

Protection for Sale and Trade Liberalization: an Empirical Investigation

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Abstract

The paper uses Grossman and Helpman's "protection for sale" model (1994) to analyze the process of trade liberalization that has occurred in Australia. First, this paper verifies that the predictions of the "protection for sale" model are consistent with the data. Then, it analyzes the endogenous dimension of the Australian experience of trade liberalization. The estimated structural parameters imply that the process of trade liberalization has been driven by increases in both the fraction of the voting population represented by lobbies, and the government's relative valuation of welfare (the former playing the more prominent role).

1. Introduction

When countries embark on a process of unilateral trade liberalization, most observers predict that a period of backsliding is not far away. The main reason for this skepticism is the existence of groups with a vested interest in maintaining tariff protection. However, the Australian experience stands in contrast to these predictions, managing to transform itself from a country where protectionism flourished under the "midway" doctrine and "made to measure" protection in the 1960s to become a low-tariff country in the 1990s.¹ This transformation is even more remarkable given that it was conceived and implemented almost entirely outside the GATT framework. How has this trade liberalization been achieved in an environment where interest groups are so prominent and policy is relatively unconstrained by international agreements? The objective of this paper is to provide an answer to this question by viewing the process of trade liberalization from the perspective of the "protection for sale" model (Grossman and Helpman, 1994).

This model is adopted for two reasons. First, it yields clear predictions for the cross-sectional structure of tariff protection. Hence, as a first step this paper checks to see whether the predictions of the "protection for sale" model are consistent with the data. Second, the model can be used to analyze the endogenous dimension of the Australian experience of trade liberalization. This ability to provide a structural interpretation arises because estimation of the model allows two key parameters to be identified. These parameters are: government's relative valuation of welfare to political contributions (a), and the fraction of the voting population represented by lobbies (α_L). Both of these parameters play an important role in the model, with higher values of either associated with a more liberal trade policy, holding other things constant. The implied behavior of these structural parameters over the period considered can provide some insight into the factors that have been driving the process of trade liberalization in Australia.

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The contribution of this study is twofold. First, it applies the “protection for sale” model to Australian data, offering a closer match between the underlying assumptions of the model and the structure of the economy than available in previous studies. The previous studies (Gawande and Bandyopadhyay, 2000; Goldberg and Maggi, 1999) have both estimated the model using US data for 1983 and suffer from three main problems. First, these studies have used information based on nontariff barriers. However, the predictions of the model depend on the nature of the protective instrument analyzed, with tariffs and quantitative restrictions producing different predictions (Maggi and Rodriguez-Clare, 2000). Second, the “protection for sale” model assumes that trade policy is influenced only by domestic political considerations. However, the conduct of post-World War II US trade policy has been conditioned to a large extent by its participation in the GATT and its many rounds of trade negotiations. Once again the appropriate analysis of trade policy in this environment is not the basic “protection for sale” model but an augmented model (Grossman and Helpman, 1995). Finally, these studies assume that the US is a small country, when it seems more appropriate to treat the US as a large country and amend the model in the appropriate manner. The present study avoids these problems as Australia is a small country and for the periods studied did rely predominantly on tariffs as a tool to encourage industrial development. The flexibility that Australia enjoyed in the use of tariffs came from its special status within the GATT as a “midway” country and consequently gained exemption from applying tariff cuts or even binding tariffs. Hence the environment in which Australian trade policy operated in the two periods examined aligns closely with the assumptions of the “protection for sale” model.

The second contribution this paper makes is its structural interpretation of the factors which have contributed to the process of trade liberalization. Previous econometric studies have relied on reduced-form specifications to analyze the changes in the structure of Australian tariffs (Anderson, 1980). While these studies have indicated that the estimated coefficients appear to have changed magnitude and even signs over time, the reduced-form nature of the models make it impossible to interpret the meaning of such changes. In contrast this paper is able to confirm that the patterns of protection in Australia in the periods 1968 and 1992 are consistent with the “protection for sale” model. Furthermore, the estimation of structural parameters enables tests to be conducted on hypotheses concerning the factors underlying the process of trade liberalization. The first hypothesis examined is that government preferences have changed. This view is described in the Australian trade policy literature as “economic rationalism” (Walsh, 1993). To test this hypothesis, the estimated weight that the government puts on social welfare is compared across the two periods. A second hypothesis which is prominent in the literature is that changes in the way pressure groups operated was important for trade liberalization. In particular it has been argued that tacit agreements not to lobby against proposed tariff increases in other sectors was undermined (Ewer et al., 1987; Glezer, 1982). The breakdown of such agreements, resulting in greater opposition from other lobby groups, is tested by comparing the estimates of the fraction of the population represented by lobby groups across the two periods. Both of these hypotheses find some support in the data, with the changes in the role of lobby groups appearing to be more robust.

2. Protection for Sale and Intermediate Inputs

This section briefly reviews the “protection for sale” model and provides the straightforward extension to include an intermediate input. The version of the model pre-

sented is slightly simpler than set out in Grossman and Helpman (1994) and follows the general structure of Goldberg and Maggi (1999), although the model yields exactly the same predictions under either formulation.

A small economy is populated by a continuum of individuals with identical preferences but different endowments. The population size is assumed to equal one. The preferences are given by

$$u = x_0 + \sum_{i=1}^n u_i(x_i),$$

where x_0 is consumption of good 0, x_i is consumption of good i , and u_i is an increasing concave function. With these preferences demand for good i is given by $x_i = d_i(p_i)$, where $d_i(\cdot)$ is the inverse of $u_i(x_i)$. The indirect utility of an individual with expenditure E is given by $V(p, E) = E + \sum_{i=1}^n s_i(p_i)$, where $s(p) = u(d(p)) - pd(p)$.

There are $n + 1$ final goods and one importable intermediate input. Good 0 (the *numéraire*) is produced using only labor, with constant returns to scale and an input coefficient equal to one, so the wage is also equal to one. Each of the other final goods is produced using labor, the intermediate input, and a sector-specific input. The intermediate input is produced using labor and a sector-specific input. The return to the specific factor used to make the intermediate input depends only on its domestic price, q , and is denoted by $\pi_{n+1}(q)$. The return to a specific factor used in the production of final good i depends on both p_i and q and is denoted by $\pi_i(p_i, q)$. Note that by Hotelling's lemma $\partial\pi_i(p_i, q)/\partial p_i = y_i$, where y_i is the supply function for good i .

The government's choice of policy instruments is restricted to trade taxes and subsidies. These policies drive a wedge between domestic prices and the (exogenous) world prices (p_i^* and q^*). The government redistributes the revenue from operating trade policy by equal lump-sum transfers to all citizens.

Summing indirect utility over all individuals, and noting that aggregate income is the sum of labor income, returns to the specific factors, and tariff revenue, then aggregate welfare is

$$W = 1 + \pi_{n+1}(q) + \sum_{i=1}^n \pi_i(p_i, q) + \sum_{i=1}^n (p_i - p_i^*)m_i(p_i, q) + (q - q^*)m_{n+1}(q) + \sum_{i=1}^n s_i(p),$$

where m_i and m_{n+1} are imports of the final and intermediate goods, respectively.

Suppose that in some subset of the final goods and intermediate input sectors $L \subset \{1, 2, \dots, n, n + 1\}$ the owners of the specific factors are able to form a lobby. Let α_j denote the fraction of people who own specific factor j . Assume that each individual owns a unit of labor and at most one type of specific factor. Summing indirect utilities over all individuals who belong to lobby j and rearranging, we obtain the lobby's aggregate wellbeing

$$W_j = \pi_j + \alpha_j \left(1 + \sum_{i=1}^n (p_i - p_i^*)m_i + (q - q^*)m_{n+1} + \sum_{i=1}^n s_i(p) \right)$$

Lobby j 's objective is to maximize $W_j - C_j$, where C_j is the contribution paid to the government. The government's objective is to maximize a combination of welfare and contributions:

$$G = \sum_{j \in L} C_j + aW,$$

where a represents the government's valuation of welfare relative to contribution and is assumed to be nonnegative.

To derive the equilibrium trade policies, Grossman and Helpman assumed that the interaction between the government and the lobbies took the form of a "menu auction." Here we will follow Goldberg and Maggi (1999) and assume that the trade policies are the outcome of a Nash bargaining game. At the Nash bargaining solution, trade policies are selected to maximize the joint surplus of all parties involved. Joint surplus is given by²

$$\Omega = \sum_{j \in L} W_j + aW,$$

which can be rewritten as

$$\begin{aligned} \Omega = & \sum_{i=1}^n (a + I_i)\pi_i + (a + I_{n+1})\pi_{n+1} \\ & + (a + \alpha_L) \left(1 + \sum_{i=1}^n (p_i - p_i^*)m_i + (q - q^*)m_{n+1} + \sum_{i=1}^n s_i(p) \right), \end{aligned}$$

where $\alpha_L \equiv \sum_{j \in L} \alpha_j$ represents the fraction of the population that is represented by lobbies, and I_j is an indicator variable that takes on the value of one if $j \in L$ and zero otherwise. The first-order condition with respect to the domestic price of final good i is

$$\frac{\partial \Omega}{\partial p_i} = (a + I_i) \frac{\partial \pi_i(p_i, q)}{\partial p_i} + (a + \alpha_L) \left[-d_i + (p_i - p_i^*) \frac{\partial m_i}{\partial p_i} + m_i + (q - q^*) \frac{\partial m_{n+1}}{\partial p_i} \right] = 0$$

Using Hotelling's lemma and rearranging gives

$$\frac{t_i}{1 + t_i} = \frac{I_i - \alpha_L}{a + \alpha_L} \frac{y_i}{m_i} \frac{1}{e_i} + t_q \frac{\partial m_{n+1}}{\partial p_i} \frac{q^*}{m_i} \frac{1}{e_i}, \quad (1)$$

where t_i is the *ad valorem* tariff on good i , t_q is the *ad valorem* tariff on the intermediate input, and e_i is the import demand elasticity of final good i .

The model makes three clear predictions about the cross-sectional structure of tariff protection. First, for organized sectors the level of protection increases with y_i/m_i . This follows since the political power of an organized sector is reflected in the ratio of domestic output to imports. In sectors with large domestic output, the owners of the specific factors have more to gain from an increase in the domestic price, while (for a given import demand elasticity) the economy has relatively less to lose from protection when the volume of imports is low. Second, sectors with high import elasticities will receive less protection. This arises since, in sectors with high import elasticities, the deadweight loss from protection is also high, so the government is less willing to grant protection. Finally, tariffs on final goods are an increasing function of the tariff on the intermediate good.

Two special cases which play a prominent role in the analysis below are worth noting. First, if all of the voting population is represented by lobbies ($\alpha_L = 1$) then free trade is the equilibrium outcome. In this situation the competing claims of the lobby groups neutralize one another and the joint surplus of all lobbies taken as a whole coincides with the welfare of society. Second, if the government does not value political contributions ($a = \infty$), then free trade is the equilibrium outcome. In this instance the government has no incentive to impose tariffs as they only lower aggregate welfare. Given

that Australia has substantially reduced tariffs over the period considered, it is of interest to see what the model implies about the behavior of these parameters.

3. The Econometric Model

Equation (1) forms the basis of the model specification. In order to empirically implement this model, a stochastic version is specified with an additive normally distributed error term. Following Goldberg and Maggi, the import demand elasticity is brought to the left-hand side, giving the following empirical model:

$$\frac{t_i}{1+t_i} e_i = \beta_1 \frac{y_i}{m_i} + \beta_2 I_i \frac{y_i}{m_i} + \sum_{j=1}^7 \beta_{j+2} D_j t_i^q + \varepsilon_i, \tag{2}$$

where $\beta_1 = -\alpha_L/(a + \alpha_L)$, $\beta_2 = 1/(a + \alpha_L)$, and D_j is a dummy variable that equals one if an industry belongs to industry group j and zero otherwise. The inclusion of this dummy variable is to allow the coefficient on the intermediate input tariff to vary between industries. Since it is not possible to estimate a separate coefficient for each industry, seven relatively similar industry groups were identified.³

This empirical specification of the model makes clear the innovation contained in the “protection for sale” model. Whereas previous studies employ a structure where the import penetration ratio enters additively (Anderson, 1980; Trefler, 1993), the current model interacts the import penetration ratio with the political organization dummy. Therefore, the model predicts that the relationship between tariffs and import penetration depends fundamentally on whether or not an industry is organized.

The objective of this paper is to use the “protection for sale” model to interpret the forces that have been driving the Australian experience in trade liberalization. As a first step the model is estimated to determine whether it is consistent with the data. This consistency check involves examining the signs of the β along with $\beta_1 + \beta_2$ to see whether they are in line with the predictions of the model. Consistency requires $\beta_1 < 0$, β_2 through $\beta_9 > 0$, and $\beta_1 + \beta_2 > 0$. If the model is consistent with the data, then the structural parameters can be identified owing to the one-to-one relationship between β_1 and β_2 and a and α_L . Provided these parameters fall within the feasible ranges ($\alpha_L \in [0, 1]$ and $a \geq 0$) the “protection for sale” model can be used to characterize the forces that have been driving the Australian process of trade liberalization. However, in order to estimate equation (2) a number of issues relating to the construction of the variables and the endogeneity of the regressors need to be discussed.

4. Data

The variables on the left-hand side are *ad valorem* tariffs and import demand elasticities. The focus on tariffs rather than other protective instruments is due to tariffs being the dominant form of protection used in Australia in the 1960s, with the first cross-sectional pattern of tariffs we consider being those in place in 1968/69. Australia’s ability to use tariffs as a discretionary policy instrument was related to its special status within the GATT system as a “midway” country. Australia argued that it was “midway” between an industrialized country and a developing country, with the former characteristic due to its high per capita income and the latter due to its heavy reliance on primary products for export income. Gaining “midway” status was important for Australia since agriculture was effectively removed from GATT discipline in the mid-1950s, with the implication being that if Australia lowered its tariff barriers on

industrial goods it could not gain adequate reciprocity in terms of market access for its major export commodities. Consequently Australia was not an active participant in the Kennedy or Tokyo rounds of trade barrier reductions, and up until the completion of the Uruguay round it had only a small number of tariffs subject to bindings. This absence of tariff bindings meant that Australia had the scope to use tariffs as a discretionary policy instrument in a manner that few other industrialized countries could without being subject to multilateral discipline (Crawford, 1968; Snape et al., 1998).

There are two dimensions to this policy environment which are important for estimating the “protection for sale” model. First, the focus on tariffs is important because the predictions of the “protection for sale” model don’t necessarily hold when other trade barriers such as quantitative restrictions are imposed (Maggi and Rodriguez-Clare, 2000). Second, the tariffs were not subject to the discipline of the GATT and therefore could be set with the same degree of discretion as assumed in the “protection for sale” model. In contrast, if tariffs are constrained by the GATT then the appropriate model would be that of “trade wars and trade talks” set out in Grossman and Helpman (1995).

The import demand elasticities are taken from Sawers (1988). Sawers used a trade expenditure function approach, with estimates derived from a translog specification which was applied to annual data over the period 1968/69 to 1982/83. Since these are the only estimates of elasticity available they will be used in both periods. As with previous studies of the “protection for sale” model, the inclusion of import elasticities raises two issues for estimation: the endogeneity of the elasticities, and concerns about using a variable measured with error. The approach taken here, following Goldberg and Maggi, is to move e_i to the left-hand side. This transformation allows the parameters of the model to be identified and is therefore a feasible estimation strategy. It is also an appropriate estimation strategy since endogenous variables are represented on the left-hand side and exogenous variables are on the right-hand side. Therefore the issue of endogeneity of e_i is addressed directly. The inclusion of e_i as a left-hand-side variable also addresses the issue of measurement error directly, since the noise associated with using estimates of e_i is incorporated directly into the error of the estimated equation. Consequently the estimated parameters are consistent (Greene, 1990).

Of the right-hand-side variables, the political organization dummies are the most difficult to find an empirical analogue to match the theoretical ideal. In the model an industry is organized if it makes financial contributions. However, data on contributions are not available at a sufficiently disaggregated level to allow an assignment to particular industries, let alone determine the extent to which the contributions are directed towards influencing trade policy. Instead a more pragmatic approach is adopted to assess the extent to which an industry is politically organized.

The approach adopted in this paper uses information on Australian trade policy institutions in order to infer which industries are organized.⁴ Since 1921 the operation of trade policy in Australia has been reviewed by an independent advisory body. In the first instance this body was known as the Tariff Board, but since then it has experienced a number of name and operational changes.⁵ The advice this body offered on trade policy came in two forms: mandatory and optional. As part of its mandatory advice the Tariff Board was obliged to inquire into any increase, decrease, or deferment of any existing or proposed duty. Therefore, any variation in the tariff schedule warranted a report by the Tariff Board. However, between 1940 and 1960 the major protective instruments were quantitative restrictions, imposed mainly to achieve external balance. After 1960 and the abolition of import licensing, tariffs once again emerged

as the major protective instrument. This change in protective regimes allows an inference to be made about which industries were organized. In particular, if an industry was able to initiate an inquiry to have its tariff revised, after the quantitative restrictions had been removed, it will be defined as a politically organized sector. Note that this measure does not directly account for the structure of tariffs, since not all inquiries in this period resulted in tariff increases.⁶ Nevertheless an industry had to be organized to get an inquiry initiated since over 90% of the inquiries were started at industries' request (Glezer, 1982). That is, unless an industry was organized it was not considered for a tariff increase.

The construction of the political organization dummies employed the following procedure: an industry was defined as politically organized, and consequently assigned a value of one, if a Tariff Board report was prepared on it between 1960 and 1969. The first date of 1960 coincides with the abolition of import licenses, while the cutoff date of 1969 matches the date for which the first set of tariff observations are made in the current study. Information on whether a Tariff Board report was made on a particular industry is contained in Industries Assistance Commission (1974) which is an index of Tariff Board reports classified by industry from 1921 to 1973. This index of reports contains information disaggregated to the Australian standard industrial classification industry class, which is more disaggregated than required. In order to aggregate the information to the Australian standard industrial classification group level, the number of politically organized classes within a group was tallied up and divided by the number of total classes within that group (e.g., if a group contained five classes but only one received a report within the relevant period then the political organization variable would record a value of one-fifth). The construction of the political organization variable in this way reflects an effort to capture some of the additional information that was available in the data in a manner that is consistent with the theoretical model. The resulting index is between zero and one, and reflects the degree of organization within an industry.

The remaining variables are the inverse import penetration ratio and the *ad valorem* tariffs on the intermediate inputs. The inverse import penetration ratio is taken from Industry Commission (1995a) and is defined as the value of domestic output in industry i divided by the value of imports in industry i . The tariff on the intermediate input, t_i^q , is taken from Industries Assistance Commission (1976) and Industry Commission (1995a) and is constructed as the weighted average of the tariffs on intermediate inputs used in industry i .

A difficulty in estimating the model using the variables as they are currently defined is that they are all likely to be correlated with the error term. The political organization variable is likely to be endogenous by construction. On the other hand, both the inverse import penetration ratio and the tariff on the intermediate inputs are endogenous variables in the complete system that describes the determination of trade policy and trade volumes. For this reason the model is estimated by two-stage least squares. The process of two-stage least squares employed estimates of the political organization variable in a probit model, while the inverse import penetration ratio and the intermediate input tariff are both estimated using ordinary least squares.⁷ The common set of instruments are divided into two groups: those that affect the probability of being politically organized (concentration ratio, number of firms, employment size, and wage bill), and those that account for comparative advantage (amount of physical capital, human capital—professional & technical employees and administrative and executive employees, and labor used in each sector). The Appendix gives a complete list of data definitions and sources.

5. Econometric Estimates

The dual purpose of this paper is to check the consistency of the “protection for sale” model with the data and also use this model to interpret the process of trade liberalization that has occurred in Australia. The static nature of the model calls for cross-sectional analysis, which is conducted for two periods, 1968/69 and 1991/92. The focus is on the manufacturing sector with the level of aggregation constrained by the availability of estimates of the import demand elasticity. Consequently, 34 observations are recorded for each period. Table 1 provides the summary statistics for both periods.⁸

The results from two-stage least squares for 1968/69 are presented in Table 2. These results are consistent with the “protection for sale” model, with $\beta_1 < 0$, β_2 through $\beta_9 > 0$, $\beta_1 + \beta_2 > 0$, and all the estimated coefficients are statistically significant. In other words, the results confirm the model’s prediction that the relationship between tariff protection and import penetration depends on whether or not a sector is organized. In particular, the sign and statistical significance of β_1 confirms the positive relationship between import penetration and tariff protection in unorganized industries. Furthermore, the sign and statistical significance of $\beta_1 + \beta_2$ confirms the prediction of a negative relationship between tariff protection and import penetration in politically organized industries. Finally, the sign and statistical significance of estimates of β_3

Table 1. Summary Statistics

Variable	1968/69		1991/92	
	Mean	SD	Mean	SD
Tariff (%)	24.9	13.1	11.9	13.1
Intermediate tariff (%)	17.9	12.5	6.4	4.9
Organizational dummy	0.59	0.31	0.59	0.31
Penetration ratio (m_i/y_i)	0.23	0.36	0.42	0.55
Import elasticity	2.59	1.47	2.59	1.47

Table 2. “Protection for Sale” Model Estimates: 1968/69

Parameter	Estimate	Standard error	t-statistic
β_1	-0.022	0.012	-1.84
β_2	0.025	0.013	1.91
β_3	2.73	0.59	4.63
β_4	3.11	0.82	3.81
β_5	2.64	1.41	1.87
β_6	1.89	0.93	2.03
β_7	1.30	0.51	2.56
β_8	3.82	0.75	5.09
β_9	4.15	1.02	4.09
$\beta_1 + \beta_2$	0.0022	0.0009	2.44
a	40.88	14.63	
α_L	0.88	0.004	

through β_9 verifies a positive relationship between the tariff on the intermediate input and the final good.

The support that the “protection for sale” model finds in the 1968/69 data offers an opportunity to examine the endogenous dimension of the Australian process of trade liberalization. This process of trade liberalization has been substantial and has seen the average tariff in the manufacturing sector decline from 25% to under 12% over the period 1968/69 to 1991/92. Not surprisingly, a large literature has focused on documenting both the consequences and motivations for this decline in protection. The “protection for sale” model offers an opportunity to test a number of these hypotheses about the factors which have contributed to this process of trade liberalization. The ability to test hypotheses comes directly from the structural parameters recovered from the data.

The first hypothesis considered is that the process of trade liberalization is due to a change in government preferences. This view is described in the Australian trade policy literature as “economic rationalism” (Walsh, 1993). To test this hypothesis, the estimated weight that the government puts on social welfare is compared across the two periods. A second hypothesis which is prominent in the literature is that changes in the way pressure groups operated was important for trade liberalization. In particular it has been argued that tacit agreements not to lobby against proposed tariff increases in other sectors was undermined (Ewer et al., 1987; Glezer, 1982). The breakdown of such agreements, resulting in greater opposition from other lobby groups, is tested by comparing the estimates of the fraction of the population represented by lobby groups across the two periods.

The decision to analyze 1991/92 does not reflect a completion of the process of trade liberalization. Indeed, the process of trade liberalization has continued in Australia. Instead 1991/92 represents the last period for which data are collected under the same industry definitions as in 1968/69. A second data issue that emerges relates to the political economy dummies and the import demand elasticities. A lack of data for 1991/92 imposed the constraint that the same raw data for these variables had to be used in the estimates for both 1968/69 and 1991/92.⁹ Despite this shortcoming, as is described below, the results for 1991/92 produced parameter estimates that were both feasible and significant.

The results for 1991/92 are presented in Table 3. Once again the model finds broad support in the data with β_1 and β_2 having the hypothesized signs and being statistically significant, while $\beta_1 + \beta_2$ has the predicted sign but is not significant. In addition β_3 through β_9 all have the correct sign and four out of the seven are statistically significant.

Turning to the two hypotheses, the implied values of a and α_L are reported in Tables 2 and 3. In support of the “economic rationalism” hypothesis, the implied value of a is higher in 1991/92 than in 1968/69. However, the difference between these two estimates is not statistically significant. On the other hand, the implied value of α_L is higher in 1991/92 than in 1968/69 and this difference is significant. This provides strong support for the hypothesis that changes in lobbying behavior is an important factor underlying the process of trade liberalization.

To gain a sense of the relative importance of the change in the structural parameters, the average predicted value of the dependent variable in 1968/69 was calculated using the implied structural parameters for both 1968/69 and 1991/92.¹⁰ This calculation uses the mean values of the regressors and assumes that in aggregate the manufacturing industry is politically organized (i.e., the political organization dummy is set equal to one).¹¹ The substitution of the estimated parameters reduced the predicted

Table 3. "Protection for Sale" Model Estimates: 1991/92

<i>Parameter</i>	<i>Estimate</i>	<i>Standard error</i>	<i>t-statistic</i>
β_1	-0.022	0.013	-1.75
β_2	0.023	0.013	1.75
β_3	6.77	1.17	5.76
β_4	4.52	2.64	1.71
β_5	3.51	4.28	0.82
β_6	4.00	3.84	1.04
β_7	3.10	4.23	0.73
β_8	5.42	1.64	3.29
β_9	6.80	2.76	2.46
$\beta_1 + \beta_2$	0.0009	0.003	0.32
a	43.41	21.36	
α_L	0.96	0.003	

Table 4. Sensitivity Analysis for 1968/69

<i>Omitted instrument</i>	β_1	β_2	$\beta_1 + \beta_2$	a	α_L
<i>Comparative advantage</i>	-0.020	0.022	0.002	46	0.91
<i>Human capital1/labor</i>	-0.027	0.030	0.003	35	0.92
<i>Human capital2/labor</i>	-0.014	0.016	0.002	63	0.88
<i>Capital/labor</i>	-0.019	0.021	0.002	49	0.90
<i>Political economy</i>	-0.042	0.048	0.005	22	0.89
<i>Concentration ratio</i>	-0.017	0.018	0.001	55	0.94
<i>Number of firms</i>	-0.022	0.024	0.002	43	0.92
<i>Employment</i>	-0.006	0.009	0.003	128	0.84
<i>Wage bill</i>	-0.025	0.028	0.003	36	0.89

value of the dependent variable substantially, with 10% of this reduction due to the increase in a and the remaining 90% due to the increase in α_L . From this perspective, the estimated increase in the fraction of the voting population represented by lobbies has played the more prominent role in the process of trade liberalization.

Sensitivity Analysis

One concern about the above results is the prominent role that instrumental variables have played in their estimation. It is of particular interest to determine how sensitive the results are to the choice of instruments used. Tables 4 and 5 address this issue and present results for nine different specifications for both periods, each containing a different set of instruments. The variables listed in the left-hand column are the instruments that have been omitted from the estimated model. For each specification the values of β_1 , β_2 , and $\beta_1 + \beta_2$ are reported, along with the implied values of a and α_L .¹² For 1968/69, the estimated results appear to be remarkably robust, with all of the model's predictions being satisfied and the implied values of a and α_L within the feasible ranges. Consequently, the predictions of the "protection for sale" model appear to be robust to various choices of instruments for 1968/69.

Table 5. Sensitivity Analysis for 1991/92

Omitted instrument	β_1	β_2	$\beta_1 + \beta_2$	a	α_L
<i>Comparative advantage</i>	-0.017	0.016	0.0001	62	1.02
Human capital1/labor	-0.029	0.031	0.002	33	0.93
Human capital2/labor	-0.023	0.024	0.002	42	0.94
Capital/labor	-0.026	0.027	0.0001	38	0.96
<i>Political economy</i>	0.014	-0.015	-0.0001	-66	0.90
Concentration ratio	-0.023	0.024	0.0001	43	0.96
Number of firms	-0.023	0.024	0.0001	43	0.96
Employment	-0.014	0.014	0.0001	71	0.96
Wage bill	-0.017	0.017	0.0001	61	0.97

For 1991/92, the results are somewhat more mixed. In eight of the nine cases the signs of β_1 and β_2 are consistent with the predictions of the “protection for sale” model. The sole violation of the predictions occurs when all the political economy factors are omitted. In this instance the predicted signs of β_1 and β_2 no longer hold. A separate violation of the model occurs when all the comparative advantage variables are omitted and $\beta_1 + \beta_2$ records a sign opposite to that predicted. Leaving aside these two instances, it is the case that the implied values of α_L are higher in 1991/92 than in 1968/69. On the other hand, the results for the predicted value of a are more mixed, with the predicted value of a in 1991/92 only being greater than the predicted value of a in 1968/69 in two of the seven times the parameters had feasible values. This suggests that the conclusion that increases in α_L played a role in the process of trade liberalization are robust, while the role of a is less clear.

6. Conclusion

The Australian experience of trade liberalization is interesting because it has been a process of unilateral liberalization rather than one that has been brought about through GATT negotiations. To gain an understanding of the factors that have driven this process of unilateral trade liberalization, this paper estimated a structural model based on Grossman and Helpman’s “protection for sale” framework. This produced two broad conclusions. First, it was verified that the predictions of the “protection for sale” model are consistent with the data in both 1968/69 and 1991/92. This consistency is important as it then allowed the endogenous dimension of the Australian experience of trade liberalization to be analyzed. This was done by estimating the two key parameters of the model: the government’s relative valuation of welfare to political contributions, and the fraction of the voting population represented by lobbies. The estimated structural parameters implied that the process of trade liberalization has been driven by increases in both the fraction of the voting population represented by a lobby, and the government’s relative valuation of welfare (the former playing the more prominent role).

Appendix

This appendix sets out the definition of the variables and their sources. All variables are classified according to the 1983 version of the Australian Standard Industrial Classification (ASIC) definition of industry group.

- *Ad valorem* tariff on final goods (t_i), domestic output (y_i), and imports (m_i) are taken from Industry Commission (1995a).
- *Ad valorem* tariff on intermediate good (t_q): 1968/69 from Industry Assistance Commission (1976) and 1991/92 from Industry Commission (1995a).
- Industry dummies (D_j):
 $D_1 = \text{ASIC 215 to 243}$, $D_2 = \text{ASIC 251 to 262}$, $D_3 = \text{ASIC 271 to 273}$, $D_4 = \text{ASIC 281 to 284}$, $D_5 = \text{ASIC 291 to 316}$, $D_6 = \text{ASIC 321 to 332}$, $D_7 = \text{ASIC 341 to 344}$.
- Elasticity of import demand (e_i) is from Sawers (1988).
- Political organization dummy (I_i) is constructed from Industries Assistance Commission (1974).
- *Capital* = real net capital stock: 1968/69 is taken from Lattimore (1989). A comparable series was not available for 1991/92, therefore it was extrapolated, using an exponential specification, from the information in Lattimore (1989).
- *Human capital 1* = number of administrative, executive, and managerial employees: The 1968/69 estimates use data taken from the 1971 Census of Population and Housing. The 1991/92 estimates use data taken from the 1991 Census of Population and Housing.
- *Human capital 2* = number of professional and technical employees. The 1968/69 estimates use data taken from the 1971 Census of Population and Housing. The 1991/92 estimates use data taken from the 1991 Census of Population and Housing.
- *Labor* = employment by industry group. The 1968/69 estimates use data taken from the 1971 Census of Population and Housing. The 1991/92 estimates use data taken from the 1991 Census of Population and Housing.
- *Employment* is from Industry Commission (1995b).
- *Concentration ratio* = share of four largest firms in the industry group's turnover. 1968/69 is taken from Australian Bureau of Statistics (1972). The Australian Bureau of Statistics did not publish concentration ratios at the group level in 1991/92. As an alternative the concentration ratio closest to 1991/92 was used; this was from 1988.
- *Number of firms* is from Industry Commission (1995b).
- *Wage bill* is from Industry Commission (1995b).

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Notes

1. For a discussion of the "midway" doctrine and "made to measure" protection, see Arndt (1965) and Corden (1967). For a commentary on reform over this period, see Corden (1996) and Pomfret (1995).
2. The menu auction approach adopted by Grossman and Helpman provides a microfoundation for the different weights associated with the various groups in society.
3. The Appendix contains a list of industries in each group.
4. The institutional information given below is drawn primarily from Glezer (1982) and Crawford (1968).
5. The Tariff Board has since evolved to the Industries Assistance Commission (IAC), the Industry Commission (IC), and currently the Productivity Commission (PC).
6. Over 25% of inquiries resulted in no tariff increase.
7. For the parameter estimates associated with the first stage of the procedure, see McCalman (2000). The inclusion of a probit specification for the political organization variable in the first stage follows Maggi and Goldberg (1999).
8. Note that the data on the organizational dummy and the elasticity of import demand are the same for both periods. This is a reflection of data constraints.
9. While the raw data from 1968/69 were used for the political economy dummy, the instruments used in the 1991/92 estimates of equation (2) use data for 1991/92.
10. Remember that the dependent variable is not *ad valorem* tariffs but $t_i/(1 + t_i)e_i$. Therefore the calculation does not directly generate an implied reduction in *ad valorem* rates of protection.

11. This exercise is conducted only to determine the relative importance of the changes in the two estimated structural parameters. It is not intended to be a calculation that decomposes the change in the predicted value of the dependent variable into all possible influences contained in the model. In particular, changes in both comparative advantage and tariffs on intermediate inputs are not considered.

12. In order to keep the dimension of the tables manageable, the estimates for β_3 through β_9 have been omitted. These estimates all had the predicted sign for the sensitive analysis carried out below.