Chapter 9 – Political Economy of Trade Policy

In the previous two chapters we have covered the basic analysis of trade policies, including models of imperfect competition. The idea that non-competitive markets give rise to opportunities for governments to gain from trade policies has been an important line of research. It has ultimately been concluded, however, that such opportunities for "strategic" use of trade policy are very limited. This raises the obvious question of why trade policies are used so often? One answer is that such policies are politically motivated: tariffs are granted in response to demands by special interest groups, such as industries and unions. The research issue is to understand how such demands are mediated through the political process. In this chapter we outline research on the political economy of protection, including the median voter model of Mayer (1984) and the "protection for sale" model of Grossman and Helpman (1994).

The "protection for sale" model has been extended in a number of directions. Mitra (1999) has shown how to introduce *endogenous* lobbies into that framework, as we shall discuss. Grossman and Helpman (1995a) further use this framework to analyze a tariff war between two countries, and the potential benefits from international agreements. Along the same lines, Bagwell and Staiger (1999, 2002) examine the economic rationale for the trade rules embodied in the General Agreement on Trade and Tariffs (GATT) and the World Trade Organization (WTO). These rules include GATT's principle of "reciprocity," whereby each country agrees to reduce its trade barriers in return for a reciprocal reduction by another. Bagwell and Staiger's framework is general enough to include both the median voter model and the "protection for sale" model, and we use it to show the outcome of a trade war, along with the benefits from reciprocal tariff reductions using GATT rules.

Another importance principle of GATT is the "most favored nation" (MFN) provision, which states that all member countries of GATT should be granted the same tariffs. This provision is violated when countries join into regional trade agreements, granting zero tariffs to countries *within* but not outside the agreement. Our third topic is to examine the incentives for countries to join regional trade agreements versus multilateral agreements. A key question here, raised by Bhagwati (1993), is whether joining a regional trade agreement *helps or hinders* the ultimate goal of multilateral free trade. Models indicating that regional agreements may hinder multilateral free trade include Krishna (1998) and McLaren (2002), and views on the other side include Baldwin (1995) and Ethier (1998). We will examine this issue using the median voter model, as in Levy (1997). In the basic version of this model a regional agreement cannot hinder a multilateral agreement, but in an extended version of the model this can occur.

We conclude the chapter with an application of political economy to a non-democratic setting: the People's Republic of China. In this case the special interest groups do not take the form of well-funded lobbying groups as in the U.S., but rather, include the large state-owned industries and the smaller but growing private industries, as well as foreign firms. The distribution of these firms is very uneven across provinces. China's recent entry into the WTO came only after regional concerns in China about the impact of import competition were overruled. We argue that the regional variation towards openness (as evidenced by the inflow of foreign firms), combined with the variation in location of state-owned firms, can be used to identify the political weights given to the various interest groups. We present the results of Branstetter and Feenstra (2002), which show how the Grossman-Helpman framework can be applied in this setting.

Median Voter Model

Used in many applications, the median voter model presumes that policies are established by majority vote. Provided that preferences are "single peaked" over the policy being voted upon (i.e. each person has a unique maximum), then it follows that the policy adopted will maximize the utility of the median voter. In the application to trade policy we assume that the policy is an import tariff or subsidy. The optimal tariff for the median voter will depend on the production structure in the economy, and for simplicity in this section we assume the two-by-two Heckscher-Ohlin (HO) model (Mayer, 1984, also considers other structures). Then we will show that if the median voter owns a lower capital/labor ratio than overall for the economy, and imports are labor-intensive, the economy will have a positive import tariff.

As in chapter 7, we will suppose that each individual has a quasi-linear utility function given by $c_0^h + U(c^h)$, where c_0^h is consumption of a numeraire export good, and c^h is the consumption of the import good for consumer h=1,…,L. (We use L rather than H to denote the number of consumers, since L also equals the number of workers). Consumers all have the same increasing and strictly concave utility function U, so they have the same optimal consumption $c^h = d(p)$, $d'(p) < 0$, with remaining income spent on the numeraire good, $c_0^h = I^h - p'd(p)$. Then individual utility is,

$$V(p,I^h) \equiv I^h - p'd(p) + U[d(p)] \ . \qquad (9.1)$$

Both the export and import goods are produced using labor and capital. The total endowments of labor and capital are L and K, respectively. The fixed world price of the import is denoted by p*, and this good has a specific tariff of t, so the domestic price is p = p* + t. We let y(p) denote the supply of the import-competing good, with $y'(p) > 0$. Imports are then m(p) =

d(p)L – y(p), and tariff revenue collected is T = tm(p), which is redistributed with a poll subsidy. We will suppose that individual h has one unit of labor and K^h units of capital, h=1,…,L, so that individual income is, $I^h = w + rK^h + (T/L)$. We can re-express this as,

$$I^h = \frac{1}{L}(wL + rK^h L + T) = \frac{1}{L}(wL + \rho^h rK + T), \tag{9.2}$$

where $\rho^h = K^h/(K/L)$ is the capital/labor ratio for the individual in question relative to the *overall* capital/labor ratio in the economy. Total GDP in the economy is $G = y_0(p) + py(p) = wL + rK$. It follows that we can re-write individual income in (9.2) as:

$$I^h = \frac{1}{L}[wL + rK + (\rho^h - 1)rK + T] = \frac{1}{L}[(\rho^h - 1)rK + y_0(p) + py(p) + T]. \tag{9.2'}$$

Differentiating individual utility in (9.1) with respect to the tariff, we obtain:

$$\begin{aligned} \frac{dV^h}{dt} &= -d(p) + \frac{dI^h}{dt} \\ &= (\rho^h - 1)\frac{dr}{dp}\frac{K}{L} + \left[\frac{y(p)}{L} - d(p)\right] + \frac{1}{L}\frac{dT}{dp} \\ &= (\rho^h - 1)\frac{dr}{dp}\frac{K}{L} + \frac{t}{L}m'(p), \end{aligned} \tag{9.3}$$

where the first line follows from Roy's Identity, the second line using (9.2'), and the third line using tariff revenue of T = t[d(p)L – y(p)] = tm(p).

If the tariff is determined by majority vote, then the tariff prevailing will be that which maximizes the utility of the median voter. Denoting the median voter by "m," with utility

$V^m = V(p, I^m)$, this tariff will satisfy $dV^m/dt = 0$ and $d^2V^m/dt^2 < 0$. Setting (9.3) equal to zero, this tariff is:

$$t^m = (1-\rho^m)\frac{dr}{dp}\frac{K}{m'(p)}, \tag{9.4}$$

where ρ^m is the capital/labor ratio for the *median* individual h relative to the overall capital/labor endowment for the economy. This ratio is less than one for all countries (Alesina and Rodrik, 1994), so that $\rho^m < 1$. Then since $m'(p) < 0$, we see that the tariff t^m is *positive* when the import good is labor-intensive, so that $dr/dp < 0$, but *negative* when the import good is capital- intensive, so that $dr/dp > 0$. In other words, import tariffs should be used in capital-abundant industrialized countries, but import subsidies in labor-abundant developing countries.

In practice, import subsidies are rarely observed, despite this prediction from the median voter model. There are many reasons for this, some of which we will investigate later in this section. Setting aside this most obvious limitation of the median voter model, Dutt and Mitra (2002) ask whether there is some *other* prediction that might accord better with real world evidence. In particular, suppose that we compare countries with varying degrees of inequality, which we measure by $(1-\rho^m)$, i.e. with lower values of the median voter's capital/labor endowment ρ^m, corresponding to higher inequality. Then differentiating the first-order condition $\frac{dV^m}{dt} = 0$, we obtain $\frac{d^2V^m}{dt^2}dt + \frac{d^2V^m}{d(1-\rho^m)dt}d(1-\rho^m) = 0$, so that from (9.3):

$$\frac{dt^m}{d(1-\rho^m)} = \frac{dr}{dp}\frac{K}{L}\Big/\frac{d^2V^m}{dt^2}, \tag{9.5}$$

where $d^2V^m/dt^2 < 0$ from the second-order condition.

It follows that for capital-abundant countries importing the labor-intensive good, so that dr/dp < 0, the median voter model predicts that *increased* inequality (a rise in $1-\rho^m$) will lead to a *higher* tariff. Conversely, for labor-abundant countries importing the capital-intensive good, so that dr/dp > 0, the median voter model predicts that *increased* inequality (a rise in $1-\rho^m$) will lead to a *reduced* tariff or increased subsidy (a fall in t^m). Stated less formally, we expect increased inequality to be associated with more restrictive trade policies in industrialized countries, but more open trade policies in developing countries.

Dutt and Mitra test this prediction by running the regression:

$$TR^i = \alpha_0 + \alpha_1 INEQ^i + \alpha_2 INEQ^i (K/L)^i + \alpha_3 (K/L)^i + X^i\beta + \varepsilon_i, \qquad (9.6)$$

where TR^i is an measure of trade restrictions in country i, $INEQ^i$ is an index of income inequality in that country, $(K/L)^i$ is the capital/labor ratio in country i, and X^i is a matrix of other control variables. Taking the partial derivative of TR^i with respect to $INEQ^i$, we obtain,

$$\frac{\partial TR^i}{\partial INEQ^i} = \alpha_1 + \alpha_2 (K/L)^i. \qquad (9.6')$$

The prediction from the median voter is that this derivative should be negative for low levels of the capital/labor ratio $(K/L)^i$, but positive for higher levels of the capital/labor ratio. This will occur if $\alpha_1 < 0$ and $\alpha_2 > 0$, with the turning point between the negative and positive derivatives occurring where (9.6') equals zero, or at the capital/labor ratio $(K/L)^i = -\alpha_1/\alpha_2 > 0$.

In their estimates, Dutt and Mitra confirm these signs of α_1 and α_2 for several different measures of tariffs used for TR^i. The turning point $(K/L)^i = -\alpha_1/\alpha_2$ turns out to be quite close to the median capital/labor ratio in the sample (South Korea). For developing countries with lower capital/labor ratios, greater inequality leads to lower tariffs. Conversely, for industrialized countries with higher capital/labor ratios, greater inequality leads to higher tariffs. This provides striking support for the median voter framework in the context of the Heckscher-Ohlin model. In addition, Dutt and Mitra find that this relationship holds better in democracies than in dictatorships.

This confirmation of the median voter model seems at odds with its first prediction, that tariffs should be positive in advanced countries importing labor-intensive goods, but negative in developing economies importing capital-intensive goods. As we have mentioned, import subsidies are rarely observed. Fernandez and Rodrik (1991) provide one explanation for the "anti-trade" bias of nearly all countries. Specifically, they argue that even if policies are determined by majority vote, when individuals do not know whether they will be included among the gainers or losers, there is a tendency for voters to prefer the status quo. This occurs even in a model where everyone is perfectly informed about the aggregate gains and losses in each industry, but cannot predict their individual returns. Therefore, there is a tendency to apply tariffs to offset import competition and preserve the status-quo income distribution.[1] This can help to reconcile the positive tariffs observed in most countries with the median voter model, and the logic of Fernandez and Rodrik holds equally well in other models, as well.

[1] The idea that trade policy is applied to preserve the status-quo income distribution has also been proposed by Cordon (1974), and is known as the "conservative social welfare function;" see also Deardorff (1987). In Fernandez and Rodrik (1991), this is the outcome of majority vote rather than a criterion imposed by the government.

Protection for Sale

The median voter model assumes that policies are determined by majority vote. This is an overly simplified description of representative democracies where the electorate votes for legislators, who then determine the policies. In such settings the policies chosen will be jointly influenced by votes, voice, and dollars from the campaign contribution of lobbying groups. The second model we consider, due to Grossman and Helpman (1994), proposes an elegant solution to the problem of how the government simultaneously considers the contributions of numerous lobbies, as well as consumer welfare, in determining trade policy.[2]

We assume that there are N goods plus the numeraire commodity. On the demand side, consumer utility functions are $c_0^h + \sum_{i=1}^N u_i(c_i^h)$, where c_0^h is the numeraire export good, and c_i^h is the consumption of good i=1,…,N. Maximizing utility subject to the budget constraint gives the per-capita consumption $d_i(p_i)$ of each good, i=1,…,N, with remaining income spent on the numeraire good, $c_0^h = I^h - p'd(p)$. We let $d(p) = [d_1(p_1),\ldots,d_N(p_N)]$ denote the vector of per-capita consumptions, depending on prices $p=(p_1,\ldots,p_N)$. Then individual utility is similar to that in (9.1),

$$V(p, I^h) \equiv I^h - p'd(p) + \sum_{i=1}^N u_i[d_i(p_i)] \ . \qquad (9.7)$$

Notice that the last two terms on the right of (9.7) give per-capita consumer surplus, or

[2] Earlier political economy models, such as Findlay and Wellisz (1982), simply assumed a functional relationship between lobbying contributions and tariffs. Hillman (1989) allowed for a government objective function with a general tradeoff between the benefits to a special interest group and costs to consumers of tariff protection. The advantage of Grossman and Helpman (1994) is that these functional relationships are endogenously determined rather than assumed.

$S(p) \equiv \sum_{i=1}^{N} u_i[d_i(p_i)] - p'd(p)$, so that consumer welfare can be written as:

$$V^h(p, I^h) \equiv I^h + S(p) \ , \qquad (9.7')$$

with $\partial S(p)/\partial p_i = -d_i(p_i)$, by Roy's Identity.

On the production side, each of the N industries has the production function $y_i = f_i(L_i, K_i)$, where capital K_i is *specific* to each sector. The numeraire commodity is produced with one unit of labor, so wages are fixed at unity. Given the product price p_i in each sector, the return to the specific factor in that sector is,

$$\pi_i(p_i) = \max_{L_i} [p_i f_i(L_i, K_i) - L_i]. \qquad (9.8)$$

From (9.8) we can determine the optimal outputs $\pi_i'(p_i) = y_i(p_i)$ in each industry. The international prices of the goods are fixed at p_i^*, and each industry may receive a specific trade policy of t_i, i=1,…,N, where $t_i > (<) 0$ indicates a tariff (subsidy) in an import industry, and a subsidy (tariff) in an export industry. Imports of each good are then $m_i(p_i) = d_i(p_i)L - y_i(p_i)$ (which are negative for exports), and tariff revenue collected is $T(p) = \sum_{i=1}^{N}(p_i - p_i^*)m_i(p_i)$. We assume that this revenue is redistributed by a poll subsidy of (T/L) per person.

The specific factor in each industry i is owned by H_i members of the population, so that $H = \sum_{i=1}^{N} H_i$ is the total number of persons owning some capital. For simplicity, we suppose that every individual also own one unit of labor. The total population is L, so there are an additional $(L - H) \geq 0$ persons who own one unit of labor but no capital. The owners of specific capital in each industry earn the return $\pi_i(p_i)$ from (9.8), and obtain their wages of unity plus consumer

surplus, along with re-distributed tariff revenue. Summing these various terms, the owners of specific capital in industry i earn:

$$W_i(p) = \pi_i(p_i) + H_i[1+S(p)] + (H_i/L)T(p), \quad i=1,\ldots,N. \tag{9.9a}$$

The remaining (L – H) persons obtain their wages plus consumer surplus, and re-distributed tariff revenue, so their welfare is:

$$W_0(p) = (L-H)[1+S(p)] + [(L-H)/L]T(p). \tag{9.9b}$$

Summing (9.9) over all workers and industries, we obtain total welfare,

$$W(p) = \sum_{i=0}^{N} W_i(p) = \sum_{i=1}^{N} \pi_i(p_i) + L[1+S(p)] + T(p). \tag{9.10}$$

We suppose that a subset of the industries $j \in J_o$ are organized into lobbies, while the complementary set $j \in J_u$ are unorganized industries, with $J_o \cup J_u = \{1,...,N\}$. The purpose of each lobby is to provide contributions to the government in return for influencing the tariff/subsidy schedule. Specifically, they announce a *campaign contribution* schedule $R_j(p)$ that they are willing to pay, depending on the vector of prices $p_i = p_i^* + t_i$ prevailing across the industries, i=1,…,N. The government values campaign contributions, but also weighs these against the consumer welfare of all individuals. Giving social welfare the weight of $\alpha > 0$, Grossman and Helpman assume that the government chooses tariffs and subsidies t_i to maximize,

$$G(p) = \sum_{j \in J_o} R_j(p) + \alpha W(p) \quad . \tag{9.11}$$

The key question is how the lobbies in industries $j \in J_o$ determine their campaign contributions. The answer to this comes from the work of Bernheim and Whinston (1986). They argue that in the Nash equilibrium of the game we have described – with each lobby optimally choosing its contribution schedule $R_j(p)$ taking as given the schedules of the other groups, and knowing that the tariffs will be chosen to maximize (9.11) – then the lobbies can do no better than to select a contribution schedule of the form:

$$R_j(p) = \max \{0,\ W_j(p) - B_j\}, \qquad j \in J_o, \tag{9.12}$$

where B_j is a constant.[3] Bernheim and Whinston refer to this as a *truthful contribution schedule,* since it reflects the true welfare levels $W_j(p)$ obtained by the lobby for various tariffs. They argue that a *truthful Nash equilibrium,* where each lobby uses a schedule like (9.12), is included among the equilibria of the game.

Accepting this result of Bernheim and Whinston (1986), we can substitute (9.12) into (9.11) to obtain:

$$G(p) = \sum_{j \in J_o} [(1+\alpha)W_j(p) - B_j] + \sum_{j \notin J_o} \alpha W_j(p), \tag{9.11'}$$

where the summation over $j \notin J_o$ also include the welfare W_0 of workers with no capital. Notice that this statement of the government's objective function indicates that it gives *differential weights* to the welfare of organized and unorganized industries: the organized lobbies have the weight $(1+\alpha)$, whereas other industries plus workers have the weight α.

[3] Notice that by using the truthful contribution schedules in (9.12), the welfare of each lobby *net* of the contributions becomes $W_j(p) - R_j(p) = \min \{W_j(p), B_j\}$, so B_j is an upper-bound on *net* welfare. Grossman and Helpman (1994, pp. 843-847) discuss how B_j might be determined, as does Mitra (1999).

Choosing the tariffs t_i to maximize (9.11') is equivalent to choosing the domestic prices p_j, $j \in J_o$ to maximize this. Before computing the first-order condition, we can differentiate welfare for an organized industry, unorganized industry and workers as:

$$\frac{\partial W_j}{\partial p_j} = y_j - H_j d_j(p) + \left(\frac{H_j}{L}\right)\left[m_j + (p_j - p_j^*)\frac{dm_j}{dp_j}\right], \qquad \text{for } j \in J_o, \qquad (9.12a)$$

$$\frac{\partial W_i}{\partial p_j} = -H_i d_j(p) + \left(\frac{H_i}{L}\right)\left[m_j + (p_j - p_j^*)\frac{dm_j}{dp_j}\right], \qquad \text{for } i \in J_u, \qquad (9.12b)$$

$$\frac{\partial W_0}{\partial p_j} = -(L - H)d_j(p) + \left(\frac{L - H}{L}\right)\left[m_j + (p_j - p_j^*)\frac{dm_j}{dp_j}\right], \qquad (9.12c)$$

where $m_j = d_j(p_j)L - y_j(p_j)$ is the imports of good j (which is negative for exports).

Then multiply (9.12a) by $(1+\alpha)$, and (9.12b) and (9.12c) by α, and sum these over all organized and unorganized industries to obtain:

$$\frac{\partial G}{\partial p_j} = (1+\alpha)y_j - \sum_{j \in J_o} H_j d_j(p) - \alpha L d_j(p) + (\lambda_o + \alpha)\left[m_j + (p_j - p_j^*)\frac{dm_j}{dp_j}\right], \; j \in J_o, \qquad (9.13)$$

where $\lambda_o \equiv \sum_{j \in J_o}(H_j / L)$ denotes the fraction of the population owning a specific factor in an organized industry, and this first-order condition holds for an *organized* industry j. For an industry that is *not organized* into a lobby, the term $(1+\alpha)y_j$ that appears first on the right would be replaced by αy_j, since the unorganized industry receives the weight α rather than $(1+\alpha)$ in the government's objective function.

We can make use of the definition of imports, $m_j = d_j(p_j)L - y_j$, to simplify (9.13) as:

$$\frac{dG}{dp_j} = y_j(1-\lambda_o) + (\alpha+\lambda_o)(p_j - p_j^*)\frac{dm_j}{dp_j}, \quad j \in J_o, \tag{9.14}$$

while for an industry *without* a lobby, the term $y_j(1-\lambda_o)$ on the right is replaced by $-y_j\lambda_o$. Setting (9.14) and the modified condition for the unorganized industry equal to zero, we solve for the equilibrium tariffs $t_j = (p_j - p_j^*)$, j =1,…,N, as:

$$\frac{t_j}{p_j} = -\left(\frac{\delta_j - \lambda_o}{\alpha+\lambda_o}\right)\left(\frac{y_j}{m_j}\right)\left(\frac{\partial m_j}{\partial p_j}\frac{p_j}{m_j}\right)^{-1}, \text{ where } \delta_j = \begin{cases} 1 \text{ for } j \in J_o \\ 0 \text{ otherwise} \end{cases}. \tag{9.15}$$

This simple equation linking the tariffs/subsidies to underlying determinants is the key prediction of the "protection for sale" model of Grossman and Helpman (1994). To interpret it, notice that the import elasticity appearing in (9.15) is negative, while δ_j is an indicator variable that equal unity for organized industries j, and zero otherwise. Recall that $\lambda_o \equiv \sum_{j\in J_o}(H_j/L)$ equals the fraction of the population owning a specific factor in an organized industry. Then by inspection, for $0 < \lambda_o < 1$ the tariffs in (9.15) are negative (i.e. import subsidies or export taxes) for unorganized industries, but are positive (i.e. import tariffs or export subsidies) for industries organized into a lobby. On the other hand, if either λ=0 or λ=1 (no individuals or all individuals belong to a lobby), then the tariffs in (9.15) are all zero, so free trade is the political optimum.

The result that unorganized industries receive import subsidies or export taxes serves as a way to lower their domestic prices and therefore benefit consumers. The fact that these instruments are seldom observed in reality may reflect political opposition to them, or some

other reason. We do not take this to be a refutation of the "protection for sale" model, any more than we took the fact that tariffs are used in both capital-scarce and capital-abundant countries to be a refutation of the median voter model. Instead, to test the "protection for sale" model we look for other correlations implied by (9.15). Notice that the *magnitude* of the tariffs or subsidies depends on the ratio of production to imports (y_j/m_j), and also on the inverse of the import demand elasticity. Having higher domestic production relative to imports will lead to *higher* import tariffs or export subsidies for organized industries (since then $\delta_j - \lambda_o = 1 - \lambda_o > 0$), but *lower* import tariffs or export subsidies for unorganized industries (where $\delta_j - \lambda_o = -\lambda_o < 0$). These are the key predictions that will be tested.

Goldberg and Maggi (1999) denote the import demand elasticity (measured as a positive number) by e_j, and multiply (9.15) by this magnitude to obtain:

$$e_j\left(\frac{t_j}{p_j}\right) = \beta_0 + \beta_1\left(\frac{y_j}{m_j}\right) + \beta_2\delta_j\left(\frac{y_j}{m_j}\right) + \varepsilon_j, \qquad (9.16)$$

where $\beta_1 = -[\lambda_o/(\alpha+\lambda_o)]$, $\beta_2 = 1/(\alpha+\lambda_o)$, and β_0 is a constant term.[4] Notice that $\beta_1<0$ indicates how the trade barriers vary with the output/import ratio in *any* industry, while $\beta_2>0$ reflects the *additional* impact of having the industry organized as a lobby. So a change in the output/import ratio in an unorganized industry affects the trade barrier by $\beta_1<0$, and in an organized industry affects the trade barrier by $(\beta_1+\beta_2)>0$.

[4] Notice that a constant term in the tariff equation is not implied by the theory in (9.15), but it is generally a good idea to include it in empirical work. It turns out that β_0 is insignificantly different from zero in the estimates of Goldberg and Maggi (1999).

We multiply through by the import demand elasticity because that variable is measured with error, which is therefore incorporated into the error term ε_j of (9.16). Data on e_j is taken from the compendium of import elasticities in Shiells et al (1986). For the trade barriers (t_j/p_j), Goldberg and Maggi use *non-tariff* barriers in the United States. The reason for using non-tariff barriers rather than tariffs is that the latter have been reduced by international agreements, so we might expect their level to be lower than that predicted by (9.16). Non-tariff barriers are measured by the "coverage ratio" in each industry, i.e. the fraction of disaggregate products in each industry covered by quotas or some other restriction on trade. The independent variables in (9.16) are the indicator variable δ_j for whether an industry is organized or not, and the output/import ratio. Goldberg and Maggi measure the former using a threshold of contributions by industries to the 1981-82 congressional elections in the U.S., from Gawande (1995). The output/import ratio is treated as endogenous (since changes in trade barriers affect both output and imports), and estimation is performed using the instruments from Trefler (1993). With this data, (9.16) is estimated over a cross-section of 107 U.S. industries.

In their results, Goldberg and Maggi find estimates of β_1 and β_2 of –0.0093 (0.0040) and 0.0106 (0.0053), respectively (with standard errors in parentheses). These both have the expected sign, with $(\beta_1+\beta_2) = 0.0013 > 0$ as predicted, though the latter estimate is not significantly different from zero. Recalling that $\beta_1 = -[\lambda_o/(\alpha+\lambda_o)]$, and $\beta_2 = 1/(\alpha+\lambda_o)$, we can use these estimates to recover $\alpha = 93$ and $\lambda_o = 0.88$. In alternative estimates, they obtain $\alpha =$ 53 and $\lambda_o = 0.83$. Regardless of which we use, it is evident that the weight α on consumer welfare in the government's objective function is very high: between 50 and 100 times higher than the weight given to political contributions.

Gawande and Bandyopadhyay (2000) extend the Grossman-Helpman model to allow for trade in intermediate inputs. Final-goods industries that use the intermediate input suffer from a tariff on it, so the predicted tariffs in those final-goods industries are higher. In other words, controls are added to the right of (9.16) to reflect the tariffs on intermediate inputs, but otherwise the estimating equation is similar, with $\beta_1 < 0$, $\beta_2 > 0$ and $(\beta_1+\beta_2)>0$ expected. Gawande and Bandyopadhyay use an expanded dataset of 242 U.S. industries, and again use non-tariff barriers as the dependent variable. In their results, they estimate β_1 and β_2 of –0.000309 (0.00015) and 0.000315 (0.00016), respectively. These both have the expected sign, and again we find that $(\beta_1+\beta_2) = 0.000006 > 0$, though this coefficient is not significant. Using these estimates, we recover the values of $\alpha = 3{,}175$ and $\lambda_o = 0.98$, so Gawande and Bandyopadhyay find even a higher weight on consumer welfare than do Goldberg and Maggi! In alternative estimates, they obtain $\alpha = 1{,}750$ and $\lambda_o = 0.95$, which is still a remarkably high weight on consumer welfare.

There have been a number of other empirical applications of the Grossman-Helpman model, including McCalman (2000) who applies it to Australia, Grether et al (2002) who apply it to Mexico, and Mitra et al (2002) who apply it to Turkey.[5] Rather than describe these, we shall explore other theoretical extensions of the "protection for sale" model.

Endogenous Lobbies

In the description of Grossman and Helpman's model above, we treated the existence of the lobbies as exogenous. This is a limitation, of course, and in reality we would expect lobbies to form when their potential returns are sufficiently high or costs of organizing are sufficiently

[5] See also the survey by Gawande and Krishna (2001)

low. By allowing for the endogenous formation of lobby group, following Mitra (1999), we will obtain some important additional insights from the "protection for sale" model.

Recall that $\lambda_o \equiv \sum_{j \in J_o} (H_j / L)$ denotes the fraction of the total population belonging to organized industries. This can be re-written as $\lambda_o = (H/L)[\sum_{j \in J_o} (H_j / H)]$, and decomposed into two terms: (H/L) is the fraction of the population that owns some specific factor, and $[\sum_{j \in J_o} (H_j / H)]$ is the fraction of specific-factor owners who are organized. Let us impose some symmetry on the model, so that H_j is the same across all industries j, and also capital K_j and the production functions f_j are the same across all j=1,…,N. Then denoting the number of organized industries by $N_o \leq N$, it is immediate that $[\sum_{j \in J_o} (H_j / H)] = (N_o/N)$, which measures the fraction of industries that are organized. So we can rewrite the term λ_o as $\lambda_o = \lambda_k n_o$, where $\lambda_k \equiv (H/L)$ is the fraction of the population that owns some specific factor (i.e. capital), and $n_o \equiv (N_o/N) = [\sum_{j \in J_o} (H_j / H)]$ is the fraction of industries that are organized.

Substituting $\lambda_o = \lambda_k n_o$ into (9.16), the predicted trade policies are:

$$\frac{t_j}{p_j} = -\left(\frac{\delta_j - \lambda_k n_o}{\alpha + \lambda_k n_o}\right)\left(\frac{y_j}{m_j}\right)\left(\frac{\partial m_j}{\partial p_j}\frac{p_j}{m_j}\right)^{-1}, \quad \text{where } \delta_j = \begin{cases} 1 \text{ for } j \in J_o \\ 0 \text{ otherwise} \end{cases}. \qquad (9.17)$$

In the Grossman-Helpman model, a *rise in either λ_k or n_o will lower* (t_j/p_j) across all industries in (9.17). That is, holding the import demand elasticity and output/import ratio constant, we have:

$$\frac{d(t_j/p_j)}{d(\lambda_k n_o)} = \frac{(\alpha+\delta_j)}{(\alpha+\lambda_k n_o)^2}\left(\frac{y_j}{m_j}\right)\left(\frac{\partial m_j}{\partial p_j}\frac{p_j}{m_j}\right)^{-1} < 0, \qquad (9.18)$$

where the sign of (9.18) follows because the import demand elasticity is negative (or for exports, this supply elasticity is positive but (y_j/m_j) is negative). Continuing to hold this elasticity constant, if we also allow the output/import ratio to respond, then this would *reinforce* the negative sign on (9.18): the rise in either λ_k or n_o will lower (t_j/p_j) as in (9.18), which lowers the domestic prices $p_j = p_j^* + t_j$, and further lowers the output/import ratio (y_j/m_j).

Now let us work this thought experiment in reverse. A *decline* in λ_k corresponds to fewer people owning the stock of capital, which is a more unequal income distribution. This would *raise* (t_j/p_j) across all industries as in (9.18) and also raise all domestic prices, meaning that import tariffs and export subsidies rise in organized industries, while import subsidies and export taxes are reduced in unorganized import industries. It can be argued that this has a *greater* beneficial impact to the organized industries receiving protection than for the unorganized industries.[6] That would create an incentive for new groups to enter, so if n_o is treated as endogenous then it would rise. But that would *offset* the initial decline in λ_k, since the increase in n_o would lower (t_j/p_j) in (9.17). So with the number of lobbies treated as endogenous, it is no longer clear whether a more unequal income distribution leads to more or less protection. That is the issue that Mitra (1999) aims to resolve.

[6] See problems 9.1 – 9.3.

To model the entry of groups, we impose a high degree of symmetry on the model. We already assumed K_i and H_i do not vary across industries, and further assume that demand and production functions are symmetric across products, as are international prices. Then the tariff/subsidies computed from (9.16) will be t_o/p_o for all organized industries, and t_u/p_u for all unorganized industries. These policies depend on the *product* $n_o\lambda_k$ from (9.17), reflecting on the fraction of organized industries (which will be endogenous), and the fraction of population that owns capital (which is exogenous). These policies fully determine the welfare $W_o(n_o\lambda_k)$ to capital-owners in organized industries, and welfare $W_u(n_o\lambda_k)$ to capital-owners in unorganized industries, as in (9.9a). The *gross benefits* to forming a lobby are then:

$$\Delta W(n_o\lambda_k) \equiv W_o(n_o\lambda_k) - W_u(n_o\lambda_k), \tag{9.19}$$

while the *net benefits* are obtained by subtracting the cost of political contributions:

$$NB(n_o\lambda_k) \equiv \Delta W(n_o\lambda_k) - R_o(n_o\lambda_k). \tag{9.20}$$

Following Mitra, some properties of these schedules can be derived. Given the symmetry we have assumed, the gross benefits in (9.19) are simply the difference between the returns to the fixed factors in organized and unorganized industries: $\Delta W(n_o\lambda_k) = \pi(p_o) - \pi(p_u) > 0$. We argued above that as λ_k *declines,* leading to a rise in the tariff/subsidies as in (9.18), this creates a greater beneficial on the organized than unorganized industries, so that $\pi(p_o) - \pi(p_u)$ increases and gross benefits rise.[7] Thus, $\Delta W'(n_o\lambda_k) < 0$.

[7] See problems 9.1 – 9.3.

For net benefits, Mitra investigates the determinants of the truthful contribution schedules $R_o(n_o\lambda_k)$, including solving for the lower-bounds B_j to organized-industry welfare in (9.12). He is able to show that even when the impact of the number of lobbies n_o to contributions $R_o(n_o\lambda_k)$ is taken into account, it is still the case that net benefits rise if the number of lobbying groups falls. Thus, $NB'(n_o\lambda_k) < 0$. The declining net benefits as a function of the number of organized industries is shown in Figures 9.1 and 9.2.

What about the costs of forming a lobby? In addition to the political contributions, there may be some significant costs of grass-roots organizing and communication between members so as to overcome the free-rider problem. Let us denote these costs (measured in terms of the numeraire good) by $C(n_o)$, where we assume that $C'(n_o) \geq 0$, so the cost of creating a new lobby is non-decreasing in the number of lobbies already there. This cost schedule is also illustrated in Figures 9.1 and 9.2. Then we suppose that lobbies form up to the point where net benefits just equal to the costs of creating a new lobby, which is illustrated by the lobbies n_o in both figures.

Now consider the effect of a fall in λ_k, which is a worsening of the income distribution. The impact effect from (9.17) (holding n_o constant) would be an increase in (t_j/p_j) and higher domestic prices for all industries. This creates addition gains to organizing an industry, and in Figures 9.1 and 9.2, the net benefits schedule *rises* to NB'. Equivalently, net benefits remain the same if along with the decline in λ_k there is an equi-proportional increase in n_o, so that the net benefit curves shifting *rightwards* by the amount $-d\lambda_k/\lambda_k = dn_o/n_o$.

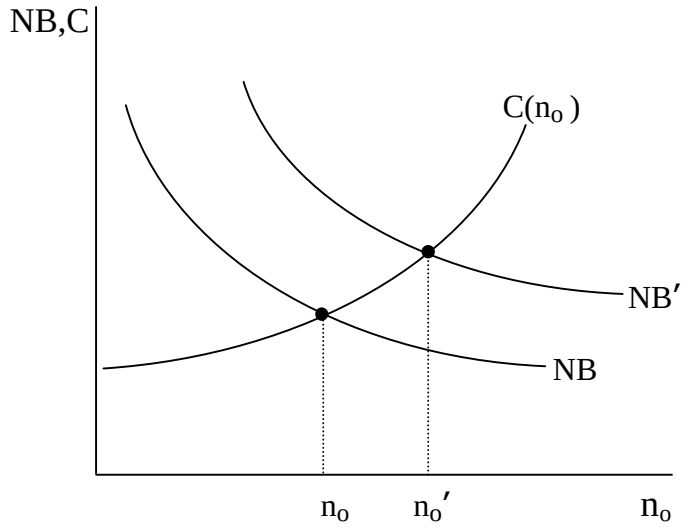

Figure 9.1

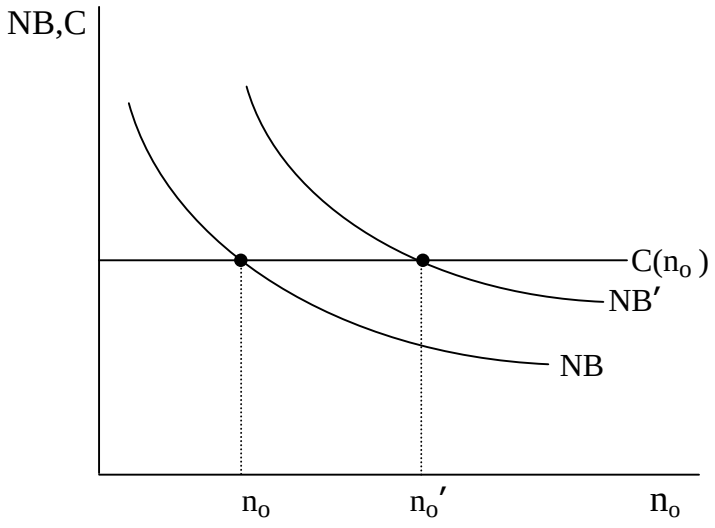

Figure 9.2

In Figure 9.1, where the cost of organizing lobbies is increasing, the induced increase in the number of lobbies from n_o to n_o' is clearly less than the rightward shift of the NB schedule. Therefore, $dn_o/n_o < -d\lambda_k/\lambda_k$, and it follows that $dn_o/n_o + d\lambda_k/\lambda_k < 0$, so that $n_o\lambda_k$ falls in equilibrium. This leads to an increase in the trade policies (t_j/p_j) from (9.17), so that organized industries receive higher import tariffs or export subsidies, and unorganized industries have reduced import subsidies or export taxes. Overall, there is a rise in domestic prices, and in this sense the net level of protection has increased due to the more concentrated income distribution and increased lobbying.

In Figure 9.2, by contrast, the cost of organizing lobbies is constant. In that case the increase in the number of lobbies from n_o to n_o' is just equal to the rightward shift of the NB schedule, so that $dn_o/n_o = -d\lambda_k/\lambda_k$ and $n_o\lambda_k$ is *unchanged* in equilibrium. Therefore the trade policies from (9.17) are also unchanged. We see that the overall impact of income inequality on protection is very sensitive to the structure of lobbying costs $C(n_o)$, which could reflect a wide range of legal and political features in a country. It would be difficult, then, to predict the effects of changes in income distribution on protection either within or across countries. This finding makes it all the more remarkable that in the median voter model, discussed earlier, Dutt and Mitra (2002) find a systematic (though non-monotonic) relationship between trade barriers and inequality. Obtaining such time-series or cross-country empirical results from the "protection for sale" model would be more difficult. That model is ideally suited, however, to explaining *cross-industry* trade protection, as we have already discussed.

Two-Country Model

In the median voter model and the "protection for sale" model of Grossman and Helpman (1994), the governments treats the international price p* as fixed. But what if instead the country is large, so that its tariffs affect the terms of trade? Obtaining a terms of trade gain creates an additional reason to use tariffs. In a two-country model, both countries would have this incentive, and we could conjecture that they would both end up with tariffs higher than those we solved for above. Bagwell and Staiger (1999, 2002) argue that this creates an important role for international institutions such as the GAT/WTO: to offset or eliminate the incentive to manipulate the terms of trade.

To formalize this idea, we return to the median voter or the "protection for sale" model. For simplicity, suppose that there are only two goods: the additively-separable numeraire good that is exported from the home country, and a second good with demand d(p) at home and supply y(p). Home imports are then m(p) = d(p) – y(p). Likewise, the foreign country has demand d*(p*) for this good, and supply y*(p*), depending on its own price p*. Foreign exports are denoted by x*(p*) = y*(p*) – d*(p*).

Home and foreign prices differ due to tariffs in both countries. Suppose that the home country applies an *ad valorem* tariff, and let τ equal *one plus the ad valorem tariff*. Then the home prices are $p = p^w\tau$, where p^w are the world prices. The foreign country applies an *ad valorem* tariff on its own imports, and let τ^* equal *one plus the foreign ad valorem tariff*. Since p^w is the world relative price of the home import and foreign *export*, then $1/p^w$ is the world relative price of the foreign *import.* Applying the tariff of τ^* means that the foreign price of its import good is τ^*/p^w, so the relative price of the foreign *export* is p^w/τ^*.

Using these prices, market clearing means that home imports equal foreign exports:

$$m(p^w\tau) = x^*(p^w/\tau^*) \quad \Rightarrow \quad p^w(\tau, \tau^*). \tag{9.21}$$

This equation determines the world equilibrium price $p^w(\tau, \tau^*)$, depending the tariff in each country. Under the standard assumptions on the import demand and export supply curves, it is readily confirmed that:

$$\frac{dp^w}{d\tau} < 0 < \frac{dp}{d\tau}, \quad \text{and} \quad \frac{dp^w}{d\tau^*} > 0 > \frac{dp^*}{d\tau^*}. \tag{9.22}$$

In other words, the home tariff *lowers* the world price of imports for the home country and raises the domestic price, while the foreign tariff *raises* the world price of its exports and lowers its local price of the export good.[8]

Let us now consider the government objective function in each country. In the median vote model the objective function was welfare of the median voter $V(p, I^m)$, where from (9.2') income of the median voter was: $I^m = [(\rho^m - 1)r(p)K + y_0(p) + py(p) + T]$.[9] Using the *ad valorem* tariffs defined above, tariff revenue in this expression is $T = (\tau - 1)p^w[d(p) - y(p)]$. Because domestic prices are $p = p^w\tau$, we can substitute this into tariff revenue and income, and obtain an expression for income that depends on the world price and domestic tariff, $I^m(p^w, \tau)$. It follows that the objective of the home government is:

$$G(p^w, \tau) = V[p^w\tau, I^m(p^w, \tau)] \ . \tag{9.23}$$

[8] You are asked to demonstrate (9.22) in problem 9.4.

[9] We now normalized the size of the population at L = 1 to simplify notation.

Thus, the objective function of the home government can be written as a function of the world prices, and the tariff. Bagwell and Staiger argue that this formulation of the objective function is general enough to encompass a number of models, including the median voter model and the "protection for sale" model of Grossman and Helpman.[10]

Furthermore, it is readily verified that the tariffs in the median voter model (equation 9.4) or in the "protection for sale" model (equation 9.15), satisfy the first-order condition:

$$G_\tau(p^w, \tau) = 0 \,. \tag{9.24a}$$

That is, these tariffs are obtained by maximizing the government's objective while treating the world price p^w as *fixed*. For the foreign country there will be an analogous objective function $G^*(p^w, \tau^*)$, with first-order condition for the tariff:

$$G^*_\tau(p^w, \tau^*) = 0 \,. \tag{9.24b}$$

Bagwell and Staiger refer to the tariffs satisfying (9.24) as *politically optimal.*

However, the tariffs satisfying (9.24) will generally *not be* chosen by a government that recognizes its ability to influence the terms of trade. Instead, the tariffs would be chosen in the two countries to achieve:

$$\frac{d}{d\tau} G[p^w(\tau, \tau^*), \tau] = G_p \frac{\partial p^w}{\partial \tau} + G_\tau = 0 \,, \tag{9.25a}$$

and in the foreign country,

$$\frac{d}{d\tau} G^*[p^w(\tau, \tau^*), \tau^*] = G^*_p \frac{\partial p^w}{\partial \tau^*} + G^*_{\tau^*} = 0 \,. \tag{9.25b}$$

[10] Notice that G in (9.11) is a function of domestic prices p, but also depends on international prices p* which we did not make explicit. Then G(p,p*) can be rewritten as G(τp*, p*), so that G again depends on p* and τ.

Notice the obvious difference between the politically optimal tariffs in (9.24), and the first-order conditions (9.25) that incorporate the terms of trade effects. Bagwell and Staiger refer to the tariffs satisfying (9.25) as the *Nash equilibrium* tariffs, since they are the best response by each country given the tariff choice of the other.

The question then arises as to how the politically optimal tariffs (which ignore the terms of trade effects) compare with the Nash equilibrium tariffs (which incorporate these effects). To make this comparison, it is convenient to define the *reduced form* government objective functions as,

$$\tilde{G}(\tau, \tau^*) \equiv G[p^w(\tau, \tau^*), \tau], \tag{9.26a}$$

and in the foreign country,

$$\tilde{G}^*(\tau, \tau^*) \equiv G^*[p^w(\tau, \tau^*), \tau^*]. \tag{9.26b}$$

These give the objectives as functions of the tariffs in the two countries. Notice that the Nash equilibrium in (9.25a) can be equivalently written as $\tilde{G}_\tau = 0$, which defines the best home response $\tau = r(\tau^*)$ to the foreign tariff. Similarly, the Nash equilibrium in (9.25b) can be written as, $\tilde{G}^*_{\tau^*} = 0$, which defines the best foreign response $\tau^* = r^*(\tau)$ to the home tariff.

The Nash equilibrium is defined by the intersection of these reaction curves $\tau = r(\tau^*)$ and $\tau^* = r^*(\tau)$. Assuming that this intersection is unique, it is illustrated by point N in Figure 9.3. Since this is the maximum of $\tilde{G}(\tau, \tau^*)$ subject to a given τ^*, the iso-curve of $\tilde{G}(\tau, \tau^*)$ will be concave with slope infinity at point N, and is increasing in the leftward direction, as illustrated. Similarly, the iso-curve of $\tilde{G}^*(\tau, \tau^*)$ has a slope of zero at point N, and is increasing in the downward direction, as illustrated. It is evident that there is a region *below and to the left* of point N,

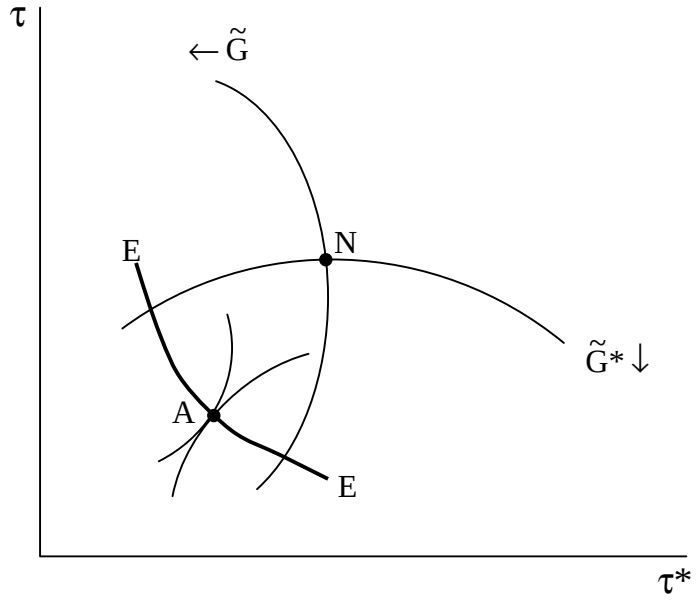

Figure 9.3

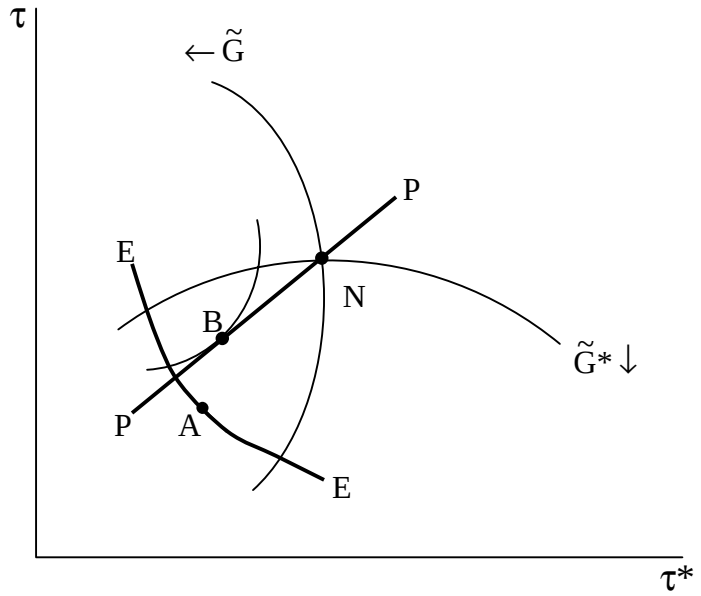

Figure 9.4

whose boundaries are defined by the iso-curves of $\tilde{G}(\tau,\tau^*)$ and $\tilde{G}^*(\tau,\tau^*)$, where *both countries are better off than at the Nash equilibrium.* Through this region, there lies the efficiency locus EE on which the iso-curves of $\tilde{G}(\tau,\tau^*)$ and $\tilde{G}^*(\tau,\tau^*)$ are tangent.

We have shown, therefore, that the Nash equilibrium does not lie on the efficiency frontier. This is the first-half of the following result:

Theorem (Bagwell and Staiger, 1999; Grossman and Helpman, 1995a)

(a) The Nash equilibrium is not efficient;

(b) The political optimum is efficient.

Grossman and Helpman (1995a) demonstrate part (a) by explicitly calculating the optimal tariffs for a *large* country in the "protection for sale" model. Rather than equation (9.15), which corresponds to the politically-optimal tariffs $G_\tau(p^w,\tau) = 0$, they instead find that the tariffs are as in (9.15) *plus* the inverse elasticity of foreign export supply. Thus, the optimal tariffs are increased by exactly the same terms of trade effect that we discussed in chapter 7, and that is included in (9.25) by the terms $\tilde{G}_\tau$ and $\tilde{G}^*_{\tau^*}$.

To demonstrate part (b) of this theorem, let us calculate the condition for tangency of the iso-curves of $\tilde{G}(\tau,\tau^*)$ and $\tilde{G}^*(\tau,\tau^*)$. This is $\tilde{G}_\tau/\tilde{G}_{\tau^*} = \tilde{G}^*_\tau/\tilde{G}^*_{\tau^*}$. Using the definition of these reduced-form objective functions in (9.26), we can re-write this tangency condition as:

$$\frac{G_\tau + G_p \partial p^w/\partial\tau}{G_p \partial p^w/\partial\tau^*} = \frac{G^*_p \partial p^w/\partial\tau}{G^*_{\tau^*} + G^*_p \partial p^w/\partial\tau^*}. \qquad (9.27)$$

Now substitute in the condition for the politically optimal tariffs, $G_\tau = G^*_{\tau^*} = 0$. Then (9.27)

simply becomes $(\partial p^w / \partial \tau) / (\partial p^w / \partial \tau^*) = (\partial p^w / \partial \tau) / (\partial p^w / \partial \tau^*)$, which is obviously satisfied. Therefore, the political optimum lies on the efficiency locus, as illustrated by point A in Figure 9.3. It follows that the Nash equilibrium N is worse *for both countries* than the political optimum at point A.[11]

This raises the question of whether it is possible to improve on the Nash equilibrium by some simple rules agreed upon by both countries. Bagwell and Staiger (1999, 2002) argue that this creates an important role for the GATT, and in particular, justifies the GATT principles of reciprocity and nondiscrimination. As they describe (1999, pp. 216-217): "the principle of reciprocity is a GATT norm under which one country agrees to reduce its level of protection in return for a reciprocal 'concession' from its trading partner…The principle of nondiscrimination is a separate norm, under which a member government agrees that any tariff on a given product applies to the import of one trading partner applies equally to all other trading partners." We will examine the first of these principles.

How is reciprocity applied in practice? Bagwell and Staiger suggest the following definition in our two-country model: the tariffs τ and τ^* are reduced so that *import levels in both countries rise by the same amount.* Since these imports occur in different goods, they must be compared at some prices, so let us use the *initial* world prices p^{w0}. Then the tariff reductions are reciprocal if $p^{w0}\Delta m = \Delta m^*$, where m^* is foreign imports of the numeraire good. But from trade balance, the value of imports equals the value of exports abroad, so that $\Delta m^* = m^{*1} - m^{*0} = p^{w1}x^{*1} - p^{w0}x^{*0}$. But we also know that foreign exports equal home imports, so that $x^{*1} = m^1$

[11] We have not quite shown this last result, because it is possible that the countries are so asymmetric in size that the political optimum at point A lies on the efficiency locus EE, but *outside* the region bounded by the iso-curves of $\tilde{G}$ and $\tilde{G}^*$ in Figure 9.1. We assume that this asymmetric case does not apply.

and $x^{*0} = m^0$. Therefore, Bagwell and Staiger's definition of reciprocity implies:

$$\underbrace{p^{w0}\Delta m = p^{w0}m^1 - p^{w0}m^0}_{\Delta\text{Home imports}} = \underbrace{\Delta m^* = p^{w1}m^1 - p^{w0}m^0}_{\Delta\text{Foreign imports}}. \qquad (9.28)$$

By inspection, this equality is satisfied if and only if world prices are constant, $p^{w1} = p^{w0}$. So the implication of reciprocity in the two-country model is that *mutual tariff reductions should leave the world price unchanged.*

Totally differentiating the world price $p^w(\tau,\tau^*)$, it is unchanged when:

$$\frac{dp^w}{d\tau}d\tau + \frac{dp^w}{d\tau^*}d\tau^* = 0 \quad \Rightarrow \quad \frac{d\tau}{d\tau^*} = -\frac{dp^w}{d\tau^*}\Big/\frac{dp^w}{d\tau} > 0, \qquad (9.29)$$

where the positive sign follows from the inequalities in (9.22). The locus of tariffs along which the world price $p^w(\tau,\tau^*)$ is held fixed at its Nash-equilibrium level is illustrated by PP in Figure 9.4. Since this line has a positive slope, and the iso-curves of $\tilde{G}(\tau,\tau^*)$ and $\tilde{G}^*(\tau,\tau^*)$ have slopes of infinity and zero at point N, the PP locus clearly falls *inside* the region bounded by those iso-curve. Therefore, *reciprocal reductions in tariffs from the Nash equilibrium raise the government objective function for both countries.* This result provides strong justification for the GATT principle of reciprocity.

How far should the tariff reductions proceed? Bagwell and Staiger argue that if the two countries are symmetric in size, then the line PP will intersect the efficiency locus at precisely the political optimum at point A. That is, tariff reduction should proceed until both countries are applying tariffs as in the median voter or "protection for sale" model, and therefore avoiding the mutual losses associated with exploiting the terms of trade.

When countries are not symmetric in size, however, the situation is more complicated. As we move down the iso-price locus PP from point N in Figure 9.4, the government objective function of both countries initially rises. It might be the case, though, that the objective of one country is maximized on PP *before* we get to the efficiency locus EE. This is illustrated in Figure 9.4 by point B, where the government objective of the *home* country is maximized. At point B, both governments attain higher objectives than at the Nash equilibrium N, but further reciprocal reductions in tariffs would lower the objectives for the home country. So in this case, the political optimum at point A is not reached.

Bagwell and Staiger, as well as Grossman and Helpman (1995a), discuss various bargaining mechanisms that might enable the two countries to still agree on the political optimum at point A, or some other point on the efficiency locus. Bagwell and Staiger (1999, 2002) further discuss how many other principles of GATT – including nondiscrimination – can be understood as being efficient. The reader is to refer to their work for further details, which provides a quite general economic justification for GATT rules.[12]

Regional Trade Agreements

Another foundation of GATT is the MFN principle of nondiscrimination. Recall that this principle is embodied in Article I (see Table 6.1). This principle is violated, however, by Article XXIV, which allows for customs unions and free trade areas in some circumstances. That raises the question of whether allowing for such regional trade agreements conflicts with the overall GATT goal of multilateral tariff reductions. Bhagwati (1993) has suggested that this question can be broken into two distinct issues: the "static impact effect" of regionalism, which is the

[12] See also McCalman (2002) and Maggi (1999) on the role of the GATT.

impact of successive regional agreements (possibly leading towards global free trade) on world welfare; and the "dynamic time path," which is the issue of whether having the option of a regional trade agreement will impact countries' willingness to enter into a multilateral agreement. The first issue has been touched on at the end of chapter 6, drawing on the work of Krugman (1991a,b) and Frankel (1996). We will examine here the second issue in the context of the median voter model, following Levy (1999).[13]

Levy proposes the following framework for thinking about sequential regional and multilateral agreements. In a multi-country world where the median voter in each country determines policy, suppose that a vote is taken initially on whether two countries should enter into bilateral free trade. For convenience, we treat the initial tariffs as prohibitive, so these countries are voting on whether to move from autarky to free trade between them, while retaining prohibitive tariffs with other countries. In the next period, a vote is then taken in each country as to whether to join into free trade with a larger group of countries, in a multilateral agreement. At this second stage, either country in the initial bilateral agreement has *veto power* over whether that agreement can be extended to incorporate new countries.

We shall assume that multilateral free trade brings benefits to both countries as compared to their autarky positions. That is, the median voters in both countries would approve a movement from autarky to multilateral free trade. The question is whether having bilateral free trade (with the assumed veto power of each country) acts as a "stepping stone" or a "stumbling block" towards multilateral free trade, to use the terminology of Bhagwati. To answer this, we need to consider four conceivable voting paths:

[13] See also Grossman and Helpman (1995b) for a treatment of regional agreements in the "protection for sale" model, as well as the papers cited in the introduction to this chapter.

(1) The median voter in at least one country rejects the bilateral agreement, and then both countries agree to the multilateral agreement;
(2) The median voters in both countries agree to the bilateral agreement and then agree to the multilateral agreement;
(3) The median voters in both countries agree to the bilateral agreement and then both reject the multilateral agreement;
(4) The median voters in both countries agree to the bilateral agreement, but then one country vetoes the multilateral deal, whereas the other country would approve multilateral free trade.

Paths (1) and (2) are both possibilities, but in those cases the bilateral arrangement does not act as a hindrance to multilateral free trade. The multilateral deal is rejected in paths (3) and (4), so we need to examine whether these paths can actually occur. Case (4) can be *ruled out* by the assumption that the time spent in bilateral free trade is very short as compared to the time spent in multilateral free trade (if approved). This means that the median voter in the country that benefits from bilateral free trade, and then *also* benefits from multilateral trade, will anticipate that the *other* country will block the multilateral deal. Therefore, this median voter will refuse to approve the bilateral arrangement initially, correctly anticipating that multilateral free trade will still be achieved (since by assumption, this is better for both countries than autarky). By this argument, path (4) never occurs.

We are left, then, with only having to consider whether or not path (3) can occur: is it possible that the median voters in both countries are worse off going from bilateral to multilateral free trade, whereas they are better off going from autarky to multilateral free trade? We will demonstrate that this is *impossible* with a HO production structure. After showing this,

we discuss an extended model that incorporates monopolistic competition and product variety, under which path (3) can occur.

To demonstrate the impossibility of path (3) in the HO model, we use a simple but powerful graphical technique introduced by Levy. In Figure 9.5, a country's production possibilities frontier (PPF) is illustrated, with the autarky equilibrium at point A. Treating all consumers as having identical homothetic tastes, there is an indifference curve tangent to the PPF at point A, with the autarky relative price of good 1 given by the slope of the line p^a. Also shown is a *smaller* PPF, which corresponds to just the labor and capital endowments owned by the median voter. Treating good 1 as labor-intensive, and supposing that the median voter has a capital/labor ratio that is lower than the overall for the economy, this PPF is skewed towards good 1. Thus, at the autarky price ratio p^a, the median voter would have "individual production" at point B^m, and consumption at point C^m, with utility of U^m. It is evident that there are gains from the opportunity to trade with others in the economy, since consumption at point C^m is above the median voter's "individual PPF."

Now suppose that the economy enters into trade with another country (or group of countries). We assume that the countries are similar enough in their factor endowments for factor price equalization to occur, and let k^w denote the "world" capital/labor ratio in this integrated equilibrium (this would be the overall capital/labor ratio of the two countries with bilateral free trade, or all countries with multilateral free trade). With identical homothetic tastes across countries, the equilibrium relative price of good 1 can be written as a function $p(k^w)$, with $p'(k^w) > 0$ since good 1 is labor-intensive.

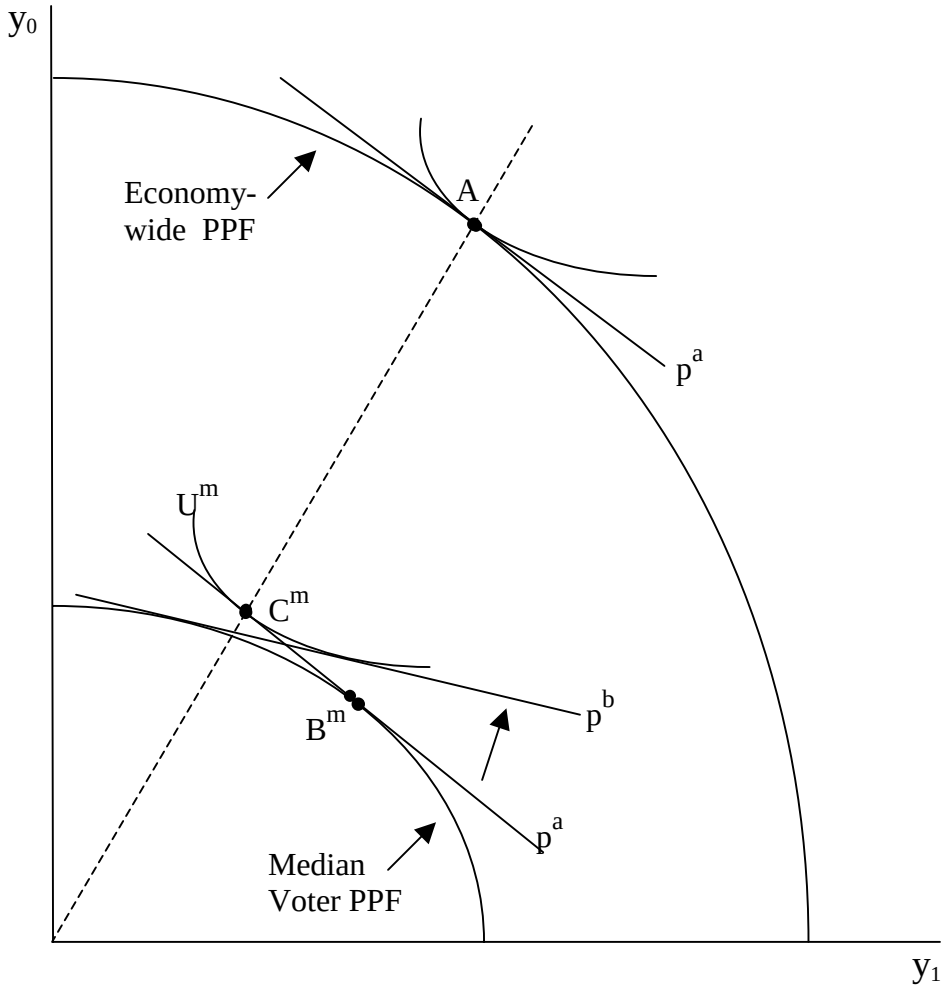

Figure 9.5

If the economy shown in Figure 9.5 enters into trade with another country that has a *lower* capital/labor endowment that its own, this will *lower* the relative price of good 1, which then becomes the import good. A slight fall in p, from p^a in the direction of p^b, will clearly *lower* the welfare of the median voter. If this import price falls by a substantial amount, however, then the median voter can instead gain: at the price $p^b < p^a$ shown in Figure 9.5, the median voter has the *same* utility level U^m, so for $p < p^b$ the median voter will gain. Conversely, starting at the autarky equilibrium, if the economy enters into trade with another country that had a *higher* capital/labor endowment than its own, then the relative price of good 1 will rise as that good is exported, and for $p > p^a$ in Figure 9.5 the median voter again gains.

Summarizing these observations, in Figure 9.6 we graph the welfare of the median voter in country 1 against the capital/labor endowment k^w of the integrated world equilibrium. The endowment of the country is k^{a1}, so in autarky the relative price of good 1 is $p^{a1} = p(k^{a1})$, and the median voter obtains utility U^{m1}. If the country now trades in an integrated equilibrium with $p(k^w)$ *slightly lower* than p^{a1}, meaning that $k^w < k^{a1}$, we have argued above that the median voter is worse off. This is shown by utility declining in Figure 9.6 for k^w slightly below k^{a1}. But if the country trades in an integrated equilibrium with k^w *much lower* than k^{a1}, than we can obtain the price p^{b1} at which the median voter is back at their autarky utility level U^{m1}.

Let us denote the integrated capital/labor ratio at which the median voter achieves the same utility as in autarky by k^{b1}, with $p^{b1} = p(k^{b1})$. Then we see from Figure 9.6 that the median voter in country 1 will *reject free trade* with other countries when the integrated equilibrium has

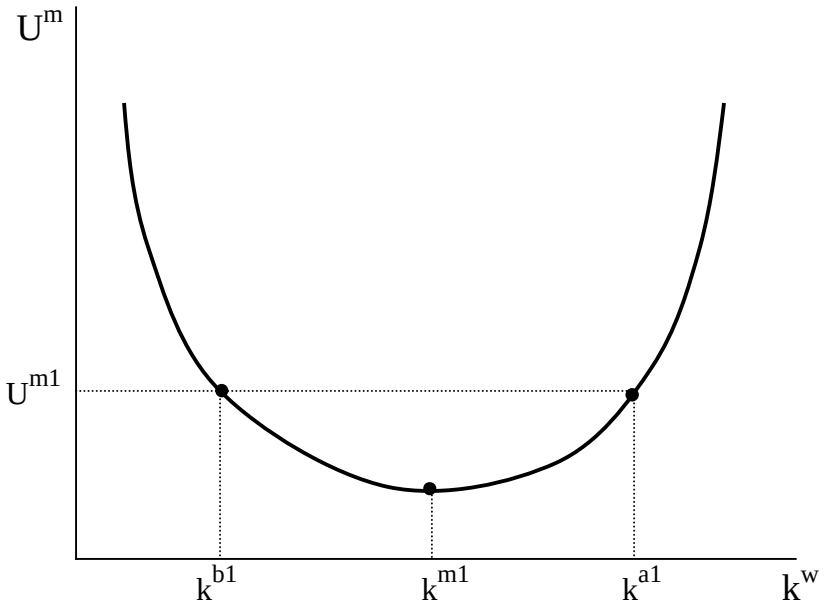

Figure 9.6

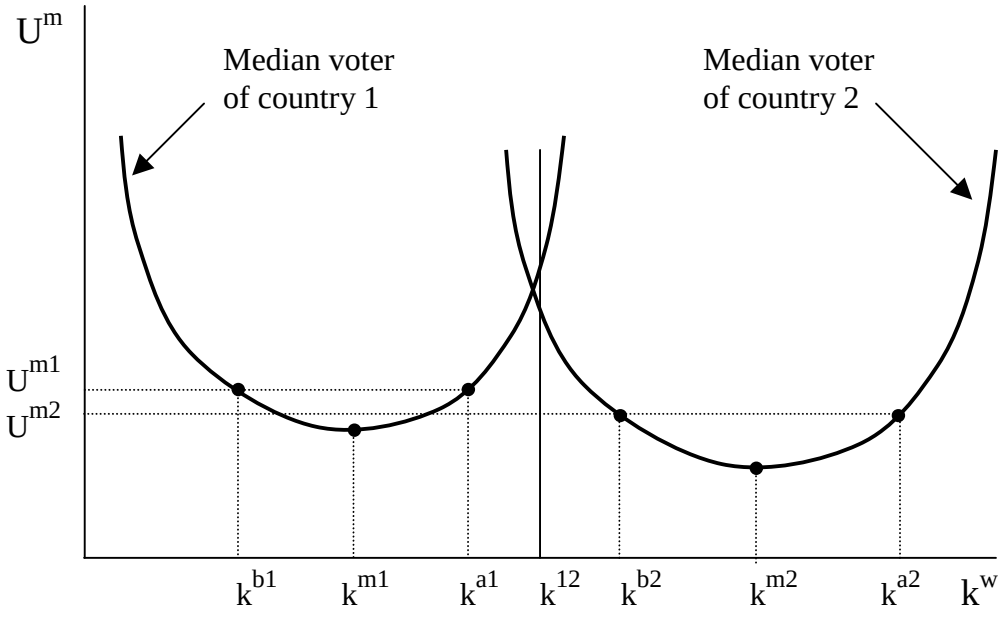

Figure 9.7

a capital/labor endowment $k^w \in (k^{b1},k^{a1})$, but otherwise will accept free trade for $k^w \notin (k^{b1},k^{a1})$. Notice that the "rejection set" (k^{b1}, k^{a1}) is convex, which reflects the fact that utility of the median voter, $U^m(k^w)$, is a quasi-convex function of the capital/labor endowment in the integrated equilibrium.

Now consider the situation of countries 1 and 2 deciding whether to engage in bilateral free trade. In Figure 9.7 we graph the utilities of the median voters in each country. The "rejection sets" are (k^{b1}, k^{a1}) and (k^{b2}, k^{a2}), and in the case we have illustrated country 2 is capital-abundant, since its capital/labor endowment exceeds that of country 1, $k^{a1} < k^{a2}$. Then with bilateral free trade, the integrated world equilibrium has a capital/labor endowment denoted by $k^{12} = (K^1+K^2)/(L^1+L^2)$, and this lies in-between the capital/labor endowments of the two countries, $k^{a1} \leq k^{12} \leq k^{a2}$. In order for the median voter *in both* countries to benefit from bilateral free trade, it must be the case that k^{12} lies *outside* both the sets (k^{b1}, k^{a1}) and (k^{b2}, k^{a2}), as illustrated. Since we also have that $k^{a1} \leq k^{12} \leq k^{a2}$, it then follows that bilateral free trade can benefit both countries only if the two "rejection sets" are *disjoint*, as illustrated.

Now let us ask whether countries 1 and 2, which are both better off from *bilateral* free trade, would be better or worse off from *multilateral* free trade. Let k^w denote the world capital/labor endowment in that integrated equilibrium. If $k^w = k^{12}$ then the two countries are obviously indifferent between bilateral and multilateral free trade (since the relative price is not affected). If k^w is *slightly above* k^{12}, then we can see from Figure 9.7 that country 1 would *gain* moving from bilateral to multilateral, but country 2 would *lose.* On the other hand, if k^w is *much*

above k^{12}, so that $k^w > k^{a2}$ in Figure 9.7, then it is possible that both countries gain. Checking the other cases, if k^w is *slightly below* k^{12}, then country 2 would *gain* moving from bilateral to multilateral, but country 1 would *lose*; while if k^w is *much below* k^{12}, so that $k^w < k^{b1}$, then it is possible that both countries gain. In all cases, we see that *countries 1 and 2 cannot both lose in the move from bilateral to multilateral free trade.* Therefore, we have proved part (a) of the following:

Theorem (Levy, 1999)

(a) Under the 2x2 Heckscher-Ohlin production structure, if the median voters in both countries gain from bilateral free trade, then at least one country must gain from multilateral free trade;
(b) Allowing for product variety under monopolistic competition, it is possible that the median voters in both countries gain going from autarky to bilateral free trade, or from autarky to multilateral free trade, but lose going from bilateral to multilateral free trade.

Part (a) this rules out path (3), and established that bilateral free trade agreement cannot act as a hindrance to a multilateral deal. The essential logic is that the two countries will accept the bilateral arrangement if only if their "rejection sets" are *disjoint*, with their combined capital/labor endowment k^{12} lying in-between these sets. This immediately rules out having the endowment k^w of a multilateral equilibrium contained in both sets. It is not difficult to see that this logic extends to an initial free trade area involving any number of countries, who cannot subsequently all lose from multilateral free trade.

Having established this result for the 2x2 HO model, what about more general models? In part (b) of the theorem, we suppose that one sector produces a differentiated product under monopolistic competition, while another sector produces a labor-intensive homogeneous good. Furthermore, suppose that countries 1 and 2 are *identical.* There will still be gains from free trade between them, just as was demonstrated in Krugman's model at the beginning of chapter 5. So the median voters in countries 1 and 2 both prefer the free trade area consisting of the country pair (1, 2).

Now suppose that there is country 3, with the same production structure as 1 and 2 but having a higher labor/capital endowment. Under multilateral free trade, it would produce more of the labor-intensive homogeneous good, and for convenience suppose that it is fully specialized in that good. Then the free trade area consisting of (1, 2) obtains no further product variety gains from free trade with country 3, but there will still be a change in relative prices: since country 3 is labor-abundant, that would lower the relative price of that good. This can quite possibly *lower* the welfare of the median voters in both countries 1 and 2. Therefore, it is entirely possible that the median voters in countries 1 and 2 *both lose* going from bilateral to multilateral free trade.

Finally, we need to check whether our initial assumption – that country 1 and 2 are both better off with multilateral free trade than in autarky – is satisfied in this example. That is, we need to consider utility for the median voter in country 1 when it moves from autarky to free trade with countries (2, 3) combined. Country 1 then gains from increased product variety with the identical country 2, and possibly loses from the price change with labor-abundant country 3. Provided that the product variety gains *exceed* the losses for the median voter due to import competition, which is entirely possible, then country 1 gains overall from free trade with (2, 3). The same argument applies to country 2 moving from autarky to free trade with (1, 3). So

despite the fact that multilateral free trade can bring gains as compared to *autarky*, we have found that it can bring losses as compared to *bilateral* free trade. In this situation, the bilateral agreement would prevent multilateral free trade from being pursued: it would indeed be a stumbling block rather than a stepping stone. This demonstrates part (b) of the theorem, and the general concern expressed by Bhagwati that regional trade agreements may inhibit the pursuit of multilateral free trade.[14]

Political Economy of Foreign Investment in China

All of the applications in the chapter so far have been to economies governed by direct democracy (with the median voter determining the optimal policy) or representative democracy (where voters elect representatives who then determine policies). Grossman and Helpman (2001) present a general formulation of democratic political systems where special interests exert an influence on policies. We conclude this chapter with an application of their framework to a non-democratic system – the People's Republic of China. The motivation for this application is much the same as in Goldberg and Maggi (1999): to use the observed levels of some policy instrument or outcome to "reveal" the weights given by the government to various interest groups. In the case of China, import tariffs have (until recently) been bound at relatively high and inflexible levels, so that policy instrument cannot be used. Instead, we examine the policies towards foreign investment, as indicated by the entry of foreign firms into various provinces, to infer the weights in the government's objective function.

The model we use relies on the choice of policies to influence foreign investment. We shall not discuss the decisions of firms to enter foreign markets until the next chapter, but

[14] McClaren (2002) further argues that introducing *sector-specific sunk costs* can have a similar effect, under which a regional agreement can inhibit future multilateral deals.

introduce here the idea that they may enter a market to "jump the tariff," i.e. because they cannot export there due to tariff protection.[15] Grossman and Helpman (1996) have introduced foreign investment into their "protection for sale" model, and Branstetter and Feenstra (2002) make use of that model to analyze policies towards multinationals in China, as follows.

Consumers are assumed to have preferences over an additively separable numeraire good d_0, and a CES aggregate denoted by D,

$$U = d_0 + \left(\frac{\gamma}{\gamma - 1}\right) D^{(\gamma-1)/\gamma}, \quad \gamma > 0, \gamma \neq 1, \tag{9.30a}$$

where the CES aggregate is,

$$D = \left[N_h d_h^{(\sigma-1)/\sigma} + (N_f - M) d_f^{(\sigma-1)/\sigma} + M d_m^{(\sigma-1)/\sigma}\right]^{\sigma/(\sigma-1)}, \quad \sigma > 1. \tag{9.30b}$$

The values d_j denotes consumption of the differentiated varieties from sources: j=h (home firms), of which there are N_h in number; j=f (foreign imported products), of which there are $(N_f - M)$; and j=m (multinationals in China) of which there are M. As usual, σ is the elasticity of substitution across individual varieties, while γ is the elasticity of demand for the aggregate good D, and we add the restriction that $\sigma > \gamma$.

Branstetter and Feenstra (2002) suppose that the domestic industry is owned by the government, as with state-owned firms in China. The profits earned by these firms receive extra weight in the government's objective function.[16] The presence of multinationals presents a

[15] Bhagwati (1996) has taken this argument a step further and suggested that foreign firms may enter a market to "defuse" the threat of future protection, in what he calls "quid-pro-quo" foreign investment. See also Bhagwati, et al (1987), Dinopoulos (1989, 1992), and Wong (1989).

[16] As Naughton (1996) and several other authors have noted, the Chinese government still relies on remittances from state-owned enterprises for about two-thirds of its revenue.

potential threat to the state-owned enterprises through product market competition.[17] This creates a conflict between the entry of foreign firms and the profits of state-owned firms, that must be resolved though government policy towards entry of the multinationals.

In designing the government policies, we allow the various *provinces* of China to exercise autonomous control over multinational entry. This is broadly consistent with the multiple layers of approval required for foreign investment in China. Only the largest projects (initially $30 million but later $50 million) require approval from the central government, whereas all projects require approval from the regional and provincial governments. In addition, we suppose that the separate provinces control trade between themselves through *internal* border barriers. The level of such barriers is the subject of current debate among experts on the Chinese economy. On the one hand, Young (1997) has argued that internal border barriers are rising, whereas Naughton (1999) disagrees. For reasons of modeling convenience, we take an extreme version of the view in Young and assume there is no trade between the provinces. This means that when a multinational enters one province, it is selling only to the local consumers. The utility function in (9.30) therefore applies to *each* province, which differs in the number of firms of each type found there.

We will suppose that labor is the only factor of production, and one unit of the numeraire is produced with one unit of labor, so wages are unity. We shall assume, however, that the multinational firms pay a *wage premium* of $(w-1) > 0$. The wage premium is meant to proxy for a wide array of possible benefits that multinationals bring that are not captured in our model.

[17] Notice that foreign investment might also be complementary rather than competitive, because until recently in China the foreign firms were required to have local partners, which could benefit the state-owned enterprises. But a number of studies suggest that the Chinese government, both national and local, is acutely aware of this competition, and has taken steps to impede the ability of foreign firms to compete in the Chinese market (e.g. Li and Chen, 1998; Rosen, 1999).

Costs for the locally produced products are c_j, j = h, m. Costs for products produced abroad are c_f, but also face a specific tariff of t, so that marginal costs become $c_f + t$. Prices are a standard markup over these marginal costs, using the elasticity σ. We make the key assumption that $c_m < c_f + t$. This assumption ensures that price charged by multinationals, p_m, is less than that for imports, p_f. It follows that as more multinationals enter (M increases) and these products are sold for $p_m < p_f$, the demand for products of the state-owned firms will decline due to substitution away from these products. This is how product market competition between the multinationals and domestic firms is captured in the model.

Each foreign firm faces the decision of whether to supply locally through imports, or through setting up a local plant which requires a fixed cost of F > 0. We suppose that the government also charges the multinational a profit tax of $\tau \geq 0$. This instrument is supposed to reflect the vast range of actual policies used in China to extract rents from multinationals, and not just the corporate tax on multinationals.[18] By modeling these policies as a tax on profits, we are abstracting from the inefficiencies caused by actual policies.

The net profits earned locally are thus $(1-\tau)\pi_m - F$, where $\pi_m = p_m d_m/\sigma$ is profits under the standard CES markup-pricing rule. Alternately, the multinational could just export to the home country, and earn $\pi_f = p_f d_f/\sigma$. Thus, entry will occur if and only $(1-\tau)\pi_m - F \geq \pi_f$. This condition is written as:

[18] In fact, foreign firms are often taxed at zero or reduced rates for the first years of operation. Despite this, there are many ways that local and national agencies extract rents from the multinationals. For example, the fact that most multinationals have had to use local partners reflects an implicit tax on their profits, which are shared with the partner; similarly, the land-use fees that are commonly charged reduce the multinationals' profits, as do conditions of technology transfer and export requirements. Of course, bribes paid to allow multinationals to enter are another

$$(1-\tau)\frac{p_m d_m}{\sigma} - F \geq \frac{p_f d_f}{\sigma} \quad . \tag{9.31}$$

Entry is influenced through the profits tax τ and the specific tariff t, so the number of multinational firms is written as a function $M(\tau,t)$. Multinationals react in the expected manner to changes in these policies: when (9.31) holds as an equality, then $dM/d\tau < 0$ and $dM/dt > 0$.

We now define the government's objective function over the various interest groups, beginning with consumer/worker utility U, which receives a weight of α. The profits of the home state-owned firms are $N_h\pi_h = N_h p_h d_h/\sigma$, which accrue to the regional and national government. We give revenue from state-owned firms a weight β in the objective function. Finally, the government extracts rents $M\tau\pi_m$ from the multinationals, and also collects tariff revenue of $(N_f - M)td_f$. These two sources of revenue are each given weights of unity. The objective function for each province is then defined by,

$$G(M,\tau,t) \equiv \alpha U + \beta N_h\pi_h + M\tau\pi_m + (N_f - M)td_f , \tag{9.32}$$

where the multinationals entering each province are endogenously determined from (9.31).

We suppose that the central and the provincial governments jointly determine the rents appropriated from the multinationals. The central government also chooses the tariff rate. Denoting provinces by the subscript i, we let $G_i[M_i(\tau_i,t),\tau_i,t]$ denote the objective function (9.32) for each. Then the profit tax and tariff are chosen to solve:

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example of the profit tax. Wei (1998) argues that corruption in China, which includes the need for "questionable payments," acts as a significant deterrent to foreign direct investment.

$$\max_{\tau_i, t} \sum_i G_i[M_i(\tau_i, t), \tau_i, t]. \quad (9.33)$$

We solve (9.33) over the choice of the profits tax rate τ_i, while a discussion of the solution for tariffs t is in Branstetter and Feenstra (2002). Differentiating (9.33), the first-order condition is that $\partial G_i/\partial M_i = -M_i\pi_{mi}/(\partial M_i/\partial \tau_i)$. This means that the gain from attracting one more multinational ($\partial G_i/\partial M_i$) is just balanced against the *fall* in the revenue $\tau_i M_i \pi_{mi}$ when the tax rate is lowered to attract another multinational. That is, the regions are acting as monopsonists in attracting foreign capital. This first-order condition for the choice of τ_i can be written as:[19]

$$s_{mi} = -\beta s_{hi} + \eta\left(\frac{w_i - 1}{w_i}\right) + \alpha(\sigma - 1)\left(\frac{w_i - 1}{w_i}\right)(s_{hi} + s_{fi}) - \sigma\left(\frac{t}{p_f}\right)s_{fi} + \left(\frac{M_i}{N_f - M_i}\right)s_{fi} + \varepsilon_i, \quad (9.34)$$

where s_j, j = h,f,m denotes the *share of provincial consumption* purchased from home state-owned firms, imported products, or multinational products, respectively, and ε_i is a term involving unobserved profit levels that is treated as a random error.

The first term on the right of (9.34) is the share of provincial consumption on state-owned firms, which enters with the coefficient $-\beta$. Thus, the weight on state-owned firms in the provincial objective function is simply obtained as the coefficient on their share in the regression (9.34). A high weight on the state-owned firms indicates that in provinces where these firms are more prevalent, the share of multinational firms will be correspondingly reduced. The next term on the right of (9.34) is the wage premium paid by multinationals, which has the coefficient

[19] This first-order condition is derived in Branstetter and Feenstra (2002).

$\eta \equiv \alpha(\sigma-1)(\gamma-1)/(\sigma-\gamma)$, which is of ambiguous sign. Following this is the wage premium times the share of spending on state-owned firms plus imports. When the wage premium is higher, we expect that regions would be more willing to accept multinationals, and this is confirmed by having a positive coefficient $\alpha(\sigma-1)$ on that variable.

The estimate of σ itself comes from the next term, which is the tariff rate times the share of spending on imports. This term reflects the loss in tariff revenue as multinationals enter and the coefficient is $-\sigma$.[20] Thus, combined with the former coefficient we can recover an estimate of α. The final term reflects the number of multinationals times the share of imports. For simplicity we measure the number of multinationals M_i by their capital stock in each province, and treat the number of foreign firms wanting to export or invest in China, N_f, as constant over provinces and time and estimate it as a coefficient.

For estimation, a time subscript is added to most variables in (9.33). There is an obvious endogeneity problem in that the share of state-owned sales, on the right, will be correlated with the share of multinational sales (since all the shares sum to unity), and to offset this, Branstetter and Feenstra estimate (9.33) in levels rather than shares (i.e. multiplying all variables by provincial apparent consumption) and also use instruments and weights.[21]

The results from estimating (9.33) using a panel of data for Chinese provinces over 1984-1995, are shown in Table 9.1. Each of the three columns of results uses a different estimation

[20] See our discussion of Brecher and Diaz Alejandro (1977) in problem 11.1 of chapter 11.

[21] The instruments are: provincial electricity production (used as an instrument for expenditure on state-owned firms); indexes of urban, state and overall wages (used as instruments for the wage premium); provincial GDP, population, average rural and urban income (used as instruments for apparent consumption); provincial processing imports (used as an instrument for ordinary imports); and various interactions between these terms. The weighted regressions use provincial GDP as a weight

Table 9.1: Dependent Variable –
Provincial Spending on Output of Multinational Enterprises

		Estimation Method:		
	Coefficient	**OLS**	**TSLS**	**Weighted TSLS**
Independent Variable:				
Provincial Spending on State-owned production	$-\beta$	-0.41 (0.12)	-1.30 (0.40)	-1.66 (0.48)
Wage premium × (state-owned + imports)	$\alpha(\sigma-1)$	0.42 (0.23)	2.19 (0.87)	3.62 (1.16)
Tariff ×imports	$-\sigma$	-0.15 (2.7)	-7.4 (3.3)	-15.9 (5.1)
Wage premium	$\frac{\alpha(\sigma-1)(\gamma-1)}{(\sigma-\gamma)}$	-118 (64)	-967 (435)	-3333 (1085)
FDI stock × Imports	$1/N_f$	0.037 (0.022)	0.037 (0.017)	0.052 (0.013)
Provincial Apparent Consumption		0.11 (0.02)	0.15 (0.03)	0.15 (0.02)
R^2, N		0.85, 297	0.74, 280	0.76, 280

Notes:
The sample consists of 29 provinces (excluding Tibet) over 1984-1995, using fixed effects for provinces and for time; only provinces with positive multinational output are included. All regressions except the first are estimated with TSLS. The weighted regressions use provincial GDP as a weight. White standard errors are reported in parentheses.

technique, beginning with OLS, and moving to weighted TSLS (standard errors are in parentheses). OLS estimates are largely uninformative, as we are unable to obtain reasonable estimates of σ. However, our estimates improve substantially when we move to two-stage least squares, and further weight the observations by provincial GDP. Each regression includes a full set of provincial and year fixed effects.

The estimate of the parameter β, the weight of state-owned enterprise output in the government's objective function, is taken from the regression coefficient on state-owned enterprise output, and ranges from 1.3 to 1.66 (ignoring the OLS estimate).[22] Estimates of α, the weight on consumer welfare, can be derived from the regression coefficients shown in the second and third rows of Table 9.1. For our preferred specification, which is the weighted TSLS estimate in the third regression, we obtain $\hat{\alpha} = 0.24$ as reported in Table 9.2. The difference between the state-owned and consumer weight is $\hat{\beta} - \hat{\alpha} = 1.42$, and the standard error of this difference is computed as 0.46. Thus, we find that the weight given to consumer welfare is *significantly lower* than that applied to the output of state-owned enterprises (at the 5% level), with their ratio being about *one-seventh* in our preferred estimates. Without using provincial GDP as weights, the TSLS estimate in the second regression gives $\hat{\alpha}=0.34$, which is still *one-quarter* of the weight given to the state-owned enterprises. Turning to other parameters, we obtain high estimates of the elasticity of substitution σ (from 7 to 16), though these are somewhat imprecise.

A breakdown of the structural coefficients of interest is provided in Table 9.2 for later

[22] We note that the sign and magnitude of this estimate is contingent on including total provincial consumption as a control variable in the regression: controlling for total provincial spending, a decline in the spending on state-owned firms is associated with a rise in the spending on multinationals; but without this control variable, the sign of $\hat{\beta}$ is reversed. See the empirical exercise to reproduce Tables 9.1 and 9.2.

Table 9.2: Coefficient Estimates, by Time Period

	Coefficient:		
	α	β	σ
Sample:			
1984-1995,	0.24	1.66	15.9
(N=280)	(0.07)	(0.48)	(5.1)
1988-1995,	0.24	1.32	11.5
(N=210)	(0.13)	(0.50)	(6.7)
1990-1995,	0.20	1.04	10.0
(N=132)	(0.15)	(0.49)	(7.6)

Notes
Computed from the third regression reported in Table 9.1, but run over different samples. The estimation method is weighted TSLS. White standard errors are in parentheses.

sub-samples of the data, the 1988-1995 period and the 1990-1995 period. As we confine our view to the later sub-samples, we lose observations and consequently precision in some of our estimates; sub-periods smaller than 1990-1995 do not yield many significant coefficients at all. In the later sub-periods, the estimated magnitude of the weight on state-owned enterprises falls. This is consistent with the historical trend towards liberalization, of course. In the relatively liberal 1990-95 sub-period, for example, we find that the weight on state-owned enterprises is *unity,* which is still considerably higher than the weight on consumer welfare (though the difference between them is no longer significantly different from zero).

These estimates provide a start contrast to the results of Goldberg and Maggi (1997) for the U.S., where consumer welfare had a weight that was 50 to 100 times more than campaign contributions. For China, we find that state-owned enterprises have a weight that is between four and seven times greater than that given to consumers. The evidence of a political premium on state-owned industries diminishes over time, but the point estimates still indicate these firms are favored. Branstetter and Feenstra (2002) further investigate the impact on provincial objective functions of the changes in tariff structure that China has promised under WTO accession. They find that these changes could potentially lower welfare in some provinces, due to the exit of multinationals. This provides some quantitative backing for skepticism that China, given the current political equilibrium, will actually follow through with the promised liberalization in all sectors and regions under its entry into the WTO.

Conclusions

In this chapter we have relied on two major models: the median voter model (first applied to trade policy by Mayer, 1984), and "protection for sale" of Grossman and Helpman (1994, 1995a,b, 1996). There are many other models of the political economy of trade policy,

and the reader is referred to Hillman (1989) and Rodrik (1995) for surveys. The median voter model relies on a voting mechanism under direct democracy, and despite this rather simplified framework, receives surprising empirical support from Dutt and Mitra (2002). In comparison, the "protection for sale" model allows for the government to be influenced by many industry lobbies. This has received strong empirical support for the U.S. from Goldberg and Maggi (1999) and Gawande and Bandyopadhyay (2000), along with numerous empirical applications to other countries, as surveyed by Gawande and Krishna (2003).

In their original formulations, the median voter and "protection for sale" models both treat international prices as fixed, so that tariffs shift income between interest groups, but cannot raise the welfare of all groups. In contrast, Bagwell and Staiger (1999, 2002) explicitly introduce a large-country model, under which tariffs can improve the terms of trade and raise a country's welfare. The government objective function used by them encompasses the median voter and "protection for sale" model, while Grossman and Helpman (1995a) also investigate terms of trade effects in the latter model. A country that uses an import tariff to improve its terms of trade does so at the expense of the other country (plus an added deadweight loss), so from the viewpoint of world efficiency, it would be better for countries to agree to avoid such actions. This creates an important role for the GATT, and the principle of *reciprocity* in tariff reductions provides a way to eliminate the incentive to manipulate the terms of trade. Notice that even under this principle, tariffs are still used in Bagwell and Staiger (1999, 2002) and Grossman and Helpman (1995a) for political economy reasons.

We have also reviewed the role of regional trade agreements, and whether they help or hinder the movement towards multilateral free trade. Levy (1999) employs a median voter model to address this, while Grossman and Helpman (1995b) extend the "protection for sale"

model in that direction. Empirically, it would be difficult to infer the impact of regional agreements on the pursuit of multilateral free trade, since the multilateral agreements of GATT are themselves so infrequent. But there are a number of related empirical questions that can be addressed. Krishna (2002) provides empirical evidence on the distance between countries and the potential welfare gains from regional agreements. He finds that close trading partners do not appear to have a "natural" advantage in created welfare-improving free trade areas. Baier and Bergstrand (2002) and Magee (2002) introduce the endogeneity of free trade agreements into a gravity equation, of the type discussed in chapter 5. These authors find that the impact of FTAs is significantly affected by treating these agreements as endogenous. The variables they include to explain free trade areas also provide a test of the determinants of these regions, and these papers are recommended for further reading.

Problems

In the model of Mitra (1999), organized and unorganized industries are treated as symmetric, having the same world prices, capital stocks, production and demand functions and differ only in their lobbying ability. Therefore, the return to the fixed factor in any industry can be written as $\pi(p_i)$ instead of $\pi_i(p_i)$, depending on the price by not on any other industry characteristic. Normalizing the world prices at unity, denote the price in organized industries by $p_o = 1 + t_o$, and in unorganized industries by $p_u = 1 + t_u$. The following questions derive additional results for that model:

9.1 Consider the return to the specific-factor in sector i, from (9.8):

$$\pi(p_i) = \max_{L_i} [p_i f(L_i, K) - L_i],$$

where we assume that $f_{LL} < 0$. By differentiating the first-order condition for this problem and using $\pi'(p_i) = y(p_i)$, show that profits are a convex function of the industry price.

9.2 Replace $\lambda_k n_o$ with λ_o in (9.17), and rewrite the optimal tariff $t_o > 0$ and subsidy $t_u < 0$ as,

$$t_j = \left(\frac{\delta_j - \lambda_o}{\alpha + \lambda_o}\right) y(p_j) \left|\frac{\partial m}{\partial p_j}\right|^{-1}, \quad \text{where } \delta_o = 1 \text{ and } \delta_u = 0.$$

Output depends on the industry price, but for convenience, we treat the import derivative as fixed and equal across industries. Then compute $\frac{dt_o}{d\lambda_o}$ and $\frac{dt_u}{d\lambda_o}$, and show that $\left|\frac{dt_o}{d\lambda_o}\right| > \left|\frac{dt_u}{d\lambda_o}\right|$.

9.3 Continuing to denote $\lambda_k n_o$ by λ_o, consider the return to the specific factor in an organized rather than an unorganized industry, $\Delta W(\lambda_o) = \pi(p_o) - \pi(p_u)$. Using the results from problems 9.1 and 9.2, show that $\Delta W'(\lambda_o) = \pi'(p_o)(dt_o/d\lambda_o) - \pi'(p_u)(dt_u/d\lambda_o) < 0$.

9.4 The equilibrium prices $p^w(\tau,\tau^*)$ in (9.21) are defined by $m(p^w\tau) = x^*(p^w/\tau^*)$. Assuming that $m'(p^w\tau) < 0$ and $x^{*\prime}(p^w/\tau^*) > 0$, show that the inequalities in (9.22) hold.

Empirical Exercise

This exercise is to reproduce regression results Branstetter and Feenstra (2002). To complete the exercise, the file "china_fdi.dta" should be stored in: c:\Empirical_Exercise\Chapter_9\.
Then do:

8.1 Run the program "share_reg.do" to reproduce the regression results in Table 9.1. Notice that apparent consumption ("appcon3") is included as a control variables in these regressions. What happens if this variable is dropped?

8.2 Open the excel file "standard_errors.xls" to see how the results in Table 9.2 are computed. What formula is used for α, and for its variance and standard error? Justify these formulas.
Hint: Consider the easier case of taking the difference between α and β. Then:

$$\text{var}(\alpha - \beta) = E[(\alpha - \beta) - (\bar{\alpha} - \bar{\beta})]^2 = E\, f(\alpha,\beta),$$

where $f(\alpha,\beta)$ is the quadratic function indicated. To compute this expected value, we take a second-order Taylor series expansion:

$$\begin{aligned} f(\alpha,\beta) \approx\ & f(\bar{\alpha},\bar{\beta}) + f_\alpha(\bar{\alpha},\bar{\beta})(\alpha-\bar{\alpha}) + f_\beta(\bar{\alpha},\bar{\beta})(\beta-\bar{\beta}) \\ & + \tfrac{1}{2} f_{\alpha\alpha}(\bar{\alpha},\bar{\beta})(\alpha-\bar{\alpha})^2 + \tfrac{1}{2} f_{\beta\beta}(\bar{\alpha},\bar{\beta})(\beta-\bar{\beta})^2 + f_{\alpha\beta}(\bar{\alpha},\bar{\beta})(\alpha-\bar{\alpha})(\beta-\bar{\beta}). \end{aligned}$$

It follows that,

$$Ef(\alpha,\beta) \approx \tfrac{1}{2} f_{\alpha\alpha}(\bar{\alpha},\bar{\beta})\sigma_\alpha^2 + \tfrac{1}{2} f_{\beta\beta}(\bar{\alpha},\bar{\beta})\sigma_\beta^2 + f_{\alpha\beta}(\bar{\alpha},\bar{\beta})\,\text{cov}(\alpha,\beta).$$

So computing the derivatives of the quadratic function $f(\alpha,\beta)$, we obtain,

$$\text{var}(\alpha - \beta) = E[(\alpha - \beta) - (\bar{\alpha} - \bar{\beta})]^2 \approx \sigma_\alpha^2 + \sigma_\beta^2 - 2\,\text{cov}(\alpha,\beta).$$

Now given the formula for α, use the same approach to justify its variance.