THE ECONOMIC IMPACT OF TARIFFS OF THE 1930S AUSTRALIA: THE BRIGDEN REPORT RE-EXAMINED

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ABSTRACT

In 1927, the Prime Minister of Australia Mr S.M. Bruce appointed a committee of economists to carry out an inquiry into the economic impact of the Australian tariffs. The report of this committee, also known as the Brigden Report, was published in July, 1929. In assessing the impact of tariffs on national income, the committee attempted to answer the following counterfactual question: In the absence of tariff protection would export and other industries have grown sufficiently enough to contribute to the national income the same amount as the protected sector would have produced with the assistance of tariffs? The purpose of this paper is to examine this counterfactual quantitatively by simulating a computable general equilibrium (CGE) model of the 1930s in Australia. The results provide a more formal assessment of the impact of tariffs during the period and throw some light on the debate of the efficacy of protection during the 1930s.

I Introduction

Australia has a long history as one of the most highly protected industrial nation in the world during the 20th century. Indeed, the beginning of the protective tariff policy goes as far back as to the middle of the 19th century when the colony of Victoria formally introduced high tariff barriers to improve employment conditions for ex-diggers within the manufacturing industry[1]. However, a formal justification of Australian protection policy did not become apparent until the 1929 inquiry into the impact of tariffs (Brigden *et al.*, 1929). Then the Prime Minister of Australia, Mr S.M. Bruce, appointed a five-member committee, comprising four eminent economists, namely J.B. Brigden as head of the committee, L.F. Giblin, D.B. Copland and E.C. Dyason, and the Commonwealth Statistician , C.H. Wickens to report the effects of tariff policy and its future operations. The report was published in July 1929 and became well known as the ***Brigden Report.*** The authors did not recommend any reduction of the amount of protection at that time afforded to Australian industry. The report indeed remains as one of the classic pieces in Australian economic thought in protectionism.

In assessing the impact of tariffs on national income, the committee attempted to answer the following counterfactual question: In the absence of tariff protection would export and other industries have grown sufficiently enough to contribute to the national income the same amount as the protected sector would have produced with the assistance of tariffs? The purpose of this paper is to examine this counterfactual quantitatively by simulating a computable general equilibrium (CGE) model of the

[1] See Siriwardana (1991) for a quantitative analysis on the impact of Victorian tariffs.

1930s Australia. The results provide a more formal assessment of the impact of tariffs during that period and throw some light on the debate on the efficacy of protection during the 1930s.

The paper is organised as follows. Section II provides an overview of the Brigden's case for tariff protection. This is essential to put the ensuing analysis in a proper perspective. Section III gives a brief outline of the CGE model used in the paper. Section IV describes the data requirements and calibration of the model while Section V outlines the simulations. The results are analysed in Section VI. Section VII reports the main conclusions.

II Brigden's Case for Protection

The nature of Australia's export and import trade gave rise to the importance of the question of tariff protection as an economic policy. Australia's exports mainly consisted of raw products of pastoral, agricultural and mining industries. On the other hand, her imports were primarily manufactured goods. Consequently, the debate was concerned with the protection to manufacturing industry.

As a preview, it is worth summarising some of the protectionists arguments in the 1920s. In order to achieve as large a national income under free trade as under protection, it was necessary to expand production elsewhere to compensate for the loss of protected manufacturing output. This would necessarily mean the expansion of outputs in export industries. They were the primary goods producing industries which were suffered from the cost of protection. These industries were supposed to have been experiencing diminishing returns. Any further attempt to expand their output would have resulted in increasing cost. Furthermore, Australia was producing a substantial proportion of the world supply of primary goods such as wool and wheat. Any further increase in the Australian supply of these commodities would have undoubtedly depressed the world prices of those commodities. Protectionists thus argued that the free trade policy would shift the terms of trade to the disadvantage of Australia. Thus the expansion of the manufacturing industry under protection was seen as a viable option which would avoid this unfavourable outcome (Anderson, 1938).

The other side of the argument was that tariff had the effect of shifting distribution of income in favour of labour, supporting a larger population. Under free trade, the concentration would be on the production of primary goods which would produce national income primarily absorbed in land rent. The extension of production into

areas such as pastoral, agricultural and mining would have reduced the demand for labour, resulting a smaller wage income. This would mean a reduced standard of living or a smaller population. Under protection, labour would be absorbed into the manufacturing activities where it could command higher remuneration. Therefore tariff was regarded as a means of redistribution of income. It subsidised the labour at the expense of the land owners and improved employment opportunities for a larger population (Viner, 1929).

The Brigden Committee formally endorsed this protectionist view and provided a seminal document which described the reasoning for not reducing the amount of protection given to the manufacturing industry. The committee's support for the protection policy was founded on the belief that it had assisted Australia to maintain a larger population with substantially higher standard of living. The report says that "The evidence available does not support the contention that Australia could have maintained its present population at a higher standard of living under free trade" (Brigden *et al.*, 1929, p.140). One of the conclusions of the committee was that free trade would have delivered the national income for Australia which would have been as great as under protection, but the population would have been at least 230,000 smaller. The protection made it possible to support a greater number of workers by extracting the necessary income from the landlords and capitalists.

Briefly, the committee's justifications for maintaining the existing tariff levels were the following: (a) Protection would reduce the amount of primary goods output available for export by diverting variable resources, mainly labour, from primary industries to manufacturing industries. Since Australia's supply represented an appreciable proportion of primary goods in the world market, such reduction in supply would shift the terms of trade in favour of Australia. This would eventually increase the national income of Australia. (b) Since the production of manufactured goods is relatively labour intensive, an expanded production in manufacturing would increase the demand for labour, resulting in a larger relative and absolute income to the labouring class. (c) As primary industries experienced diminishing returns from marginal land usage, it would appear more profitable to divert resources to manufacturing where constant, if not increasing, returns would be forthcoming[2].

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2 A more critical discussions on the Brigden Report are found in Samuelson (1940), Reitsma (1958), Corden (1962), Cain (1973), Samuelson (1981) and Manger (1981).

III An Overview of the CGE Model

We use a CGE model of the Australian economy (Siriwardana, forthcoming 1995) in the early 1930s to examine the impact of protection. The model belongs to the tradition of multisectoral models pioneered by Johansen (1974). The specification of the model follows closely the ORANI model of the Australian economy developed by Dixon *et al.* (1982). The paucity of appropriate economic data has been a major obstacle preventing the application of large scale CGE models to economic history. Nevertheless, the general equilibrium analysis has been a popular tool in new economic history concerning the United States economy, following the pioneering work by Pope (1972) and James (1978) in the analysis of the effects of ante-bellum tariffs[3].

There are five categories of economic agents in the model: domestic producers of current goods, domestic producers of capital goods, households, government and foreigners who import and consume Australian goods. The model consists of nine sectors: agriculture, pastoral, other rural, mining, manufacturing, construction, transport, trade services and other services. The output of the latter four sectors are nontraded. The producers of current goods use two types of primary factors, capital and labour, and intermediate inputs in their production process. On the other hand, the producers of capital goods require intermediate inputs as direct inputs and use of labour and capital indirectly. The major behavioural postulates that govern the producer and consumer behaviour are cost minimisation and utility maximisation.[4] The equations of the model in the linear percentage change form are listed in Table A1 in the Appendix. The variables are defined in Table A2 and coefficients are described in Table A3. As can be seen from Table A1, the equations of the model are grouped under six headings.[5]

Final Demands

Final demands are divided into four categories: household consumption, investment, exports and government demand. Consumers are assumed to maximise a nested utility function subject to an aggregate budget constraint. At the first level, we use the Leontief function implying no substitution between effective units of commodities. The effective units of commodities are the Cobb-Douglas aggregation of imported and domestic goods belonging to the same commodity group. Thus at this second level, consumers have the

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3 See James (1984) and Siriwardana (1985) for surveys of literature on the use of general equilibrium models in economic history.

4 See Dixon *et al.* (1982, ch.3)for details.

5 More details regarding the theory and the derivation of the equation system of the model are available in Siriwardana (forthcoming 1995).

substitution possibilities between domestic and imported commodities of the same type according to a Cobb-Douglas function. The resultant set of household demand functions for domestic and imported commodities are given by equation (1.1) in Table A1.

It is assumed that each industry uses sector specific capital goods. These capital units for use in a given sector are created in a perfectly competitive environment under constant returns to scale two-tiered production technology. At the first level, industry j chooses effective intermediate inputs to minimise the total cost of capital creation subject to a Leontief production function. At the second level, industry j chooses its inputs for capital creation from domestic and imported sources to minimise costs subject to a Cobb-Douglas production function. The input demand functions derived from this specification are given by equation (1.2) in Table A1.

In relation to exports, each commodity faces less than perfectly elastic demand curve The relevant export demand functions of the model are represented by equation (1.3). The elasticity of export demand facing producers vary across industries. Government demand for domestic and imported commodities is explicitly recognised though the model contains no particular theory to describe the government behaviour. These demand functions appear as equation (1.4).

Industry Demands for Inputs

Producers of current goods are assumed to minimise the production costs subject to two-level nested production function. The first level contains the constant returns to scale Leontief production technology. This technology implies no substitution between different types of intermediate inputs and between intermediate inputs and primary factors. At the second level, producers substitute between domestically produced intermediate inputs and imports, and between different types of primary factors according to a Cobb-Douglas technology. The cost minimisation subject to this production technology gives demand functions for intermediate inputs and for primary factors (see equations (1.5), (1.6) and (1.7) in Table A1).

Zero Pure Profits

The assumption of constant returns to scale in production and competitive pricing behaviour in each of the economic activity ensure that zero pure profits are earned in equilibrium. Equations (1.8), (1.9), (1.10) and (1.11) in Table A1 impose these zero profit conditions for production, capital creation, exporting and importing respectively.

Market clearing

Equations (1.12), (1.13), and (1.14) indicate that supply equals demand for domestically produced commodities, labour and fixed capital respectively. However, it is important to notice that the latter two equations do not necessarily imply full employment conditions for factors.

Miscellaneous Equations

Most of the equations listed under this heading are self-explanatory. Equation (1.15) represents the consumption function of the model. The characteristics of a Keynesian type consumption function are embodied in this equation. Equation (1.16) gives real aggregate consumption and equation (1.17) defines the aggregate real investment. The capital accumulation of the economy is described by equation (1.18). It implies that the variables which influence the capital stock at the end of one period are the current capital stock, the depreciation rate and the current level of investment. The consumer price index of the model is given by equation (1.19). Import volumes in domestic currency terms are described by equation (1.20). Equations (1.21) and (1.22) give total import bill and export revenue in terms of foreign currency respectively. The balance of trade for the Australian economy is defined by equation (1.23). Equation (1.24) provides a flexible way of handling wages by indexing money wages to the consumer price index. Equations (1.25) and (1.26) define the aggregate tariff revenue and export subsidies respectively. Equation (1.27) is included in the model to project the changes in real gross domestic product (GDP). Finally, equation (1.28) defines the ratio of real aggregate consumption to real aggregate investment.

IV Data and Calibration of the Model

To calibrate the model described in the previous section, we require numerical values for a large number of parameters. They include various shares or weights (e.g., sales and cost shares) and estimates of the elasticity parameters such as household demand elasticities, capital-labour substitution elasticities and export demand elasticities. In obtaining values for these parameters, a reference is made to the existing econometric studies so as to be consistent with a given historical benchmark data set. A Common practice in the tradition of Johansen type CGE models is to use the input-output data to compute the base period sales, cost and revenue shares. A benchmark input-output

database was compiled for the Australian economy for the year 1934/35.[6] This database disaggregates the economy into nine production sectors. The use of Leontief and Cobb-Douglas functional forms in the model allows almost all the parameters to be derived from this input-output table.[7]

The export demand elasticities which are required to implement the export demand functions of the model are not available for Australia for the time period under consideration. As will be seen in the following analysis, three export demand elasticity scenarios, namely 'low', 'medium' and 'high', are adopted in the model simulations. Plausible values for export demand elasticities for both 'low' and 'medium' scenarios were determined by reference to an econometric study for the United Kingdom and the United States (1921-1938) by Zelder (1958). The values for export demand elasticities chosen for the simulation under 'low' scenario are 0.5 for agriculture, pastoral and mining and 20.0 for other sectors. Similarly, the simulation under 'medium' scenario is conducted with export demand elasticities of 2.0 for agriculture, pastoral and mining and 20.0 for other sectors. A common value of 20.0 is adopted for all the commodities under the 'high' elasticity scenario.

V Economic Environment of the Simulations

The model can be simulated to quantify the impact of tariff policies by posing the following counterfactual: What would have been the effects if all the existing tariff rates in the late 1920s Australia were raised by 20 per cent[8]. In evaluating this counterfactual, we treat the proposed tariff increase as an exogenous shock to the economy. When this tariff increase is imposed on the model exogenously, the model projects the values of endogenous variables showing how they will differ from the values that would have eventuated in the absence of the tariff shock.

The model usually does not project some of the features of the macroeconomy endogenously. Therefore, the user of the model should specify the macroeconomic environment under which the proposed simulations would be carried out. This involves primarily classifying the variables of the model into endogenous and exogenous groups.

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[6] M.F. Rola provided an excellent research assistance in compiling this inpu-output database. More details of the data tables are available from the author upon request. See also Siriwardana (1987) for details on the construction of historical input-output tables.

[7] Detailed technical discussions concerning the computational procedure of these parameters and coefficients from input-output tables can be found in Dixon *et al.* (1982, ch.2) and Higgs (1987, pp.41-56).

[8] The frequent changes to the tariff schedule during the1920s make it difficult to guage the the impact of tariffs on domestic prices of imports. Thomas (1988, p.257) indicates that the Sculling amendments to preferential and general tariffs may have increased domestic prices of imports by about 20 per cent.

The CGE model as described earlier contains 573 variables and 480 equations (see Tables A1 and A2). Thus, the number of variables exceeds the number of equations by 93. To obtain a solution for the model, this number of variables must be declared exogenous. Table A4 in the Appendix contains the chosen list of exogenous variables for the proposed tariff experiment. The selection of exogenous variables and assignment of values for them and for the wage indexation parameter of the model create the economic environment for the simulations.[9]

The model is simulated to examine the impact of tariff under a number of alternative sets of assumptions concerning the macroeconomic environment. In particular, the assumptions which govern the simulations are as follows: (1) industry-specific fixed capital in use are exogenous; (2) the real wages are constant; (3) real private consumption varies with real disposable income; (4) the shares of real private consumption, real government 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 the short-run effects of tariffs. Assumption (2) indicates a slack labour market for the Australian economy and this is appropriate for the period under consideration. Assumptions (3) and (4) imply that the real domestic absorption is endogenously determined in all simulations. Finally, assumption (5) sets the numeraire of the model. Thus, all domestic price changes are measured relative to the world prices.

VI Results of Model Simulation

The results presented in this section correspond to the simulations carried out to examine the impact of tariff protection in the economy. We report three different simulations concerning three different scenarios of export demand elasticities faced by the Australian exports in the world market. It is important to note that in all three simulations the assumptions described earlier regarding the economic environment are maintained.

Before analysing the results in detail, it is useful to distinguish the 'low' elasticity case from 'medium' and 'high' elasticity situations. The former is consistent with the orthodox interpretation of the Brigden Committee. Under the 'low' elasticity scenario, an increase in tariff would expand the national income via the terms of trade effect. The presumption is that as Australian exports represent an appreciable proportion of world exports, any reduction in supply of exports due to the contraction in the exportable sector in the domestic economy under tariff would raise the world prices for such exports. Since

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9 The computation of the solution for the present model was performed by using the (4.2.02) version of GEMPACK. This allows the use of multi-step solution approach which minimizes the Johansen linearization errors of the model. See Codsi and Pearson (1988) for details on GEMPACK.

Australian demand does not affect the import prices, the outcome would be to shift the terms of trade in Australia's favour.

The 'medium' elasticity scenario assumes somewhat elastic demand curves for Australian exports. This means exporters cannot pass on cost increases to their foreign buyers without facing significant reduction in export sales. Correspondingly, under this scenario, tariffs would not raise the national income to the extent of 'low' elasticity case. However, depending on the magnitude of the terms of trade effect, the extent of the expansionary push from the protection of the domestic manufacturing sector and the way the structural interdependencies are captured by the input-output relationships, we can expect some expansion in the domestic economy. The 'high' elasticity scenario, on the other hand, assumes away the Brigden's orthodoxy and represents a case where Australia is almost a price taker in the world market for its exports. Under this scenario, the export sector experiences a severe cost-price squeeze and can be expected to contract considerably.

Overall, the results presented in this section are meant to illustrate the various issues which have been crucial to the conclusions of the ***Brigden Report***. They could demonstrate whether the Brigden case for protection is valid under the committee's vision of the Australian economy at that time. The results are presented and discussed for various macroeconomic variables first and then for various production sectors.

The Macroeconomic Effects of Tariff

Table 1 reports the likely macroeconomic impact of the across-the-board increase in protection by 20 per cent. Overall, these projections indicate that the terms of trade effects have been the key to understanding the macroeconomic performance of the economy under increased protection. Column I of Table 1 shows the results when tariffs are increased having possibility of exploiting the terms-of-trade via monopoly power (i.e. 'low' export demand elasticity scenario) in the world market for Australian exports[10]. The conclusions of the ***Brigden Report*** implicitly relied upon such possibility for Australia. As can be seen from Table 1, the terms of trade is improved by 17.9 per cent under the 'low' elasticity scenario. This raises the real income of Australia by 3.5 per cent and the real domestic absorption by 7.3 per cent. The expansion in domestic consumption induces demand for imports by 19 per cent despite the increased protection. As export growth is lower than the expansion in imports, the balance of trade shows a small deficit which is equivalent to 0.7 per cent of the base period GDP. Corresponding with the real growth in the economy as reflected by the 6.2 per cent increase in real GDP, there is an

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10 This is known as the optimum tariff argument in the international trade theory.

Table 1 Projected Macroeconomic Effects of Tariffs[a]

Variable	'Low' elasticity (I)	'Medium' elasticity (II)	'High' elasticity (III)
Real GDP	6.27	0.89	-2.60
Real Income	3.51	0.03	-2.47
Terms of trade	17.91	5.51	0.95
Real domestic absorption	7.34	1.87	-1.52
Aggregate exports[b]	8.08	-5.51	-13.73
Aggregate imports[b]	19.09	0.56	-9.00
Balance of trade	-0.73	-0.91	-1.16
Consumer price index	41.45	19.28	8.41
Aggregate demand for labour[c]	6.22	0.05	-4.32
Money wages	41.45	19.28	8.41
Real wages[d]	0.00	0.00	0.00
Nominal exchange rate	0.00	0.00	0.00
Real exchange rate[e]	-41.45	-19.28	-8.41

Notes: (a) All projections are in percentage changes except the balance of trade which is expressed as a percentage of base period GDP.
(b) These are in foreign currency terms.
(c) This projection shows the effective demand for labour.
(d) Calculated by deflating movements in money wages by movements in the model's consumer price index.
(e) Calculated by subtracting the percentage change in the model's consumer price index from the percentage change in the nominal exchange rate.

increase in aggregate demand for labour by 6.2 per cent. This employment gain is largely due to the improvement in the import-competitive manufacturing sector as a result of the resource re-allocation under protection. It is also important to notice that the nontrading sectors of the economy also contribute to the employment growth via the general stimulus provided by tariffs.

Column II of Table 1 is concerned with the results of the tariff increase with 'medium' elasticity scenario. As we move from the export demand elasticity of 0.5 to 2.0 (i.e from 'low' elasticity scenario to 'medium' elasticity scenario), the positive terms of trade effect declines significantly from 17.9 per cent to 5.5 per cent. The rest of the results in column II closely follow this movement in the terms of trade. It is clearly noticeable that the increased protection becomes largely ineffective at macro level with the reduced market power for Australian exports in the world market. The increase in aggregate employment (0.05 per cent) and real income (0.03 per cent) are almost negligible. It appears that the increased employment in the import-competitive manufacturing sector is largely offset by the decline of employment in the export sector. Though the tariff increase improves the competitive position of the manufacturing sector, at the same time it induces a rise in the economy's cost structure, particularly with the full wage indexation. The ultimate outcome of the latter effect is to worsen the competitiveness of the export sector of the economy. Consequently, the primary goods producing exporting sector experiences a contraction in output and employment. The results show a 5.5 per cent decline in exports leading to a balance of trade deficit which is equivalent to a 0.9 per cent in GDP at the base period.

Column III of Table 1 demonstrates the macroeconomic effects of tariffs under 'high' elasticity scenario which considers Australia as a small economy, one in which there is no possibility of exploiting terms of trade via tariffs. It turns out that in the short-run, tariff increase becomes a burden to the economy as there is no possibility of passing domestic cost increases stemmed from tariffs to the world market. Increased tariff protection induces nothing but domestic inflation. The terms of trade effect becomes almost negligible (0.9 per cent improvement) and the real income and employment decline by 2.4 and 4.3 per cents respectively. Aggregate exports decline by 13.7 per cent while imports contract by 9 per cent, leading to a considerable deterioration of the trade balance. The former is due to the cost-price squeeze imposed on the producers of exports who face export demand curves which are fairly elastic.

The Sectoral Effects of Tariffs

The sectoral output, employment and export projections of the three tariff simulations are presented in Table 2. Clearly, these results show that they are very sensitive to changes in the export demand elasticities. The main losers of tariffs are the export sectors (i.e., agriculture, pastoral and mining) of the economy. Increase in tariffs imposes a profit squeeze on exporting sectors. The model recognises a variety of ways of increasing costs with tariffs. Tariffs increase the costs of imported intermediate inputs and prices of some of the domestically produced industry inputs. Tariffs also increase the wage costs as wages tend to move with the consumer price index. The success of the export sector of the economy depends on its ability to cope with these cost increases.

The strength of passing the domestic cost increases to foreign buyers by way of higher prices is determined by the elasticity of export demand curves in the model. The lower the export demand elasticities the more inflationary is the tariff increase in the domestic economy. However, the export sectors are less adversely affected by the inflationary effects of tariffs when the export demand curves facing them are inelastic. This is clearly evident from the results in Table 2. As we move from 'low' elasticity to 'high' elasticity scenario, the output and employment losses in the exporting sectors are magnified.

Similar outcome occurs within the protected manufacturing sector of the economy. The output and employment gains enjoyed by this sector gradually diminishes with the move from inelastic export demand to elastic export demand. This finding has very interesting implications for the Brigden conclusions. The overall success of the tariff policy as a means of shifting resources from primary to manufacturing sector seems to have depended upon the export sectors' performance and their abilities to exploit the world market with reduced supplies and increased prices. In other words, it was essential for Australian exports to have market power in the world market if Australia to have gained from imposition of high tariff barriers on imports.

The performance of the nontrading sectors of the economy under tariffs is largely depends upon the general economic activity as implied by the change in real GDP. The sensitivity of output and employment results of these sectors to change in the export demand elasticities is clearly evident from Table 2. The large output and employment gains experienced with the 'low' elasticity scenario are reversed to losses as we switch to the 'high' elasticity scenario. Again this implies that the economy's

Table 2 Projected Sectoral Effects of Tariffs[a]

Sector	'Low' elasticity (I)	'Medium' elasticity (II)	'High' elasticity (III)
Outputs			
Agriculture	-2.87	-6.87	-15.14
Pastoral	-3.99	-4.60	-2.61
Other rural	2.54	1.20	-0.03
Mining	-4.10	-11.21	-17.50
Manufacturing	2.22	1.44	0.39
Construction	7.34	1.87	-1.52
Transport	4.69	0.57	-2.32
Trade services	6.23	1.26	-1.98
Other services	6.67	1.66	-1.47
Employment			
Agriculture	-3.68	-8.83	-19.15
Pastoral	-17.52	-21.21	-11.67
Other rural	6.05	2.82	-0.09
Mining	-5.45	-14.98	-22.89
Manufacturing	4.65	2.99	0.81
Construction	9.77	2.46	-2.00
Transport	5.00	0.61	-2.47
Trade services	12.08	2.41	-3.74
Other services	10.55	2.60	-2.29
Export volume			
Agriculture	-16.94	-35.66	-71.06
Pastoral	-12.06	-11.40	-5.38
Mining	-16.74	-32.00	-45.65

Note: (a) All projections are in percentage changes.

ability to cater larger population with tariffs would have been subject to the performance of the export sector.

Sectoral Real Incomes

Table 3 contains the projections of sectoral real income changes in response to increased tariffs under different elasticity scenarios. These results clearly exhibit that the manufacturing sector gains income at the expense of the exportable goods producing sectors. However, its potential for deriving higher income diminishes significantly when export demand curves become more elastic. Severe income losses are associated with exporting sectors though the magnitude of the estimated income change is generally lower under the 'low' elasticity scenario. These sectors suffer from the cost-price squeeze arising from the domestic inflationary pressure due to protection. Substantial income gains are projected for the nontrading sectors of the economy when export demand elasticities are low. However, these income gains are completely eroded when we adopt high export demand elasticities. These income losses are associated with the general contraction of the economy which is reflected by the decline in real GDP.

VII Conclusions

The Brigden Report remains as one of the most comprehensive reviews of the early Australian protection policy. It has documented the economic thought of the 1920s protectionism in Australia and has given rise to some theoretical developments in international trade theory in the following two decades. Since its publication, many have reviewed merits and demerits of Brigden's conclusions. This paper adds a novel and substantial interpretation to this literature on Australian tariffs in general and provides more insights into the Brigden Report's conclusions in particular. To this end, the paper has used an applied general equilibrium model of the 1930s Australia, recognising the need for a more formal economic analysis of the Australian protection issue[11].

In reviewing the Brigden case for protection, many writers have emphasised the importance of the terms of trade effects of protection. The present study reiterates the fact that it is the key to understand the macroeconomic and industrial performance of the Australian economy during the period under consideration. The results presented

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11 The importance of tariffs in the recovery process of the Great Depression are analysed in Siriwardana (1993).

Table 3 Projected Changes in Sectoral Real Incomes[a]

Sector	'Low' elasticity (I)	'Medium' elasticity (II)	'High' elasticity (III)
Agriculture	-3.89	-8.83	-19.39
Pastoral	-21.19	-21.21	-12.18
Other rural	6.95	2.82	-0.09
Mining	-5.81	-14.98	-23.22
Manufacturing	5.27	2.99	0.83
Construction	10.37	2.46	-2.03
Transport	5.07	0.61	-2.47
Trade services	13.55	2.41	-3.84
Other services	11.52	2.60	-2.33

Note: (a) Sectoral income projection is obtained as a weighted average of real returns to capital and labour in each sector.

in this paper form the opinion that the level of income was very sensitive to the degree of the terms of trade effects. Then the question arises as to how one could place the present analysis into the Brigden Committee's framework and their conclusions.

As many critics would argue, the Brigden Committee worked under the belief that Australia enjoyed the monopoly power in the world market for her primary commodity exports. Thus the presumed inelastic demand for Australian exports would have allowed her to exploit the terms of trade effects of protection. Perhaps the most general and important conclusion of the present analysis is that the terms trade did matter. In view of this rationale, our findings seem to support the conclusion of the Brigden Committee that protection policy did generate a higher national income for Australia, enabling the country to maintain a higher standard of living for a larger population. The implication of this finding is that Australia's economic progress would have been lower than it actually was during the 1930s had the country adopted a free trade policy rather than the protectionist path.

The results suggests that if export demand elasticities were low, on average less than one, the foreign currency value of export revenue would have increased as the supply of exportable goods declined with increased protection. The import competing sector of the economy would have expanded increasing the demand for labour. The model projects a considerable increase in employment level with inelastic export demands implying that the growth in employment in import competing sector would have outweighed the employment loss in the exportable sector. If the real wage was allowed to change endogenously in the model, then instead of having employment increase, we would have seen an increase in real wage. Implication of this in general seems to be that the labouring class has gained from protection.

It is worth noting that the model also indicates that these conclusions will be reversed if one disagrees with the possibility that Australia enjoyed an inelastic demand for her exports during the period under study. Although the elasticities concerned are quantitatively unknown, the general consensus is that this was unlikely. Indeed, it is an empirical matter which cannot be fully resolved in the absence of numerical estimates of export demand elasticities for Australian exports. Perhaps this may be another aspect in the agenda for further research.

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Table A1

Equations of the CGE Model in Linear Percentage Change Form

No.	Equation	Subscript Range	No.	Description
	Final Demands			
(1.1)	$x^H_{(is)} = e_{(is)}c + \sum_{q=1}^{9}\sum_{r=1}^{2}\eta_{(is)(qr)}p_{(qr)}$	$i = 1,...,9$ $s = 1,2$	18	Household demands for commodities by source
(1.2)	$x^I_{(is)j} = y_j - (p_{(is)} - \sum_{r=1}^{2}\alpha^I_{(ir)j}p_{(ir)})$	$i = 1,...,9$ $s = 1,2$ $j = 1,2,...,9$	162	Demand for inputs to capital creation
(1.3)	$p^*_{(i1)} = -\gamma_i x^E_{(i1)} + f^E_{(i1)}$	$i = 1,...,9$	9	Export demands
(1.4)	$x^G_{(is)} = c_R h^G_{(is)} + f^G_{(is)}$	$i = 1,...,9$ $s = 1,2$	18	Government demands for commodities by source
	Demand for Inputs			
(1.5)	$x^O_{(is)j} = x_j - (p_{(is)} - \sum_{r=1}^{2}\alpha^O_{(ir)j}p_{(ir)})$	$i = 1,...,9$ $s = 1,2$ $j = 1,...,9$	162	Demand for intermediate inputs by source
(1.6)	$x^O_{(10,1)j} = x_j - [p_{(10,1)j} - (\alpha^O_{(10,1)j}p_{(10,1)j} + \alpha^O_{(10,2)j}p_{(10,2)j})]$	$j = 1,...,9$	9	Demand for labor
(1.7)	$x^O_{(10,2)j} = x_j - [p_{10,2)j} - (\alpha^O_{(10,1)j}p_{(10,1)j} + \alpha^O_{(10,2)j}p_{(10,2)j})]$	$j = 1,...,9$	9	Demand for capital
	Zero Pure Profits			
(1.8)	$p_{(j1)} = \sum_{i=1}^{9}\sum_{s=1}^{2}p_{(is)}S^O_{(is)j} + p_{(10,1)}S^O_{(10,1)j} + p_{(10,2)j}S^O_{(10,2)j}$	$j = 1,...,9$	9	Zero pure profits in production
(1.9)	$\pi_j = \sum_{i=1}^{9}\sum_{s=1}^{2}p_{(is)}S^I_{(is)j}$	$j = 1,...,9$	9	Zero pure profits in capital creation
(1.10)	$p^*_{(i1)} + v_i + \phi = p_{(i1)}$	$i = 1,...,9$	9	Zero pure profits in exporting
(1.11)	$p^*_{(i2)} + t_i + \phi = p_{(i2)}$	$i = 1,...,9$	9	Zero pure profits in importing
	Market Clearing			
(1.12)	$x_{(i1)} = \sum_{j=1}^{9}x^O_{(i1)j}B^O_{(i1)j} + x^I_{(i1)}B^I_{(i1)} + x^H_{(i1)}B^H_{(i1)} + x^E_{(i1)}B^E_{(i1)} + x^G_{(i1)}B^G_{(i1)}$	$i = 1,...,9$	9	Demand equals supply for domestically produced commodities
(1.13)	$l = \sum_{j=1}^{9}x^0_{(10,1)j}W^O_{(10,1)j}$		1	Demand for labor equals employment of labor
(1.14)	$x^O_{(10,2)j} = k_j(0)$	$j = 1,...,9$	9	Demand equals employment of capital in each industry

Table A1 (continued)

Equations of the CGE Model in Linear Percentage Change Form

No.	Equation	Subscript Range	No.	Description
	Miscellaneous Equations)			
(1.15)	$c = f_c + \Phi_1[\sum_{j=1}^{9}(p_{(10,1)j} + x^0_{(10,1)j})N_{(10,1)j}]$ $+\Phi_2[\sum_{j=1}^{9}(p_{(10,2)j} + x^0_{(10,2)j})N_{(10,2)j}] + \Phi_3 t - \Phi_4 v$		1	Consumption function
(1.16)	$c_R = c - \xi^H$		1	Real aggregate consumption
(1.17)	$y_R = \sum_{j=1}^{9} W^I_j y_j$		1	Aggregate real investment
(1.18)	$k_j(1) = k_j(0)(1 - G_j) - 100\Delta D_j G^*_j + y_j G_j$	$j = 1, ..., 9$	9	Capital accumulation
(1.19)	$\xi^H = \sum_{i=1}^{9}\sum_{s=1}^{2} p_{(is)} W^H_{(is)}$		1	Consumer price index
(1.20)	$x_{(i2)} = \sum_{j=1}^{9} x^O_{(i2)} B^O_{(i2)} + x^I_{(i2)} B^I_{(i2)} + x^H_{(i2)} B^H_{(i2)} + x^G_{(i2)} B^G_{(i2)}$	$i = 1, ..., 9$	9	Import volume
(1.21)	$m = \sum_{i=1}^{9}(p^*_{(i2)} + x_{(i2)})M_{(i2)}$		1	Foreign currency value of imports
(1.22)	$e = \sum_{i=1}^{9}(p^*_{(i1)} + x^B_{(i1)})E_{(i1)}$		1	Foreign currency value of exports
(1.23)	$100\Delta B = (Ee - Mm)$		1	Balance of trade
(1.24)	$p_{(10,1)j} = \xi^H h + f_{(10,1)j} + f_{(10,1)}$	$j = 1, ..., 9$	9	Flexible handling of wages
(1.25)	$t = \sum_{i=1}^{9}[\zeta^t_i t_i + p^*_{(i2)} + x_{(i2)}]T^t_i$		1	Aggregate tariff revenue
(1.26)	$v = \sum_{i=1}^{9}[\zeta^v_i v_i + p^*_{(i1)} + x^B_{(i1)}]T^v_i$		1	Aggregate export subsidies
(1.27)	$gdp = \sum_{i=1}^{9} V_j x_j$		1	Real gross domestic product
(1.28)	$f_R = c_R - y_R$		1	Ratio of real aggregate consumption to real investment
		Total =	480	

Table A2

Variables of the Model in Percentage Change Form

Variable	Subscript Range	Number	Description
x_j	$j = 1, ..., 9$	9	Industry outputs
$x^O_{(is)j}$	$i = 1, ..., 9$	162	Demands for inputs for current production
	$j = 1, ..., 9; s = 1, 2$		
$x^O_{(10,1)j}$	$j = 1, ..., 9$	9	Industry demand for labor
$x^O_{(10,2)j}$	$j = 1, ..., 9$	9	Industry demand for capital
$x^I_{(is)j}$	$i = 1, ..., 9$	162	Demands for inputs (domestic and imported)
	$s = 1, 2; j = 1, 2, ..., 9$		for capital creation
y_j	$j = 1, 2, ..., 9$	9	Sectoral capital formation
$x^H_{(is)}$	$i = 1, ..., 9$	18	Household demand for domestic and imported goods
$x^B_{(i1)}$	$i = 1, ..., 9$	9	Export demands
$x^G_{(is)}$	$i = 1, ..., 9; s = 1, 2$	18	Government demands
$p_{(is)}$	i = 1,...,9; s = 1,2,...,9	18	Price of good i from source s
$p_{(10,1)j}$	$j = 1, ..., 9$	9	Wage rate
$p_{(10,2)j}$	$j = 1, ..., 9$	9	Rental rate on capital
$p^*_{(i1)}$	$i = 1, ..., 9$	9	Foreign currency export prices (f.o.b.)
$p^*_{(i2)}$	$i = 1, ..., 9$	9	Foreign currency import prices (c.i.f.)
π_j	j = 1,...,9	9	Cost of units of capital
c		1	Nominal aggregate consumption
$f^B_{(i1)}$	i = 1,...,9	9	Export demand shift variable
$f^G_{(is)}$	i = 1,...,9; s = 1,2	18	Government demand shift variable
ϕ		1	Nominal exchange rate
v_i	$i = 1, ..., 9$	9	One plus the ad valorem export subsidies
t_i	$i = 1, ..., 9$	9	One plus the ad valorem tariffs
$k_j(0)$	$j = 1, ..., 9$	9	Employment of capital in each industry
$k_j(1)$	$j = 1, ..., 9$	9	Future capital stocks
$100\Delta D_j$	$j = 1, ..., 9$	9	Depreciation rate
c_R		1	Real aggregate consumption
y_R		1	Real aggregate investment
ξ^H		1	Consumer price index
$x_{(i2)}$	$i = 1, ..., 9$	9	Aggregate imports by commodity
l		1	Aggregate employment
ΔB		1	Balance of trade
e		1	Foreign currency value of exports
m		1	Foreign currency value of imports
$f_{(10,1)j}$	$j = 1, ..., 9$	9	Shift term for sectoral wages
$f_{(10,1)}$		1	Aggregate wage shift variable
gdp		1	Real gross domestic product
t		1	Aggregate tariff revenue
v		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 =	573	

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.
$\alpha^O_{(ir)j}$	Share of commodity i from source r (domestic or imported)in industry j's purchases of i for current production.
$\alpha^I_{(ir)j}$	Share of commodity i from source r (domestic or imported) in sector j's purchases of i for capital creation.
$\alpha^O_{(10,1)j}$	Share of wages in total primary factor costs of industry j.
$\alpha^O_{(10,2)j}$	Share of rentals in total primary factor costs of industry j.
$S^O_{(is)j}$	Share of industry j's production costs represented by intermediate inputs good i from source s.
$S^O_{(10,1)j}$	Share of industry j's production costs represented by labor inputs.
$S^O_{(10,2)j}$	Share of industry j's Production costs represented by capital inputs.
$S^I_{(is)j}$	Share of industr j's investment costs represented by input i from source s.
$B^O_{(i1)j}$	Share of the total sales of domestic good i absorbed by industry j as intermediate inputs.
$B^I_{(i1)}$	Share of the total sales of domestic good i used in capital creation.
$B^H_{(i1)}$	Share of the total sales of domestic good i used in household consumption.
$B^E_{(i1)}$	Share of the total sales of domestic good i absorbed by exports.
$B^G_{(i1)}$	Share of the total sales of domestic good i absorbed by the government demand.
$W^O_{(10,1)j}$	Share of industry j in aggregate employment.
W^I_j	Share of total investment accounted for by industry j.
G_j	Ratio of gross investment to next period capital stock of sector j.
G^*_j	Ratio of the current capital stock to next-period capital stock of sector j.
$W^H_{(is)}$	Expenditure weight of good i from source s in the consumer price index.
$B^O_{(i2)j}$	Share of the total sales of imported good i absorbed by industry j as intermediate inputs.
$B^I_{(i2)}$	Share of the total sales of imported good i absorbed by capital creation.
$B^H_{(i2)}$	Share of the total sales of imported good i absorbed by household consumption.
$B^G_{(i2)}$	Share of the total sales of imported good i absorbed by the government demand.
$M_{(i2)}$	Share of total foreign currency costs accounted for by imported good i.
$E_{(i1)}$	Share of total foreign currency export earnings accounted for by exported good i.
E	Aggregate foreign currency value of exports.
M	Aggregate foreign currency value of imports.
h	Wage indexation parameter.
Φ_i	Share in domestic income accounted for by wage income, tariff revenue, export subsidies and capital income.
$N_{(10,1)j}$	Share of industry j in total wage payments.
$N_{(10,2)j}$	Share of industry j in total returns to capital.
ζ^t_i	Ratio of the power of the tariff on good i to the ad valorem rate.
T^t_i	Share of total tariff revenue accounted for by tariffs on good i.
ζ^v_i	Ratio of the power of the export subsidy on good i to the ad valorem rate.
T^v_i	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
$p^*_{(i2)}$	$i = 1, ..., 9$	9	Foreign currency import prices (c.i.f.)
t_i	$i = 1, ..., 9$	9	One plus the ad valorem tariffs
v_i	$i = 1, 2, 4$	3	One plus the export subsidy for the major export commodities
$x^B_{(i1)}$	$i = 3, 5, ..., 9$	6	The export volumes for the minor export commodities
$f^B_{(i1)}$	$i = 1, ..., 9$	9	Export demand shift variables
$k_j(0)$	$j = 1, ..., 9$	9	Employment of capital in each industry
$f^G_{(is)}$	$i = 1, ..., 9$	18	Shifts in government demands
	$s = 1, 2$		
$100\Delta D_j$	$j = 1, 2, ..., 9$	9	Depreciation rate
π_j	$j = 1, 2, ..., 9$	9	Cost of units of capital
$f_{(10,1)j}$	$j = 1, ..., 9$	9	Shift term for sectoral wages
$f_{(10,1)}$		1	Aggregate wage shift variable
ϕ		1	Nominal exchange rate
f_c		1	Shift in the average propensity to consume
	Total =	93	