Exchange Rate Policy and Market Power: A General Equilibrium Analysis for Singapore

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EXCHANGE RATE POLICY AND MARKET POWER: A GENERAL EQUILIBRIUM ANALYSIS FOR SINGAPORE*

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Abstract

A computable general equilibrium (CGE) model of the Singapore economy is simulated to project the impact of the appreciation of the Singapore dollar under different export demand elasticity scenarios. The macroeconomic and sectoral results are not very sensitive to variations in the export demand elasticities over the elastic range. A significant change in the projections is apparent when highly inelastic export demand curves are adopted. These results are consistent with the economic performance of Singapore over recent years under the strong currency regime. The analysis thus supports the belief that Singapore is becoming to enjoy some degree of market power in the world trade of manufactures.

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I. Introduction

The Singapore dollar has appreciated since 1980 by a cumulative 25 per cent against other main currencies. This is an outcome of a deliberate policy that has been aimed at insulating domestic prices from imported inflation. Prior to the 1985 recession the burden of the anti-inflation policy was placed on wage restraint under the National Wage Council guidelines. However this wage policy became unsustainable due to tight labour market situation and the growing significance of relatively labour-intensive service sector in the national economy. While Singapore government has recognised the causal link between real wage costs and international competitiveness, it has accepted its limited ability to influence money wages as an anti-inflationary instrument as the economy tends to mature. It is in the light of this setting that the exchange rate has become an intermediate target of monetary policy and the domestic price stability as its final target.

The monetary authorities of Singapore aim to keep the inflation low and stable, which meant less than 3 per cent. In setting this target, the current and projected inflation pressures are taken into consideration. In the case of the latter, the medium-term outlook for both foreign inflation and domestic unit labour costs play a significant role. If these factors are likely to accelerate the inflation to unacceptable levels, the exchange rate is allowed to appreciate sufficiently to reduce imported inflation. The appreciation is also expected to dampen domestic demand pressure in order to maintain domestic price stability (Bercuson, 1995). The precise impact of this exchange rate movement on reducing domestic inflation and country's performance in external trade are dependent upon to a large extent on Singapore's market power in world markets. Given the fact that Singapore's exports, mainly manufactures, account for about 1.5 per cent of the world exports¹ and retained imports represent 1.7 per cent of world imports, the small country assumption seems applicable to its international trade. However, there is uncertainty with respect to export demand elasticities associated with manufacturing

exports as accurate estimates of such elasticities are very scanty for a country like Singapore (see Athukorala and Riedel, 1991)².

In this paper we attempt to use a computable general equilibrium (CGE) model of the Singapore economy (Siriwardana, 1991) to simulate the impact of the appreciation of the Singapore dollar by adopting different values of export demand elasticities. The CGE methodology is a useful technique to gauge the sensitivity of the exchange rate policy to different export demand scenarios, especially when the magnitude of the relevant elasticity parameters is uncertain. It is observed that the model projections are not very sensitive to variations in the export demand elasticities over the elastic range. When extremely low values are adopted (i.e. inelastic export demand curves), there is a significant change in the projections.

The paper is organised as follows. Section II presents a brief outline of the main structural features of the Singapore economy. In section III, a description of the CGE model of the Singapore economy is presented. Section IV contains the simulation results of the exchange rate appreciation under different export demand elasticities. Finally, section V reports the conclusions.

II. Some Structural Features of the Singapore Economy

Singapore's rapid economic growth can be largely attributed to its economic policies that promoted macroeconomic stability, i.e., low inflation, positive real interest rate, sound budgetary policy, and less prominent relative price distortions due to liberalised foreign trade policies and the stable exchange rate policy. The liberalised approach for foreign investment also played an important role, leading to a large inflow of foreign capital that set the stage for export-led economic growth (Kapur, 1983). Singapore is regarded as one of the most open economies in the world according to its trade orientation. Its trade to GDP ratio is 2.75 and exports to GDP ratio is 1.32. Naturally,

Singapore depends more on overseas markets than its domestic market. Table 1 presents basic data overview concerning the recent economic growth of the Singapore economy.

	1988	1989	1990	1991	1992	1993
Output and Expenditure (annual % change):						
Real GDP	11.1	9.2	8.8	6.7	6.0	9.9
Of which: Manufacturing Commerce Financial and business services	18.0 16.5 5.3	9.8 8.3 9.7	9.5 11.0 11.8	5.4 9.3 7.5	2.5 4.5 5.3	9.8 8.5 13.1
Real domestic demand Net external demand	6.4 5.2	8.6 2.3	14.2 -5.1	5.8 1.4	7.5 -1.4	12.2 -1.7
Prices and labour market:						
Consumer prices Unit labour cost Unemployment rate	1.5 3.4 3.3	2.4 8.9 2.2	3.4 8.5 1.7	3.4 7.0 1.9	2.3 2.5 2.7	2.4 -0.5 2.7
Terms of trade	-1.4	-0.2	0.6	0.9	-1.0	-1.3
Import Volume	32.4	9.5	9.6	12.4	7.2	17.6
Export Volume	28.5	9.2	14.9	7.4	6.5	19.0
Nominal effective exchange index (1980=100)	101.9	108.8	117.2	121.6	125.3	125.1

Table 1Basic Data Overview of the Singapore Economy

Source: Bercuson (1995)

Note: All figures in the table are annual percentage changes except the nominal effective exchange rate.

In recent years, Singapore's real GDP has been growing steadily and well above 6 per cent per annum. However, there has been a considerable variation in sectoral growth, with manufacturing and financial and business services recording the most rapid growth. As these data show, domestic demand has contributed to GDP growth quite significantly compared to net external demand, which has registered a negative growth in recent years. The latter development may be attributed to Singapore's exchange rate

policy which has appreciated the Singapore dollar by making country's exports expensive to foreign consumers.

The performance of the labour market over the recent years in Singapore has impressive record, indicating signs of almost near full employment. The competitiveness of the economy has improved steadily due to the falling unit labour cost. The unemployment rate mirrors the country's strong growth performance. Unemployment rate increased from 3 per cent to 6.5 per cent during the 1985-86 recession but with economic recovery, it has fallen again to 2 per cent by 1991. The strong dollar has kept the inflation at record low level in the early part of the 1990s.

III The Structure of the CGE Model

This section provides a brief overview of the structure of CGE model of the Singapore economy used in the analysis³. A more comprehensive description of the model is found in Siriwardana (1991; 1995). The model is in the tradition of CGE models pioneered by Johansen (1974). Since then, a numerous Johansen type CGE models have been constructed for many economies in the world. The theoretical structure of the model in this paper follows closely the ORANI model of the Australian economy (Dixon et. al, 1982).

Main Features of the Model

The model recognises the role of relative prices and substitution possibilities in domestic production and consumption activity, and trade. It has 8 production sectors, three categories of final demands (i.e., household consumption, investment and exports), and two types of primary factors (i.e., capital and labour). The producers and consumers are assumed to behave as in a perfectly competitive market environment.

The main theoretical postulates governing the producer and consumer behaviour are cost minimisation and utility maximisation.

Consumers are assumed to maximise utility subject to a budget constraint. The utility function is of a two-level nested form. At the first level, we use the Leontief function implying no substitution between various commodity groups. At the second level, consumers have the substitution possibilities between domestic and imported commodities of the same type. This choice between domestic and imported goods in each sector is modelled with the conventional Armington specification. The preferences of the domestic consumers are characterised by the Cobb-Douglas aggregation of domestically produced goods and imports of the same type which are considered to be imperfect substitutes.

Each industry uses sector specific capital goods. The capital units for use in a given industry are produced in a perfectly competitive environment under constant returns to scale production technology. There are two levels in the production process. At the first level, a given industry chooses effective intermediate inputs to minimise the total cost of the production of capital goods subject to a Leontief production function. At the second level, the industry chooses its inputs for capital creation from domestic and imported sources to minimise costs subject to a Cobb-Douglas production function.

Each sector produces a share for domestic market and exports the remaining share of output to foreign markets. With respect to exports, each industry faces an export demand curve which is downward sloping. The relationship between export demand and world prices is given by the export demand elasticity. The small country assumption is adopted on the import side, and domestic output and imports are treated as imperfect substitutes in the Armington fashion.

Production functions in the model have the two-level constant returns to scale nested form. The first level contains Leontief production technology, implying no possibilities of substitution between different types of intermediate inputs and between intermediate inputs and primary factor inputs, capital and labour. The second level allows some degree of substitution between imported and domestically produced intermediate inputs, and between different primary factors according to the Cobb-Douglas technology.

The model is derived under the assumptions of constant returns to scale and competitive market structures which ensure that each of the economic activity experiences zero pure profits in equilibrium. Table A1 in the appendix lists the model equations in linear percentage change form. Tables A2 and A3 in the appendix contain variables and coefficients of the model, respectively. A list of exogenous variables selected for the model closure is given in Table A4.

Model Calibration

The eight sector CGE model of Singapore is calibrated to a data base which was published in 1987 by the Department of Statistics. The data required for the calibration of the model are various shares or weights (i.e., sales and cost shares) for different variables of the model and estimates of the elasticity parameters such as household demand elasticities, import-domestic substitution (the Armington) elasticities, capital-labour substitution elasticities and export demand elasticities. The use of Leontief and Cobb-Douglas functional forms in the model derivation permits that almost all the parameters and coefficients of the model could be obtained from input-output tables. In deriving the data base, we have used the eight-sector aggregated version of the input-output tables of Singapore (Department of Statistics, 1987).

The choice of suitable values for export demand elasticities of the model is crucial to the present simulations. Unfortunately, limited published estimates of such elasticities are

available for Singapore. The country's export trade is dominated by manufacturing sector and it accounts for 79 per cent of total exports. However, in a global context, Singapore is regarded as a small country as its exports of manufactures represent merely a 1.5 per cent of world manufacturing exports. It has been the conventional belief that export demand elasticity for Singapore's exports is relatively large, implying that country is simply a price taker in world markets.

A value between 2 and 5 could be regarded as the most plausible estimate for the export demand elasticity of manufactures in Singapore. Lim Chong Yah et al. (1988, p.306) estimated Singapore's short-run price elasticity of export demand to be 1.67 and long-run elasticity to be 2.65. However, in this study we have been more ambitious to derive values beyond these conventional figures of export demand elasticity and to use them in the sensitivity analysis of the model simulations. Given the availability of reliable trade data with respect to exports, it is possible to use the method explained in Freebairn (1978) to estimate a range of export demand elasticities for manufactured exports of Singapore, after assigning plausible values for the two key parameters, price elasticity of demand in the consuming country and the price elasticity of world supply⁴. Table 2 reports estimates of export demand elasticities obtained using this method.

Price elasticity of demand in the consuming country (η)	Price elasticity of world supply (ε)	Export Demand Elasticity (EDE)
1.5	1.0	93.5
1.0	0.7	63.5
0.7	0.4	41.2
0.5	0.3	30.0
0.2	0.1	11.2
0.1	0.1	7.5

 Table 2
 Estimates of Export Demand Elasticities for Manufactured Goods

Note: These elasticity estimates are obtained on the basis of trade data from WTO (1995).

The simulations reported in this paper employs a range of export demand elasticity values which vary from 0.5 to 93.5. Of these, estimates shown in Table 2 were obtained according to Freebairn (1978). Though the existence of a downward-sloping demand curve is assumed for Singapore's exports, the actual shape of the demand curve is determined by the numerical value of the export demand elasticity used in each simulation. For example, a value of 0.5 implies that Singapore has some influence on world price level and may act as a price setter in world markets. On the other hand, a value of 94.5 is meant to reflect the fact that Singapore is a small country and has no control over world price level. Export prices and quantities exported are interrelated even in a situation where the country's market share is quite small. If the objective of the country is to increase its market share, then it has to lower the price of exports. Considerably low export demand elasticities may capture this possibility. By specifying infinitely elastic demand curves for exports, it is possible to implement the small country assumption on the export side (Dixon, Parmenter and Rimmer, 1982). The objective of the present exercise is to establish the relationship between the export demand elasticity and the appreciation of the exchange rate so that some policy implications could be drawn from the analysis.

Economic Environment of the Simulations

The model is simulated by increasing the nominal value of Singapore dollar by a 5 per cent. The magnitude of this exogenous shock is determined in view of the change in the exchange rate in recent years. When this appreciation of the dollar is imposed on the model exogenously, the model projects the values of endogenous variables indicating how they differ from the values that would have resulted in the absence of the appreciation.

The simulations are conducted to examine the effects of appreciation of the dollar under a number of alternative sets of assumptions regarding the macroeconomic environment. In particular, the assumptions which govern the simulations reported in the paper are as follows: (1) industry-specific fixed capital in use are exogenous; (2) nominal wages are constant; (3) real private consumption varies with real disposable income; (4) shares of real private consumption and real investment in total real domestic absorption remain unchanged; and (5) the nominal exchange rate is exogenous. Assumption (1) implies that the analysis is concerned with short-run (one to two years) effects of the exchange rate policy. Even though we could adopt the full employment scenario in the simulations, we keep assumption (2) just to indicate that the real domestic absorption is endogenously determined in all simulations. In many CGE models, it has been customary to assume either the balance of trade or the real domestic absorption exogenous.

Manufacturing exports are treated endogenous in all the simulations. As noted earlier, the manufacturing sector is the leader in export trade in Singapore. With respect to the remaining seven commodities, the changes in export volumes are set exogenously to zero. The implication is that for these commodities, the change in domestic prices are mainly determined by the change in domestic costs in response to the policy shock.

VI. Model Simulation Results

The main concern of the analysis is to examine how sensitive the results are to the variation in export demand elasticities. We present ten different simulations of the 5 per cent appreciation of the nominal value of the Singapore dollar using ten different values of export demand elasticities. It is worth noting that in all the simulations the assumptions explained earlier about the economic environment are maintained.

As noted before, large values of export demand elasticities are consistent with the smallcountry assumption. Similarly, small values reflect that exporters enjoy market power in world markets and they can increase their market share by lowering the price level. The immediate effects of the appreciation are to decrease the Singapore dollar prices paid for imports and received for exports. Since the prices of traded goods decline relative to the non traded goods there will be an expansion in the non traded goods sector in the domestic economy relative to the traded goods producing sector. However, the relative price effect could certainly be affected by the degree of wage indexations in the economy and the extent to which the nominal appreciation reduces the domestic inflation. This means the extent of real appreciation is an important element in the investigation of the exchange rate policy on various economic activity of the economy. In view of this, we have conducted our simulations on two different wage indexation allows the real wage to increase in the event of general price decline to the extent of the drop in the consumer price (CPI) index, 70 per cent wage indexation limits the improvement in the real wage.

The simulation results reported in this section are meant to illustrate the extent to which the market power could influence Singapore's economic activity and welfare in response to recent policy approach adopted with respect the exchange rate. They could show whether Singapore's present policy is appropriate and whether there are further gains to be realised by improving its market power. The results are reported and discussed for macroeconomic variable first and then for various industrial sectors.

The Macroeconomic Effects of the Currency Appreciation

The projected effects of the 5 per cent appreciation of the Singapore dollar on various macroeconomic variables for different export demand elasticity scenarios are presented in Table 3. The results are separately given in the table for zero and 70 per cents wage indexations. The export demand elasticities vary from 0.5 (almost vertical export demand curve) to 93.5 (almost horizontal export demand curve). For the purpose of

comparison, we could regard export demand elasticity of 2 as the standard value for Singapore. This standard elasticity implies that export demand curve is fairly elastic and the appreciation of the currency leads to exports being more expensive in terms of foreign currency prices.

We first consider the projections under standard elasticity scenario with zero per cent wage indexation. As currency appreciates the domestic price of imports fall and the consumer price index shows a 1.1 per cent reduction in general price level of the economy. The real wage moves in an opposite direction to the CPI with fixed nominal wage. Consequently, there is a 1.1 per cent increase in the economy's real wage. If exporters are influential in the world markets, they could exploit the potential revenue by lowering export prices and then by increasing the quantity exported. However, the advantage for exporters from the domestic deflationary condition is limited by the fact that they behave as price takers rather than price setters in world markets under the standard elasticity assumption. Our results indicate that the decline in consumer prices which has resulted in improved real wage leads to an expansion in real domestic absorption.

The improved activity in the domestic economy is reflected in an increase in real GDP by 1.9 per cent and, aggregate demand for labour by 4.2 per cent. The demand for imports increases due to the expansion in domestic consumption and the reduction of domestic currency prices of imports. In contrast, exports decline by about 0.9 per cent simply because of the rise in export prices in foreign currency terms. Consequently, the balance of trade shows a deficit which is equivalent to a 2.8 per cent of the base period GDP. The expansion in real domestic absorption , however, more than compensates the contraction in foreign demand so that real GDP rises with the currency appreciation. Due to the minor improvement in the terms of trade, real incomes increase by even more (2.7 per cent).

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Short-run Projections of the Mcroeconomic Effects of a 5 per cent Appreciation of the Exchange Rate Under Different Values of Export Demand Elasticities

Export demand elasticity	0.5	1.0	2.0	5.0	7.5	11.2	30.0	41.2	63.5	93.5
Variable										
0% wage indexation										
Real GDP	4.29	3.27	1.94	0.16	-0.49	-1.01	-1 .79	-1.94	-2.09	-2.17
Terms of trade	1.42	1.21	0.92	0.54	0.40	0.29	0.12	0.09	0.06	0.04
Real incomes	5.56	4.35	2.73	0.54	-0.22	-0.84	-1.82	-1.98	-2.16	-2.27
Real domestic absorption	9.39	7.65	5.39	2.36	1.26	0.39	-0.95	-1.20	-1.44	-1.59
Aggregate exports	0.71	0.00	-0.92	-2.15	-2.59	-2.95	-3.50	-3.60	-3.70	-3.76
Aggregate imports	3.54	2.46	1.07	-0.78	-1.46	-2.00	-2.82	-2.98	-3.13	-3.22
Balance of trade/GDP	-4.23	-3.61	-2.82	-1.71	-1.37	-1.07	-0.59	-0.51	-0.42	-0.37
Consumer price index	0.33	-0.29	-1.11	-2.19	-2.58	-2.89	-3.37	-3.46	-3.55	-3.60
Aggregate demand for labour	9.32	7.09	4.21	0.34	-1.07	-2.18	-3.90	-4.22	-4.53	-4.71
Money wages	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Real wages	-0.33	0.29	1.11	2.19	2.58	2.89	3.37	3.46	3.55	3.60
Nominal exchange rate	-5.00	-5.00	-5.00	-5.00	-5.00	-5.00	-5.00	-5.00	-5.00	-5.00
Real exchange rate	-5.33	-4.71	-3.89	-2.81	-2.42	-2.11	-1.63	-1.54	-1.45	-1.40
70% wage indexation										
Real GDP	5.06	2.87	1.28	0.08	-0.22	-0.43	-0.69	-0.74	-0.78	-0.81
Terms of trade	1.68	1.06	0.61	0.27	0.18	0.12	0.05	0.03	0.02	0.01
Real incomes	6.60	3.81	1.80	0.28	0.09	-0.36	-0.71	-0.76	-0.80	-0.84
Real domestic absorption	11.07	6.71	3.55	1.17	0.57	0.16	-0.37	-0.46	-0.54	-0.59
Aggregate exports	0.84	0.00	-0.60	-1.06	-1.17	-1.25	-1.36	-1.37	-1.39	-1.40
Aggregate imports	4.17	2.16	0.71	-0.39	-0.66	-0.85	-1.09	-1.13	-1.18	-1.20
Balance of Trade/GDP	-4.99	-3.17	-1.86	-0.87	-0.62	-0.45	-0.23	-0.19	-0.16	-0.14
Consumer price index	1.28	-0.87	-2.43	-3.61	-3.90	-4.10	-4.36	-4.41	-4.45	-4.47
Aggregate demand for labour	10.9	6.23	2.78	0.17	-0.48	-0.93	-1.51	-1.61	-1.70	-1.76
Money wages	0.89	-0.61	-1.70	-2.53	-2.73	-2.87	-3.06	-3.09	-3.11	-3.13
Real wages	-0.39	0.26	0.73	1.08	1.17	1.23	1.30	1.32	1.34	1.34
Nominal exchange rate	-5.00	-5.00	-5.00	-5.00	-5.00	-5.00	-5.00	-5.00	-5.00	-5.00
Real exchange rate	-6.28	-4.13	-2.57	-1.39	-1.1	-0.90	-0.64	-0.59	-0.55	-0.53

Note : All projections are in percentage changes except the balance of trade which is given as a per cent of the base period GDP.

Turning to 70 per cent wage indexation, the projections under standard elasticity case reveal a little different story on domestic economic expansion. A higher reduction in domestic prices is projected as shown by the 2.4 per cent decline in CPI which inturn influences nominal wages to decline by 1.7 per cent. Compared to zero per cent wage indexation, the improvement in the real wage is fairly moderate (0.7 per cent). This sort of price and wage outcome means that the real exchange rate now appreciates by 2.5 per cent compared to 3.8 per cent in zero per cent wage indexation. Consequently, there is a better performance on the export side but domestic economic activity slows down as indicated by the increase in real GDP and the demand for labour in the economy. The main cause for this slow down in the domestic economy could be found in the increase in real domestic absorption which is 3.5 per cent compared to 5.3 per cent under zero per cent wage indexation. However, it is worth pointing out that the performance in employment and in real GDP is still noticeable; the increase in the demand for labour is 2.7 per cent and in real GDP is 1.2 per cent. The analysis so far reveals a crucial point for Singapore's economic performance for the decade. That is the domestic demand is one of the important factors that has influenced the country to achieve very stable employment and real GDP growth rate.

Projections obtained using the export demand elasticity larger than 2 reveal similar pattern for both zero and 70 per cents wage indexations. It is noticeable that the range of response becomes small even though large values of elasticities are employed. As export demand curves become more and more elastic, the export price is independent from the volume exported. The appreciation is more deflationary because export prices have no impact on domestic price level as the country becomes a price taker in world markets. Though consumer price index falls sharply and the real exchange rate appreciates moderately, the domestic producers find difficult to take this cost advantage to overseas markets as they are unable to influence world price level. The net effect is to experience an increasing reduction in export sales as currency appreciates. The real wage of the economy increases due to reduced domestic price level but real domestic absorption declines mainly due to the contraction in economic activity as shown by the real GDP projections. The sensitivity of employment and the balance of trade projections to higher export demand elasticities as shown in Table 2 is important in assessing the impact of current exchange rate policy in Singapore.

As can be observed from Table 3, an opposite change in the projections occur as we adopt less elastic export demand curves. The currency appreciation turns out to be less deflationary with unitary elasticity and it becomes inflationary with relatively inelastic demand (when export demand elasticity is below unity) for exports. When export demand is inelastic, exporters are in a position to raise the price level by reducing the export volume which will eventually increase their export revenue. As this happens, the CPI moves upward because the price of the exportable commodity component in the consumer price index tends to increase. The relative improvement in the exporting sector has expanded the domestic economic activity as shown by the projection of higher real GDP. It is clearly seen that with inelastic demand for exports, the domestic economy shows an expansion as evidenced by the employment growth and increased real domestic absorption. All these positive outcomes are achieved by the exchange rate appreciation at the expense of deteriorating balance of trade. To a large extent, these results are consistent with the performance of the Singapore economy in recent years.

The sectoral results presented in Tables 4 and 5 under two different wage indexations could be used to obtained a better insight into the way the economy adjusts to the exchange rate shock with different degree of export demand elasticities. As noted in macroeconomic results, zero per cent wage indexation appears to be less deflationary compared to the 70 per cent indexation within the elastic range of export demand. This clearly has an impact on real wages which eventually influence the relative domestic prices of various sectors of the economy.

Considering first the sectoral projections at the elastic range (export demand elasticity from 2.0 to 93.5), we notice that the appreciation leads to a substantial decline in the manufacturing sector's performance in the Singapore economy. This is the main export earner of the country and its poor performance is largely attributable to the large drop in domestic currency prices of manufacturing in response to the currency appreciation. The sector has benefited relatively little from the expansion of the real domestic absorption, and consequently it experiences large losses in output and employment. These losses are even magnified when the export demand is highly elastic. The strong dollar and the rising domestic demand have produced favourable relative price effects domestically for the non-trading sectors of the economy. Thus, the sectors that appear to be clear winners of the exchange rate policy are construction, other services, commerce, financial and business services, and utilities. The relatively higher export orientation of the transport and communication sector explains its fairly modest output gain. Though the agricultural sector's contribution to the GDP in Singapore is negligible, it has been disadvantaged by the decline in domestic currency prices of imports.

Overall, the sectoral performance under elastic demand for exports is heavily dependent upon how various sectors are affected by 'spending effect' that originates from increase

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in real incomes due to deflation and 'resource movement effect' that is induced by the shift in relative prices as the domestic currency is allowed to appreciate. As revealed by the macroeconomic projections, the increase in domestic real incomes creates extra spending on both tradeable and non-tradeable goods of the economy. Under the elastic export demand which reflects the small country behaviour, the price of tradeables is determined in the world market. Hence the additional domestic consumption does not lead to increase in their domestic prices but it tends to raise the prices of non tradeables which are determined in the domestic market. Consequently, the relative price of tradeables production of the latter more attractive and thus discouraging the former.

Turning to the sectoral projections with inelastic exports demand reveals a stronger sectoral growth across the economy than in the elastic case. The lower export demand elasticity means there is some market power which can be used to raise the foreign currency price of exports by lowering export volumes. Projections reported in Tables 4 and 5 with respect to export volume and foreign currency price for manufactures indicate this possibility. When manufacturing exports are in inelastic demand (i.e., export demand elasticity is less than one), the 5 per cent appreciation under zero per cent wage indexation results in 0.9 per cent reduction in export volume to have export prices raised by 1.8 per cent. The 70 per cent wage indexation tends to produce even better results as economy's real wage decline is slightly higher in this simulation. Even though the share of exports sales of manufactures reduces in response to the currency appreciation, there is a steady increase in domestic consumption of those goods as a consequence of higher real incomes. This in fact together with improved domestic relative price for manufactured goods brings an increased output in the manufacturing sector in Singapore.

Export demand elasticity	0.5	1.0	2.0	5.0	7.5	11.2	30.0	41.2	63.5	93.5
Industry										
Outputs:										
Agriculture	2.11	1.50	0.72	-0.33	-0.72	-1.02	-1.49	-1.58	-1.66	-1.71
Manufacturing	0.29	-0.43	-1.46	-2.63	-3.09	-3.45	-4.01	-4.11	-4.22	-4.20
Utilities	4.33	3.25	1.87	-0.00	-0.08	-1.21	0	-2.19	-2.34	-2.45
Construction	9.20	1.40	2 90	1.05	0.38	-0.15	-0.97	-1.13	-1.28	-1.37
Commerce	1.76	1 33	0.78	0.04	-0.23	-0.44	-0.77	-0.84	-0.89	-0.93
Financial & business services	4.95	3.89	2.51	0.66	-0.01	-0.54	-1.37	-1.51	-1.66	-1.76
Other services	8.54	6.91	4.80	1.98	0.96	0.14	-1.11	-1.34	-1.57	-1.70
Employment:										7 6 4
Agriculture	9.05	6.45	3.08	-1.44	-3.08	-4.38	-6.39	-6.75	-7.12	-7.34
Manufacturing	0.65	-0.95	-3.02	-5.80	-6.81	-7.62	-8.85	-9.08	-9.50	-9.45
Utilities	20.89	15.70	8.99	-0.00	-3.20	-3.80	-9.00	-10.59	-11.51	-2.89
Construction	10.45	8 00	9.40	4.07	0.78	-0.32	-2.03	-2.20	-2.66	-2.84
Commerce	4 56	3 4 5	2.02	0.10	-0.59	-1.15	-2.00	-2.16	-2.32	-2.40
Transport & communication	16.92	13.28	8.57	2.25	-0.04	-1.86	-4.67	-5.18	-5.69	-6.00
A principal & business services	9.15	7.81	5.43	2.24	1.08	0.16	-1.25	-1.51	-1.77	-1.92
Other services										
Prices:		1.77	0.01	2.21	2.01	2 65	1 61	1 87	1 00	-5.10
Agriculture	2.94	1.00	0.01	-2.21	-3.01	-3.03	-4.04	-4.02	-4.99	-4.95
Manufacturing	-3.19	-3.47	-3.63	-4.51	-4.45	-4.05	-4.04	-6.27	-6 54	-671
Utilities	2.29	5.0 4 1.44	0.31	-1.20	-1.77	-2.21	-2.89	-3.02	-3.14	-3.21
Construction	4 40	3 29	1.85	-0.08	-0.78	-1.33	-2.19	-2.34	-2.50	-2.59
Commerce	0.17	-0.34	-1.01	-1.90	-2.23	-2.49	-2.88	-2.96	-3.03	-3.07
Financial & business services	9.25	7.11	4.34	0.62	-0.73	-1.80	-3.45	-3.75	-4.05	-4.23
Other services	0.29	-0.08	-0.56	-1.22	-1.46	-1.64	-1.93	-1.99	-2.04	-2.07
Export volume.										
LADUL VOLUMY								1.00		4.00
Manufacturing	-0.90	-1.53	-2.33	-3.41	-3.80	-4.12	-4.59	-4.69	-4.77	-4.82
Export price:										
Foreign currency export price	1.80	1.53	1.16	0.68	0.51	0.37	0.15	0.11	0.07	0.05
of manufacturing						-				

Table 4 :	The Industry Output Projections of a 5 per cent Appreciation of the Exchange Rate Under Different Values of Export Demand Elasticities
	with Zero per cent Wage Indexation

Note: All projections are in percentage changes.

*		0								
Export demand elasticity	0.5	1.0	2.0	5.0	7.5	11.2	30.0	41.2	63.5	93.5
Industry										
Outputs:										
Agriculture	2.49	1.32	0.47	-0.16	-0.32	-0.43	-0.57	-0.60	-0.62	-0.64
Manufacturing	0.34	-0.37	-0.90	-1.30	-1.40	-1.46	-1.56	-1.57	-1.59	-1.60
Utilities	5.11	2.85	1.23	-0.00	-0.31	-0.51	-0.79	-0.84	-0.88	-0.91
Construction	10.85	6.56	3.46	1.12	0.54	0.14	-0.38	-0.47	-0.55	-0.60
Commerce	6.31	3.76	1.91	0.52	0.17	-0.07	-0.38	-0.43	-0.48	-0.51
Transport & communication	2.08	1.17	0.51	0.02	-0.10	-0.19	-0.30	-0.32	-0.33	-0.35
Financial & business services	5.84	3.41	1.05	0.32	-0.01	-0.23	-0.53	-0.58	-0.62	-0.65
Other services	10.07	6.06	3.17	0.98	0.43	0.06	-0.43	-0.51	-0.59	-0.63
Employment:										
Agriculture	10.68	5.66	2.03	-0.71	-1.39	-1.86	-2.48	-2.58	-2.68	-2.73
Manufacturing	0.77	-0.83	-1.99	-2.87	-3.09	-3.24	-3.43	-3.47	-3.50	-3.52
Utilities	24.64	13.78	5.93	-0.00	-1.48	-2.49	-3.83	-4.04	-4.26	-4.38
Construction	19.40	11.74	6.20	2.01	0.96	0.25	-0.68	-0.84	-0.99	-1.07
Commerce	13.11	7.81	3.98	1.08	0.35	-0.14	-0.79	-0.89	-1.00	-1.06
Transport & communication	5.38	3.03	1.33	0.05	-0.27	-0.49	-0.78	-0.82	-0.87	-0.89
Financial & business services	19.96	11.66	5.65	1.12	-0.01	-0.79	-1.81	-1.98	-2.14	-2.24
Other services	11.38	6.85	3.58	1.11	0.49	0.07	-0.49	-0.57	-0.66	-0.72
Prices:										
Agriculture	4.36	0.84	-1.69	-3.62	-4.09	-4.42	-4.86	-4.93	-4.99	-5.03
Manufacturing	-2.87	-3.66	-4.23	-4.66	-4.76	-4.84	-4.94	-4.95	-4.97	-4.98
Utilities	7.49	2.58	-0.96	-3.65	-4.32	-4.78	-5.38	-5.48	-5.58	-5.64
Construction	3.64	0.66	-1.49	-3.12	-3.33	-3.81	-4.18	-4.24	-4.30	-4.33
Commerce	0.09	2.27	-0.47	-2.50	-3.08	-3.44	-3.91	-3.98	-4.00	-4.10
Transport & communication	1.10	-0.91	-2.37	-3.40	-3./4	-3.93	-4.17	-4.22	-4.25	-4.28
Financial & business services	11.81	3.03	1.10	-2.22	-3.00	-3.03	-4.40	-4.52	-4.04	-4./1
Other services	1.24	0.08	-2.07	-3.13	-3.39	-3.37	-3.81	-3.83	-3.88	-3.91
Export volume:										
Manufacturing	-1.06	-1.34	-1.53	-1.69	-1.73	-1.75	-1.78	-1.79	-1.79	-1.80
Export price:										
Foreign currency export price of manufacturing	2.13	1.34	0.79	0.34	0.23	0.16	0.06	0.04	0.03	0.02

Table 5 :The Industry Output Projections of a 5 per cent Appreciation of the
Exchange Rate Under Different Values of Export Demand Elasticities
with 70 per cent Wage Indexation

Note: All projections are in percentage changes.

What is the impact on non tradeable goods producing sectors when exports are price inelastic in demand? Our results show that those sectors perform better than in the elastic scenario as the economy tends to experience higher real income which is the direct result of the market power enjoyed by Singapore exporters. Non tradeable sectors such as utilities, construction, financial and business services, and other services record substantial growth, boosting their capacity to provide more employment.

Sectoral Real Income Changes

The effects of the 5 per cent appreciation of the Singapore dollar on real incomes of different sectors of the economy are presented in Table 6. These projections show that there is a significant variation in sectoral incomes as we move from inelastic to elastic export demand curves. In general, higher deflationary effects of the 70 per cent wage indexation produce more real incomes. A close examination of the projections proves that non-trading sectors of the economy gain income at the expense of trading sectors. However, their income generating potential gradually diminishes when export demand becomes more elastic. The manufacturing sector is projected to lose its real income quite significantly except in the case of highly inelastic demand for Singapore's exports.

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Projections of Sectoral Real Income Changes of the 5 per cent Appreciation of the Exchange Rate

									<u> </u>	
Export demand elasticity	0.5	1.0	2.0	5.0	7.5	11.2	30.0	41.2	63.5	93.5
Industry										
0% wage indexation:										
070 wago muoxuuon.										
	8.73	6.74	4,19	0.75	-0.50	-1.49	-3.02	-3.31	-3.57	-3.74
Agriculture	0.22	0.66	1 01	2.61	1 22	1 72	5 49	5 67	5 7 5	6.26
Manufacturing	0.52	-0.00	-1.91	-5.01	-4.25	-4.75	-3.40	-3.02	-5.75	-0.50
Utilities	20.56	15.99	10.11	2.18	-0.68	-2.97	-6.49	-7.13	-7.76	-8.15
Construction	16.12	13.66	10.51	6.26	4.71	3.48	1.60	1.25	0.91	0.71
Commerce	10.79	9.19	7.14	4.37	3.36	2.56	1.33	1.11	0.89	0.75
Transport & communication	4.23	3.74	3.13	2.29	1.98	1.73	1.37	1.30	1.23	1.19
Financial & business services	16.59	13.57	9.68	4.44	2.54	1.02	-1.30	-1.72	-2.14	-2.40
Other services	8.88	8.10	6.54	4.43	3.66	3.05	2.11	1.94	1.78	1.68
70% wage indexation.										
10% wage indexation.										
	10.00	6 00	0.74	0.07	0.00	0.62	1 10	1.00	1.24	1 20
Agriculture	10.29	5.92	2.76	0.37	-0.22	-0.03	-1.18	-1.20	-1.34	-1.39
Manufacturing	0.38	-0.57	-1.26	-1.78	-1.92	-2.01	-2.13	-2.15	-2.16	-2.18
Utilities	24.25	14.04	6.66	1.08	-0.31	-1.26	-2.52	-2.72	-2.92	-3.04
Construction	19.01	12.00	6.93	3.09	1.77	1.48	0.62	0.48	0.34	0.26
Commerce	12.72	8.07	4.70	2.16	1.10	1.09	0.51	0.42	0.33	0.27
Transport & communication	4.99	3.28	2.06	1.13	0.89	0.23	0.52	0.49	0.46	0.44
Financial & business services	19.58	11.92	6.38	2.20	0.57	0.43	-0.51	-0.66	-0.81	-0.90
Other services	10.99	7.11	4.31	2.19	1.56	1.29	0.81	0.74	0.67	0.61

Note: All projections are in percentage changes.

V. Conclusions

The aim of this paper has been to examine the effects of the appreciation of the Singapore dollar and to establish the link between exchange rate change and the export demand elasticity for Singapore's exports. This is achieved by using an eight-sector general equilibrium model of the Singapore economy. The CGE model provides an effective analytical tool, enabling a sensitivity analysis by adopting different degree of export demand elasticities.

Despite the appreciation of the dollar, Singapore has been able to maintain a steady improvement in its exports over recent years. This robust trade performance naturally calls into question whether Singapore could be regarded as a small country in the global context. The limited estimates of export demand elasticities indicate that Singapore faces price elasticity of export demand which is well above unity, implying that the country is a price taker in world markets. Contrary to these, the findings of the present analysis lead to the belief that Singapore is becoming to enjoy some degree of market power. Our simulations with inelastic export demand curves tend to produce projections which are consistent with the economic performance of Singapore over recent years under the strong currency regime. If export demand is elastic, as many would believe, then the present results may perhaps suggest that Singapore is pursuing a wrong exchange rate policy. This latter observation is however subject to criticism because policy makers have continued to rely upon the current exchange rate policy to achieve low inflation target domestically. Moreover, the policy of maintaining strong currency has produced not only low inflation but also low unemployment and strong growth in real GDP.

The appreciation of the currency generally erodes the country's external competitiveness. Singapore's economic performance over recent years indicate that this was not the case. What explanation is offered by the results of this paper towards this contradictory outcome? It appears that the answer remains within what happens to

nominal wages in the face of appreciation of the currency. Our simulation results show that there is a tendency of nominal wages to decline over a wide range of export demand elasticities. This is supported by the downward trend in unit labour costs in Singapore (see Table 1). In a recent study, Tongzon and Menon (1996) have found that Singapore has market power in some manufacturing exports (e.g., telecommunication equipment, office and data machines, transport equipment, electrical machinery) and concluded that 'Singapore exporters generally adjust their markups in response to exchange rate changes to remain competitive in the world market. That is, they are not passive acceptors of the world market prices'. Their findings give further support to the results reported in this paper with regard to the importance of market power of Singapore's exporters towards their success under present exchange rate policy.

Perhaps the most general and important conclusion of the present analysis is that the market power may have a significant influence over Singapore's export performance. The current exchange rate policy seems to have achieved what was not possible via direct wage policy. That is to maintain domestic price stability by appreciating the currency without jeopardising country's external competitiveness. Overall the general equilibrium results presented in the paper under different export demand elasticity scenarios provide some information which may prove useful in understanding the success of the present exchange rate policy in Singapore.

End Notes

1. Singapore's exports represent 2.6 per cent of world exports when re-exports are included.

2. An exhaustive review of the literature on empirical estimates of the price elasticities of export demand is found in Goldstein and Khan (1985).

3. Chia (1993) used a CGE model to examine the impact of tax policies in Singapore. He emphasised that the CGE methodology is quite appealing to analyse recent policy issues in Singapore.

4. The export demand elasticity (EDE) is calculated using the following formula:

$$EDE = [\eta + (S/D) \varepsilon] D/X ,$$

where η is the price elasticity of demand in the consuming country, ε is the price elasticity of world supply, D is rest of world demand, S is rest of world supply and X is Singapore's exports (Freebairn, 1978) See Siriwardana (forthcoming) for further use of this method in estimating export demand elasticities.

5. The decision to choose the 70 per cent wage indexation was governed by the fact that it is the half-way mark with regard to the impact on real variables of the appreciation under zero and full wage indexation.

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 Table A1:
 Equations of the CGE Model for Singapore in Linear Percentage Change Form

				na an a
No.	Equation	Subscript range	No.	Description
	Final demands	n derennen er en		
E.	$x_{(is)}^{(3)} = \varepsilon_{(is)}c + \Sigma_q^8 = 1\Sigma_r^2 = 1$ $\eta_{(is)(qr)}p_{(qr)}$	i = 1,, 8; s = 1, 2	16	Houschold demands for commodifies
(<u>2</u>)	$x_{(is)j}^{(2)} = y_j - (p_{(is)} - \Sigma_r^2 = 1 \ \alpha_{(ir)j}^I p_{(ir)})$	i = 1,,8; s = 1,2; j = 1,,8	128	Demand for inputs to capital creation
(3)	$p_{(i1)}^* = -\gamma_i x_{(i1)}^{(4)} + f_{(i1)}^{(4)}$	<i>i</i> = 1,,8	ø	Export demands
	Demand for inputs			
(4)	$x_{(is)j}^{(1)} = x_j - (p_{(is)} - \Sigma_r^2 = 1\alpha_{(ir)j}^{(1)} p_{(ir)})$	<i>i</i> = 1,,8 ; <i>s</i> =1,2; <i>j</i> =1,,8	128	Demand for intermediate inputs by source
(2)	$x_{(91)j}^{(1)} = x_j - [p_{(91)} - (\alpha_{(91)j}^{(1)} p_{(91)} + \alpha_{(92)j}^{(1)} p_{(92)j}^{-1} p_{(92)j}^{-1})]$	<i>j</i> = 1,,8	8	Demand for labour
(9)	$x_{(92)j}^{(1)} = x_j - [p_{(92)j} - (\alpha_{(91)j}^{(1)} p_{(91)} + \alpha_{(92)j}^{(1)} p_{(92)j})]$	<i>j</i> = 1,,8	8	Demand for capital
	Zero pure profits			
(2)	$P_{(j1)} = \sum_{i=1}^{8} \sum_{s=1}^{2} P_{(is)}^{2} P_{(is)}^{(1)} + P_{(91)}^{(1)} P_{(91)j}^{(1)} + P_{(92)j}^{(1)} P_{(92)j}^{(1)}$	<i>j</i> = 1,,8	8	Zero pure profits in production
(8)	$\pi_{j} = \sum_{i=1}^{8} \sum_{s=1}^{2} p_{(is)} S_{(is)j}^{(2)}$	<i>j</i> =1,,8	80	Zero pure profits in capital creation
(6)	$p_{(i1)}^* + \nu_i + \phi = p_{(i1)}$	i=1,,8	80	Zero pure profits in exporting
(10)	$p_{(i2)}^* + t_i + \phi = p_{(i2)}$	i ≓1,,8	90	Zero pure profits in importing
(11)	$x_i = \sum_{j=1}^{8} x_{(i1)j} B_{(i1)j}^{(1)} + x_{(i1)}^{(2)} B_{(i1)}^{(2)} + x_{(i1)}^{(3)} B_{(i1)}^{(3)} + x_{(i1)}^{(4)} B_{(i1)}^{(4)}$	<i>i</i> =1,,8	œ	Demand equals supply for domestic goods
(12)	$l = \sum_{j=1}^{8} x^{(1)}_{(91)j} W^{(1)}_{(91)j}$		1	Demand equals employment of labour
(13)	$x_{(92)j}^{(1)} = k_j(0)$	j=1,,8	80	Demand equals employment of capital

<u>4</u> 0.	Equation	Subscript range	No.	Description
	Miscellancous Equations			
- 3	$c = f_c + \Phi_1 [\Sigma_{j=1}^8 (p_{(91)} + x_{(91)j}^{(1)}) N_{(91)j}]$			
(JI4)	+ $\Phi_2[\Sigma_{j=1}^8(P_{(92)j}+x_{(92)j}^{(1)})N_{(92)j}]+\Phi_3t-\Phi_4v$		-	Consumption function
(15)	$c_R = c - \xi^{(3)}$		-	Real aggregate consumption
(16)	$y_R = \Sigma_j^8 = 1 W_j^{(2)} y_j$		1	Aggregate real investment
(11)	$k_j(1) = k_j(0)(1-G_j) - 100 \Delta D_j G_j^* + \gamma_j G_j$	<i>j</i> =1,,8	×	Capital accumulation
(18)	$\xi^{(3)} = \sum_{i=1}^{8} \sum_{s=1}^{2} P_{(is)} W_{(is)}^{(3)}$		-	Consumer price index
(61)	$x_{(i2)} = \sum_{j=1}^{8} x_{(i2)}^{(1)} B_{(i2)}^{(1)} + x_{(i2)}^{(2)} B_{(i2)}^{(2)} + x_{(i2)}^{(3)} B_{(i2)}^{(3)}$	<i>i</i> =1,,8	œ	Import volume
(20)	$m = \sum_{i=1}^{8} (p_{(i2)}^{*} + x_{(i2)}) M_{(i2)}$		1	Foreign currency value of imports
(11)	$e = \sum_{i=1}^{8} \left(p_{(i)}^{*} + x_{(i)}^{(4)} \right) E_{(i1)}$		Ţ	Foreign currency value of exports
(22)	$100\Delta B = (Ee - Mm)$		-	Balance of trade
(23)	$p_{(91)j} = \xi^{(3)}h + f_{(91)}$	<i>j</i> =1,,8	œ	Flexible handling of wages
(24)	$t = \sum_{i=1}^{8} \left[\zeta_{i}^{t} t_{i} + p_{(i2)}^{*} + x_{(i2)} \right] T_{i}^{t}$		Ĩ	Aggregate tariff revenue
(25)	$v = \sum_{i=1}^{8} [\zeta_{i}^{v} v_{i} + p_{(i1)}^{*} + x_{(i1)}^{(4)}] T_{i}^{v}$		-1	Aggregate export subsidics
(26)	$gdp = \sum_{i=1}^{8} V_j x_j$		1	Real gross domestic product
(27)	$f_R = c_R - y_R$		Ţ	Ratio of real aggregate consumption
	Total		373	to real investment

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Table A1: (continue)

Variable	Subscript Range	Number	Description
	<i>j</i> = 1,,8	8	Industry outputs
$x_{(is)}^{(1)}i$	i = 1,,8; $j = 1,,8$; $s = 1,2$	128	Demands for inputs for current production
$x^{(1)}_{(91)i}$	<i>j</i> = 1,,8	8	Industry demand for labour
$x^{(1)}_{(92)i}$	<i>j</i> = 1,,8	8	Industry demand for capital
$x_{(is)i}^{(2)}$	i = 1,,8; $j = 1,,8$; $s = 1,2$	128	Demand for inputs for capital creation
у _і	<i>j</i> = 1,,8	8	Sectoral capital formation
$x_{(is)}^{(3)}$	i = 1,,8; $s = 1,2$	16	Household demand for domestic and imported goods
$x_{(i1)}^{(4)}$	<i>i</i> = 1,,8	8	Export demands
P(is)	i = 1,,8; $s = 1,2$	16	Price of good i from source s
P(01)		1	Wage rate
P(02);	<i>j</i> = 1,,8	8	Rental rate on capital
$p_{(j1)}^{*}$	<i>i</i> = 1,,8	8	Foreign currency export prices (f.o.b.)
* P(;2)	<i>i</i> = 1,,8	8	Foreign currency import prices (c.i.f.)
π;	<i>j</i> = 1,,8	8	Cost of units of capital
c		1	Nominal aggregate consumption
$f_{(i1)}^{(4)}$	<i>i</i> = 1,,8	8	Export demand shift variable
φ		1	Nominal exchange rate
vi	<i>i</i> = 1,,8	8	One plus the ad valorem export subsidies
t _i	<i>i</i> = 1,,8	8	One plus the ad valorem tariffs
k j(0)	<i>j</i> = 1,,8	8	Employment of capital in each industry
$k_i(1)$	<i>j</i> = 1,,8	8	Future capital stocks
$100\Delta D_i$	<i>j</i> = 1,,8	8	Depreciation rate
- J C D		1	Real aggregate consumption
V D		1	Real aggregate investment
~ K *(3)		1	Consumer price index
5(3)	÷ - 1 8	8	Aggregate imports by commodity
x(i2)	<i>t</i> = 1,,o	1	A geregate employment
L AR		1	Balance of trade
e		1	Foreign currency value of exports
m		1	Foreign currency value of imports
^f (91)		I	wage shirt variable
<u>\-</u>			

Table A2: Variables of the Model in Percentage Change Form

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Table A2: (continue)

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Variable	Subscript Range	Number	Description
gdp		1	Real gross domestic product
t		1	Aggregate tariff revenue
ν		1	Aggregate export subsidy
f _c		1	Shift in the average propensity to consume
f_{R}		1	Ratio of real aggregate consumption to investment
Total variable		432	

- -

Table A3: Coefficients of the Model

Coefficient	Description			
$\varepsilon_{(is)}$	Expenditure elasticities in household consumption for good i from source s			
$\eta_{(is)(qr)}$	Own and cross price elasticities in household demands			
γ _i	Reciprocals of the foreign demand elasticities for Australian exports of commodity i			
$lpha_{(ir)j}^{(1)}$	Share of commodity i from source r (domestic or imported) in industry j 's purchases of i for current production			
$\alpha^{(2)}_{(ir)j}$	Share of commodity i from source r (domestic or imported) in sector j 's purchases of i for capital creation			
$\alpha^{(1)}_{(91)j}$	Share of wages in total primary factor costs of industry j			
$\alpha^{(1)}_{(92)j}$	Share of rentals in total primary factor costs of industry j			
$S^{(1)}_{(is)j}$	Share of industry j's production costs represented by intermediate inputs good i from source s			
$S^{(1)}_{(91)j}$	Share of industry j 's production costs represented by labour inputs			
$S^{(1)}_{(92)j}$	Share of industry j's production costs represented by capital inputs			
$S^{(2)}_{(is)j}$	Share of industry j's investment costs represented by input i from source s			
$B_{(i1)j}^{(1)}$	Share of the total sales of domestic good i absorbed by industry j as intermediate inputs			
$B_{(i1)}^{(2)}$	Share of the total sales of domestic good i used in capital creation			
$B_{(i1)}^{(3)}$	Share of the total sales of domestic good <i>i</i> used in household consumption			
$B_{(i1)}^{(4)}$	Share of the total sales of domestic good <i>i</i> absorbed by exports			
W ₍₉₁₎ j	Share of industry <i>j</i> in aggregate employment			
$W_{j}^{(2)}$	Share of total investment accounted for by industry j			
Gj	Ratio of gross investment to next period capital stock of sector j			
G_j^*	Ratio of current capital stock to next-period capital stock of sector j			

Table A3: (continue)

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Coefficient	Description	
$W^{(3)}_{(is)}$	Expenditure weight of good i from source s in the consumer price index	
$B^{(1)}_{(i2)j}$	Share of the total sales of imported good i absorbed by industry j as intermediate inputs	
$B^{(2)}_{(i2)}$	Share of the total sales of imported good <i>i</i> absorbed by capital creation	
$B_{(i2)}^{(3)}$	Share of the total sales of imported good <i>i</i> absorbed by household consumption	
$M_{(i2)}$	Share of total foreign currency costs accounted for by imported good i	
$E_{(i1)}$	Share of total foreign currency export earnings accounted for by export good i	
E M h	Aggregate foreign currency value of exports Aggregate foreign currency value of imports Wage indexation parameter	
Φ_i	Share in domestic income accounted for by wage income, tariff revenue, export subsidies and capital income	
N(91)j	Share of industry j in total wage payments	
N ₍₉₂₎ j	Share of industry j in total returns to capital	
ζ_i^t	Ratio of the power of the tariff on good <i>i</i> to the ad valorem rate	
T_i^t	Share of total tariff revenue accounted for by tariffs on good i	
ζ_i^{v}	Ratio of the power of the export subsidy on good <i>i</i> to the ad valorem rate	
T_i^{ν}	Share of total export subsidies accounted for by export subsidies on good i	
v _j	Share of sector j in GDP	

Table A4: The Selection of Exogenous Variables

Variable	Subscript Range	Number	Description .
<i>p</i> [*] _(i2)	<i>i</i> = 1,,8	8	Foreign currency import prices (c.i.f.)
t_i	<i>i</i> = 1,,8	8	One plus the ad valorem tariffs
v _i	<i>i</i> = 2	1	One plus the export subsidy for the major export commodities
$x_{(i1)}^{(4)}$	<i>i</i> = 1,3,,8	7	Export volumes for the minor export commodities
$f_{(i1)}^{(4)}$	<i>i</i> = 1,,8	8	Export demand shift variables
$k_j(0)$	<i>j</i> = 1,,8	8	Employment of capital in each industry
$100\Delta D_{j}$	<i>j</i> = 1,,8	8	Depreciation rate
π _j	<i>j</i> = 1,,8	8	Cost of units of capital
f ₍₉₁₎		1	Aggregate wage shift variable
φ		1	Nominal exchange rate
f_{c}		1	Shift in the average propensity to consume
-	Total	59	

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