

Belfrage, Carl-Johan

**Working Paper**

## Special Interest Politics and Trade Policy – An Empirical Challenge

Working Paper, No. 2005:31

**Provided in Cooperation with:**

Department of Economics, School of Economics and Management, Lund University

*Suggested Citation:* Belfrage, Carl-Johan (2004) : Special Interest Politics and Trade Policy – An Empirical Challenge, Working Paper, No. 2005:31, Lund University, School of Economics and Management, Department of Economics, Lund

This Version is available at:

<https://hdl.handle.net/10419/259915>

**Standard-Nutzungsbedingungen:**

Die Dokumente auf EconStor dürfen zu eigenen wissenschaftlichen Zwecken und zum Privatgebrauch gespeichert und kopiert werden.

Sie dürfen die Dokumente nicht für öffentliche oder kommerzielle Zwecke vervielfältigen, öffentlich ausstellen, öffentlich zugänglich machen, vertreiben oder anderweitig nutzen.

Sofern die Verfasser die Dokumente unter Open-Content-Lizenzen (insbesondere CC-Lizenzen) zur Verfügung gestellt haben sollten, gelten abweichend von diesen Nutzungsbedingungen die in der dort genannten Lizenz gewährten Nutzungsrechte.

**Terms of use:**

*Documents in EconStor may be saved and copied for your personal and scholarly purposes.*

*You are not to copy documents for public or commercial purposes, to exhibit the documents publicly, to make them publicly available on the internet, or to distribute or otherwise use the documents in public.*

*If the documents have been made available under an Open Content Licence (especially Creative Commons Licences), you may exercise further usage rights as specified in the indicated licence.*

# Special Interest Politics and Trade Policy - An Empirical Challenge

Carl-Johan Belfrage\*  
Department of Economics  
Lund University  
Box 7082  
S-220 07 Lund

June 3, 2004

## Abstract

The model of protectionist support for individual industries as an endogenous outcome of special interest politics pioneered by Grossman and Helpman (1994) is generalized and then empirically examined using data for a number of OECD countries and regions. Cross-sectional regressions are performed on the full sample, as well as on individual countries. The model generally holds up quite well to this empirical challenge. The estimates indicate that equilibrium ratios of special interest to general interest marginal utilities (with respect to protection levels) vary positively with protection levels as the theory has led us to expect. Terms of trade concerns seem important to the larger countries in our sample as implied by the present generalization of the GH model (as well as by the optimum tariff literature), but the influence of downstream interests does not come across in the estimates. The results seem robust also to inclusion of variables reflecting exogenous political concerns (indicated as relevant in other studies), although those bring a substantial addition to predictive power which strengthens the impression that (what is endogenously derived in) the GH model only captures a limited share of the considerations underlying trade policy decisions.

JEL classification: F13. Keywords: Trade policy; Lobbying; Special interest groups

---

\*I wish to thank Luca de Benedictis, Rod Falvey, Rikard Forslid, and Göte Hansson for helpful comments on earlier drafts of this paper. Financial support from the Tore Browaldh Foundation, the Swedish Institute of International Affairs, the Crafoord Foundation, and the Foundation for Advancement of Economic Research at Lund University is gratefully acknowledged.

# 1 Introduction

A number of political economy oriented empirical studies of cross-industry variations in trade policy have been performed, e.g. by Anderson and Baldwin (1987), Ray (1981), Ray (1987), Marvel and Ray (1983), Conybeare (1983), Godek (1986), Frey (1984), Lee and Swagel (1994), and Trefler (1993). While those studies have lent support to the case that special interest politics explain at least some of the *cross-sectoral variations in protection*, none of them have sought to examine the implications from a consistent theoretical model.

In contrast, the present empirical analysis is entirely focused on the implications of an empirically oriented generalization of the model of Grossman and Helpman (1994) (henceforth referred to as the GH model). It assumes that the incumbent government maximizes a weighted sum of aggregate welfare and political contributions from lobbies representing owners of sector-specific factors of production. It predicts that high levels of protection will be found in industries with organized lobbies, low import-penetration ratios, and low price elasticities of import demand. There are several reasons to examine the GH model from an empirical perspective. It is well-known and has been applied in a number of analyses, not least by the authors themselves.<sup>1</sup> At the same time, however, the model has been widely criticized for its seeming lack of empirical support (see Rodrik (1995)) but its inventors claim that existing empirical work fails to control for essential elements of the model (particularly the elasticity of import demand).

One other study has been devoted to empirical testing of the GH model, namely that of Goldberg and Maggi (1999) who test the most basic version of the model on U.S. data. This study extends beyond their analysis in several ways. For one, we generalize the GH model to account for the possibility of downstream lobbying and optimum tariff concerns

---

<sup>1</sup>Those articles include Belfrage (1999*a*), Belfrage (1999*b*), Cadot, DeMelo, and Olarreaga (1997), and Mitra (1999), as well as Grossman and Helpman (1995*b*) and Grossman and Helpman (1995*a*).

(while keeping the basic GH model as a special case which is also tested). Another important extension is our use of data drawn from the Global Trade Analysis Project (GTAP) which is uniquely recent, consistent and adaptable to our needs. While lacking information on sectoral contributions, it allows us to consider not only the United States (with about the same number of sectors (50) as in Goldberg and Maggi's study), but also a number of other countries or regions, of which our focus will be on the OECD.

Cross-sectional regressions are performed on the full sample, as well as on individual countries. The model generally holds up quite well to this empirical challenge. The estimates indicate that equilibrium ratios of special interest to general interest marginal utilities (with respect to protection levels) vary positively with protection levels as the theory has led us to expect. Terms of trade concerns seem important to the larger countries in our sample as implied by the present generalization of the GH model (as well as by the optimum tariff literature), but the influence of downstream interests does not come across in the estimates. The results seem robust also to inclusion of variables reflecting exogenous political concerns (indicated as relevant in other studies), although those bring a substantial addition to predictive power which strengthens the impression that (what is endogenously derived in) the GH model only captures a limited share of the considerations underlying trade policy decisions.

In section 2 the theoretical model is developed and its implications are explained. Section 3 is devoted to the intricacies of adapting the theoretically derived expression for equilibrium industry protection to a format which fits the available data and vice versa. In section 4 we present the results from regressions corresponding to alternative theoretical assumptions (including the basic GH model evaluated also by Goldberg and Maggi (1999)). Section 5 follows up with a more general discussion of the regression results, with reference to estimates for individual countries. Section 6 concludes with a review of the limitations of the present study and the associated implications for future work.

## 2 The GH model with intermediate goods and the possibility of optimum tariff considerations

The model presented below generalizes the economic framework of Grossman and Helpman (1994) by simultaneously allowing for a large country which may influence world market prices (done also in Grossman and Helpman (1995b)), and for the possibility of lobbying also by downstream producer interests (previously used in extensions of the GH model by Belfrage (1999b) and Cadot, DeMelo, and Olarreaga (1997)).

### 2.1 Production

There are  $m$  perfectly competitive sectors producing one good each with constant returns to scale. The output of a unit of good  $i$  requires inputs of a sector-specific factor of production which is completely inelastic in supply, a fully mobile (within the country) factor henceforth referred to as labor, and possibly also goods produced in one or more of the other sectors.

The specific factor of production as well as the goods used as inputs are employed in fixed proportions according to a Leontief-type technology, while there is some substitutability with labor. A sector's output  $y_i$  is produced with the same technology using an amount  $L_i$  of labor (the fully mobile factor), the fixed amount  $K_i$  of the factor of production specific to sector  $i$ , and a number of goods  $X_{1i}, X_{2i}, \dots, X_{qi}$  used as inputs. The relationship is assumed to take the form

$$y_i = f(L_i, \tilde{K}_i) \quad (1)$$

where

$$\tilde{K}_i = \min [K_i, \beta_{1i}X_{1i}, \beta_{2i}X_{2i}, \dots, \beta_{qi}X_{qi}] \quad (2)$$

so that profit-maximizing behavior by firms in the sector ensures that

$$\tilde{K}_i = K_i = \beta_{1i}X_{1i} = \beta_{2i}X_{2i} = \dots = \beta_{qi}X_{qi}.$$

The optimal amount of good  $k$  used in sector  $i$  is hence given by

$$z_{ki} \equiv \frac{K_i}{\beta_{ki}}. \quad (3)$$

The existence of a sector using only labor with constant returns to scale and a suitable choice of units ensures a constant wage rate of unity. Then, assuming perfect competition and that input prices are not prohibitively high (so that no production takes place), bidding for the use of the (inelastically supplied) sector-specific factor of production ensures that all the surplus

$$\pi_i = p_i f(L_i, \tilde{K}_i) - L_i - p_1 z_{1i} - p_2 z_{2i} - \dots - p_q z_{qi} \quad (4)$$

accrues to its owners. This function has the convenient derivative properties

$$\frac{\partial \pi_i}{\partial p_i}(p_i) = y_i(p_i) \quad (5)$$

and

$$\frac{\partial \pi_i}{\partial p_k} = -z_{ki} \quad \forall k \in I_i \quad (6)$$

where  $I_i$  is the set of sectors which provide inputs to the production of good  $i$ .

## 2.2 Individual utility, income and consumption

All individuals are assumed to have identical quasilinear utility functions of the type

$$u = x_0 + \sum_{i=1}^m u_i(x_i) \quad (7)$$

where  $x_i$  denotes consumption of good  $i$ . The subutility functions  $u_i(\cdot)$  are further assumed to be differentiable, increasing and strictly concave. Good 0 serves as the numeraire with a world market and domestic price equal to 1, notationally represented as  $p_0 = \bar{p}_0 = 1$  where the bar indicates the world market price. An individual  $j$  earning (=spending) an amount  $E_j$  will then demand the non-numeraire goods  $i = 1, 2, \dots, m$  according to a demand function  $d_i(p_i)$  which solves  $u'_i(x_i) = p_i$ . Assuming that her income

$E_j$  is sufficiently large, each individual will then consume the numeraire good according to  $x_0 = E_j - \sum_{i=1}^m p_i d_i(p_i)$ . Reinserting those demands into the utility function we find that each individual's indirect utility takes the form

$$v_j(p_1, \dots, p_m, E_j) = E_j + \sum_{i=1}^m s_i(p_i) \quad (8)$$

where

$$s_i \equiv u_i[d_i(p_i)] - p_i d_i(p_i) \quad (9)$$

is the consumer surplus derived from the consumption of good  $i$ .

The level of an individual's spending,  $E_j$ , is assumed to equal his total net income which is the sum of labor income  $l_j$  (given the wage rate of 1), factor income  $\sum_{i=1}^m \lambda_{ji} \pi_i(p_i, \mathbf{p}_{Ii})$  (where  $\lambda_{ji}$  is the ownership share of individual  $j$  in the stock of sector-specific factor  $i$ ), and his share in net government income after a deduction for contributions made for political influence purposes. In order to get the complete picture we therefore devote section 2.3 to deriving net government income.

## 2.3 Net government income

The policy options open to the government are an ad valorem tariff or export subsidy in which case  $\tau_i > 1$ , or an import subsidy or export tax in which case  $\tau_i < 1$ . The domestic price of good  $i$  can hence be defined as

$$p_i \equiv \tau_i \bar{p}_i(\tau_i, \tau_i^*) \quad (10)$$

where  $\bar{p}_i$  is the border price and  $\tau_i^*$  is the trade policy applied on the other side of the border. Assuming that the net government income arising from the chosen trade policy is distributed equally among the voters, each voter can expect to receive

$$r_i = \frac{1}{N} (\tau_i - 1) \bar{p}_i M_i(p_i) \quad (11)$$

where  $N$  is the population size and net imports of good  $i$  ( $M_i$ ) are given by the sum of the quantity demanded of a good for final consumption and the quantity demanded for

intermediate uses less the domestic output, according to

$$M_i(p_i) = Nd_i(p_i) + \sum_{k \in F_i} z_{ik} - y_i(p_i) \quad (12)$$

where  $F_i$  is the set of productive sectors in which good  $i$  is used as an input.

## 2.4 Individual indirect utility

We are now in a position to summarize voter  $j$ 's spending on goods by adding her factor income, her share in net government income and deducting the sum of her contributions to political influence activities (denoted by  $c_j$ ). This gives us

$$E_j = l_j + \sum_{i=1}^m [\lambda_{ji} \pi_i(p_i, \mathbf{p}_{Ii}) + r_i(p_i)] - c_j. \quad (13)$$

and individual  $j$ 's indirect utility can then be written

$$v_j = l_j + \sum_{i=1}^m v_{ji}(p_i) - c_j \quad (14)$$

where

$$v_{ji} \equiv \sum_{i=1}^m \lambda_{ji} p_i y_i(p_i) - \sum_{k \in F_i} \lambda_{jk} p_i z_{ik} + \begin{matrix} r_i + s_i \\ \left( \begin{array}{l} \text{net government income} \\ \text{and consumer surplus} \end{array} \right) \end{matrix} \quad (15)$$

(sector-specific factor income)

may be interpreted as sector  $i$ 's contribution to the welfare of voter  $j$ . Note that individual differences in utility are confined to differences in ownership of sector-specific factors of production.

## 2.5 Aggregate welfare

Summing  $v_j$  over all individuals, while removing the deduction for aggregate political contributions,  $C \equiv \sum_{j=1}^N c_j$ , we arrive at the following expression for aggregate welfare



gross of political contributions:<sup>2</sup>

$$W = L + \sum_{i=1}^m \{\pi_i(p_i, \mathbf{p}_{Ii}) + Q_i\} \quad (16)$$

where  $L = \sum_{i=1}^m L_i = \sum_{j=1}^N l_j$  is the total size of the labor force, and

$$Q_i \equiv N[r_i + s_i] = (\tau_i - 1)\bar{p}_i M_i(p_i) + N u_i[d_i(p_i)] - p_i N d_i(p_i) \quad (17)$$

is the sum of net government income and consumer surplus.

## 2.6 Special interest groups

Assuming that an individual does not own factors of production specific to more than one sector and summing equation (14) over all individuals who owns some of the factor specific to sector  $j$  yields the gross-of-political-contributions aggregate welfare of the potential membership of special interest group  $j$

$$W_j \equiv L_j + \pi_j(p_j, \mathbf{p}_{Ij}) + \alpha_j \sum_{i=1}^m Q_i \quad (18)$$

where  $\alpha_i$  represents those specific factor owners' share of the population and  $\mathbf{p}_{Ij}$  is the vector of prices of goods used as inputs in sector  $j$ . Effective lobby formation, here the ability of a group of specific factor owners to act so as to maximize the group's aggregate welfare ( $W_j$  less campaign contributions), is exogenously given.

## 2.7 The government

The government is assumed to maximize a weighted sum of aggregate welfare and campaign contributions received, according to

$$G = aW + C. \quad (19)$$

The inherent willingness to trade off a loss of aggregate welfare against campaign contributions is what drives special interest politics in this model.

---

<sup>2</sup>For convenience we will henceforth refer to the "gross-of-political-contributions aggregate welfare" simply as "aggregate welfare".

## 2.8 The political equilibrium

The political game involves the lobby groups and the government. Campaign contributions are offered (or perhaps solicited as in Belfrage (1999b)) in return for trade policy favors. Either with Nash bargaining (as in Belfrage (1999b)) or in the menu auction version of the game played between the government and active lobbies (as in the application of the results of Bernheim and Whinston (1986) in the GH model), the vector of equilibrium trade policies will be that which maximizes the joint surplus of the government and the lobby groups, i.e.

$$\Omega = aW + \sum_{j=1}^m \Psi_j W_j. \quad (20)$$

where  $\Psi_j$  is a binary variable which takes on the value of unity for effective lobby formation (for representation of the group's collective interest) and zero otherwise. Hence, the objective function for policy formation ( $\Omega$ ) is in effect created by letting a summation over lobby group welfare levels replace contributions in the government objective function. The underlying intuition is that optimizing lobbies on the margin will be willing to make financial contributions corresponding to the benefit of trade policies accommodating their interests.

The first-order condition for maximization of the joint benefit  $\Omega$  (derived in the appendix) implies that the equilibrium ad valorem rate of protection for a sector  $i$  in the Home country is given by

$$\tau_i^o - 1 = \frac{(\Psi_i - \alpha_L) y_i^o - \sum_{k \in F_i} (\Psi_k - \alpha_L) z_{ik}}{-(a + \alpha_L) \bar{p}_i^o M_i'^o} + \frac{1}{e_i^{*o}} \quad (21)$$

where  $y_i^o$ ,  $\bar{p}_i^o$ ,  $M_i'^o$  and  $e_i^{*o}$  (the foreign elasticity of import demand) are equilibrium values indirectly determined by  $\tau_i^o$ .

A value of  $\tau_i^o$  greater than unity indicates an import tariff on an imported good or an export subsidy on an exported good. Analogously, a negative value of  $\tau_i^o$  indicates an import subsidy on an imported good or an export tax on an exported good. This

equilibrium level of protection balances marginal welfare of organized special interest groups which have been able to organize themselves for political action against marginal aggregate welfare (i.e. the marginal deadweight loss associated with protection).

Domestic output enters in the numerator of equation (21) because it does, by Hotelling's lemma, reflect the marginal effect of (here tariff or subsidy induced) changes in the domestic price of good  $i$  on the income of owners of factors of production which are specific to the production of good  $i$ . The political influence weighted sum of intermediate use of good  $i$ , the second term in the numerator, enters the way it does for analogous reasons. The marginal effect of a change in the domestic market price of good  $i$  on the income of owners of factors specific to the production of good  $k$  is simply the extent to which good  $i$  is used as an input in that production. The denominator of equation (21) relates to the marginal deadweight loss from protection while the last term in equation (21), which is the inverse of the foreign elasticity of net import demand, reflects the optimum tariff argument. The elasticity of import demand or export supply facing the home country on the world market is related to the terms of trade gain (loss) accruing to the home country if it imposes an import tariff (subsidy) or an export tax (subsidy). If good  $i$  is imported (exported) by the home country, it is exported (imported) by the foreign country so that  $e_i^* > 0$  ( $e_i^* < 0$ ). If the home country were to act as a genuine price taker on the world market, this would simply be reflected in  $e_i^*$  approaching positive (or negative) infinity making the last term disappear.

The balance struck between the general interest and the special interest will depend on the effectiveness of lobby formation (whether  $\Psi_j$  equals zero or unity) as well as on the extent of government consideration for aggregate welfare ( $a$ ).

In the original GH model, the effectiveness of lobby formation is exogenous, as already noted in section 2.6 above. An attempt at endogenizing this, along the lines suggested by the original authors, have been made by Mitra (1999), who shows that an industry-specific lobby is more likely to be effectively organized if the industry has a large capital stock,

face an inelastic demand function, and have very few capital owners. These determinants are, however, closely correlated to the determinants of the expected level of protection for industries with effectively organized lobbies. Hence, from an empirical viewpoint, one would simply expect this to strengthen the implications of the model with exogenous lobby formation.

The parameter  $a$ , reflecting the relative weights assigned to aggregate welfare can be interpreted as the unitary cost, in terms of reduced reelection chances or perhaps even moral suffering, incurred by the government when deviating from the utilitarian optimum in pursuit of campaign contributions. In the original GH model,  $a$  is constant across sectors but presumably not across countries. It is not difficult to imagine, however, that considerations other than effects on consumer surplus may be of importance and give rise to industry differences in the political cost of providing protection. Such cost differentials may for example relate to initial sympathy or disdain for the groups of specific factor owners concerned. Another plausible reason for industry variations in  $a$  is the ability of the average voter to discern how government policies affect her utility, i.e. information asymmetries between special and general interests. This can be shown in models using the same general framework, with voters that have less than full information (with boundedly rational voters as in Belfrage (1999*a*) or fully rational voters as in Lohmann (1997)).

Before we can subject this theoretical framework to an empirical examination, no matter how limited, we have to make a number of adjustments to the model. This is the subject of Section 3 below.

### **3 Empirical specification**

When trying to apply the data, to be described in Section 3.6, to the relationship exhibited in equation (21), we are confronted with two sets of problems. The first relates to the elasticities of domestic and foreign import demand and the second concerns measures of

lobby formation ( $\Psi_i$ ) as well as the share of the population represented by lobbies ( $\alpha_L$ ). It turns out that the former set of problems can be resolved to a large extent with the aid of some algebra and the use of a not all too distant proxy, whereas the latter set of issues require us to impose some quite restrictive assumptions.

### 3.1 Elasticities

Our first step toward a better correspondence between the implications of our model and the available data requires us to restate equation (21) in a more suitable form. Note that

$$\begin{aligned} M'_i &= Nd'_i - y'_i \\ &= \frac{1}{p_i} [e_{yi} y_i - e_{di} Nd_i] \end{aligned}$$

where  $e_{yi} \equiv y'_i \frac{p_i}{y_i}$  is the own-price elasticity of domestic supply and  $e_{di} \equiv Nd'_i \frac{p_i}{Nd_i}$  is the own-price elasticity of domestic demand. Dividing both sides of equation (21) by  $\tau_i \equiv \frac{p_i}{p_i}$  then yields

$$\tilde{\tau}_i^o = \frac{(\Psi_i - \alpha_L) y_i^o - \sum_{k \in F_i} (\Psi_k - \alpha_L) z_{ik}}{(a + \alpha_L) [e_{yi}^o y_i^o - e_{di}^o Nd_i^o]} + \frac{1}{\tilde{e}_i^*} \quad (22)$$

where  $\tilde{\tau}_i^o \equiv \frac{\tau_i^o - 1}{\tau_i^o}$  is a construct based on the ad valorem rate of protection and  $\tilde{e}_i^*$  is the foreign elasticity of import demand scaled by the domestic protection rate. With the exception of  $\tilde{e}_i^*$ , which must be proxied, the elasticities in equation 22 can be calculated from the available data as shown in the Appendix.

### 3.2 Lobby formation and representation

The issue of which groups of sector-specific factor owners will be represented by effective lobbies is a difficult one. Grossman and Helpman (1994) leave this to unspecified exogenous conditions. In the empirical literature, parameters such as industry concentration (used to capture the ability to overcome free rider problems) and changes in output or imports (to capture "crisis" induced organization) have sometimes been used. We do,

however, lack data consistent (e.g. in terms of sectors) with those used for the other variables. Furthermore, the present concern also with intermediate uses of goods and the associated reasons for lobbying by downstream industries would mean that proxies for effective lobby formation would have to be introduced not only for lobby  $i$ , but for all lobbies  $k \in F_i$ . The rather radical assumption to be used in the following is therefore that all groups of owners of specific factors of production have managed to organize their political influence activities so that the aggregate of group member utilities can be maximized, i.e. that  $\Psi_j = 1$  for all  $j$ . This leaves us with the following simplified version of (22) :

$$\tilde{\tau}_i^o = \left( \frac{1 - \alpha_L}{a + \alpha_L} \right) \frac{y_i^o - \sum_{k \in F_i} z_{ik}}{[e_{yi}^o y_i^o - e_{di}^o N d_i^o]} + \frac{1}{\tilde{e}_i^*}. \quad (23)$$

Next, let us consider how to econometrically specify and evaluate the contents of this equation.

### 3.3 Regression equations

Without further restrictions on producer or consumer behavior, the theory (including the assumptions stated in earlier sections) only tells us that, in an interior equilibrium, the choice of trade policy must balance relative marginal utilities and optimum tariff concerns as specified in equation (23) which is a way of expressing the first-order condition for government optimization given expectations of voter behavior and optimal lobby group behavior. It is thus possible that (i) the specific behavioral and technological relationships in a sector are such that an interior equilibrium is not reached (which in the case of an import-competing good would imply that a level of protection which eliminates all imports is enacted), and (ii) the actual equilibrium level of protection is one of several levels of protection which fulfills the first-order condition.

Let us, in view of the considerations just mentioned, return to the issue of how we can get an impression of the relevance of the theory by empirical means. Ruling out that,

if feasible, interviews with people involved in the policy-making process would provide us with truthful answers as to whether there is a market for trade policies working in the way described by the model, we will here settle with an attempt to make use of the implied equilibrium relationships in a very simple econometric framework.

Our empirical examination will be a heteroscedasticity consistent least squares estimation of the relationship

$$\tilde{\tau}_i^o = \beta \phi_i \Omega_i^L (\tilde{\tau}_i^o) + \gamma \Theta_i (\tilde{\tau}_i^o) + e_i \quad (24)$$

where  $\tilde{\tau}_i^o$  is the construct based on equilibrium ad valorem tariff equivalents defined in conjunction with equation (22);  $\beta \equiv \frac{1-\alpha_L}{a+\alpha_L}$  is a constant the size of which depends on the population coverage of effective specific-factor owner lobbies ( $\alpha_L$ ) and the government's relative weight ( $a$ ) on aggregate welfare;  $\phi_i$  represents the level of exogenous political concerns in favor of protection for sector  $i$  (which is allowed to vary across sectors under an alternative specification to be discussed below, but is restricted to unity in the basic regression),  $\Omega_i^L (\tilde{\tau}_i^o)$  is the equilibrium ratio of special and general interest marginal utilities (where  $L = UpDo$ ,  $Up$  signifies whether both upstream and downstream ( $UpDo$ ) or only upstream ( $Up$ ) special interests are assumed to be actively involved in the political game), and  $\Theta_i (\tilde{\tau}_i^o)$  is the optimum tariff term which is assumed to vary with country size on the market for  $i$ . The parameter  $\gamma$  enters on account of the fact that a proxy is to be used for  $\Theta_i (\tilde{\tau}_i^o)$  and that the scale of the proxy measure is likely to differ from the underlying variable.

In its basic form, i.e. with  $\phi_i = 1 \forall i$  and  $L = UpDo$  (so that  $\Omega_i^L (\tilde{\tau}_i^o) = \Omega_i^{UpDo} (\tilde{\tau}_i^o)$ ), equation (24) is merely a compact form of equation (23) with an error term added to account for the likely case that, due to slower than instant adjustments to new equilibria, the data will at the time of recording deviate from the equilibrium given by equation (24). The error term  $e$  is assumed to have the properties  $E[e] = 0$  and  $\text{Var}(e) = \sigma_e^2$ . We expect  $\beta > 0$  and, where applicable,  $\gamma > 0$ . Our alternative hypothesis is that there is no

such equilibrium relationship. The arguably rather weak criteria to be used concern the estimates and estimated variances of the coefficients  $\beta$  and  $\gamma$ .

By allowing different specifications of  $\Omega_i^L$ ,  $\phi_i$  and  $\gamma$  we make it possible to separately examine the original version of the GH model where we have  $\Omega_i^{Up}(\tilde{\tau}_i^o) \equiv \frac{y_i^o}{[e_{yi}^o y_i^o - e_{di}^o N d_i^o]}$  as well as  $\phi_i = 1 \forall i$  and  $\gamma = 0$  (so that optimum tariff concerns are restricted to zero). Allowing for exogenous political concerns in favor of protection of sector  $i$ , as reflected in the coefficient  $\phi_i$ , is a deviation from the route of strictly endogenous derivation of policy choices. Still, it is compatible with the general model framework so it lets us explore somewhat more complex political considerations while leaving their endogenous derivation for future research. The "exogenous political concerns" are arguably related to what Anderson and Baldwin (1987) characterize as factors influencing the supply of protection. The underlying reasoning is that the gross political cost of providing protection to an industry may be lower if people in general can rationalize protection with social insurance motives or a consideration for low-income groups. To be most faithful to the GH model, these exogenous concerns should be reflected in variations of  $a$  so that e.g.  $a_i = \frac{\bar{a}}{\phi_i}$  where  $\bar{a} \geq 0$  and  $\phi_i > 0$ . This coincides perfectly with the econometric specification in equation (24) under the assumption that the effective lobbies organize a negligible share of the total population (so that  $\alpha_L = 0$ ) and reasonably well otherwise. Specified in this way,  $\phi_i$  will take on a large value in a sector where a policy-induced change in the sum of marginal utilities can be expected to carry a relatively small political cost. Possible proxies for  $\phi_i$  are discussed in Section 3.5 below.<sup>3</sup>

The different specifications allowed by the theoretical framework yields a few alterna-

---

<sup>3</sup>The introduction of variable weights on the general interest does, however, also cause variability in the relative influences of upstream and downstream interests, which complicates an empirical formulation of the alternative with political influence from downstream sectors. If the weights are indeed variable, then the alternative with influence for downstream interests as formulated in the standard model will perform poorly.



tive regressions. Those are:

**Alternative 1a: A weight on the general interest in the government objective function which is constant across sectors, no political influence from downstream sectors, and no optimum tariff concerns.** This is as close as we are able to get to the original contribution by Grossman and Helpman (1994). The special assumption made here is that all relevant special interest groups are effectively organized, while effective organization of special interest groups is exogenously given in the original model. The regression equation for this case is

$$\tilde{\tau}_i^o = \beta \Omega_i^{Up} (\tilde{\tau}_i^o) + e_i. \quad (25)$$

**Alternative 1b: A weight on the general interest in the government objective function which is constant across sectors, political influence from downstream sectors, and no terms of trade concerns.** This alternative represents the set of assumptions associated with the extension of the GH model to intermediate uses of goods by ?, and they bear a close resemblance also to those in a paper by Cadot, DeMelo, and Olarreaga (1997). The regression equation for this case is

$$\tilde{\tau}_i^o = \beta \Omega_i^{UpDo} (\tilde{\tau}_i^o) + e_i. \quad (26)$$

**Alternative 2a: A weight on the general interest in the government objective function which is constant across sectors and no political influence from downstream sectors, but a presence of optimum tariff concerns.** This adds the optimum tariff term from equation (23) to the predictions outlined in alternative 1a, so that the regression equation becomes

$$\tilde{\tau}_i^o = \beta \Omega_i^{Up} (\tilde{\tau}_i^o) + \gamma \Theta_i (\tilde{\tau}_i^o) + e_i. \quad (27)$$

**Alternative 2b: A weight on the general interest in the government objective function which is constant across sectors, political influence from downstream sectors, and a presence of optimum tariff concerns.** This adds the optimum tariff term from equation (23) to the predictions outlined in alternative 1b, yielding the regression equation

$$\tilde{\tau}_i^o = \beta \Omega_i^{UpDo} (\tilde{\tau}_i^o) + \gamma \Theta_i (\tilde{\tau}_i^o) + e_i. \quad (28)$$

**Alternative 3a: A weight on the general interest in the government objective function which varies across sectors with exogenous political concerns, no political influence from downstream sectors, and a presence of optimum tariff concerns.** This relatively general, yet not strictly endogenously derived, specification is associated with the regression equation

$$\tilde{\tau}_i^o = \beta \phi_i \Omega_i^{Up} (\tilde{\tau}_i^o) + \gamma \Theta_i (\tilde{\tau}_i^o) + e_i. \quad (29)$$

**Alternative 3b: A weight on the general interest in the government objective function which varies across sectors with exogenous political concerns, political influence from downstream sectors, and a presence of optimum tariff concerns.** As noted above, exogenous variation in political concerns for different sectors is not strictly compatible with the present modelling of political influence from downstream sectors, but for the sake of comparison this alternative is also included. The associated regression equation is

$$\tilde{\tau}_i^o = \beta \phi_i \Omega_i^{UpDo} (\tilde{\tau}_i^o) + \gamma \Theta_i (\tilde{\tau}_i^o) + e_i. \quad (30)$$

### 3.4 Endogeneity concerns

There is clearly, as declared in the regression equations, some influence of the trade policy variable on the regressors. Considering equation (23), we observe that the equilibrium

output of an industry would, political concerns aside, be expected to increase with the level of protection from foreign competition.  $y_i^o$  does, however, enter with positive sign in both the numerator and the denominator. The domestic demand for the good as an input in other sectors is likely to decrease with its price level (although this is not the case in the present Leontief-type specification of input-output relationships) making the numerator of  $\Omega_i^L$  vary positively with the protection level. As for domestic consumption demand, it enters positively in the denominator (since the elasticity  $e_{di}$  takes on a negative value), thereby strengthening the expectation of a negative endogenous relationship between dependent variable and regressor. The relationship between protection levels and the supply and demand elasticities in the denominator of  $\Omega_i^L$  is difficult to predict, but if those elasticities are assumed to be constant in relevant ranges, our reasoning suggests that the endogeneity bias from an OLS estimation would tend to support rejection of the theoretical model's predictions. Furthermore, the cross-sectional character of the analysis and the fact that a very wide range of industry characteristics is covered in the sample, makes it likely that the exogenous reasons for variations in industry output and demand at a given set of prices will vastly dominate the effects of trade policy.

### 3.5 Proxy variables for market power in trade and exogenous political concerns

As already noted in Section 3.3, the available data do not allow us to derive a direct measure for the inverse of the rest-of-world export supply or import demand elasticity for Home country goods, expressed as  $\Theta_i$  in the regression equations above. Since the term to be captured is strongly related to what may be referred to as the home country's "market power in trade" in the sector concerned, our choice of proxy is *the share of net home country imports in world trade*.

In our discussion on exogenous political concerns ( $\phi_i$ ) in Section ??, we made reference

to social insurance motives and special consideration for low-income groups. The former set of motives would make it more favorable to provide protection for declining industries while industries relying on a low-wage workforce would be high-ranking candidates for protection if there is special consideration for low-income groups. We have chosen a proxy variable for exogenous political concerns which, we hope, actually captures both kinds of motives - *the share of unskilled labor in value added*. The low-income character of unskilled labor is self-evident. Furthermore, in our sample of highly industrialized OECD countries, unskilled labor intensive industries tend to be under decline pressure. One reason may be that falling costs of transportation (note that any fall in policy determined trade costs should be endogenous to our model) and an increasing integration of labor rich countries into the world economy accentuates the role of comparative advantages. Compatibility with the specific-factors model used here requires us to be able to assume that also unskilled laborers own sector-specific capital.

### 3.6 Construction of variables from the GTAP data

The database assembled within the Global Trade Analysis Project (GTAP) has been constructed and maintained with broad participation of leading researchers, is fully documented and is widely used for quantitative analyses of international trade issues. The modelling framework, earlier versions of the database and some applications are described by Hertel (1997) whereas the full documentation is given in McDougall, Elbehri, and Truong (1998). The data base encompasses detailed bilateral trade, transport and protection data characterizing economic linkages among 45 regions, linked together with individual country input-output data bases which account for intersectoral linkages among the 50 sectors within each region. We have had access to version (4) which utilizes data from 1995.

The variables  $y_i^o$ ,  $z_{ik} \forall k \in F_i$ , and  $Nd_i^o$  in equation (23) represent equilibrium quantities of domestic output, input use and domestic demand, respectively. We do not have

quantity data, but this is of no concern since we have access to valuations at a common price - the domestic market price (which, as easily verified by the reader, implies multiplication of both numerator and denominator in equation (23) by that price).

In collecting the appropriate data on  $y_i^o$  (or rather  $p_i^o y_i^o$ ) we run into the tricky issue of how to deal with sectors exhibiting both imports and exports.  $y_i^o$  is supposed to capture the marginal effect of a domestic price rise (here achieved through trade policy) on the factor income of domestic specific factor owners in sector  $i$  and the model underlying our analysis in effect assumes away pure intra-industry trade. If we are to stick with the model, we should therefore assume that an observation of both exports and imports in a sector is the result of aggregation (but keep that assumption in mind when we interpret results for sectors known for high degrees of pure intra-industry trade). So if both imports and exports are observed for a sector  $i$ , we must conclude that the output of sector  $i$  consists of one subset containing goods which at current market prices are import-competing and another subset containing goods which at current market prices are exported. There is, however, no information available to guide efforts to split the sum of domestic sales between import-competing and exportable subsets of the output of good  $i$ . The same is true for intermediate and final demands for the output of sector  $i$ . The present solution to this problem is to utilize the symmetry between import tariffs for import-competing goods and export subsidies for exportables in the model by simply summing reported values of tariff income and export subsidy expenditures in each sector. In the following we will refer to this as the "netting-aggregating scheme". According to this scheme, the ad valorem equivalent level of protection  $\tau_i - 1$  is given by the ratio of the sum of import tax revenue and export subsidy costs to the sum of imports and exports.

The derivation of the necessary elasticity measures is more tricky since they are not directly provided in the GTAP database. As shown in the Appendix, however, it is possible to derive the compensated and uncompensated own-price elasticities of household

demand which are compatible with the parameters and consumption shares provided in the GTAP database. As also shown in the Appendix, we have been able to use the CES substitution parameters and factor intensities provided in the database to derive the own-price elasticities of domestic output under the assumption of CES technologies.

In the database, all protective measures contribute to differences between the value of trade flows at domestic market and the value of trade flows at world market prices. The net import tariff revenue (import subsidy cost if negative) equivalent of the protective measures for domestic importables in sector  $i$  taken together is given by the difference between the value of imports at home country market prices and the value of the same import flow at world market prices, while the net export subsidy cost (or export tax revenue if negative) is given by the difference between the value of exports at home country market prices and the value of the same export flow at world market prices. It should be noted that to the extent that non-tariff barriers have been accommodated in the data, they have been converted to trade tax/subsidy equivalents to fit the structure of the database (which has been designed to accommodate applied general equilibrium modelling). Since only trade taxes and subsidies fit our theoretical framework, this is a convenient coincidence although it should be noted that our results will be distorted to the extent that the marginal welfare effects of non-tariff barriers differ from those of trade taxes and subsidies.

The ad valorem rate of protection in the netting-aggregating scheme equals the ratio of the sum of import tariff revenues and export subsidy expenses to the sum of imports and exports valued at world market prices.

### **3.7 Restricting the set of sectors and countries**

The sets of 50 sectors and 45 regions/countries in the GTAP database, together with protection rates derived from our sample, are given in the Appendix.

### **3.7.1 Sectors**

Clearly, the theory is not applicable to sectors producing non-tradeables. Considering our focus on protectionist policies, we should therefore seek out and exclude from our analysis those sectors which mainly contain non-tradeables. We will also need to exclude service sectors, trade in the output of which is subjected to protectionist measures of types (e.g. restrictions on movement of individuals and licensing requirements) which are not readily compared to traditional tariff-like measures applied to goods, and where the heterogeneity is so significant that world market to domestic market price comparisons provide little useful information. A reflection of those difficulties is that for typical service sectors, there is virtually no reporting of protection measures either in the GTAP database or in TRAINS which is a database constructed with the main focus on politically determined barriers to trade. We have decided to follow a simple rule for exclusion of sectors from our analysis, which fulfills the criteria for exclusion just discussed, namely to exclude those GTAP sectors with no SITC/HS concordances, i.e. those implicitly designated as containing only non-tradeables in the construction of the major trade classification schemes.

### **3.7.2 Countries**

We can think of two reasons to exclude a country from the analysis - its institutions for trade policy-making may be fundamentally at odds with the assumptions implicit in the design of the political-economic framework for our theoretical analysis, or its data is suspected to be of insufficient quality. For both reasons we have decided to consider all OECD regions in the data base except for Turkey, Mexico and the European Free Trade Association (EFTA). The EFTA was excluded since it is only reported in the data as a region but the countries involved determine trade policies (external to the area) independently and heterogeneously. Furthermore, considering the coordination of

trade policies in the European Union, we have constructed all variables also for the EU regions as an aggregate. This explains region number xx in the list of database regions in the Appendix. The regions/countries involved in our estimations are thus at this point Australia, New Zealand, Japan, Canada, the United States, and the European Union.

## 4 Estimation procedures and results

In all cases we have used ordinary least squares, adjusted for heteroscedasticity according to White's method, to obtain estimates of the coefficients  $\beta$  and  $\gamma$  in equation (24). For the country set used, the mean of the dependent variable is 0.058 and its standard error is 0.15. The number of observations are in all cases 246 and there are no omitted values. The reported probability values correspond to the one-tailed test with which we are concerned, i.e. to evaluate whether we can reject the null hypotheses that  $\beta \leq 0$  and, for applicable alternatives,  $\gamma \leq 0$ . The results for regressions involving individual countries/regions are reported in the Appendix.

Table 5.1					
<b>Regression results for the full country selection</b>					
Variable	Coefficient and expected sign	Alt. 1a Estimate (P-value)	Alt. 1b Estimate (P-value)	Alt. 2a Estimate (P-value)	Alt. 2b Estimate (P-value)
$\Omega_i^{Up}$	$\beta > 0$	$7.36 \times 10^{-4}$ (0.007)		$6.66 \times 10^{-4}$ (0.012)	
$\Omega_i^{UpDo}$	$\beta > 0$		$-9.70 \times 10^{-5}$ (0.155)		$6.64 \times 10^{-5}$ (0.112)
$\Theta_i$	$\gamma > 0$			0.456 (0.001)	0.468 (0.001)
$R^2$		0.010	0.002	0.115	0.107



Table 5.1 (continued)			
Regression results for the full country selection			
Variable	Coefficient and expected sign	Alt. 3a Estimate (P-value)	Alt. 3b Estimate (P-value)
$\psi_i \Omega_i^{Up}$	$\beta > 0$		
$\psi_i \Omega_i^{UpDo}$	$\beta > 0$		
$\phi_i \Omega_i^{Up}$	$\beta > 0$	$6.88 \times 10^{-3}$ (0.002)	
$\phi_i \Omega_i^{UpDo}$	$\beta > 0$		$-3.97 \times 10^{-4}$ (0.331)
$\Theta_i$	$\gamma > 0$	0.452 (0.001)	0.449 (0.001)
$R^2$		0.150	0.107

**Results for Alternatives 1a and 1b: A weight on the general interest in the government objective function which is constant across sectors but no terms of trade concerns**

The results indicate that no more than one percent of the overall variation in the dependent variable is explained by variations in the ratio of marginal utilities. We do therefore hesitate to draw any conclusions from the estimates at hand. It should be noted, however, that the substantial errors of measurement which are likely to be present lead to an underestimation of  $R^2$  and (if present also in the explanatory variable) a bias toward zero in the estimates of  $\beta$ . Such a bias toward zero implies an overestimation of the relative weight assigned to the general interest in the government objective function (since  $\beta$  is

inversely related to  $a$  in our specification). If we were to ascribe the low  $R^2$  values to substantial yet non-systematic deviations from the political equilibrium (as dictated by the econometric specification in equation (24)) and possibly also to errors of measurement in the dependent variable, the estimation results would allow us to reject the null hypothesis of a non-positive value of  $\beta$  at the one percent level of significance under alternative 1a but not under 1b. This implies some, in view of the  $R^2$  values undoubtedly quite weak, support for the original GH model with the restrictive assumption on overall lobby effectiveness discussed in Section 3.2, but not for the (similarly restricted) extension of this model to account for political influence from special interest groups associated with downstream sectors.

**Results for Alternatives 2a and 2b: A weight on the general interest in the government objective function which is constant across sectors and a presence of terms of trade concerns**

These results tell us that the model specification underlying alternatives 1a and 1b left out at least one important variable, since the present introduction of the variable reflecting terms of trade concerns in trade policy determination, i.e.  $\Theta_i$ , has contributed to a significant increase in the share of the variation in the dependent variable which appears to be explained by the model. For the "a" alternative (the one excluding considerations of political influence from downstream interests), the estimated coefficients and their standard errors point to a preliminary rejection of the null hypotheses of  $\beta \leq 0$  and  $\gamma \leq 0$ . This may be regarded as some support to the large country version of the GH model, although we should keep in mind that the prediction of a positive value of  $\gamma$  is shared with the entire standard literature on optimum tariffs (see e.g. Johnson (1954)).

## **Results for Alternative 3a and 3b: A weight on the general interest in the government objective function which varies across sectors with exogenous political concerns and a presence of terms of trade concerns**

The results appear to support what we in terms of the model framework consider to be cross-sectoral variations in the political cost of accommodating the wishes of special interests. The interaction of social insurance or equality concerns represented by  $\phi_i$  with the ratio of marginal utilities in the alternative excluding downstream influence ( $\Omega_i^{Up}$ ) produces an estimate of  $\beta$  with a p-value of 0.002 and contributes to a considerably higher value of  $R^2$  than in the other regressions. Furthermore, we boldly choose to interpret the results under alternative 3b as an illustration of the point we argued in Section 3.3, i.e. that the model does not support the kind of symmetric treatment for downstream interests inherent in the "b" alternative when there are exogenous political concerns.

## **5 A discussion of the estimation results with references to individual country estimates**

The results indicate that the term representing optimum tariff considerations ( $\Theta_i$ ) is significantly and positively related to the equilibrium protection level for a sector. It may be argued that the proxy we have used, i.e. the share of home country trade in world trade in the particular sector at hand, could capture other influences than the optimum-tariff-like concerns suggested by our model. It may therefore be of interest to consider a weak yet interesting indication that the term may indeed reflect terms of trade concerns, namely that the performance of this variable in the individual country estimates (found in Section 6.1) is considerably better in the larger countries (the United States, Japan and to some extent also in Canada) than in the smaller countries (Australia and

New Zealand). The possible exception to the rule is that it performs poorly also in the EU estimates. Although the EU hardly can be considered small in economic terms, a speculative explanation is that in these rather early stages of integration, trade policy harmonization is still the overriding concern. In other words, as far as external trade policy determination has been concerned, the EU has not been able to act as an optimum tariff seeking unit but rather as a collection of smaller countries (however with similar special interest pressures if we are to believe the comparatively strong explanatory power of the individual EU estimates).

Another feature of our estimates is that they contain relatively little support for the "b" alternatives which rely on consideration for downstream interests while there is comparably strong support for the "a" alternatives which rely on a specification that does not account for any political influence from downstream interests. We may be able to explain this without deviating far from the general framework by considering the premises for the derivation of influence from downstream interests. In the theoretical model, downstream interests are treated as if they were on an equal footing with upstream interests in the political game in the sense that they have been assumed to possess the same set of complete information, have been equally successful in organizing for political action, and have had equal opportunities to bargain with the government. One common argument (endogenous as in Lohmann (1997) or exogenous as in most models) for differential weights on general and special interests in models based on political support functions (to which the present model framework can be said to belong) is that special interests have an information advantage when it comes to policies of great importance to them. Special interests associated with a downstream sector for which the good subject to protection is a minor input may not be much better informed on the issue than the average voter. The equal success of downstream interests in organizing for political action may also be called into question. If the main reason for individuals in a downstream sector to organize politically is to fight against protection on input goods (as would e.g. be the case

for a downstream sector which produces non-tradeables), the stakes may not be sufficient to overcome the free rider problems associated with successful organization for political influence purposes. The pattern in favor of no consideration for input user interests is fairly similar in the individual country estimates, with one significant exception - Japan. If we were to allow ourselves room for pure speculation and were to pick one country in the sample with political institutions favorable to channeling also downstream interests, Japan would be a strong candidate. The general picture is one where business interests are strongly linked to the political sphere. Access to politicians is thus ensured with or without strong interests in the trade policy sphere and some of the relative disadvantages of downstream interests would therefore not be of the same magnitude in Japan as in the other countries in the sample.

The results under alternative 3 favor a model specification which allows for exogenously given cross-sectoral variations in the political cost of accommodating the wishes of special interests. This could be interpreted in support of criticisms levied at the GH model for failing to endogenously capture central determinants of cross-sectoral variations in protection. On the other hand, since inclusion of these concerns fits the model framework without violating its assumptions, the results can be said to show the versatility of the model while pointing to candidates for endogenization in future formulations.

## 6 Concluding remarks

We have examined whether it is possible that recently recorded industry protection levels in a set of OECD countries could have been generated within an endogenous trade policy framework centered around the model of Grossman and Helpman (1994, 1995) and extensions thereof. The relationships estimated in a simple econometric specification of the theoretical model generally appear to be quite supportive of its implications. There are, however, a number of good reasons for maintaining a skeptical stance toward any

interpretations of our results as evidence for the empirical relevance of the theoretical model. The following is an unranked listing of some of the more important caveats.

- The lack of relevant data forced us to assume effective lobby formation by owners of sector-specific factors of production in all industries. If there are any correlations between effective lobby formation and the other explanatory variables in our regressions, the current estimates are biased in unknown directions.
- There are a number of well-known problems associated with data on trade policy, one of those being the reporting and quantification of non-tariff barriers to trade. In our case this problem is somewhat aggravated because NTBs are treated as if they were trade taxes or subsidies (see the discussion of this issue in Section 3.6).
- The limited availability of consistent and comparable data has forced us to rely on a data set involving substantial aggregations. In the theoretical model there is one homogeneous good in each sector. In the data used, all goods and services produced in an economy are aggregated into 50 productive sectors.
- In all the alternative estimations discussed above, the share of total variation in protection that is explained by the regression model is fairly low. The value of  $R^2$  never exceeds 0.15 in estimates involving the full sample. For individual country/region samples the maximum is 0.416 (alternative 3a for the European Union).

# References

- Anderson, K. and R. E. Baldwin (1987), *The Political Market for Protection in Industrial Countries* chap. 2, pp. 20–36. Macmillan.
- Belfrage, C.-J. (1999a), “Special Interest Influence on Trade Policy through the Provision of Biased Information”, mimeo, Department of Economics, Lund University.
- (1999b), “Trade Policy, Intermediate Uses of Goods, and the Political Game”, mimeo, Department of Economics, Lund University.
- Bernheim, B. D. and M. Whinston (1986), “Menu Auctions, Resource Allocation, and Economic Influence”, *Quarterly Journal of Economics*, **101**, 1–31.
- Cadot, O., J. DeMelo and M. Olarreaga (1997), “Lobbying and the Structure of Protection”, Mimeo, CEPR.
- Conybeare, J. A. C. (1983), “Tariff Protection in Developed and Developing Countries: A Cross-Sectional and Longitudinal Analysis”, *International Organization*, **37**, 441–467.
- Frey, B. S. (1984), *International Political Economics*. Blackwell, Oxford.
- Godek, P. E. (1986), “The Politically Optimal Tariff: Levels of Trade Restrictions Across Developed Countries”, *Economic Inquiry*, **24**, 587–593.
- Goldberg, P. K. and G. Maggi (1999), “Protection for Sale: An Empirical Investigation”, *American Economic Review*, **89**, 1135–1155.
- Grossman, G. M. and E. Helpman (1994), “Protection for sale”, *American Economic Review*, **84**, 833–850.
- (1995a), “The Politics of Free Trade Agreements”, *American Economic Review*, **85**, 667–90.

- (1995b), “Trade Wars and Trade Talks”, *Journal of Political Economy*, **103**, 675–708.
- Hertel, T. W. (1997), *Global Trade Analysis: Modeling and applications*. Cambridge University Press.
- Johnson, H. G. (1954), “Optimum Tariffs and Retaliation”, *Review of Economic Studies*, **21**, 142–153.
- Lee, J.-W. and P. Swagel (1994), “Trade Barriers and Trade Flows Across Countries and Industries”, National Bureau of Economic Research Working Paper No. 4799.
- Lohmann, S. (1997), “Electoral Incentives, Informational Asymmetries, and the Policy Bias Toward Special Interests”, Mimeo, Department of Political Science, University of California at Los Angeles.
- Marvel, H. P. and E. J. Ray (1983), “The Kennedy Round: Evidence on the Regulation of International Trade in the United States”, *American Economic Review*, **73**, 190–197.
- McDougall, R., A. Elbehri and T. P. Truong (eds.) (1998), *Global Trade, Assistance and Protection: The GTAP 4 Data Base*. Center for Global Trade Analysis, Purdue University.
- Mitra, D. (1999), “Endogenous Lobby Formation and Endogenous Protection: A Long-Run Model of Trade Policy Determination”, *American Economic Review*, **89**, 1116–1134.
- Ray, E. J. (1981), “The Determinants of Tariff and Nontariff Trade Restrictions in the United States”, *Journal of Political Economy*, **89**, 105–121.
- (1987), “The Impact of Special Interests on Preferential Tariff Concessions by the United States”, *Review of Economics and Statistics*, **69**, 187–193.



- Rodrik, D. (1995), *Political Economy of Trade Policy* vol. 3, chap. 28, pp. 1457–1494. North-Holland.
- Trefler, D. (1993), “Trade Liberalization and the Theory of Endogenous Protection: An Econometric Study of U.S. Import Policy”, *Journal of Political Economy*, **101**, 138–160.

# Appendix

## 6.1 Derivation of the first-order condition for maximization of the joint benefit $\Omega$

Differentiation of  $\Omega$  from equation (20) with respect to  $\tau_i$  yields

$$\frac{\partial \Omega}{\partial \tau_i} = a \frac{\partial W}{\partial \tau_i} + \sum_{j=1}^m \Psi_j \frac{\partial W_j}{\partial \tau_i}. \quad (\text{A.1})$$

The details of the first term is found with the help of equations (16), (5), and (6) (12)

$$\begin{aligned} \frac{\partial W}{\partial \tau_i} &= \left( \frac{\partial \pi_i}{\partial p_i} + \sum_{k \in F_i} \frac{\partial \pi_k}{\partial p_i} \right) \frac{\partial p_i}{\partial \tau_i} + \frac{\partial Q_i}{\partial \tau_i} \\ &= \left( y_i - \sum_{k \in F_i} z_{ik} \right) \frac{\partial p_i}{\partial \tau_i} + \frac{\partial Q_i}{\partial \tau_i} \end{aligned} \quad (\text{A.2})$$

The marginal effect of domestic trade policy on the sum of net government income and consumer surplus is given by

$$\frac{\partial Q_i}{\partial \tau_i} = (\tau_i - 1) \bar{p}_i \frac{\partial p_i}{\partial \tau_i} M'_i + M_i (\tau_i - 1) \frac{\partial \bar{p}_i}{\partial \tau_i} + M_i \bar{p}_i + N u'_i [d_i(p_i)] d'_i \frac{\partial p_i}{\partial \tau_i} - N p_i d'_i \frac{\partial p_i}{\partial \tau_i} - \frac{\partial p_i}{\partial \tau_i} N d_i.$$

Using the first-order condition for utility maximization in consumption that  $u'_i [d_i(p_i)] = p_i$ , this reduces to

$$\frac{\partial Q_i}{\partial \tau_i} = (\tau_i - 1) \bar{p}_i \frac{\partial p_i}{\partial \tau_i} M'_i + M_i (\tau_i - 1) \frac{\partial \bar{p}_i}{\partial \tau_i} + M_i \bar{p}_i - N d_i \frac{\partial p_i}{\partial \tau_i}.$$

Rearranging terms while noting that  $\frac{\partial p_i}{\partial \tau_i} = \tau_i \frac{\partial \bar{p}_i}{\partial \tau_i} + \bar{p}_i$ , the expression simplifies to

$$\frac{\partial Q_i}{\partial \tau_i} = [(\tau_i - 1) \bar{p}_i M'_i + M_i - N d_i] \frac{\partial p_i}{\partial \tau_i} - \frac{\partial \bar{p}_i}{\partial \tau_i} M_i.$$

Now, using equation (12) to replace domestic consumption demand  $N d_i$  by  $M_i + y_i -$

$\sum_{k \in F_i} z_{ik}$  we have

$$\frac{\partial Q_i}{\partial \tau_i} = \left[ (\tau_i - 1) \bar{p}_i M'_i - y_i + \sum_{k \in F_i} z_{ik} \right] \frac{\partial p_i}{\partial \tau_i} - \frac{\partial \bar{p}_i}{\partial \tau_i} M_i \quad (\text{A.3})$$

When inserting this result into equation (A.2) we find that the producer surplus effects cancel out so that

$$\begin{aligned}\frac{\partial W}{\partial \tau_i} &= \left( y_i - \sum_{k \in F_i} z_{ik} \right) \frac{\partial p_i}{\partial \tau_i} + \frac{\partial Q_i}{\partial \tau_i} \\ &= [(\tau_i - 1) \bar{p}_i M'_i] \frac{\partial p_i}{\partial \tau_i} - \frac{\partial \bar{p}_i}{\partial t_i} M_i.\end{aligned}\tag{A.4}$$

The effect of the domestic trade policy selection on the border price can be derived from the identity requiring that, for any given good, one country's net imports is the rest of the world's net exports:

$$B \equiv M_i(\tau_i \bar{p}_i) + M_i^*(\tau_i^* \bar{p}_i) = 0\tag{A.5}$$

which implies that

$$\frac{\partial \bar{p}_i}{\partial t_i} = -\frac{\frac{\partial B}{\partial \tau_i}}{\frac{\partial B}{\partial \bar{p}_i}} = -\frac{\bar{p}_i M'_i}{\tau_i M'_i + \tau_i^* M_i^{*'}}.\tag{A.6}$$

Insertion of (A.6) into (A.4) then yields

$$\frac{\partial p_i}{\partial \tau_i} = \frac{\bar{p}_i \tau_i^* M_i^{*'}}{\tau_i M'_i + \tau_i^* M_i^{*'}}.\tag{A.7}$$

Using equations (A.6) and (A.7) in equation (A.4) we can express it as

$$\frac{\partial W}{\partial \tau_i} = (\tau_i - 1) \bar{p}_i M'_i \frac{\bar{p}_i \tau_i^* M_i^{*'}}{\tau_i M'_i + \tau_i^* M_i^{*'}} + \frac{\bar{p}_i M'_i}{\tau_i M'_i + \tau_i^* M_i^{*'}} M_i.$$

Setting this to zero and solving for the ad valorem tariff rate  $\tau_i - 1$  yields

$$\tau_i - 1 = -\frac{M_i}{\bar{p}_i \tau_i^* M_i^{*'}} = \frac{M_i^*}{\bar{p}_i \tau_i^* M_i^{*'}} = \frac{1}{e_i^*}$$

where

$$e_i^* \equiv M_i^{*'} \frac{\bar{p}_i \tau_i^*}{M_i^*}$$

is the foreign elasticity of import demand. This is simply the optimum tariff argument.

Now, let us turn to the second argument in the political objective function  $\Omega$  which takes us to the effect of trade policy on special interest group welfare. The trade policy applied to sector  $i$  ( $\tau_i$ ) affects the aggregate welfare of lobby  $j$  through its effect on the

domestic price of the good produced in sector  $i$  (if  $j = i$ ), through its effect on input prices (for all  $i \in I_j$  where  $I_j$  is the set of goods used as inputs in the production of good  $j$ ) as well as through its effects on consumer surplus enjoyed by and net government income redistributed to group members. The labor income of members is not affected as the wage rate is constant at unity. Hence, from equation (18) we have

$$\begin{aligned}\frac{\partial W_j}{\partial \tau_i} &= y_i + \alpha_j \frac{\partial Q_i}{\partial \tau_i} \text{ for } j = i \\ \frac{\partial W_j}{\partial \tau_i} &= -z_{ij} + \alpha_j \frac{\partial Q_i}{\partial \tau_i} \text{ for } j \neq i \text{ and } i \in I_j \\ \frac{\partial W_j}{\partial \tau_i} &= \alpha_j \frac{\partial Q_i}{\partial \tau_i} \text{ for } j \neq i \text{ and } i \notin I_j\end{aligned}$$

so that

$$\sum_{j=1}^m \Psi_j \frac{\partial W_j}{\partial \tau_i} = \left( \Psi_i y_i - \sum_{k \in F_i} \Psi_k z_{ik} \right) \frac{\partial p_i}{\partial \tau_i} + \alpha_L \frac{\partial Q_i}{\partial \tau_i} \quad (\text{A.8})$$

where  $F_i$  is the set of sectors in which good  $i$  is used as an input in production and

$$\alpha_L \equiv \sum_{j=1}^m \Psi_j \alpha_j$$

is the share of the population represented by effective lobbies.

We are now in a position to finalize the derivation of the first-order condition for trade policy selection on the political market. Inserting equations (A.4) and (A.8) and then equation (A.3) into equation (A.1) yields

$$\begin{aligned}\frac{\partial \Omega}{\partial \tau_i} &= a \left[ [(\tau_i - 1) \bar{p}_i M'_i] \frac{\partial p_i}{\partial \tau_i} - \frac{\partial \bar{p}_i}{\partial t_i} M_i \right] \\ &\quad + \left( \Psi_i y_i - \sum_{k \in F_i} \Psi_k z_{ik} \right) \frac{\partial p_i}{\partial \tau_i} + \alpha_L \left[ \left( (\tau_i - 1) \bar{p}_i M'_i - y_i + \sum_{k \in F_i} z_{ik} \right) \frac{\partial p_i}{\partial \tau_i} - \frac{\partial \bar{p}_i}{\partial t_i} M_i \right] \\ &= a \left[ [(\tau_i - 1) \bar{p}_i M'_i] \frac{\partial p_i}{\partial \tau_i} - \frac{\partial \bar{p}_i}{\partial t_i} M_i \right] \\ &\quad + \left( (\Psi_i - \alpha_L) y_i - \sum_{k \in F_i} (\Psi_k - \alpha_L) z_{ik} + \alpha_L (\tau_i - 1) \bar{p}_i M'_i \right) \frac{\partial p_i}{\partial \tau_i} - \alpha_L \frac{\partial \bar{p}_i}{\partial t_i} M_i \\ &= -(a + \alpha_L) \frac{\partial \bar{p}_i}{\partial t_i} M_i + \left( (a + \alpha_L) (\tau_i - 1) \bar{p}_i M'_i + (\Psi_i - \alpha_L) y_i - \sum_{k \in F_i} (\Psi_k - \alpha_L) z_{ik} \right) \frac{\partial p_i}{\partial \tau_i}\end{aligned}$$

Insertion of equations (A.6) and (A.7) yields

$$\begin{aligned}\frac{\partial \Omega}{\partial \tau_i} &= (a + \alpha_L) \frac{\bar{p}_i M'_i}{\tau_i M'_i + \tau_i^* M_i^*} M_i \\ &\quad + \left( (a + \alpha_L) (\tau_i - 1) \bar{p}_i M'_i + (\Psi_i - \alpha_L) y_i - \sum_{k \in F_i} (\Psi_k - \alpha_L) z_{ik} \right) \frac{\bar{p}_i \tau_i^* M_i^*}{\tau_i M'_i + \tau_i^* M_i^*} \\ &= \frac{(a + \alpha_L) \bar{p}_i M'_i M_i + ((a + \alpha_L) (\tau_i - 1) \bar{p}_i M'_i + (\Psi_i - \alpha_L) y_i - \sum_{k \in F_i} (\Psi_k - \alpha_L) z_{ik}) \bar{p}_i \tau_i^* M_i^*}{\tau_i M'_i + \tau_i^* M_i^*}.\end{aligned}$$

Setting this result to zero and solving for the ad valorem level of protection  $\tau_i - 1$  finally yields

$$\begin{aligned}(\tau_i - 1) &= \frac{-(a + \alpha_L) \bar{p}_i M'_i M_i - ((\Psi_i - \alpha_L) y_i - \sum_{k \in F_i} (\Psi_k - \alpha_L) z_{ik}) \bar{p}_i \tau_i^* M_i^*}{(a + \alpha_L) \bar{p}_i M'_i \tau_i^* M_i^*} \\ &= -\frac{((\Psi_i - \alpha_L) y_i - \sum_{k \in F_i} (\Psi_k - \alpha_L) z_{ik})}{(a + \alpha_L) \bar{p}_i M'_i} - \frac{M_i}{\bar{p}_i \tau_i^* M_i^*}.\end{aligned}$$

Considering that  $M_i^* = -M_i$  and that the rest of world elasticity of import demand for good  $i$  can be defined as

$$e_i^* \equiv M_i^* \frac{\bar{p}_i \tau_i^*}{M_i^*}$$

we get

$$\tau_i - 1 = \frac{(\Psi_i - \alpha_L) y_i - \sum_{k \in F_i} (\Psi_k - \alpha_L) z_{ik}}{-(a + \alpha_L) \bar{p}_i M'_i} + \frac{1}{e_i^*}.$$

## Deriving the own-price elasticity of household demand from parameters given in the GTAP data base

The GTAP database is designed to fit the GTAP model which in turn is designed for the purpose of facilitating policy analysis. That kind of exercise does, in addition to the basic data like that already used for the construction of some of our variables, require a complete system of firm and household behavior with at least a minimum set of behavioral parameters. Some of those parameters provided with the database are calibrated within the "constant difference of elasticities" (CDE) system for household demands for the purpose of meeting target income and own-price elasticities in a consistent fashion. The

target elasticities have been obtained or estimated from various sources by the GTAP staff. With the help of the GTAP documentation we have therefore been able to arrive at the consistent sets of own-price elasticities of demand.

The parameters given in the dataset are the substitution parameter *SUBPAR* and the income expansion parameter *INCPAR*. Following the instructions in Hertel (1997, pp. 50-51) we calculate the Allen partial own-price elasticities according to the formula

$$APE = 2\alpha - \sum [CONSHR \times \alpha] - \frac{\alpha}{CONSHR}$$

where

$$\alpha = 1 - SUBPAR.$$

The compensated own-price elasticity of demand is according to all documentation given by

$$CEP = CONSHR \times APE$$

where *CONSHR* is the budget share for the commodity in question in private household expenditure. The uncompensated own-price elasticity of demand is given by

$$EP = CEP + CONSHR \times EY$$

where the income elasticity *EY* is given by

$$EY = \frac{\sum [CONSHR \times INCPAR \times \alpha] + INCPAR \times (1 - \alpha)}{\sum [CONSHR \times INCPAR]} + \alpha - \sum [CONSHR \times \alpha].$$

In the preliminary derivation of data for testing we use the uncompensated own-price elasticity of demand *EP* but the absence of income effects in our underlying theory does perhaps call for the use of the compensated *CEP* instead. A quick comparison between *EP* and *CEP* does however tell us that the differences are very small.

## Deriving domestic output elasticities as a function of the GTAP elasticity of substitution parameter and factor intensities

In order to be able to use the substitution parameter provided with the GTAP database to derive domestic output elasticities we need to assign the CES functional form to the production functions. Doing so is fully compatible with the economic framework of our political model which does not specify any production relationship but dictates constant returns to scale. The derivations in this subsection will for convenience be made without the sectoral subscripts  $i$ .

With all firms in a sector using the same constant returns technology and the price of the mobile factor fixed at  $\bar{w}$ , optimization in production dictates that

$$F \equiv p \frac{\partial y}{\partial L} - \bar{w} = 0$$

which since

$$y(L, K) = [\alpha_L L^\rho + \alpha_K K^\rho]^{\frac{1}{\rho}}$$

in the CES case expands to

$$F \equiv p [\alpha_L L^\rho + \alpha_K K^\rho]^{\frac{1}{\rho}-1} \alpha_L L^{\rho-1} - \bar{w} = 0.$$

This yields the optimal use of the mobile factor

$$L^* = L^*(p, \alpha_L, \alpha_K, \rho, K, \bar{w})$$

which at given  $p$ , the parameters and the fixed amount of  $K$  available yields optimal output  $y^*$  as

$$y^* = [\alpha_L (L^*)^\rho + \alpha_K K^\rho]^{\frac{1}{\rho}}$$

The equilibrium elasticity of supply can then be defined as

$$e_y \equiv \frac{\partial y^*}{\partial p} \frac{p}{y^*}.$$

To get an expression for it we need to derive

$$\frac{\partial y^*}{\partial p} = [\alpha_L (L^*)^\rho + \alpha_K K^\rho]^{\frac{1}{\rho}-1} \alpha_L (L^*)^{\rho-1} \frac{\partial L^*}{\partial p}$$

where implicit differentiation of the first-order condition above requires

$$\frac{\partial L^*}{\partial p} = -\frac{\frac{\partial F}{\partial p}}{\frac{\partial F}{\partial L}}$$

and we have

$$\frac{\partial F}{\partial p} = [\alpha_L L^\rho + \alpha_K K^\rho]^{\frac{1}{\rho}-1} \alpha_L L^{\rho-1}$$

$$\begin{aligned} \frac{\partial F}{\partial L} &= p [\alpha_L L^\rho + \alpha_K K^\rho]^{\frac{1}{\rho}-1} \alpha_L (\rho-1) L^{\rho-2} + L^{\rho-1} p \alpha_L \left( \frac{1}{\rho} - 1 \right) [\alpha_L L^\rho + \alpha_K K^\rho]^{\frac{1}{\rho}-2} \rho \alpha_L L^{\rho-1} \\ &= p \alpha_L (1-\rho) L^{\rho-1} L^{-1} [\alpha_L L^\rho + \alpha_K K^\rho]^{\frac{1}{\rho}-1} \{ [\alpha_L L^\rho + \alpha_K K^\rho]^{-1} \alpha_L L^\rho - 1 \} \end{aligned}$$

so that

$$\begin{aligned} \frac{\partial L^*}{\partial p} &= -\frac{[\alpha_L L^\rho + \alpha_K K^\rho]^{\frac{1}{\rho}-1} \alpha_L L^{\rho-1}}{p \alpha_L (1-\rho) L^{\rho-1} L^{-1} [\alpha_L L^\rho + \alpha_K K^\rho]^{\frac{1}{\rho}-1} \{ [\alpha_L L^\rho + \alpha_K K^\rho]^{-1} \alpha_L L^\rho - 1 \}} \\ &= \frac{L}{p (1-\rho) \{ 1 - [\alpha_L L^\rho + \alpha_K K^\rho]^{-1} \alpha_L L^\rho \}} > 0. \end{aligned}$$

Then

$$\begin{aligned} \frac{\partial y^*}{\partial p} &= [\alpha_L (L^*)^\rho + \alpha_K K^\rho]^{\frac{1}{\rho}-1} \alpha_L (L^*)^{\rho-1} \frac{\partial L^*}{\partial p} \\ &= \frac{[\alpha_L L^\rho + \alpha_K K^\rho]^{\frac{1}{\rho}-1} \alpha_L L^\rho}{p (1-\rho) \{ 1 - [\alpha_L L^\rho + \alpha_K K^\rho]^{-1} \alpha_L L^\rho \}} \end{aligned}$$

and



$$\begin{aligned}
e_y &\equiv \frac{\partial y^*}{\partial p} \frac{p}{y^*} = \frac{[\alpha_L L^\rho + \alpha_K K^\rho]^{\frac{1}{\rho}-1} \alpha_L L^\rho}{p(1-\rho) \{1 - [\alpha_L L^\rho + \alpha_K K^\rho]^{-1} \alpha_L L^\rho\}} \frac{p}{y^*} \\
&= \frac{[\alpha_L L^\rho + \alpha_K K^\rho]^{\frac{1}{\rho}-1} \alpha_L L^\rho}{(1-\rho) \{1 - [\alpha_L L^\rho + \alpha_K K^\rho]^{-1} \alpha_L L^\rho\} y^*} \\
&= \frac{[\alpha_L L^\rho + \alpha_K K^\rho]^{-1} \alpha_L L^\rho}{(1-\rho) \{1 - [\alpha_L L^\rho + \alpha_K K^\rho]^{-1} \alpha_L L^\rho\}} \\
&= \frac{1}{(1-\rho)} \frac{1}{\frac{1 - [\alpha_L L^\rho + \alpha_K K^\rho]^{-1} \alpha_L L^\rho}{[\alpha_L L^\rho + \alpha_K K^\rho]^{-1} \alpha_L L^\rho}} \\
&= \frac{1}{(1-\rho)} \frac{1}{\frac{\alpha_L L^\rho + \alpha_K K^\rho}{\alpha_L L^\rho} - 1} \\
&= \frac{1}{(1-\rho)} \frac{1}{\frac{\alpha_K K^\rho}{\alpha_L L^\rho}} \\
&= \frac{1}{(1-\rho)} \frac{\alpha_L L^\rho}{\alpha_K K^\rho}
\end{aligned}$$

and since the elasticity of substitution parameter is given by

$$\sigma = \frac{1}{1-\rho}$$

we have

$$e_y = \sigma \frac{\alpha_L L^\rho}{\alpha_K K^\rho}.$$

Now, consider, however, that with payments to the mobile factor reflecting its marginal revenue product, the aggregate payment to the mobile factor in this sector is given by

$$\begin{aligned}
p \frac{\partial y^*}{\partial L} L &= p [\alpha_L L^\rho + \alpha_K K^\rho]^{\frac{1}{\rho}-1} \alpha_L L^{\rho-1} L \\
&= p [\alpha_L L^\rho + \alpha_K K^\rho]^{\frac{1}{\rho}-1} \alpha_L L^\rho
\end{aligned}$$

which in our data is given as  $VFM(Labor)$ , i.e. the value of payments to mobile factors of production employed in the sector. From the expression for  $p \frac{\partial y^*}{\partial L} L$  we can, however,

also see that

$$\begin{aligned}
 p \frac{\partial y^*}{\partial L} L &= py [\alpha_L L^\rho + \alpha_K K^\rho]^{-1} \alpha_L L^\rho \\
 &= py \frac{\alpha_L L^\rho}{\alpha_L L^\rho + \alpha_K K^\rho} \\
 &= py \frac{1}{1 + \frac{\alpha_K K^\rho}{\alpha_L L^\rho}}
 \end{aligned}$$

and since we can write

$$\frac{\sigma}{e_y} = \frac{\alpha_K K^\rho}{\alpha_L L^\rho}$$

we have

$$VFM(Labor) = py \frac{1}{1 + \frac{\sigma}{e_y}}$$

which lets us use the data to solve for the output elasticity as

$$e_y = \frac{\sigma}{\left( \frac{py}{VFM(Labor)} - 1 \right)}$$

where  $py$  simply is the market value of output which is also in our data.

## Sectors in the GTAP (version 4) database

	Sector	Description	Sample average protection rate
1	pdr	* Paddy rice	0.952
2	wht	* Wheat	0.901
3	gro	* Cereal grains nec	0.767
4	v_f	* Vegetables, fruit, nuts	0.012
5	osd	* Oil seeds	0.000
6	c_b	* Sugar cane, sugar beet	0.483
7	pfb	* Plant-based fibers	0.123
8	ocr	* Crops nec	0.014
9	ctl	* Bovine cattle, sheep and goats, horses	0.116
10	oap	* Animal products nec	0.091
11	rmk	Raw milk	n/a
12	wol	* Wool, silk-worm cocoons	0.014
13	for	* Forestry	-0.002
14	fsh	* Fishing	0.009
15	col	* Coal	-0.011
16	oil	* Oil	0.006
17	gas	* Gas	-0.001
18	omn	* Minerals nec	-0.002
19	cmt	* Bovine cattle, sheep and goat, horse meat prods	0.117
20	omt	* Meat products nec	0.190
21	vol	* Vegetable oils and fats	0.000
22	mil	* Dairy products	0.887
23	pcr	* Processed rice	0.896
24	sgr	* Sugar	0.411
25	ofd	* Food products nec	0.021
26	b_t	* Beverages and tobacco products	0.014
27	tex	* Textiles	0.044
28	wap	* Wearing apparel	0.085
29	lea	* Leather products	0.074
30	lum	* Wood products	0.012
31	ppp	* Paper products, publishing	0.013
32	p_c	* Petroleum, coal products	-0.015
33	cip	* Chemical, rubber, plastic products	0.014
34	mmm	* Mineral products nec	0.026
35	i_s	* Ferrous metals	0.012
36	nfm	* Metals nec	0.003
37	fmp	* Metal products	0.024
38	mvh	* Motor vehicles and parts	0.039
39	otn	* Transport equipment nec	0.008
40	ele	* Electronic equipment	0.014
41	ome	* Machinery and equipment nec	0.022
42	omf	* Manufactures nec	0.031
43	ely	Electricity	n/a
44	gdt	Gas manufacture, distribution	n/a
45	wtr	Water	n/a
46	cns	Construction	n/a
47	t_t	Trade, transport	n/a
48	osp	Financial, business, recreational services	n/a
49	osg	Public admin and defence, education, health	n/a
50	dwe	Dwellings	n/a

\* Included in the analysis.

## Regions/countries in the GTAP (version 4) database

	Region	Description	Simple average protection rate	Trade-weighted protection rate
1	aus	* Australia	0.033	0.051
2	nzl	* New Zealand	0.032	0.039
3	jpn	* Japan	0.702	0.300
4	kor	Korea	0.200	0.137
5	idn	Indonesia	0.101	0.073
6	mys	Malaysia	0.162	0.050
7	phl	Philippines	0.280	0.167
8	sgp	Singapore	0.082	0.012
9	tha	Thailand	0.377	0.314
10	vnm	Viet Nam	0.083	0.144
11	chn	China	0.073	0.149
12	hkg	Hong Kong	-0.002	-0.003
13	twi	Taiwan	0.170	0.098
14	ind	India	0.213	0.227
15	lka	Sri Lanka	0.132	0.143
16	ras	Rest of South Asia	0.447	0.570
17	can	* Canada	0.038	0.010
18	usa	* United States of America	0.054	0.023
19	mex	Mexico	-0.022	0.004
20	cam	Central America and the Caribbean	0.040	0.048
21	ven	Venezuela	0.066	0.042
22	col	Colombia	0.056	0.059
23	rap	Rest of the Andean Pact	0.052	0.072
24	arg	Argentina	0.035	0.036
25	bra	Brazil	0.007	0.062
26	chl	Chile	0.064	0.060
27	ury	Uruguay	0.092	0.110
28	rsm	Rest of South America	0.069	0.102
29	gbr	(*) United Kingdom	0.114	0.050
30	deu	(*) Germany	0.086	0.017
31	dnk	(*) Denmark	0.078	0.067
32	swe	(*) Sweden	0.126	0.010
33	fin	(*) Finland	0.105	0.012
34	reu	(*) Rest of European Union	0.069	0.018
35	eft	EFTA	0.767	0.148
36	cea	Central European Associates	0.058	0.045
37	fsu	Former Soviet Union	0.006	-0.001
38	tur	Turkey	0.099	0.048
39	rme	Rest of Middle East	-0.016	-0.008
40	mar	Morocco	0.101	0.101
41	rnf	Rest of North Africa	0.137	0.117
42	saf	South African Customs Union	0.085	0.071
43	rsa	Rest of southern Africa	0.050	0.000
44	rss	Rest of sub-Saharan Africa	-0.027	-0.033
45	row	Rest of World	0.241	0.378
xx	eu	* European Union	0.080	0.020

\* Included in the analysis. (\*) Included in the analysis through EU membership.

# Estimation results for individual countries/regions

## Alternatives 1a and 1b

Table 5.2				
Individual country estimates for Alternatives 1a and 1b				
Regressor Coefficient	Alt. 1a		Alt. 1b	
	$\Omega_i^{Up}$	$R^2$	$\Omega_i^{UpDo}$	$R^2$
	$\beta > 0$		$\beta > 0$	
Australia	$3.44 \times 10^{-4}$ (0.089)	0.008	$5.06 \times 10^{-4}$ (0.223)	0.003
New Zealand	$1.14 \times 10^{-4}$ (0.130)	0.004	$1.43 \times 10^{-4}$ (0.212)	0.004
Japan	$1.45 \times 10^{-2}$ (0.012)	0.145	$-1.00 \times 10^{-4}$ (0.171)	0.002
Canada	$4.12 \times 10^{-4}$ (0.003)	0.016	$-1.44 \times 10^{-4}$ (0.108)	0.003
United States	$5.23 \times 10^{-4}$ (0.099)	0.009	$-6.17 \times 10^{-4}$ (0.167)	0.004
European Union	$1.01 \times 10^{-2}$ (0.016)	0.215	$-3.29 \times 10^{-3}$ (0.253)	0.011
Full Sample	$7.36 \times 10^{-4}$ (0.007)	0.010	$-9.70 \times 10^{-5}$ (0.155)	0.002

# Alternatives 2a and 2b

Table 5.3						
Individual country estimates for Alternatives 2a and 2b						
Regressor  Coefficient	Alt. 2a			Alt. 2b		
	$\Omega_i^{Up}$	$\Theta_i$	$R^2$	$\Omega_i^{UpDo}$	$\Theta_i$	$R^2$
	$\beta > 0$	$\gamma > 0$		$\beta > 0$	$\gamma > 0$	
Australia	$3.62 \times 10^{-4}$ (0.086)	$1.01 \times 10^{-2}$ (0.363)	0.008	$5.80 \times 10^{-4}$ (0.202)	$1.13 \times 10^{-2}$ (0.314)	0.003
New Zealand	$7.51 \times 10^{-5}$ (0.127)	$-0.347$ (0.200)	0.024	$1.03 \times 10^{-4}$ (0.212)	$-0.350$ (0.196)	0.024
Japan	$5.03 \times 10^{-3}$ (0.282)	$0.936$ (0.021)	0.262	$2.79 \times 10^{-4}$ (0.021)	$1.20$ (0.000)	0.265
Canada	$4.47 \times 10^{-4}$ (0.004)	$9.43 \times 10^{-2}$ (0.034)	0.019	$-1.37 \times 10^{-4}$ (0.115)	$2.95 \times 10^{-2}$ (0.230)	0.004
United States	$5.13 \times 10^{-4}$ (0.160)	$0.153$ (0.024)	0.050	$1.76 \times 10^{-4}$ (0.433)	$0.159$ (0.039)	0.041
European Union	$7.85 \times 10^{-3}$ (0.045)	$0.146$ (0.193)	0.239	$3.35 \times 10^{-3}$ (0.232)	$0.342$ (0.026)	0.159
Full Sample	$6.66 \times 10^{-4}$ (0.012)	$0.456$ (0.001)	0.115	$6.64 \times 10^{-5}$ (0.112)	$0.468$ (0.001)	0.107

### Alternatives 3a and 3b

Table 5.6						
Individual country estimates for Alternatives 3a and 3b						
Regressor Coefficient	Alt. 3a			Alt. 3b		
	$\phi_i \Omega_i^{Up}$ $\beta > 0$	$\Theta_i$ $\gamma > 0$	$R^2$	$\phi_i \Omega_i^{UpDo}$ $\beta > 0$	$\Theta_i$ $\gamma > 0$	$R^2$
Australia	$4.80 \times 10^{-3}$ (0.003)	$7.66 \times 10^{-2}$ (0.024)	0.056	$6.14 \times 10^{-3}$ (0.123)	$6.37 \times 10^{-2}$ (0.105)	0.015
New Zealand	$3.81 \times 10^{-3}$ (0.055)	$-6.64 \times 10^{-2}$ (0.405)	0.087	$9.05 \times 10^{-3}$ (0.091)	$7.28 \times 10^{-2}$ (0.383)	0.139
Japan	$3.49 \times 10^{-2}$ (0.075)	0.699 (0.062)	0.314	$1.15 \times 10^{-3}$ (0.159)	1.19 (0.000)	0.257
Canada	$1.47 \times 10^{-3}$ (0.019)	$8.53 \times 10^{-2}$ (0.047)	0.020	$-4.47 \times 10^{-4}$ (0.094)	$2.95 \times 10^{-2}$ (0.230)	0.004
United States	$3.67 \times 10^{-3}$ (0.135)	0.176 (0.026)	0.073	$-2.21 \times 10^{-4}$ (0.478)	0.152 (0.037)	0.041
European Union	$3.13 \times 10^{-2}$ (0.001)	$4.51 \times 10^{-2}$ (0.341)	0.416	$-4.44 \times 10^{-3}$ (0.383)	0.283 (0.039)	0.153
Full Sample	$6.88 \times 10^{-3}$ (0.002)	0.452 (0.001)	0.150	$-3.97 \times 10^{-4}$ (0.331)	0.449 (0.001)	0.107