AN EMPIRICAL ANALYSIS OF TARIFF ENDOGENEITY IN AUSTRALIA, 1904-1974

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Introduction

Conventional wisdom in economics has long held that, with some exceptions, free trade represents the optimal policy regime for small open economies. Despite the apparent fact that few, if any, exceptional cases existed in the Australian economy (Corden, 1968), tariffs have been widely applied in Australia since the nineteenth century (Horridge, 1988). This ostensibly anomalous outcome has led to a widening of the search for reasons to explain trade protection in Australia to include models of political economy. In essence, neoclassical political economy postulates that whilst impediments to free trade may be economically inefficient in aggregate, they might nonetheless generate politically efficient equilibria. An embryonic empirical literature on the question of tariff endogeneity in Australia already exists in the form of Conybeare (1978) and Anderson (1980). The present paper seeks to make at least some contribution to this literature.

The paper itself is subdivided into five main areas. Section 1 provides a brief overview of work on endogenous protection, and attempts to locate the present study within this research paradigm. Section 2 sets out the specific hypotheses under empirical evaluation, and Section 3 describes the research methodology employed. The results of these procedures are examined in Section 4. The paper ends with some concluding remarks in Section 5.

1. Overview of Endogenous Protection

Magee, Brock and Young (1989) have identified three broad genre of economic theories which sought to explain the existence of protectionist trade policies. Firstly, "policy theories" viewed the various inhibitions on international trade as policy instruments aimed at achieving certain policy targets. However, tariffs are usually a relatively inefficient means of achieving common policy objectives (Vousden, 1990). Secondly, "terms of trade theories" are premised on the notion that tariffs enable individual nations to redistribute economic welfare from other countries towards themselves. But these theories predict that the optimal protection regime for small economics resides in no tariffs. And thirdly, "political theories" which attempt to explain the pattern of tariff protection by means of domestic political considerations.

A vast research effort has been invested in endogenous protection theory¹. In general work in this area has focused on "... the issue of the determinants of trade policies and to explaining the level of protectionism (or its mirror image, the degree of trade liberalisation) in different countries - in terms of political and economic characteristics of the various classes of society" (Quibria, 1989, p.107). Accordingly, both the composition and the level of trade protection are seen as the outcome of maximising behaviour by interest groups and other actors in the political process. Thus, a demand for trade protection arises from producer groups and other vested interests, whereas supply of protective policies stems from elected politicians, and in political markets of this kind trade policies perform an analogous equilibrating function to prices in competitive economic markets. Two types of endogenous protection models have been developed. Complete endogenous models attempt to explain both the level of lobbying activity and the resultant policy mix, whilst partial endogenous models seek to explain either the amount of lobbying or the policy outcome. The present study employs a partial endogenous model in order to explain the historical level of tariff protection in Australia.

In broad terms, work on the question of tariff endogeneity has proceeded in two directions. Firstly, some researchers have focussed on endogenous special interest tariffs following Magee, Brock and Young (1989); here tariffs are explained as the outcome of lobbying activity by specific special interest groups. A second, alternative, line of inquiry known as "endogenous median voter tariffs" was developed by Mayer (1984), and rests on the premise that tariffs are set at a level which maximises the welfare of the median voter. The model employed in the present context falls into the first of these two categories.

Empirical efforts at testing endogenous special interest theory have adopted various techniques, including time series analysis. The rationale underlying empirical procedures which use time series analysis has been summarised by Bohara and Kaempfer (1991, p.958) as follows:

"Time-series analysis of the political economy of protection rest upon the presumption that over time the strengths, size, or political effectiveness of the interest groups active in the creation of trade policy will vary. In general, these time-series analyses have been aggregative in nature, and therefore macroeconomic variables, like unemployment, inflation, and real GNP are modelled as the factors that act on the effectiveness of the interest groups. Thus, for instance, in periods of high unemployment, protectionist interest groups gain political strength by employing the image of 'unfair foreign competition stealing away domestic jobs.' Time-series analysis thus posits a 'tariff cycle' in which the compensation or insurance effects of protection ebb and flow ..."

¹ For extensive surveys of this literature see Baldwin (1985), Magee, Brock and Young (1989), Quibria (1989), and Vousden (1990).

Conybeare (1978) and Anderson (1980) provide the two best known studies of tariff endogeneity in Australia. Both analyses employ partial endogenous tariff models and fall into the endogenous special interest tariff genre. Each empirically tested alternative endogenous models on the structure of tariffs so that in total four models of structural tariff endogeneity in Australia were investigated by these two studies.

Conybeare (1978) applied a combination of the techniques employed by Caves (1976) and Helliener (1977) in their work on Canadian tariffs. The specific hypotheses tested by Conybeare (1978, p.51) are set out below:

"Rational actor theory: Tariff policy is determined by a collective national preference for certain macro-level political, social and economic goals. Business interest group theory: Tariff policy is determined by the interests and influence of business firms whose goals are micro-economic in nature, being related to the firms' growth, markets, profits and industry characteristics. Labour interest group theory: Tariff policy is determined by the interests of wage labour in each industry, where labour policy towards tariffs is related primarily to its effects on employment and wage levels."

Anderson (1980), p.132) proceeded along similar lines in his investigation of "why some industries receive more government assistance than others". He argued that "the existing structure of assistance approximates a political market equilibrium state determined by two sets of factors: those affecting the incentives for vested interest groups to demand government assistance, and those affecting the government's incentives to supply assistance" (Anderson, 1980, p.132), and accordingly changes in either of these categories of factors will lead to shifts in the equilibrium level of protection. Anderson's (1980) work represented an extension of previous studies in the area by including all manufacturing industries, and not just the import competing sector.

Both Anderson (1980) and Conybeare (1978) used cross sectional data and multiple regression techniques in their respective attempts at explaining the structure of tariffs in Australia. Each acknowledged that numerous problems existed with the data, and Anderson (1980, p. 138) in particular noted that "... because of the disruptions which occurred from about 1973" and institutional changes within the Tariff Board and its successor, the Industries Assistance Commission (Anderson, 1980, fn.10), data drawn from the early 1970's may be suspect. Both studies employed the effective and nominal tariff rate as dependent variables.

Conybeare (1978) found results congruent with the comparable Canadian studies, and especially evidence to support the labour interest group theory. Anderson's (1980) results were similar but somewhat more specific. He concluded that an industry is likely to receive a higher level of assistance the more labour-intensive the industry, the smaller its value added share of output, the more lobbying support (or less opposition), the less the industry is growing, the

lower the average wage rate per employee in the industry, the greater the share of imports in domestic sales, the smaller the number of firms in the industry, the more concentrated the share of output, the less turnover per firm, the lower the natural protection via transport costs, the larger the number of employees in the industry, the more covert and the less government outlay in the assistance, the less the share of production exported, and the more marginal the electorates in which the industry is located and the more significant the industry in those electorates.

Both Conybeare (1978) and Anderson (1980) attempted to explain the structure of Australian protection over a relatively short time period. In contrast, the present paper aims to establish evidence of long-term tariff endogeneity within the political system. Moreover, whilst Conybeare (1978) and Anderson (1980) indicated that the structure of protectionism is endogenous to the politico-economic system in Australia, this study seeks to establish whether the level of protection is also endogenous to the politico-economic system in Australia, this study seeks to establish whether the level of protection is also endogenous to the politico-economic system in Australia. It thus follows empirical work on the level of endogenous protection in the United States over the long-run initiated by Magee and Young (1987), and developed further by Magee, Brock and Young (1989), and Bohara and Kaempfer (1991). In essence, this emerging literature uses time-series analysis to explore "... the interrelationship between general political pressure, as measured by fundamental macroeconomic variables, and the level of protection from a historical point of view" (Bohara and Kaempfer, 1991, p.953).

2. Model and Hypotheses

In general, the theory of endogenous protection postulates that "... protection can be explained by those exogenous variables that drive the behaviour of special interests and general interests who favour or oppose protection" (Magee, Brock and Young, 1989, p.183). Moreover, Magee, Brock and Young (1989, p.177) argue that in the particular case of protection in the United States "the U.S. variables explaining U.S. tariffs since 1900 are the labour-capital ratio, the terms of trade, the real foreign exchange rate, the unemployment rate, and the inflation rate". In their analysis of U.S. protectionism from 1890 to 1970, Bohara and Kaempfer (1991) employ real GNP, a GNP deflator, the unemployment rate and the real trade balance as explanatory variables. The dependant variable used by both Magee and Young (1987) and Bohara and Kaempfer (1991) was average tariffs. However, average tariffs were calculated slightly differently in each case. Magee and Young (1987) calculated average tariffs as total net customs revenue divided by the total value of imports, while Bohara and Kaempfer (1991) computed average tariffs as total net customs revenue divided by the total value of dutiable imports.

The formation of an explanatory economic model depends *inter alia* on *a priori* theoretical considerations and pragmatic factors such as data availability and suitability. The present study uses a combination of the variables employed by Magee and Young (1989) and Bohara and

Kaempfer (1991) for which appropriate Australian data are obtainable. Explanatory variables comprise real GDP per capita, unemployment rate, retail price index, real trade balance, and an average wage index.² The dependent variable is the average tariff rate as defined by Magee and Young (1989). Variables likely to be important in the Australian context but which are not included due to data problems are the terms of trade and the capital-labour ratio. Exchange rates are not incorporated since they remained fixed over the sample period, which extends from 1903/04 to 1973/74, or some 70 years.

The selection and calculation of both the dependent and independent variables can be justified on various theoretical and practical grounds. The selection of an endogenous variable has been largely dictated by data availability. The optimal dependent variable would measure changes in the tariff portion of the effective rate of protection, and thus would not involve the distortions contained in average tariffs. Moreover, Bohara and Kaempfer's (1991) definition of an average tariff would have been desirable, since it only includes those industries actually receiving protection. However, data restrictions dictated that the dependent variable conform to Magee and Young's (1987; 1989) definition of average tariffs as the total value of imports divided by total net customs revenue. Specified in this way, the average tariff is a suitable, if somewhat inefficient, dependent variable since it does include variations in the proportion of the value of imports paid as tariffs over time. However, a major problem with the use of average tariffs generally resides in variations in the level (and therefore value) of imports. These variations occur both as a result of cyclical fluctuations and as a result of changes in the level of protection³.

The explanatory variables employed in the model require similar assessment and *ex ante* indication of expected signs. Real GDP per capita may be construed as negatively related to the level of protection. If high growth in GDP per capita occurs, then presumably profits, employment and exports are increasing, and so pro export lobby groups will predominate in reducing or at least maintaining tariff levels. Conversely, if low growth in GDP per capita occurs, then worsening domestic economic conditions should favour protectionist lobby groups in the political process.

The rate of unemployment, defined as the average number of economically active persons unemployed as a proportion of the total labour force in given time period, may be anticipated as being positively related to the level of tariffs. The argument underlying this expectation is straight forward; "increased unemployment should render voters less hostile to the protection of jobs, and hence should increase the supply of protection even while it increases the demand for

² See appendix, Table 1, for data definitions and data sources.

³ The problems associated with average tariffs as an independent variable are well-documented (see, for example, Ray (1981) and Lavergne (1983)). However, no straightforward methods of eliminating these problems apparently exists.

protection (via compensation behaviour by labour)" (Magee, Brock and Young, 1989, p.187), and vice versa.

The retail price index acts as a proxy for the inflation rate. It is not possible to establish unambiguous *a priori* theoretical expectations of the relationship between the rate of inflation and the level of protection. In essence, the problem resides in the countervailing effects of inflation on tariffs. Bohara and Kaempfer (1991, p.953/954) summarise the issue as follows:

"Inflation will have two alternative impacts on the level of protection. Either higher inflation will lead to more imports and thus to pressure for more protection or higher prices will lead to consumers as voters demanding less protection in order to lesson inflation".

The trade balance in real terms measures the amount by which the value of exports exceeds the value of imports. If imports surpass exports and a negative trade balance results, domestic political pressure for higher tariffs may increase. Moreover, large negative trade balances may mitigate against retaliation by international trading partners thereby dampening arguments against heightened protectionism. Accordingly, the level of protection is expected to be negatively related to the real trade balance.

Empirical work on the structure of protection has shown the industry wage to be a major determinant of the structure of tariffs⁴. In general, labour-intensive, low-wage industries appear to consistently experience higher levels of protection than capital-intensive, high-wage industries. Increases in the average wage should thus include political pressure for tariff rises. There should thus be a positive relationship between the average wage index and the level of protection.

Table 1 below summarises the theoretical expectations of the signs associated with the explanatory variables:

Table	1
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Expected signs of the explanatory variables			
Variable	Expected sign		
Real GDP per capita	Negative		
Unemployment rate	Positive		
Read trade balance	Negative		
Retail price index	Positive or Negative		
Average wage index	Positive		

Expected signs of the explanatory variables

⁴ See, for instance, Kahane (1992) and Ray (1981).

3. Methodology

Figure 1 below shows the average tariff level, or the equilibrium value of the dependent variable, from 1903/04 to 1973/74



Figure 1

Average tariffs 1903/04-1973/74

Sources: Australian Bureau of Statistics (1986) and Butlin (1977).

Shifts in the average tariff rate (AT) are modelled explicitly as a function of several macroeconomic indicators comprising real GDP per capita (RCGDP), the unemployment rate (UN), the retail price index (CPI), the real trade valance (RTR), and the average wage index (AWI). Following Bohara and Kaempfer (1991) the relationships between the level of protection and the various macroeconomic explanatory variables are analysed by means of a vector autoregressive (VAR) model. An advantage of this procedure resides in the fact that VAR models, unlike their single equation and structural econometric counterparts, do "... not require any stringent 'a priori' assumptions regarding exogeneity and endogeneity" (Bohara and Kaempfer, 1991, p. 954). The general structure of a VAR model may be expressed as follows:

$$Z_{t} = \sum_{j=1}^{m} D_{j} Z_{t-j} + \eta t$$
 (1)

Where Z_t is an (N*1) vector of dependent variables;

Dj's are (N*N) matrices of lags of all other variables in the system;

 η_t is an (N*1) stochastic error term which satisfies the orthogonality conditions:

$$E_t[\eta_t^m Z_t - k'] = 0$$

Aspects of the nature of available data may reduce the model's efficiency or cause bias within the model. Prior to testing and correcting, data must be transformed by being logged and first differenced. Logging serves to remove non-stationarity of the variance which is often present within long samples of time series data. Taking first differences of logged data produces sample data in the form of rates of change. Logged data are preceded by an upper case L. Tests were applied to the data for unit roots and cointegration. In essence, unit root testing involves testing for non-stationarity of the mean of the data, a problem often associated with macroeconomic time series data. Pre-testing for unit roots also assists in testing for cointegration by identifying variables of differing orders.

Amongst the many tests available for unit root the present study employed the standard augmented Dicky - Fuller (DF) test and the Phillips - Peron (PP) test. Although both tests are open to substantial criticism, DF tests may have special problems because they embody the assumption that error terms represent white noise. Given this, where discrepancies between the DF test and PP test arose, the PP test was regarded as definitive. All variables excepted LRTR were found to be integrated of order one I (1). On this basis all the first difference form of all variables except LRTR were used in the VAR model.

Cointegration takes place when some long-run linear combination of variables integrated of the same degree occurs which is stationary, and the use of OLS estimators in the presence of cointegration is inefficient. In the present context, two standard tests of cointegration were undertaken, namely the Phillips test and the augmented Dickey - Fuller test. Given the fact that the latter test has been criticised *inter alia* as highly sensitive to the order of autoregression of differences, the Phillips test was regarded as superior when the outcomes of the tests were in conflict. Pairwise testing with lags of one, two, three and four periods, as well as combinations with three, four and five variables were undertaken following Engle and Granger (1987)⁵. Of all these analyses, only one combinated tested positive (ie. LAT, LCPI, LAWI and LUN). This combination tested positive to cointegration on all four lag lengths using the Phillips test⁶.

These testing procedures identified two problems present within the data. Firstly, all of the variables except LRTR exhibit the characteristics of integration of order one I (1). This is

⁵ Variable LRTR was not included due to the fact that it has been found to be stationary.

⁶ A full set of results is available from the authors on request.

readily solved by first differencing the variables. The second problem resides in the appearance of cointegration among several of the I (1) variables. A relatively straightforward solution is to run an error correction model (ECM) rather than a VAR model (Engle and Granger, 1987; 1991; Engle and Yoo (1987).

Although ECM models possess similar characteristics to VAR models, the structure of ECM formulations are somewhat more restrictive due to cross equation restrictions imposed by the error correction term. Estimation of ECM models typically follows a two step procedure. An initial stage involves running an OLS regression on the cointegrated variables from which the residuals are saved as a vector Z_t . The residuals are then lagged one period, and included as a variable in the VAR model which then acts as an ECM model. The ECM model is shown as equation (2) below:

$$Z_{t} = \alpha Z_{t-1} + \sum_{j=1}^{m} D_{j}^{m} Z_{t-j} + \eta_{t} \qquad \dots (2)$$

Equation (2) is identical to equation (1), except that an error correction term (Z_{t-1}) has been added.

The lag structure of a model is important. An inappropriate lag structure will reduce the efficiency of the model by either removing relevant information (too short a lag length), or by reducing the available degrees of freedom and increasing the data required with no gains in information or efficiency (too long a lag length). Moreover, questions concerning the appropriate lag length may be partially answered by pragmatic data requirements. Tests for lag length are usually based on log - likelihood ratios, residual variances and information criteria. The two procedures employed in the current context sought to test additional lags for standard constraints; additional information versus loss of efficiency (Akaike information criterion (AIC)), and normality of the residuals (Jarque - Bera sympotic normative test). The lag length which both minimised the AIC, or is longer than the length which minimised the AIC, and for which the Jarque - Bera test indicates normality of the residuals, was taken as the correct lag length.

A set of specific hypotheses adapted from Bohara and Kaempfer (1991, p.956) outlined in Table 2 below were tested⁷:

⁷ Bohara and Kaempfer (1991) used twelve specific hypotheses. The additional two hypotheses employed here arise from the inclusion of the average wage index within the model.

Table 2

Hypotheses

H1: Tariffs do not cause changes in the level of real GDP per capita.

H2: Tariffs do not cause changes in the level of unemployment.

- H3: Tariffs do not cause changes in the level of the retail price index.
- H4: Tariffs do not cause changes in the real trade balance.
- H5: Tariffs do not cause changes in the level of the average wage index.
- H6: Tariffs do not cause changes in the level of tariffs.
- H7: Unemployment does not cause changes in the level of tariffs.
- H8: Real GDP per capita does not cause changes in the level of tariffs.
- H9: The retail price index does not cause changes in the level of tariffs.
- H10: The average wage index does not cause changes in the level of tariffs.
- H11: Unemployment and real GDP per capita do not cause changes in the level of tariffs.
- H12: The real trade balance, unemployment and real GDP per capita do not cause changes in the level of tariffs.
- H13: The real trade balance, unemployment, real GDP per capita, retail price index and the average wage index do not cause changes in the level of tariffs.
- H14: The real trade balance, real GDP per capita, retail price index and the average wage index do not cause changes in the level of tariffs.

Source: Adapted from Bohara and Kaempfer (1991, p.956)

Hypotheses H1 to H5 test whether changes in the level of tariffs have any effect on the explanatory macroeconomic variables, whereas hypotheses H6 to H12 endeavour to determine the effects of movements in the explanatory macroeconomic variables on tariff levels.

The tests of the direction of Granger causality within the VAR model estimated by OLS followed Malliaris and Urrutia (1992). Criticisms of Granger-type causality tests include possible model misspecification and parameter bias due to the presence of correlation within much economic data, as well as the effects of lag lengths, detrending and pre-filtering (Sarker, 1993). The question of causality within ECM models presents somewhat different problems. Whilst Granger (1988, p.551) noted that where cointegration is present causality follows as a necessary consequence, Malliaris and Urrutia (1992) have ignored this and tested ECM models for Granger causality via F-tests identical to those used on VAR models. This approach is flawed since it fails to take into account that portion of the explanatory variables' influence

which is included in the error correcting term (Granger, 1988b). Granger (1988b) suggests that testing both parts of these models will provide an indication of the full causality of the models. The method used in this context to conduct these tests was to estimate Granger's two step procedure via non-linear least squares and use F-tests on restricted and unrestricted versions. However, many of the criticisms of causality tests on VAR models cited above also apply here. Moreover, Lutkepol (1990) has argued that this procedure may be incorrect since extra information contained in the variance - covariance matrix is required for an accurate analysis.

4. Results

Table 3				
Hypothesis		Model		
<u> </u>	ECM	Result	VAR	Result
H1	-1.018	Not rejected	0.69	Not rejected
H2	-5.290	Not rejected	1.44	Not rejected
H3	-0.706	Not rejected	4.29**	Rejected
H4	-0.893	Not rejected	0.98	Not rejected
Н5	-1.437	Not rejected	2.47*	Rejected
H6	26.583**	Rejected	1.45	Not rejected
H7	-1.073	Not rejected	0.26	Not rejected
H8	5.824**	Rejected	0.77	Not rejected
H9	4.632**	Rejected	4.43**	Rejected
H10	10.830**	Rejected	3.01*	Rejected
H11	-0.825	Not rejected	0.77	Not rejected
H12	1.7855	Not rejected	1.18	Not rejected
H13	1.165	Not rejected	1.97*	Rejected
H14	2.818*	Rejected	2.20*	Rejected

The results of the procedures outlined in the previous section are summarised in Table 3 below:

Notes: The values listed above are the calculated F-statistics associated with the VAR and ECM models.

** Shows rejection at the 5 per cent level.

* Shows rejection at the 10 per cent level.

The hypotheses were rejected if they were rejected at the 10 per cent level.

The VAR Model

Hypotheses H1, H2 and H4 are all rejected by the VAR model indicating that average tariffs do not Granger cause changes in GDP, unemployment, or the real trade balance. The results for H4 are surprising, since tariffs were expected to influence the real trade balance, at least in the short-run. Various explanations are possible. Changes in the level of tariffs may have insufficient influence on the total value of imports or exports in the short-run to affect the real trade balance materially. Alternatively, changes in the level of tariffs may affect both imports and exports in approximately equivalent proportions thereby neutralising any aggregate change.

The hypotheses that changes in the level of tariffs do not Granger cause either the retail price index or the average wage index were rejected. However, the effects of changes in the average rate of protection on the retail price index are somewhat ambiguous since the first lag has a negative sign, the second a positive sign, and the third is both extremely small and statistically insignificant. This suggests an increase in the average tariff level will induce the theoretically unlikely event of a decrease in the level of prices in the short-run. The observed medium-term influence of an increase in prices would generally be expected in the short-run. This may be due to small market effects in Australia. Following an increase in tariffs, the restriction on imports may result in a relatively large increase in market size for Australian producers. The competition for the extra market size in the short-run may hold retail prices down while over the medium term they will tend towards a parity level.

Average tariffs also cause changes in the level of the average wage index. The first lag effect is small and statistically insignificant, while the second is positive. The positive relationship may indicate the increases in the level of average tariffs cause an increase in the average wage index following a lag of two years. The effect could be explained by the lobby groups in Australia. Both unions and business groups have lobbied strongly for protection, and the structure of protection has generally favoured manufacturing, and especially those in low wage manufacturing industries. Unions would expect, as a reward for their lobbying, a pay rise for their members. The average wage index from 1903 to 1948-49 was based on an average male factory worker in Victoria. Since this group is the most affected by protection, an increase in protection may disproportionately favour the group covered by the sample. Therefore domestic adjustment in wages is likely to follow from changes in the level of protection. This result provides evidence in favour of the redistributive arguments for protection in Australia (Anderson and Garnaut, 1987).

Hypotheses H6 to H14 test whether the explanatory macroeconomic variables are Granger causing changes in the level of average tariffs. Of these hypotheses only four indicate that the level of protection may be endogenous to the politico-economic system. Failure to reject hypotheses H6, H7 and H8 suggests the level of per capita GDP, unemployment and the real trade balance do not affect the level of average tariffs, contrary to *a priori* theoretical considerations. The two hypotheses which were clearly rejected were H9 and H10, suggesting

that causality is present in both directions for the retail price index and the average wage index. The results show that the consumer price index is negatively related to average tariffs, whilst the average wage index is positively related to average tariffs. The presence of a negative relationship between the consumer price index and average tariffs may imply that consumers and industries which are able to import inputs have more lobbying power than import-competing firms. Since much of the inflation in Australia over the sample period may have been due to excess demand, import competing firms might have had little power to lobby for increased protection during periods of high inflation. Consumers and importers are able to lobby strongly for reduced protection during these periods as it can more effectively be argued that if will not harm the domestic industries.

Changes in the level of average tariffs are also caused by changes in the average wage index. This may suggest that businesses have lobbied strongly and successfully for increased protection on the basis of increased costs. The mutual causality would tend to suggest that this triggers further lobbying for wage increases. The presence of a non-Labor government for long periods over the later half of the sample period would suggest that lobbying for increased protection was via business lobby groups to comparatively conservative governments. If a Labor government was in power much of lobbying might occur via the union movement on behalf of wage earners. The implication here is that the power of a lobby group is dependent upon its relationship to government. Businesses are able to lobby a conservative government while labour groups are able to lobby a labor government. Labour groups may also lobby businesses for wage increases following tariff rises, suggesting that the success accruing to individual groups of lobbying for protection may not have been known by the participants themselves.

Some difficulty is created by the lack of significance of per capita GDP, unemployment and the real trade balance. For much of the period in question conservative governments were in power, suggesting little policy influence by the labour interest groups. Under the conditions outlined above it can be expected that GDP would remain a significant variable. If the reductions in GDP were to be concentrated among the workers, with little relatively little lobbying power, rather than the capital owners with substantial lobbying power, the capital owners would not necessarily lose unless costs are also rising substantially. Hence there would be a causal relationship between the average wage and average tariffs, but not GDP per capita and average tariffs.

The real trade balance also does not Granger cause changes in the levels of tariffs. Many scholars, including Anderson and Garnaut (1987), have postulated that domestic factors have more importance than international factors. However, the use by Australia and other countries of the tariff as a policy to affect the trade balance in the early 1950s suggests that a negative relationship should exist. ECM model test results indicate that this is at least possible.

The remaining hypotheses deal with combinations of the above hypotheses. Where the average wage index and the retail price index are involved, the hypothesis of no causal effect is rejected. The results here are not surprising considering the strong influence of the average wage index and the retail price index which are likely to dominate the remaining variables. The results give some weak support to the theory of tariff endogeneity. However, the existence of mutual causality in both the significant variables creates uncertainty as to the strength of the results. The results indicate the tariffs are Granger caused by different influences in Australia from the U.S. Since the VAR model is subject to criticism on various grounds, further work may be able to confirm or offer alternative results with more empirical strength.

ECM Results

As previously noted the presence of cointegration necessarily indicates causality (Granger, 1988a). However, the direction of causality has not been indicated. Malliaris and Urrutia (1992) do not address the question of whether F-tests are appropriate for an ECM model and simply proceed to conduct Granger causality tests via the same method used above. Here we use F-tests following Granger's (1988b) suggested methods to test the direction of causality. This is despite the criticisms expressed by Sarker (1993), Lutkepol (1990), and Lutkepol and Reimers (1993). The test procedure involves estimating Granger's two-step procedure in one step using non-linear least squares, and testing using F-tests on restricted and unrestricted models.

Causality tests on hypotheses H1 to H5 fail to reject all hypotheses. It is surprising that the real trade balance is not affected by the average tariff rate in either model. However, this may provide evidence against the effectiveness of protection as a policy to affect a country's external balance. It is also surprising that tariffs are not a significant cause of the retail price index.

Causality tests on hypotheses H6 to H10 indicate that the real trade balance, real GDP per capita, the retail price index, and the average wage index all cause changes in the level of tariffs to some extent. Unemployment does not cause changes in the level of tariffs, and is probably the reason why hypotheses H11, H12 and H13 are not rejected, while H14 is rejected. Possible explanations for unemployment remaining insignificant were set out above in the VAR results and are not repeated here. The results of this model are not appropriate for structural analysis. However, the signs of the coefficients are as expected in each case. The ECM, subject to criticisms by Sarker (1993), Lutkepol (1990), and Lutkepol and Reimers (1992), provides strong support for tariff endogeneity in Australia.

5. Concluding Remarks

The theoretical predictions of neoclassical political economy concerning tariff endogeneity have received substantial support from empirical work undertaken in a United States' national

context. Moreover, similar evidence has emerged in the fledgling literature on endogenous protection in Australia. The findings of this paper provide further limited evidence in favour of the theory of tariff endogeneity. The weight of evidence presented in this study leads to the tentative conclusion the tariffs are endogenous to the main macroeconomic indicators, namely per capita GDP, the unemployment rate, the retail price index, the real trade balance and the average wage index, on the basis of the ECM results. However, the VAR results indicate that tariffs are exogenous to the main macroeconomic indicators. On the basis of these conflicting results it is not possible to categorically reject the null hypothesis of tariff exogeneity. However, the study supports the importance of the average wage index in changes to the tariff level apparent in the structural studies by Anderson (1980) and Conybeare (1978). Despite the weakness of the empirical results, it may be deduced that the analysis, adapted from a similar model for the United States (Bohara and Kaempfer, 1991), may not be directly applicable to the Australian political environment. The results also seem to indicate that the tariff board was at least partially successful in "reducing pressures on political leaders from interest groups and to reduce the need for leaders to chose between conflicting interests" (Anderson and Garnaut, 1987, p.46).

APPENDIX

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Table 1

Data definitions and sources

Variable	Definition and Source		
Average Tariff	Definition: Net customs and primage duty divided by total value of imports.		
	Source: Net Customs and Primage: Australian Bureau of Statistics (ABS), Official Statistical Publications on Microfiche (Publications issued by Canberra Office, 1901-1984).		
	Imports: Butlin (1977 pp. 78-80) A Preliminary Annual Database 1900/01 to 1973/74.		
Real GDP	Definition: GDP at market prices.		
per capita	Source: Source Book of Australian Criminal and Social Statistics (1988)		
	Definition: The average number of persons unemployed as a		
Unemployment Rate	proportion of the labour force.		
	Source: Source Book of Australian Criminal and Social		
	Statistics (1988, p. 84-85)		
Retail Price Index	Definition: Single series consists of linking together selected		
	retail price index series from 1901 to 1914, the A		
	series index, 1914 to 1946-47, the C series index,		
	1946-47 to 1948-49, a combination of the C series		
	and the CPI, and post 1948-49 the CPI.		
	Source: ABS 1992 Australia Year Book (1992, p. 525).		
Real Trade Balance	Definition: Total imports minus total exports and then divided		
	by the retail price index.		
	Source: Imports: Butlin (1977, p. 78-80).		
	Exports: Butlin (1977, p. 78-80).		
	Retail Price Index: ABS (1992, p. 525).		
	Definition: 1900/01 to 1948/49 Victorian male factory worker		
Average Wage Index	average earnings. 1948/49 to present is the ABS		
	male unit average weekly earnings.		
	Source: Butlin (1977, p. 87-89).		

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