<u>TRADE WARS AND TRADE TALKS</u>

- **"Statist" approach of political science assumes an elite group (executive branch institutions/officials) act as independent players in international arena, with minimal concessions to domestic political groups**
- **Counterpart in international economic analysis of trade relations, where government is cast as "benevolent servant" of national interest (Johnson, 1953/54; Mayer, 1981; Dixit, 1987)**
- **In democracies, trade polices set by elected representatives, but with an electorate less than fully informed about trade issues, representatives may not select policies that maximize welfare of the median voter**
- **Literature on trade policy formation examines choices made by elected representatives who may receive financial inducements from special-interest lobby groups**
- **Literature breaks down into two main strands:**

  (i) *Political competition* approach – pioneered by Magee, Brock and Young (1989), focuses on an election between two parties, one representing free-trade (capital) the other protectionist interests (labor)

Each party commits to an election platform, while lobby groups make campaign contributions to party that represents their interests

Contributions then finance campaign expenditures, which affect parties' probabilities of winning election. Magee *et al*. (1989) analyze Nash equilibrium platforms that emerge when parties act as Stackelberg leaders with respect to lobbies

(ii) *Political support* approach – based on Stigler (1971) and Peltzman's (1976) approach to domestic regulatory policy, applied to trade policy by Hillman (1982) and Long and Vousden (1991)

Focus is on an incumbent government that can choose trade policy, constrained by prospect of next election

There is a trade-off between receiving financial support from special–interest groups and dissatisfaction among elements of general electorate – government chooses policies that maximize its political support

- **Grossman and Helpman (1994; 1995) combine elements of both approaches – focus on an incumbent government that can set trade policies, but also derive a political support function based on equilibrium actions of profit-maximizing lobby groups**

Key difference is that lobbies see contributions not as a way of influencing election outcome, but instead have aim of influencing policy announcements, i.e., lobbies "seek to curry favor with politicians who covet their financial support"

Evidence in US for example, that political action committees (PACs) give large proportion of their contributions to incumbents (Grossman and Helpman, 1994)

- **Grossman Helpman (1995) model developed as follows:**

  (i) Lobby groups represent factor owners that have specific stakes in certain industries

  Each lobby confronts its government with a campaign *contribution schedule*, set to maximize aggregate welfare of lobby group members, given schedules of other lobby groups

  Schedules are not formally announced contracts, but government understands there is an implicit link between how it treats each lobby and contributions it can expect to receive from them

  (ii) Faced with contribution schedules, incumbents choose vector of trade taxes and subsidies to maximize their own political welfare, which is a function of average voter welfare and total contributions

Average voter welfare reflects fact that likelihood of re-election depends on well-being of general electorate, while campaign contributions can be used for political advertising

(iii) Unlike earlier model (Grossman and Helpman, 1994), where world prices are given, assume here that there is scope for interaction between two governments

Allows focus on a non-cooperative game between politically motivated governments (*trade war*), and also bargaining where policies come out of international negotiation (*trade talks*)

- **<u>Model</u>**

Assume two countries, home and foreign, with similar political and economic systems, although tastes, endowments and political conditions may differ

Focusing on the home country, each individual has additively separable preferences, maximizing utility function:

(1) $$u = c_z + \sum_{i=1}^{n} u_i(c_{Xi})$$

c_z = consumption of numeraire good Z, and c_{Xi} = consumption of good X_i, i =1,2,…,n. $u_i(.)$ are differentiable, increasing and strictly concave.

Z's world and domestic price = 1, p_i = domestic price of X_i in home country, and π_i is its offshore price

With these preferences, each resident of home country demands $d_i(p_i)$ units of X_i, i=1,2,…,n, where $d_i(.)$ is inverse of u_i'. Remainder of spending E goes on Z, indirect utility being:

$$(2) \qquad v(\mathrm{p}, E) = E + S(\mathrm{p})$$

where $\mathrm{p} = (p_1, p_2, ..., p_\mathrm{n})$ is a vector of home prices of non-numeraire goods, and consumer surplus from these goods is $S(\mathrm{p}) \equiv \sum_i u_i[d_i(p_i)] - \sum_i p_i d_i(p_i)$

Z produced from labor with constant returns, aggregate labor supply l large enough to ensure positive amount produced, units chosen so competitive wage rate = 1

Other goods manufactured from labor and a sector-specific input under constant returns, specific inputs available with inelastic supply

$\Pi_i(p_i)$ is aggregate rent to specific factor used in producing X_i, and slope of this function gives industry supply curve:

$$(3) \qquad X_i = \Pi_i'(p_i)$$

Government can tax or subsidize trade in non-numeraire goods, and can collect tax/distribute tax revenue via a neutral head tax/subsidy – i.e., government has to use trade policies to redistribute income

Ad valorem **trade taxes/subsidies τ_i drive a wedge between domestic and offshore prices, such that $p_i = \tau_i \pi_i$ where $\tau_i > 1$ is an import tariff or an export subsidy, while $\tau_i < 1$ is an import subsidy or export tax**

Vector of trade policies $\tau = (\tau_1, \tau_2, ..., \tau_n)$ generates per capita government revenue of:

$$\textbf{(4)} \quad r(\tau, \pi) = \sum_i (\tau - 1)\pi_i \left[d_i(\tau_i, \pi_i) - \frac{1}{N} X_i(\tau_i, \pi_i) \right]$$

where $\pi = (\pi_1, \pi_2, ..., \pi_n)$, N is total population, normalized to 1, and tariff revenue is redistributed evenly to public

Individuals get income from wages and government transfers, and some own claims to a specific input – these assets are indivisible and non-tradeable

Some owners of specific inputs form lobby groups, the number of lobbies being exogenously determined, while others fail to organize

Politically unorganized individuals have no means of influencing policy, entering political process as ordinary voters

Lobbies express demands in form of contribution schedules, amount of available campaign funds being dependent on policies implemented by government. Each lobby *i* coordinates political activity to maximize joint welfare, their contribution schedule $C_i(\tau,.)$ maximizing:

(5) $$\upsilon^i = \tilde{W}_i(\tau,\pi) - C_i(\tau,.)$$

where:

(6) $$\tilde{W}_i(\tau,\pi) \equiv l_i + \Pi_i(\tau_i\pi_i) + \alpha_i[r(\tau,\pi) + S(\tau\pi)]$$

α_i is fraction of population that owns specific input used in *i*, and l_i is joint labor endowment of factor owners, and $\tau\pi=p$ is vector of home country prices

(6) gives total welfare of α_i members of lobby group *i*, derived from wages, quasi-rents, transfers from government and surplus from non-numeraire goods

Note - all but one argument omitted from contribution schedule, allowing distinction between trade war, and trade talks, where in latter case, contribution may also depend on policy choices of foreign government

Faced with lobbies' contribution schedules, home government's objective function is:

(7) $$G = \sum_{i \in L} C_i(\tau,.) + a\tilde{W}(\tau,\pi), \quad a \geq 0$$

where *L* is set of organized industries and:

(8) $$\tilde{W}(\tau,\pi) \equiv l + \sum_i \Pi_i(\tau_i \pi_i) + r(\tau,\pi) + S(\tau\pi)$$

which measures average gross welfare

***a* in (7) is weight placed on a $ of social welfare compared to a $ of campaign contributions, based on considering perceived political value of funds and indirect cost associated with contributor's loss of welfare**

In foreign country (* functions/variables), $u_i^*(.), \Pi_i^*(.), L^*, \alpha_i^*$ may differ from those in home country, and equations analogous to (8) exist, where trade policies are given as $\tau^* = (\tau_1^*, \tau_2^*, ..., \tau_n^*)$, internal prices are $p = (p_1^*, p_2^*, ..., p_n^*)$, and so on

Net home imports of *i* are $M_i(p_i) = d_i(p_i) - X_i(p_i)$ and for foreign country $M_i^*(p_i^*) = d_i^*(p_i^*) - X_i^*(p_i^*)$, so international equilibrium is when:

(9) $$M_i(\tau_i \pi_i) + M_i^*(\tau_i^* \pi_i) = 0, \quad i = 1, 2, ..., n$$

This allows solution for market-clearing price for each good X_i as a function of trade taxes/subsidies imposed by both countries, denoted as $\pi_i(\tau_i, \tau_i^*)$

$\pi_i(.)$ are homogeneous of degree minus one, i.e., if home country increases import tariff on some good, and foreign country increased export subsidy by same amount, world price falls so as to leave domestic prices unchanged

Gross welfare of organized lobbies and average voters can now be written as functions of both home and foreign trade policy vectors, e.g. owners of specific factor in home industry *i*, $W_i(\tau, \tau^*) \equiv \tilde{W}_i[\tau, \pi(\tau, \tau^*)]$, and average welfare of home voters, $W(\tau, \tau^*) \equiv \tilde{W}[\tau, \pi(\tau, \tau^*)]$

Can be substituted into (5) and (7) to give objectives of lobbies and politicians as functions of trade policy vectors (likewise for foreign analogues)

Sequence of actions by agents in two-country model:

(i) Lobbies in each country move first, setting contribution schedules simultaneously and non-cooperatively, taking schedules of all other lobbies as given

(ii) Governments set national policies in either a non-cooperative, simultaneous move game (trade war) or a bargaining game (trade talks)

Assume contribution schedules in one country not observable to government in the other country

- **<u>Trade Wars</u>**

Define equilibrium response of home country to arbitrary policy choices of other country

<u>Definition 1</u>:

Let τ* be trade policy vector of foreign country, so that a feasible set of contribution functions $\{C_i^0\}_{i\in L}$ and a trade policy vector $\boldsymbol{\tau}^0$ are equilibrium response to τ* if:

(a) $$\boldsymbol{\tau}^0 = \underset{\boldsymbol{\tau}}{\operatorname{argmax}} \sum_{i\in L} C_i^0(\boldsymbol{\tau};\boldsymbol{\tau}^*) + aW(\boldsymbol{\tau},\boldsymbol{\tau}^*)$$

and,

(b) For every organized lobby $i \in L$, there does not exist a feasible contribution function $C_i(\boldsymbol{\tau};\boldsymbol{\tau}^*)$ and a trade policy vector $\boldsymbol{\tau}^i$, such that (i),

$$\boldsymbol{\tau}^i = \underset{\boldsymbol{\tau}}{\operatorname{argmax}}\, C_i(\boldsymbol{\tau};\boldsymbol{\tau}^*) + \sum_{j\neq i, j\in L} C_j^0(\boldsymbol{\tau};\boldsymbol{\tau}^*) + aW(\boldsymbol{\tau},\boldsymbol{\tau}^*)$$

and (ii),

$$W_i(\boldsymbol{\tau}^{\mathrm{i}},\boldsymbol{\tau}^*) - C_i(\boldsymbol{\tau}^{\mathrm{i}};\boldsymbol{\tau}^*) > W_i(\boldsymbol{\tau}^0,\boldsymbol{\tau}^*) - C_i^0(\boldsymbol{\tau}^0;\boldsymbol{\tau}^*)$$

Feasible contribution schedules are non-negative offers that do not exceed aggregate income of lobby members

Condition (a) stipulates politicians choose policy vector that best serves their interests, given foreign policy vector and contribution schedules of domestic lobbies

Condition (b) states that given all other lobby contributions, no individual lobby i can choose a schedule $C_i(.) \neq C_i^0(.)$ thereby inducing home government to choose $\boldsymbol{\tau}^i$

There are some important aspects of definition; first, lobbies do not cooperate; second, domestic lobbies condition contributions on expected policy choices of other government

From proposition 1 in Grossman and Helpman (1994), equilibrium response to τ* satisfies not only (a) of definition 1, but also the following implied by (b):

$$(10)\qquad \begin{aligned} \boldsymbol{\tau}^0 &= \underset{\tau}{\operatorname{argmax}}\, W_i(\boldsymbol{\tau},\boldsymbol{\tau}^*) - C_i^0(\boldsymbol{\tau};\boldsymbol{\tau}^*) \\ &+ \sum_{j\in L} C_j^0(\boldsymbol{\tau};\boldsymbol{\tau}^*) + aW(\boldsymbol{\tau},\boldsymbol{\tau}^*) \text{ for every } i \in L \end{aligned}$$

Equilibrium trade policy must maximize joint welfare of each lobby *i* and government, when contribution schedules of all other lobbies other than *i* are given – no possibilities for a lobby to improve its position (an equation analogous to (10) applies to $\boldsymbol{\tau}^{*0}$)

Assume contribution schedules are differentiable around equilibrium point, i.e., where $C_i^0(\boldsymbol{\tau}^0;\boldsymbol{\tau}^{*0}) > 0$ for all i - i.e., non-negativity constraint is not binding

With differentiability, (10) satisfies the first-order condition:

$$(11)\quad \begin{aligned}&\nabla_\tau W_i(\boldsymbol{\tau},\boldsymbol{\tau}^*) - \nabla_\tau C_i^0(\boldsymbol{\tau};\boldsymbol{\tau}^*)\\ &+\sum_{j\in L}\nabla_\tau C_j^0(\boldsymbol{\tau};\boldsymbol{\tau}^*) + a\nabla_\tau W(\boldsymbol{\tau},\boldsymbol{\tau}^*) = 0 \text{ for all } i \in L\end{aligned}$$

Home politicians' maximization by (a) of definition 1, gives:

$$(12)\qquad \sum_{j\in L}\nabla_\tau C_j^o(\boldsymbol{\tau}^0;\boldsymbol{\tau}^*) + a\nabla_\tau W(\boldsymbol{\tau}^0,\boldsymbol{\tau}^*) = 0$$

(11) and (12) imply:

$$(13)\qquad \nabla_\tau C_i^o(\boldsymbol{\tau}^0;\boldsymbol{\tau}^*) = \nabla_\tau W_{\mathrm{i}}(\boldsymbol{\tau}^0,\boldsymbol{\tau}^*) \text{ for all } i \in L$$

Schedules set so marginal change in contribution for a small change in domestic policy matches marginal effect of policy change on lobby's gross welfare – *local truthfulness* (Grossman and Helpman 1994)

Sum (13) over all *i*, substitute into (12):

$$\textbf{(14)} \qquad \sum_{i\in L} \nabla_{\tau} W_i(\tau^0, \tau^*) + a\nabla_{\tau} W(\tau^0, \tau^*) = 0$$

and likewise for foreign country:

$$\textbf{(14*)} \qquad \sum_{i\in L^*} \nabla_{\tau^*} W_i^*(\tau^{*0}, \tau) + a^*\nabla_{\tau^*} W^*(\tau^{*0}, \tau) = 0$$

Invoking a Nash equilibrium:

<u>Definition 2</u>:

A non-cooperative trade equilibrium consists of a set of contribution schedules $\{C_i^0\}_{i\in L}$ and $\{C_i^{*0}\}_{i\in L^*}$ and a pair of trade policy vectors τ^0 and τ^{*0} such that $[\{C_i^0\}_{i\in L}, \tau^0]$ is an equilibrium response to τ^{*0}, and $[\{C_i^{*0}\}_{i\in L^*}, \tau^{*0}]$ is an equilibrium response to τ^0

Equilibrium policy vectors can be characterized by substituting τ^{*0} for τ^* in (14) and τ^0 for τ in (14*) and treating as a system of simultaneous equations. Derivatives in (14) calculated from (4), (6), (8), and definitions of M_i(.), W_i(.) and W(.), giving:

$$\textbf{(15)} \qquad \begin{aligned} &(I_{iL} - \alpha_L)(\pi_i + \tau_i^0\pi_{i1})X_i + (a + \alpha_L) \\ &\times[(\tau_i - 1)\pi_i(\pi_i + \tau_i^0\pi_{i1})M_i' - \pi_{i1}M_i] = 0 \end{aligned}$$

where I_{iL} is an indicator variable that equals 1 if industry is politically organized, and 0 otherwise, and $\alpha_L \equiv \sum_{j\in L} \alpha_j$ is fraction of voters in a lobby group.

From (9), get partials of world price functions, $\pi_j(.)$, and substitute in (15), yielding expression for home country's equilibrium policy:

$$(16) \qquad \tau_i^0 - 1 = -\frac{I_{iL} - \alpha_L}{a + \alpha_L} \frac{X_i}{\pi M_i'} + \frac{1}{e_i^*} \text{ for } i = 1, 2, ..., n$$

where $e_i^* \equiv \tau_i^* \pi_i M_i^{*\prime} / M_i^*$ is elasticity of foreign import demand or export supply, depending on whether M_i^* is positive or negative

An analogous equation describes equilibrium foreign trade policy:

$$(16^*) \qquad \tau_i^{*0} - 1 = -\frac{I_{iL}^* - \alpha_L^*}{a^* + \alpha_L^*} \frac{X_i^*}{\pi M_i^{*\prime}} + \frac{1}{e_i} \text{ for } i = 1, 2, ..., n$$

where $e_i \equiv \tau_i \pi_i M_i' / M_i$ is home country's import demand or export supply elasticity

(16) and (16*) express *ad valorem* trade tax and subsidy rates as sums of two components:

(i) *Political support* – reflects a balance between deadweight loss of trade policies and income gains lobbies get from such policies

(ii) *Terms of trade* – represents familiar optimal tariff (export tax) that applies in a large country with a benevolent dictator

From (16) and (16*) (i) organized competing industry emerges from a trade war with a protective tariff ($e_i^* > 0$ when foreign country exports *i*); (ii) unorganized home export industry suffers an export tax ($e_i^* < 0$ when foreign country imports *i*).

In (i), terms of trade considerations reinforce industry lobbying efforts; in (ii), terms of trade effects of an export tax reinforced by support from lobbies whose members consume exportable good

Only with organized export sectors and unorganized import sectors do special and general interests conflict

For example, suppose $e_i^* < 0$ and $I_{iL} = 1$:

- on one hand, industry's chances of getting an export subsidy are better the greater is industry output, the smaller are domestic deadweight losses, and the smaller the weight *a* placed on average welfare

- on the other hand, for given *a*, and domestic market conditions, the more price inelastic foreign demand is, the more likely an export tax

- however, even if *a*=0, and lobby *i* wants a subsidy, members of lobby groups that benefit from terms of trade gains may bid successfully for an export tax on *i*

Johnson (1953/54) equilibrium, application of Ramsey-type inverse elasticities rule, is limiting case of model, the condition(s) being:

(i) $a, a^* \rightarrow \infty$, **i.e., governments care overwhelmingly about voters' welfare**

(ii) $\alpha_L = 1$, **and** $I_{iL} = 1$ **for all** i, **i.e., all voters belong to a lobby group and all industries are organized – opposing groups neutralize each other, only remaining benefit being terms of trade effects that benefit all**

Focus on special case with constant trade elasticities, and single *i*, and assuming home country is importer of good X_i, import demand being $M = m(\tau\pi)^{-\varepsilon}$, $m>0$, and $\varepsilon = -e_i > 1$, foreign country's export supply being $-M^* = m^*(\tau^*\pi^*)^{\varepsilon^*}$, $m^*>0$, and $\varepsilon^* = e_i^* > 0$

Market-clearing world price for *i* is derived from (9) and expressions for import demand/export supply functions:

$$(17) \qquad \pi(\tau, \tau^*) = \left(\frac{m}{m^*}\right)^{1/\varepsilon+\varepsilon^*} \left(\frac{1}{\tau}^{\varepsilon/\varepsilon+\varepsilon^*}\right)\left(\frac{1}{\tau^*}^{\varepsilon^*/\varepsilon+\varepsilon^*}\right)$$

***i* subscripts being dropped in (17)**

(16) and (16*) then give equilibrium policies in constant elasticity case:

(18) $$\tau = \left(1 + \frac{1}{\varepsilon^*}\right)\left[1 - \frac{I_L - \alpha_L}{a + \alpha_L}\,\frac{X(\tau\pi)}{\varepsilon m(\tau\pi)^{-\varepsilon}}\right]^{-1}$$

(18*) $$\tau^* = \left(1 + \frac{1}{\varepsilon}\right)\left[1 - \frac{I_L^* - \alpha_L^*}{a^* + \alpha_L^*}\,\frac{X^*(\tau^*\pi)}{\varepsilon^* m^*(\tau^*\pi)^{\varepsilon^*}}\right]^{-1}$$

where π represent equilibrium prices π(τ,τ*) given in (17),

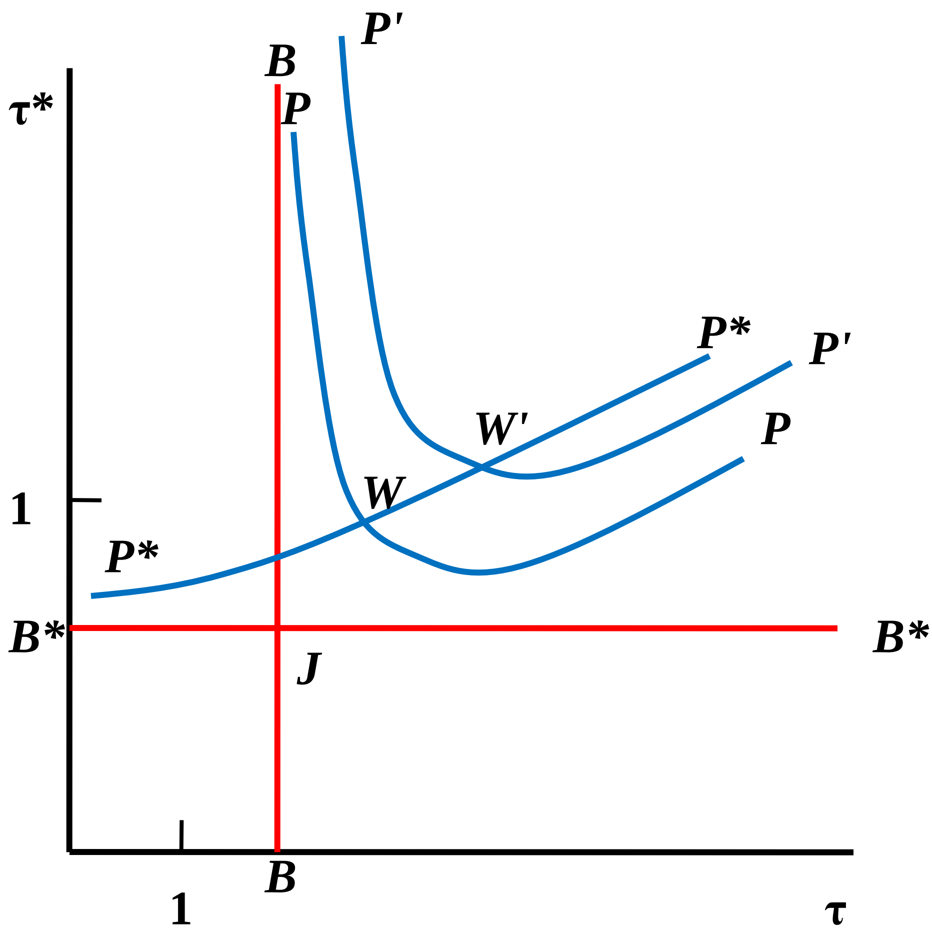
(18) and (18*) are illustrated in Figure 1 for both Johnson (1953/54) and Grossman and Helpman (1995) cases

(i) Johnson equilibrium policies are $\tau_J = 1 + (1/\varepsilon^*)$ and $\tau_J^* = 1 - (1/\varepsilon)$ - i.e, a tariff at home ($\tau_J > 1$), and an export tax abroad ($\tau_J^* < 1$), equilibrium being at intersection *J* of benevolent dictators' best-response functions *BB* and *B*B, which are vertical and horizontal in constant elasticity case**

(ii) For case where $I_L = I_L^* = 1$, home political response function (18) given by *PP*, and foreign political response function (18*) given by *P*P*

***PP* lies everywhere to the right of *BB*, and has a U-shape, approaching *BB* asymptotically at $\tau_J = 1 + (1/\varepsilon^*)$, and to a ray from origin as τ grows large (see 18)**

Figure 1: Trade War Equilibrium



P^*P^* lies everywhere above B^*B^*, and slopes upwards (see (18*))

W is political equilibrium in trade war, which lies to north east of J, politically-motivated policies being tilted in favor of lobbies: home tariff is higher, whereas foreign export tax is lower, or possibly an export subsidy

If a decreases, PP curve shifts up and to the right of fixed P^*P^* schedule, which entails a higher home tariff and a lower foreign export tax (or higher export subsidy)

Increase in tariff occurs as home lobby perceives lower marginal cost of "buying" protection from government; this lowers world price, but foreign lobby's willingness to resist export tax (pay for export subsidy) declines by less than cost to government of providing favor

Political paradox – a government that ignores public interest, may actually serve voter well, as it can credibly pre-commit to policy supporting domestic industry, improving terms of trade

(iii) For I_L=1, I_L^* =0, trade war generates higher import tariffs and higher export taxes than at J; for I_L=0, I_L^* =1, trade taxes are lower in both countries than at J, and may even turn to subsidies in one or both countries

Finally in case where I_L=0, I_L^*=0, results in lower import tariffs and higher export taxes than at *J*, as other lobbies bid for lower consumer prices

- **Trade Talks**

By choosing policies non-cooperatively, incumbent politicians impose avoidable political costs on each other – may be willing therefore to enter trade negotiations

Allow governments to bargain over trade policies τ and τ*, and also allow for possibility of a negotiated transfer payment (positive or negative) between foreign and home country

Assume $\alpha_L = \alpha_L^* \approx 0$, so interest groups are negligible fraction of voters in each country, worrying only about their factor incomes and amount of contributions

Home government comes to bargaining table with goal of maximizing:

$$(19) \qquad G = \sum_{i \in L} C_i(\boldsymbol{\tau}, \boldsymbol{\tau}^*) + a[W(\boldsymbol{\tau}, \boldsymbol{\tau}^*) + R]$$

This is similar to (7) with addition of transfer *R*, and foreign government has a similar objective function:

$$(19^*) \qquad G^* = \sum_{i \in L^*} C_i^*(\boldsymbol{\tau}^*, \boldsymbol{\tau}) + a^*[W^*(\boldsymbol{\tau}^*, \boldsymbol{\tau}) - R]$$

Assume an efficient bargaining solution comes out of trade negotiations, trade policy vectors maximizing weighted sum:

(20) $$a^{*}G + aG^{*} = a^{*}\sum_{i\in L} C_i(\tau,\tau^{*}) + a\sum_{i\in L^{*}} C_i^{*}(\tau^{*},\tau) + a^{*}a[W(\tau,\tau^{*}) + W(\tau^{*},\tau)$$

Define equilibrium in two-stage game where lobbies set contribution schedules non-cooperatively at first stage and governments bargain over trade policies in second

<u>Definition 3</u>:

An equilibrium trade agreement consists of $\{C_i^{0}\}_{i\in L}$, and $\{C_i^{*0}\}_{i\in L^{*}}$, and pair of trade policy vectors τ^{0} and τ^{0*}, such that (a)

$$(\tau^{0},\tau^{*0}) = \underset{(\tau,\tau^{*})}{\operatorname{argmax}}\, a^{*}\sum_{i\in L} C_i^{0}(\tau,\tau^{*}) + a\sum_{i\in L^{*}} C_i^{*0}(\tau^{*},\tau) + a^{*}a[W(\tau,\tau^{*}) + W(\tau^{*},\tau)]$$

(b) for every organized lobby $i \in L$, there does not exist a feasible contribution function $C_i(\tau,\tau^{*})$ and a pair of trade policy vectors (τ^{i},τ^{*i}) such that (i)

$$(\tau^{i},\tau^{*i}) = \underset{(\tau,\tau^{*})}{\operatorname{argmax}}\, a^{*}[C_i(\tau,\tau^{*}) + \sum_{j\neq i, j\in L} C_j^{0}(\tau,\tau^{*})] + a\sum_{j\in L^{*}} C_j^{*0}(\tau^{*},\tau) + a^{*}a[W(\tau,\tau^{*}) + W^{*}(\tau^{*},\tau)$$

and (ii)

$$W_{\mathrm{i}}(\boldsymbol{\tau}^{i},\boldsymbol{\tau}^{*i}) - C_{i}(\boldsymbol{\tau}^{i},\boldsymbol{\tau}^{*i}) > \mathrm{W}_{\mathrm{i}}(\boldsymbol{\tau}^{0},\boldsymbol{\tau}^{*0}) - C_{i}^{0}(\boldsymbol{\tau}^{0},\boldsymbol{\tau}^{*0})$$

(c) for every organized lobby $i \in L^{*}$, there does not exist a feasible contribution function $C_{i}^{*}(\boldsymbol{\tau}^{*},\boldsymbol{\tau})$ and a pair of trade policy vectors $(\boldsymbol{\tau}^{i},\boldsymbol{\tau}^{*\mathrm{i}})$ such that (i)

$$(\boldsymbol{\tau}^{i},\boldsymbol{\tau}^{*i}) = \underset{(\boldsymbol{\tau},\boldsymbol{\tau}^{*})}{\operatorname{argmax}}\, a^{*} \sum_{i\in L} C_{j}^{*0}(\boldsymbol{\tau},\boldsymbol{\tau}^{*}) + a[\mathrm{C}_{i}^{*}(\boldsymbol{\tau}^{*},\boldsymbol{\tau}) + \sum_{j\neq i, j\in L^{*}} C_{j}^{*0}(\boldsymbol{\tau}^{*},\boldsymbol{\tau})] + a^{*}a[W(\boldsymbol{\tau},\boldsymbol{\tau}^{*}) + W^{*}(\boldsymbol{\tau}^{*},\boldsymbol{\tau})]$$

and (ii)

$$W_{i}^{*}(\boldsymbol{\tau}^{*i},\boldsymbol{\tau}^{i}) - C_{i}^{*}(\boldsymbol{\tau}^{*i},\boldsymbol{\tau}^{i}) > \mathrm{W}_{i}^{*}(\boldsymbol{\tau}^{*0},\boldsymbol{\tau}^{0}) - C_{i}^{*0}(\boldsymbol{\tau}^{*0},\boldsymbol{\tau}^{0})$$

(a) Stipulates settlement is efficient for bargaining governments, i.e., maximizes joint welfare of politicians, while (b) and (c) requires it be impossible for any lobby in home/foreign country to gain from restructuring its contribution schedule

Trade agreement also entails a transfer of R^{0}, size depending on bargaining process

Assume an "as if" mediator or surrogate world government that maximizes (20), and replace (b) and (c) with following requirement, similar to (10)

$$(\boldsymbol{\tau}^0, \boldsymbol{\tau}^{*0}) = \underset{(\tau,\tau^*)}{\operatorname{argmax}}\, a^* [W_j(\boldsymbol{\tau}, \boldsymbol{\tau}^*) - C_j^0(\boldsymbol{\tau}, \boldsymbol{\tau}^*)]$$

(21) $$+ a^* \sum_{i \in L} C_i^0(\boldsymbol{\tau}, \boldsymbol{\tau}^*)] + a \sum_{i \in L^*} C_i^{*0}(\boldsymbol{\tau}^*, \boldsymbol{\tau})$$

$$+ a^* a[W(\boldsymbol{\tau}, \boldsymbol{\tau}^*) + W^*(\boldsymbol{\tau}^*, \boldsymbol{\tau})] \text{ for all } j \in L$$

and

$$(\boldsymbol{\tau}^0, \boldsymbol{\tau}^{*0}) = \underset{(\tau,\tau^*)}{\operatorname{argmax}}\, a[W_j^*(\boldsymbol{\tau}^*, \boldsymbol{\tau}) - C_j^{*0}(\boldsymbol{\tau}^*, \boldsymbol{\tau})]$$

(21*) $$+ a \sum_{i \in L} C_i^0(\boldsymbol{\tau}, \boldsymbol{\tau}^*)] + a \sum_{i \in L^*} C_i^{*0}(\boldsymbol{\tau}^*, \boldsymbol{\tau})$$

$$+ a^* a[W(\boldsymbol{\tau}, \boldsymbol{\tau}^*) + W^*(\boldsymbol{\tau}^*, \boldsymbol{\tau})] \text{ for all } j \in L^*$$

Assuming contribution schedules are differentiable around the equilibrium point, (21) and (21*) satisfy first-order conditions:

(22) $$a^* \sum_{i \in L} \nabla_{\tau} W_i(\boldsymbol{\tau}^0, \boldsymbol{\tau}^{*0}) + a \sum_{i \in L^*} \nabla_{\tau} W_i^*(\boldsymbol{\tau}^{*0}, \boldsymbol{\tau}^0)$$

$$+ a^* a[\nabla_{\tau} W(\boldsymbol{\tau}^0, \boldsymbol{\tau}^{*0}) + \nabla_{\tau} W^*(\boldsymbol{\tau}^{*0}, \boldsymbol{\tau}^0)] = 0$$

(22*) $$a^* \sum_{i \in L} \nabla_{\tau^*} W_i(\boldsymbol{\tau}^0, \boldsymbol{\tau}^{*0}) + a \sum_{i \in L^*} \nabla_{\tau^*} W_i^*(\boldsymbol{\tau}^{*0}, \boldsymbol{\tau}^0)$$

$$+ a^* a[\nabla_{\tau^*} W(\boldsymbol{\tau}^0, \boldsymbol{\tau}^{*0}) + \nabla_{\tau^*} W^*(\boldsymbol{\tau}^{*0}, \boldsymbol{\tau}^0)] = 0$$

Calculate partial derivatives in (22) and (22*), and substituting, obtain:

$$(23) \quad a^{*}[I_{jL}X_j + a(\tau_j^{0} - 1)\pi_j M_j'](\pi_j + \pi_j^{0}\pi_{j1})$$

$$+ a[I_{jL}^{*}X_j^{*} + a^{*}(\tau_j^{0*} - 1)\pi_j M_j^{*\prime}]\tau_j^{*0}\pi_{j1} = 0 \text{ for } j \in L$$

and

$$(23^{*}) \quad a[I_{jL}^{*}X_j^{*} + a^{*}(\tau_j^{*0} - 1)\pi_j M_j^{*\prime}](\pi_j + \pi_j^{*0}\pi_{j2})$$

$$+ a^{*}[I_{jL}X_j + a(\tau_j^{0} - 1)\pi_j M_j']\tau_j^{0}\pi_{j2} = 0 \text{ for } j \in L^{*}$$

As equations (23) and (23*) are linearly dependent, cannot solve for τ^{0} and τ^{*0} separately, only their ratios $\tau_1^{0} / \tau_1^{*0}, \tau_2^{0} / \tau_2^{*0}, ..., \tau_n^{0} / \tau_n^{*0}$

From (23) and (23*) derive implicitly equilibrium policy ratio in i:

$$(24) \quad \tau_i^{0} - \tau_i^{*0} = \left(-\frac{I_{iL}}{a}\frac{X_i}{\pi_i M_i'} \right) - \left(-\frac{I_{iL}^{*}}{a^{*}}\frac{X_i^{*}}{\pi_i M_i^{*\prime}} \right) \text{for } i = 1, 2, ..., n$$

When both sides of (24) are divided by τ_i^{*0}, trade policies enter as a ratio – this follows from definition 3 which stipulates equilibrium but not how surplus will be divided up between governments

However, τ_i / τ_i^* determines internal prices p_i and p_i^*, which in turn determines industry outputs, demands, trade flows, and factor prices in each country, i.e., allocation does not depend separately on τ_i and τ_i^*, nor does joint welfare of politicians

(24) also characterizes equilibrium trade agreement even if R=0 – governments can mimic direct transfer payment by increasing (decreasing) some τ_i and τ_i^*, while holding their ratio constant

Allowing for $\alpha_L \geq 0$ and $\alpha_L^* \geq 0$, (24) can be re-written as:

$$(25) \quad \tau_i^0 - \tau_i^{*0} = \left(-\frac{I_{iL} - \alpha_L}{a + \alpha_L} \frac{X_i}{\pi_i M_i'} \right) - \left(-\frac{I_{iL}^* - \alpha_L^*}{a^* + \alpha_L^*} \frac{X_i^*}{\pi_i M_i^{*\prime}} \right) \text{for } i = 1, 2, \ldots, n$$

This is derived assuming R=0, lobbies having objectives $\upsilon^i = W_i(\tau, \tau^*) - C_i(\tau, \tau^*)$ and $, \upsilon^{*i} = W_i^*(\tau^*, \tau) - C_i^*(\tau^*, \tau^*)$ and there is a hypothetical mediator

Compared to "free trade", (25) shows that negotiated trade agreement favors lobby with greatest political "clout"

$\tau_i / \tau_i^* > 1$ when first term on right-hand side in parentheses exceeds the second, and vice-versa when $\tau_i / \tau_i^* < 1$, and $\tau_i / \tau_i^* = 1$under "free trade"

Politically stronger industry ends up with largest profits in agreement:

(i) If specific factors organized in *i* in one country, but not other, organized group gains from trade agreement

(ii) When both countries' specific factors are organized in *i*, which is more powerful group depends on size of stake (X^i vs. X_i^*), how much government places on average welfare (a vs. a^*), and fraction of voting population in lobby groups bidding for policies (α_L and α_L^*)

(iii) Lobby in *i* will gain an advantage over foreign counterpart if home import demand or export supply is more price inelastic than that abroad

With equal political power, a negotiated trade agreement gives rise to equal rates of import tax and export subsidy, i.e., trade lobbies can neutralize each other in a trade agreement

Importantly, the terms of trade component of the trade war equilibrium and Johnson equilibrium are absent from (25), i.e., an efficient trade negotiation will eliminate this source of deadweight loss