0
Other private services	0	0	0	0
All commodities		10	-19	1.7

SOURCE: WALRAS database.

TABLE 8 : FREIGHT SAVINGS UNDER THE TRANS-TASMAN SHIPPING REFORM SCENARIO COMMODITY: WESTBOUND TRADE

	Share of sea cargo in Trans-Tasman exports by value (per cent)	Ratio of freight cost to FOB value of Trans-Tasman sea cargo (per cent)	Change in freight rate (per cent)	Ratio of change in freight cost to CIF value of all Trans-Tasman exports (per cent)
Livestock and livestock products	0	0	0	0.0
Other agriculture	60	15	-28	2.2
Other primary industries	100	33	-20	5.0
Meat products	100	10	-20	1.8
Dairy products	100	10	-20	1.8
Other food products	100	10	-20	1.8
Beverages	100	10	-20	1.8
Chemicals	100	20	-20	3.3
Petroleum and coal products	100	20	-50	8.3
Other manufacturing	55	10	-20	1.0
Construction	0	0	0	0.0
Wholesale and retail trade	0	0	0	0.0
Other private services	0	0	0	0.0
All commodities		10	-19	1.4

SOURCE: WALRAS database.

TABLE 9 : CHANGE IN FREIGHT REVENUE OF AUSTRALIAN SHIP OWNERS

	Freight Revenue ($A million)		
Freight Type	Pre-Reform	Post-Reform	Lost Revenue
Bulk	13.7	3.9	9.8
Non-bulk	23.1	18.5	4.6
All freight	36.8	22.4	14.4

TABLE 10 : CHANGE IN FREIGHT REVENUE OF NEW ZEALAND SHIP OPERATORS

	Freight Revenue ($A million)		
Freight Type	Pre-Reform	Post-Reform	Lost Revenue
Bulk	5.9	0.0	5.9
Non-bulk	92.4	73.9	18.5
All freight	98.3	73.9	24.4

SOURCE: WALRAS database.

TABLE 11 : ESTIMATED MACROECONOMIC EFFECTS OF TRANS-TASMAN SHIPPING REFORM, AUSTRALIA AND NEW ZEALAND
(Percentage changes)

Variable	Australia	New Zealand
Real net domestic product	0.01	0.10
Real consumption	0.04	0.13
Real investment	0.00	0.00
Real government spending	0.02	0.07
Real exports		
- trans-Tasman	6.93	8.10
- to the rest of the world	-0.22	-0.80
- to all destinations	0.14	0.21
Real imports		
- trans-Tasman	8.30	7.19
- from the rest of the world	-0.11	-0.70
- from all sources	0.23	0.56
Balance of trade [a]	0.00	0.03
Consumer price index	0.04	0.05
Wage rate	0.07	0.20
Rental price of capital	0.07	0.18
Rental price of agricultural land	-0.09	-0.05

a Ratio of change in the balance of trade to net domestic product (per cent).

TABLE 12 : ESTIMATED EFFECTS OF TRANS-TASMAN SHIPPING REFORM ON OUTPUT LEVELS, BY COMMODITY AND USAGE CATEGORY, AUSTRALIA
(Percentage change)

Commodity number	Commodity	Growth in sales[a]				
		Intermediate usage	Consumption	Exports	Change in stocks	Total
1	Livestock	-0.06	0.02	-0.11	-0.07	-0.07
2	Other agriculture	-0.15	-0.15	0.15	-0.05	-0.05
3	Other primary industries	0.06	0.03	0.01	0.04	0.04
4	Meat products	-0.07	0.01	-0.18	-0.06	-0.06
5	Dairy products	-0.14	-0.03	-0.24	-0.09	-0.09
6	Other food products	-0.09	0.08	0.10	-0.05	-0.05
7	Beverages	-0.07	-0.07	0.64	-0.02	-0.02
8	Chemicals	-0.05	0.01	2.96	0.12	0.12
9	Petroleum and coal products	-0.09	0.04	3.35	0.28	0.28
10	Other manufacturing industries	-0.05	-0.03	0.52	0.01	0.01
11	Construction	0.00	0.03	-0.01	0.00	0.00
12	Wholesale and retail trade	0.00	0.04	-0.28	0.01	0.01
13	Other private services	0.00	0.04	-0.55	0.00	0.00

a Sales for investment usage are held fixed. Sales to the government of all commodities grew at 0.02%.

TABLE 13 : ESTIMATED EFFECTS OF TRANS-TASMAN SHIPPING REFORM ON OUTPUT LEVELS, BY COMMODITY AND USAGE CATEGORY, NEW ZEALAND
(Percentage change)

Commodity number	Commodity	Growth in sales[a]				
		Intermediate usage	Consumption	Exports	Change in stocks	Total
1	Livestock	-0.17	0.08	-0.24	-0.17	-0.17
2	Other agriculture	-0.25	-1.80	11.78	0.96	0.96
3	Other primary industries	0.35	0.15	0.07	0.31	0.31
4	Meat products	0.13	0.07	-0.58	-0.31	-0.31
5	Dairy products	-0.11	0.08	-0.36	-0.20	-0.20
6	Other food products	-0.04	-0.14	2.82	0.44	0.44
7	Beverages	-0.14	-0.39	1.33	0.08	0.08
8	Chemicals	-0.01	0.10	8.18	0.41	0.41
9	Petroleum and coal products	-0.09	-0.01	7.91	0.95	0.95
10	Other manufacturing industries	-0.10	-0.05	1.62	0.22	0.22
11	Construction	0.01	0.13	-0.02	0.05	0.05
12	Wholesale and retail trade	0.07	0.13	-0.68	0.02	0.02
13	Other private services	-0.04	0.13	-2.27	-0.17	-0.17

a Sales for investment usage are held fixed. Sales to the government of all commodities grew at 0.14%.

TABLE 14 : ESTIMATED EFFECTS OF TRANS-TASMAN SHIPPING REFORM ON EXPORT VOLUMES, BY COMMODITY AND DESTINATION, AUSTRALIA
(Percentage changes)

Commodity	Change in Exports: to New Zealand	to the Rest of the World	to all destinations
Livestock and livestock products	-0.2	-0.1	-0.1
Other agriculture	15.2	-0.1	0.1
Other primary industries	0.6	0.0	0.0
Meat products	11.3	-0.2	-0.2
Dairy products	14.4	-0.3	-0.2
Other food products	9.1	-0.2	0.1
Beverages	7.3	-0.2	0.6
Chemicals	10.8	-0.2	3.0
Petroleum and coal products	39.5	0.0	3.4
Other manufacturing	5.8	-0.2	0.5
Construction	0.0	0.0	0.0
Wholesale and retail trade	0.0	-0.3	-0.3
Other private services	0.1	-0.6	-0.6

TABLE 15 : ESTIMATED EFFECTS OF TRANS-TASMAN SHIPPING REFORM ON EXPORT VOLUMES, BY COMMODITY AND DESTINATION, NEW ZEALAND
(Percentage changes)

Commodity	Change in Exports: to New Zealand	to the Rest of the World	to all destinations
Livestock and livestock products	-0.2	-0.2	-0.2
Other agriculture	18.0	-0.4	11.8
Other primary industries	1.2	0.0	0.1
Meat products	10.1	-0.6	-0.6
Dairy products	10.4	-0.6	-0.4
Other food products	9.6	-0.3	2.8
Beverages	7.8	-0.5	1.3
Chemicals	17.1	0.8	8.2
Petroleum and coal products	42.5	1.5	7.9
Other manufacturing	6.6	-0.3	1.6
Construction	0.0	0.0	0.0
Wholesale and retail trade	-0.5	-0.7	-0.7
Other private services	-0.2	-2.4	-2.3