

**Professor Ian Sheldon: Trade Seminar
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Topic 4: Political Economy and Trade Policy

Articles:

Gene Grossman and Elhanan Helpman: “Protection for Sale”, *American Economic Review*, 1994: 833-850

Caroline Freund and Çağlar Özden: “Trade Policy and Loss Aversion”, *American Economic Review*, 2008: 1675-1691



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Motivation (Grossman and Helpman, 1995)

- When asked “why no free trade?”, most international economists respond “it must be politics”
- In representative democracies, trade policy shaped not only by general electorate, but by special interests that lobby for what may be socially costly policies
- Two key approaches to modeling political process:
 - *political competition*: parties announce policies they will implement if elected (Magee *et al.*, 1989)
 - *political support*: incumbent governments set policies to maximize political support (Stigler, 1971)
- Paper adopts latter approach in order to explain structure of trade protection

The Model

- Small economy where all individuals have identical preferences, but different factor endowments; each maximizes utility:

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

where x_0 is consumption of good 0, and x_i consumption of goods $i=1,2,\dots,n$

$u_i(\cdot)$ are differentiable, increasing, and strictly concave

- Good 0 is *numeraire* with world and domestic price of 1; p_i^* is world price of good i , and p_i is domestic price
- Individual spending E consumes $x_i = d_i(p_i)$ of i , where demand function is inverse of $u'_i(x_i)$ and expenditure on *numeraire* good is $x_0 = E - \sum_i p_i d_i(p_i)$

The Model

- Indirect utility takes form:

$$V(p, E) = E + s(p) \quad (2)$$

where $p = (p_1, p_2, \dots, p_n)$ is vector of domestic prices, and consumer surplus is, $s(p) \equiv \sum_i u_i[d_i(p_i)] - \sum_i p_i d_i(p_i)$

- Good 0 produced from labor alone under constant returns with an input-output coefficient of 1, labor supply being large enough that wage rate equals one
- Production of x_i uses labor and sector-specific inputs under constant returns, where specific factors are inelastic in supply
- With wage rate fixed, aggregate reward to specific factor in i depends on domestic price of i , $\pi_i(p_i)$

The Model

- Government can implement trade taxes and subsidies, which drive wedge between domestic and world prices; net revenue/capita from all taxes and subsidies is:

$$r(p) = \sum_i (p_i - p_i^*) \left[d_i(p_i) - \frac{1}{N} y_i(p_i) \right] \quad (3)$$

where N is total voting population, and domestic output of good i is $y_i(p_i) = \pi'_i(p_i)$

- Government redistributes revenue uniformly to all voters, so $r(p)$ is net transfer to each one
- Typical individual derives income from wages and transfers, plus that from ownership of sector-specific inputs – income tied to production of good i , hence they have direct stake in trade taxes/subsidies

The Model

- In some set of sectors L , specific-factor owners organize into lobbies making political contributions; remaining sectors/individuals make no contributions
- Lobby in sector i makes contribution contingent on trade-policy vector of government; $C_i(p)$ is contribution schedule of i , designed to maximize total welfare of members, i.e., income plus surplus less contributions
- Joint welfare of lobby i is $V_i = W_i - C_i$ where W_i is gross-of-contributions joint welfare:

$$W_i(p) \equiv \ell_i + \pi_i(p_i) + \alpha_i N[r(p) + s(p)] \quad (4)$$

where ℓ_i is total labor supply (income) of owners of specific factors used in i and α_i is share of population owning some of that factor

The Model

- Contributions can be used to finance campaign spending, and voters more likely to re-elect government delivering high standard of living

- Government objective function is:

$$G = \sum_{i \in L} C_i(p) + aW(p) \quad a \geq 0 \quad (5)$$

W is aggregate, gross-of-contributions welfare, i.e., aggregate income plus trade tax revenues plus consumer surplus:

$$W(p) \equiv \ell + \sum_{i=1}^n \pi_i(p_i) + N[r(p) + s(p)] \quad (6)$$

- Two-stage non-cooperative game where lobbies simultaneously choose contribution schedules in first stage, government sets policy in second stage

Nash Equilibrium

- **Equilibrium is:**

- set of contribution functions $\{C_i^0(p)\}$, one for each lobby group, where each maximizes joint welfare given other contribution schedules and expected political optimization by government
- domestic price vector p^0 maximizing government's objective taking contribution schedules as given

- **Game has structure of menu-auction problem (Bernheim and Whinston, 1986) – in this case allow government (auctioneer) choice set of domestic price vectors to be continuous**

Nash Equilibrium

- $\bar{\mathcal{P}}$ is set of price vectors, each domestic price lying between minimum \underline{p}_i and maximum \bar{p}_i
- Drawing on Lemma 2 of Bernheim and Whinston, equilibrium of trade policy game is:

$(\{C_i^0\}_{i \in L}, p^0)$ is a subgame - perfect equilibrium of trade - policy game iff :

(a) C_i^0 is feasible

(b) p^0 maximizes $\sum_{i \in L} C_i^0(p) + aW(p)$ on $\bar{\mathcal{P}}$

(c) p^0 maximizes $W_j(p) - C_j^0(p) + \sum_{i \in L} C_i^0(p) + aW(p)$ on $\bar{\mathcal{P}}$ for every $j \in L$

(d) for every $j \in L$ there exists a $p^j \in \bar{\mathcal{P}}$ that

maximizes $\sum_{i \in L} C_i^0(p) + aW(p)$ on $\bar{\mathcal{P}}$ such that $C_j^0(p^j) = 0$

Nash Equilibrium

- (a) Restricts each lobby's contribution schedule to be feasible, i.e., non-negative and no greater than aggregate income of lobby members
 - (b) Given contribution schedules offered by lobbies, government sets trade policy to maximize its welfare
 - (c) For every lobby j , equilibrium price vector must maximize joint welfare of lobby and government, given contribution schedules of other lobbies, i.e., no unexploited profit opportunities can exist for any lobby
- If not the case, lobby j could reformulate policy bids to induce government to choose jointly optimal price vector and thereby appropriate much of surplus from switch in policy

Nash Equilibrium

- Assume lobbies' contribution functions are differentiable around equilibrium p^0 , implies that if p^0 maximizes $V_j + G$, then first-order condition is satisfied:

$$\begin{aligned} &\nabla W_j^0(p^0) - \nabla C_j^0(p^0) \\ &+ \sum_{i \in L} \nabla C_i^0(p^0) + a \nabla W(p^0) = 0 \text{ for all } j \in L \end{aligned} \quad (7)$$

Government maximization of G requires:

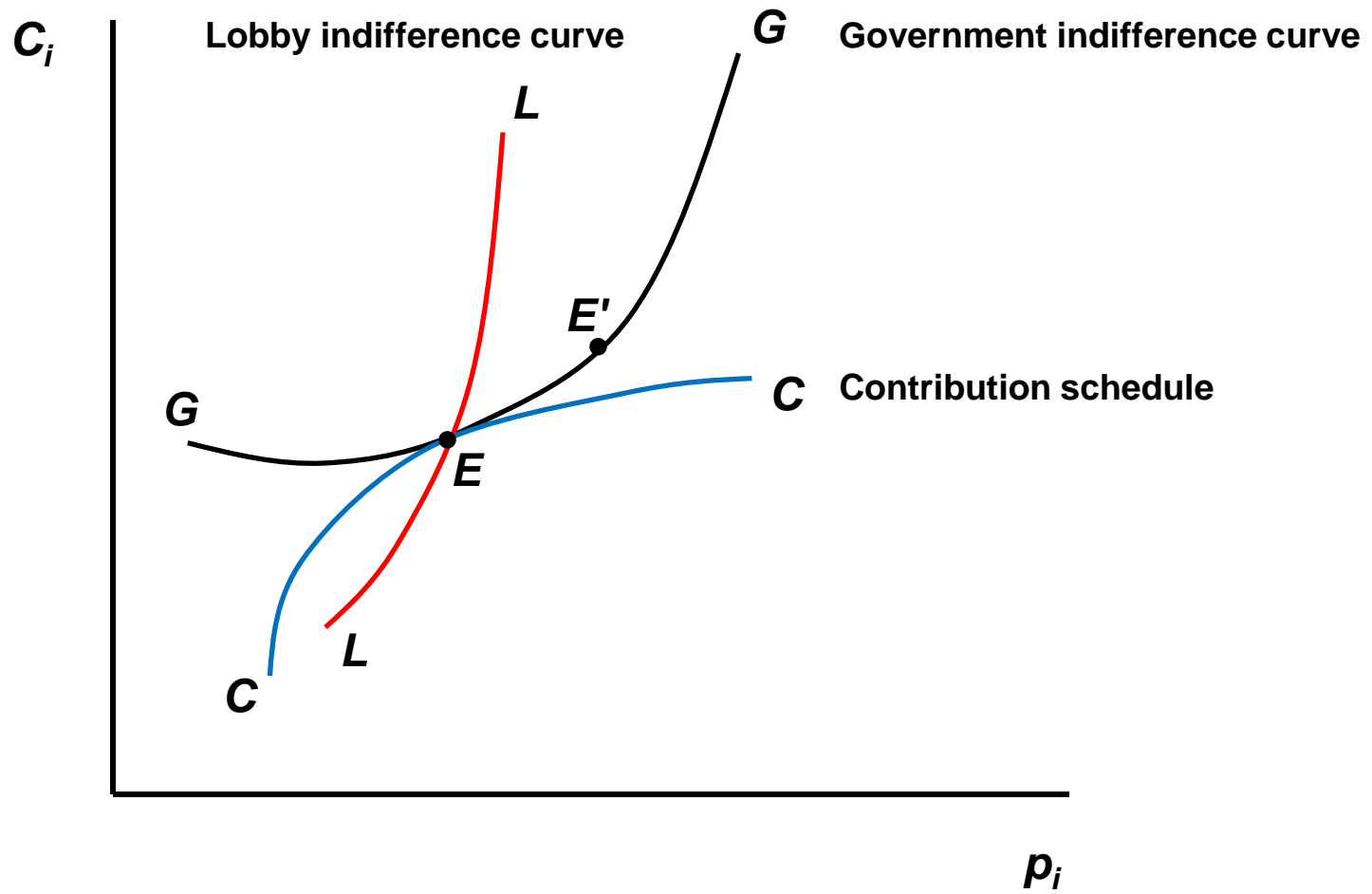
$$\sum_{i \in L} \nabla C_i^0(p^0) + a \nabla W(p^0) = 0 \quad (8)$$

Taken together, (7) and (8) imply:

$$\nabla C_i^0(p^0) = \nabla W_i(p^0) \text{ for all } i \in L \quad (9)$$

- (9) establishes contribution schedules are *locally truthful* around p^0 , i.e., each lobby sets schedule so that marginal change in contribution for small change in policy matches effect on lobby's gross welfare

Local Truthfulness



Truthful Nash Equilibrium

- Equilibrium price vector of truthful Nash equilibrium (TNE) satisfies:

$$p^0 = \underset{p \in \bar{\mathcal{P}}}{\operatorname{argmax}} \left[\sum_{j \in L} W_j(p) + aW(p) \right] \quad (10)$$

(10) States that in equilibrium, truthful contribution schedules induce government to behave as if it were maximizing a social-welfare function that weights different members of society differently

Individuals in lobby group get weight of $1+a$, others not represented getting smaller weight of a – rationalizes reduced-form political support functions used in literature

Structure of Protection

- Sum (9) over i and substitute into (8):

$$\sum_{i \in L} \nabla_i W_i(p^0) + a \nabla W(p^0) = 0 \quad (11)$$

(11) Characterizes equilibrium domestic prices supported by differentiable contribution functions

- Now calculate how marginal policy changes affect welfare of various groups in society; looking at members of lobby i , find from (3) and (4) that:

$$\frac{\partial W_i}{\partial p_j} = (\delta_{ij} - \alpha_i) y_j(p_j) + \alpha_i (p_j - p_j^*) m'_j(p_j) \quad (12)$$

where $m_j(p_j) \equiv Nd_j(p_j) - y_j(p_j)$ denotes the net import demand function and δ_{ij} is an indicator variable that equals 1 if $i=j$, and 0 otherwise

Structure of Protection

- (12) states that lobby i gains from an increase in price of i above its free trade level, and gains from a decrease in price of any other ($m'_j < 0$)
- Specific-factor owners benefit more from an increase in the price of their industry's output the larger is free-trade supply of good
- Benefit to lobby i of decline in price of good j falls as number of members in that lobby falls, and vanishes in the limit when $\alpha_i = 0$
- Summing (12) over $i \in L$:

$$\sum_{i \in L} \frac{\partial W_i}{\partial p_j} = (I_j - \alpha_L) y_j(p_j) + \alpha_L (p_j - p_j^*) m'_j(p_j) \quad (13)$$

where $I_j \equiv \sum_{i \in L} \delta_{ij}$ equals 1 if industry i is organized, and $\alpha_L \equiv \sum_{i \in L} \alpha_i$ denotes fraction of voters in a lobby

Structure of Protection

- (13) shows that starting from free-trade prices, lobby members as a whole benefit from small increase in domestic price of any good produced by an organized industry and from small decline in price of any good produced by an unorganized industry ($\alpha_L > 0$)
- Effect of marginal price change on welfare is, using definition of W in (6):

$$\frac{\partial W}{\partial p_j} = (p_j - p_j^*) m'_j(p_j) \quad (14)$$

Showing that marginal deadweight loss grows as economy deviates farther from free trade

- Substituting (13) and (14) into (11) allows solution for domestic prices in political equilibrium

Structure of Protection

- Result expressed in terms of *ad valorem* taxes/subsidies, i.e., $t_i^0 \equiv (p_i^0 - p_i^*) / p_i^*$

If lobbies use contribution schedules that are differentiable around equilibrium, and if equilibrium is in interior of $\bar{\mathcal{P}}$, government chooses taxes and subsidies satisfying:

$$\frac{t_i^0}{1+t_i^0} = \frac{l_i - \alpha_L}{a + \alpha_L} \left(\frac{z_i^0}{e_i^0} \right) \quad \text{for } i=1,2,\dots,n$$

where $z_i^0 = y_i(p_i^0) / m_i(p_i^0)$ is the equilibrium ratio of domestic output to imports (negative for exports), and elasticity of import demand or export supply (former positive, latter negative) is $e_i^0 = -m'_i(p_i^0)p_i^0 / m_i(p_i^0)$

Structure of Protection

- Result is a modified Ramsey rule: *ceteris paribus*, industries with high import demand or high export supply elasticities (in absolute value), have smaller *ad valorem* deviations from free trade
- This result follows for two reasons:
 - government bears political cost from creating deadweight loss (if $a > 0$); hence, it will prefer to raise contributions from sectors where cost is low
 - even if $a = 0$, if $\alpha_L > 0$, members of lobbies as a group bear deadweight loss from trade policy; owners of specific factors in industries other than i bid to avoid protection in i , the greater the social cost

Structure of Protection

- **Deadweight loss issues modified by political variables in determination of equilibrium structure of protection:**
 - **all sectors with lobbies protected by import tariffs/export subsidies, and sectors without representation face import subsidies and export taxes; i.e., organized lobbies raise prices where they get profit income, and lower prices of goods they consume**
 - **political power of organized lobbies reflected in ratio of domestic output to imports – with large domestic output, specific-factor owners gain from price increase; but, for a given import demand elasticity, economy has little to lose from protection when volume of imports is low**

Structure of Protection

- the less weight attached to aggregate welfare compared to campaign financing, the larger are trade taxes/subsidies; however, even if $a=0$, interest groups will not want distortions to grow too large
- as share of voters that are members of a lobby increases, rates of protection for organized industries decline; in limit if all voters are in lobby ($\alpha_L=1$) and all lobbies are represented ($I_i=1$ for all i), free trade prevails in all markets – groups neutralize each other
- if all interest-group members are small fraction of voting population, ($\alpha_L=0$) no trade taxes/subsidies applied to goods not represented by a lobby ($I_i=0$) – when political contributors are few, stand little to gain from intervention in sectors other than their own

Motivation (Freund and Özden, 2008)

- Evidence suggest industries experiencing losses more likely to get protection, e.g., Trefler (1993) finds it is higher where import penetration has increased
- Not consistent with models predicting protection should be applied to expanding sectors
- Freund and Özden (2008) construct political support model where preferences display behavioral characteristics such as loss aversion and reference dependence
- Changes dynamics of protection: *standard effect* – protection is increasing in output of domestic industry; *behavioral effect* – protection increases after negative shock

Model

- Specific-factors model with lobbying for protection and incorporate behavioral assumptions
- Key insight is that welfare is dependent on both *current* state and *change* in states; following Kahneman and Tversky (1991):
 - *reference dependence*: gains and losses relative to reference point matter
 - *loss aversion*: losses have larger effect on welfare than gains
 - *diminishing sensitivity*: marginal value of gains and losses decrease with their size
- Introduce elements into Grossman and Helpman (1994)

The Model

- $n+1$ consumption goods, where good 0 is *numeraire*, produced with labor alone under constant returns, $y_0 = L_0$
- Enough labor to ensure positive supply of good 0, price and wage rate set at one; goods 1,..., n require labor and sector-specific input fixed in supply, produced under constant returns
- Rewards to owners of specific inputs determined by domestic price p_i , denoted by $\pi_i(p_i)$, and supply of i is denoted by $y_i = \pi'_i(p_i)$
- Economy comprises individuals with identical preferences deriving utility from consuming $n+1$ goods and from deviations from reference-dependent utility

The Model

- Each individual maximizes:

$$U = x_0 + \sum_{i=1}^n u_i(x_i) - lh \left(\bar{U} - x_0 - \sum_{i=1}^n u_i(x_i) \right), \quad h' > 0, \quad h'' < 0, \quad h(0) = 0$$

x_0 is consumption of good 0, and x_i consumption of good i ; $u_i(\cdot)$ are differentiable, increasing, and strictly concave

Individual demand is $x_i = d_i(p_i)$ of i , where demand function is inverse of $u'_i(x_i)$, and $x_0 = E - \sum_i p_i d_i(p_i)$, where E is income

- Each person owns only one type of sector-specific input, and assume ownership levels are identical across individuals

The Model

- Behavioral features introduced through $h(\cdot)$, which is increasing in difference between reference utility \bar{U} and actual utility ($h'(\cdot) > 0$), marginal increase declining in size of loss ($h''(\cdot) < 0$)
- I is an indicator variable, where $I = 1$ if utility falls below reference level
- Indirect utility of individual owning specific-factor i is:

$$V_{\bar{p}_i}(p) = E + s(p) - I_i h\left(\frac{\pi(\bar{p}_i) - \pi(p_i)}{\alpha_i N}\right), \quad h' > 0, h'' < 0, h(0) = 0 \quad (1)$$

where p is domestic price vector, E is constant labor income, α_i is fraction of population N owning specific-factor i , and $s(p)$ is consumer surplus

The Model

- Income from specific factor determines extent of loss aversion, and as reward level $\pi_i(p_i)$ strictly increasing in p_i , reference reward level corresponds to unique reference price \bar{p}_i

- Net per capita tariff revenue is:

$$r(p) = \sum_i (p_i - p_i^*) \left[d_i(p_i) - \frac{1}{N} y_i(p_i) \right] \quad (2)$$

- Joint welfare of lobby i , excluding loss aversion is:

$$W_i(p) \equiv \ell_i + \pi_i(p_i) + \alpha_i N [r(p) + s(p)] \quad (3)$$

- Loss aversion of lobby i is:

$$H_i(p) = -I_i \alpha_i N h \left(\frac{\pi(\bar{p}_i) - \pi(p_i)}{\alpha_i N} \right), \quad h' > 0, h'' < 0 \quad (4)$$

The Model

- With loss aversion, welfare of lobby i is:

$$G_i(p) = W_i(p) + H_i(p) \quad (4)$$

Interests of lobby i are aligned, but opposed to other lobbies; if profits fall below reference level, $I_i=1$, lobby experiences loss through $h(\cdot)$, in addition to direct loss from decline in $\pi_i(p_i)$

- Social welfare for economy given by:

$$W(p) \equiv \ell + \sum_{i=1}^n \pi_i(p_i) + N[r(p) + s(p)] \quad (5)$$

where loss aversion for whole economy is:

$$H(p) = - \sum_{i \in L} \alpha_i N h \left(\frac{\pi(\bar{p}_i) - \pi(p_i)}{\alpha_i N} \right) \quad (6)$$

L is set of sectors with prices below reference level

The Model

- Modified social welfare function is:

$$G(p) = W(p) + H(p) \quad (7)$$

- As country is small, has no influence over p^* , domestic prices being determined by trade policy vector; government cares about social welfare and values political contributions from organized lobbies O :

$$\Omega = \sum_{i \in O} C_i(p) + aG(p) \quad a \geq 0 \quad (8)$$

- Nash game is same as in Grossman and Helpman (1994), equilibrium price vector being:

$$p^0 = \operatorname{argmax} \sum_{i \in O} G_i(p) + aG(p) \quad (9)$$

$G_i(p)$ and $G(p)$ being defined in (4) and (7)

Trade Policy

- Discontinuity in welfare function at reference price due to loss aversion; to solve for trade policy divide into three cases:

- CASE 1: Equilibrium price above reference price $p_i^0 > \bar{p}_i$

Here $H(p)=0$, and standard Grossman and Helpman (GH) result on structure of protection holds:

$$\frac{t_i^0}{1+t_i^0} = \frac{I_{oi} - \alpha_o}{a + \alpha_o} \left(\frac{z_i^0}{e_i^0} \right) \quad (10)$$

I_{oi} is an indicator variable equal to one if sector i is organized, and zero otherwise, α_o is fraction of population that is organized, z_i^0 is ratio of domestic output to imports, and e_i^0 is elasticity of import demand/export supply

Trade Policy

- There is range of world prices that lie below reference price, but equilibrium prices end up above reference prices due to lobbying and resulting protection
- Equilibrium price below reference price $p_i^0 \leq \bar{p}_i$

Optimal domestic price can be written as:

$$\operatorname{argmax}_{i \in O} \sum [W_i(p) + H_i(p)] + a[W(p) + H(p)]$$

In Figures 1 and 2, domestic price is on horizontal axis for industry i , welfare on vertical axis, with $aW(p) + W_i(p)$ and $aH(p) + H_i(p)$ drawn as functions of p_i , given p_i^*

$aW(p) + W_i(p)$ has maximum at GH equilibrium, p_i^{GH}

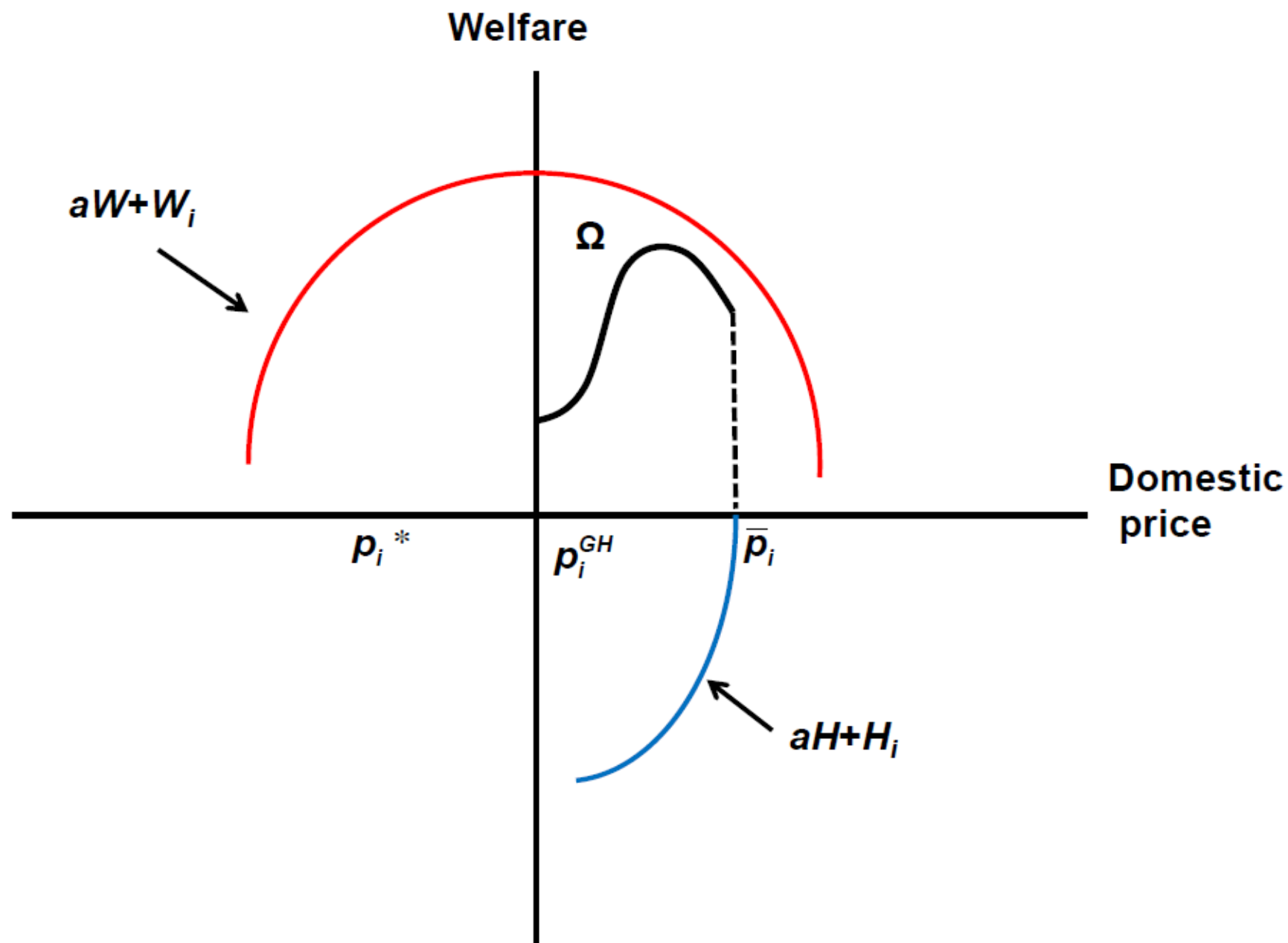
Trade Policy

- Loss aversion function $aH(p)+H_i(p)$, is convex and takes negative value when domestic price is below reference price
- Welfare $\Omega_i(p)$ cannot be at maximum if either $p_i \leq p_i^{GH}$ or $p_i \geq \bar{p}_i$ (see paper for proof); alternatives are either an interior solution $p_i^{GH} < p_i \leq \bar{p}_i$ or corner solution $p_i = \bar{p}_i$
- CASE 2: Loss aversion present and FOC satisfied:

As $\Omega'(p_i^{GH}) > 0$, p_i^0 is a unique maximum (Figure 1); government chooses tariff level such that domestic price is p_i^0 . First-order condition is:

$$(l_{oi} - \alpha_o)y_i(p_i) + (a + \alpha_o)(p_i - p_i^*)m'_i(p_i) + (a + l_{oi})y_i(p_i)h'_i\left(\frac{\pi(\bar{p}_i) - \pi(p_i)}{\alpha_i N}\right) = 0$$

Figure 1: Welfare Function and Loss Aversion – Interior Solution



Trade Policy

Optimal trade tax is:

$$\frac{t_i^0}{1+t_i^0} = \frac{(I_{oi} - \alpha_o) + \left[(a + I_{oi}) h' \left(\frac{\pi(\bar{p}_i) - \pi(p_i)}{\alpha_i N} \right) \right]}{a + \alpha_o} \left(\frac{z_i^0}{e_i^0} \right) \quad (11)$$

Behavioral term [.] has important implications – compared to GH if all sectors are organized ($I_{oi}=1$) and everyone is in lobby group $\alpha_o=1$, trade is still distorted if some experience loss aversion at free trade i.e.:

$$\frac{t_i^0}{1+t_i^0} = h'(\cdot) \left(\frac{z_i^0}{e_i^0} \right) \quad (12)$$

(12) is equilibrium tariff in loss-making industry if all sectors are organized, i.e, tariffs compensate for loss aversion

Trade Policy

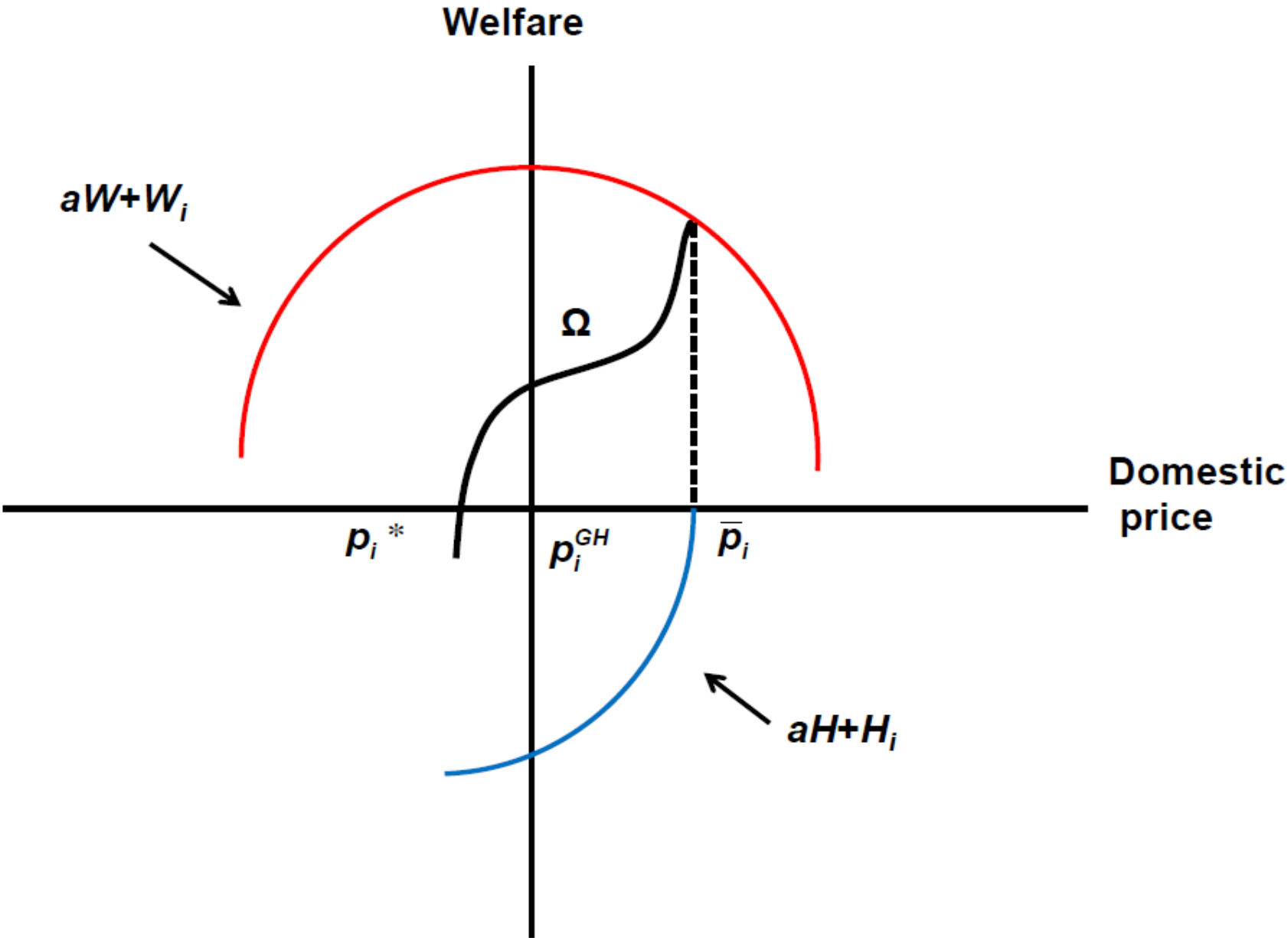
- CASE 3: Loss aversion present and FOC not satisfied in region $p_i^{GH} < p_i \leq \bar{p}_i$

First, $\Omega'(p_i^{GH}) > 0$ - implies $aH(p) + H_i(p) > aW(p) + W_i(p)$ in absolute value in entire range; therefore, $\Omega(p_i^0)$ is increasing and reaches maximum at \bar{p}_i (Figure 2)

Loss aversion below is \bar{p}_i so large that marginal gain from reduction in loss aversion is always greater than marginal loss in weighted social welfare from protection, i.e., $aH'(p) + H'_i(p) > aW'(p) + W'_i(p)$

Government chooses trade policy so that domestic price is \bar{p}_i , but once reference price is reached, loss aversion disappears, any further increase in tariff lowering government welfare

Figure 2: Welfare Function and Loss Aversion – Corner Solution



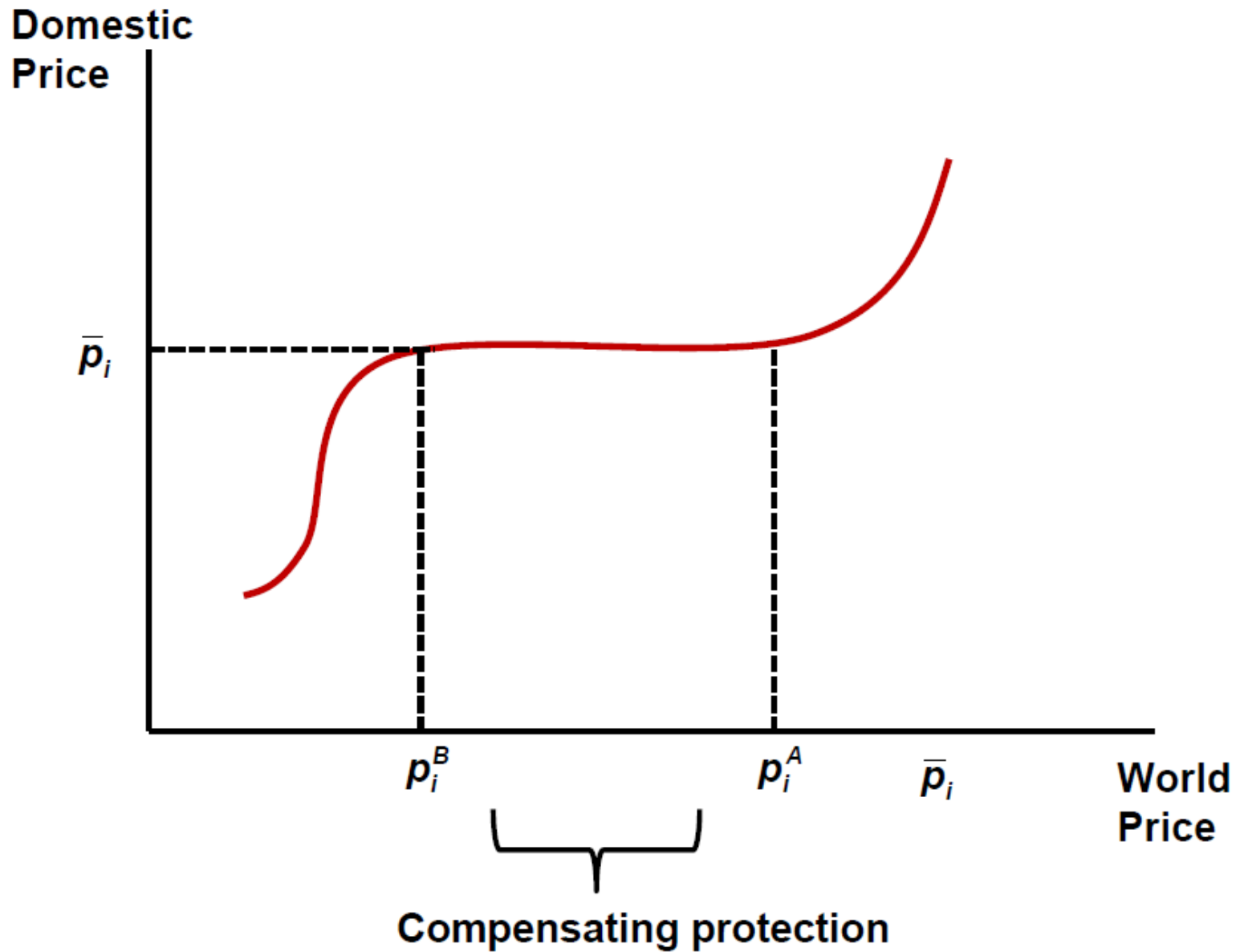
World Prices and Protection

- How does equilibrium level of protection and domestic prices respond to changes in world prices? CASE 2 vs. CASE 3
- Starting with CASE 1, no loss aversion, and GH result holds, and recalling that for range of world prices less than reference price \bar{p}_i , equilibrium domestic price may still exceed reference price due to lobbying

Let p_i^A be world price for which domestic price in GH equilibrium is exactly equal to \bar{p}_i (Figure 3)

Suppose world price falls by ε , such that $p_i^* = p_i^A - \varepsilon$, loss aversion matters – we know $W'(p_i^A) + aW'_i(p_i^A) = 0$, and $H'(p_i^*) + aH'_i(p_i^*) > 0$ implying that $G'(p_i^*) + aG'_i(p_i^*) > 0$ if ε is small enough, i.e., CASE 3

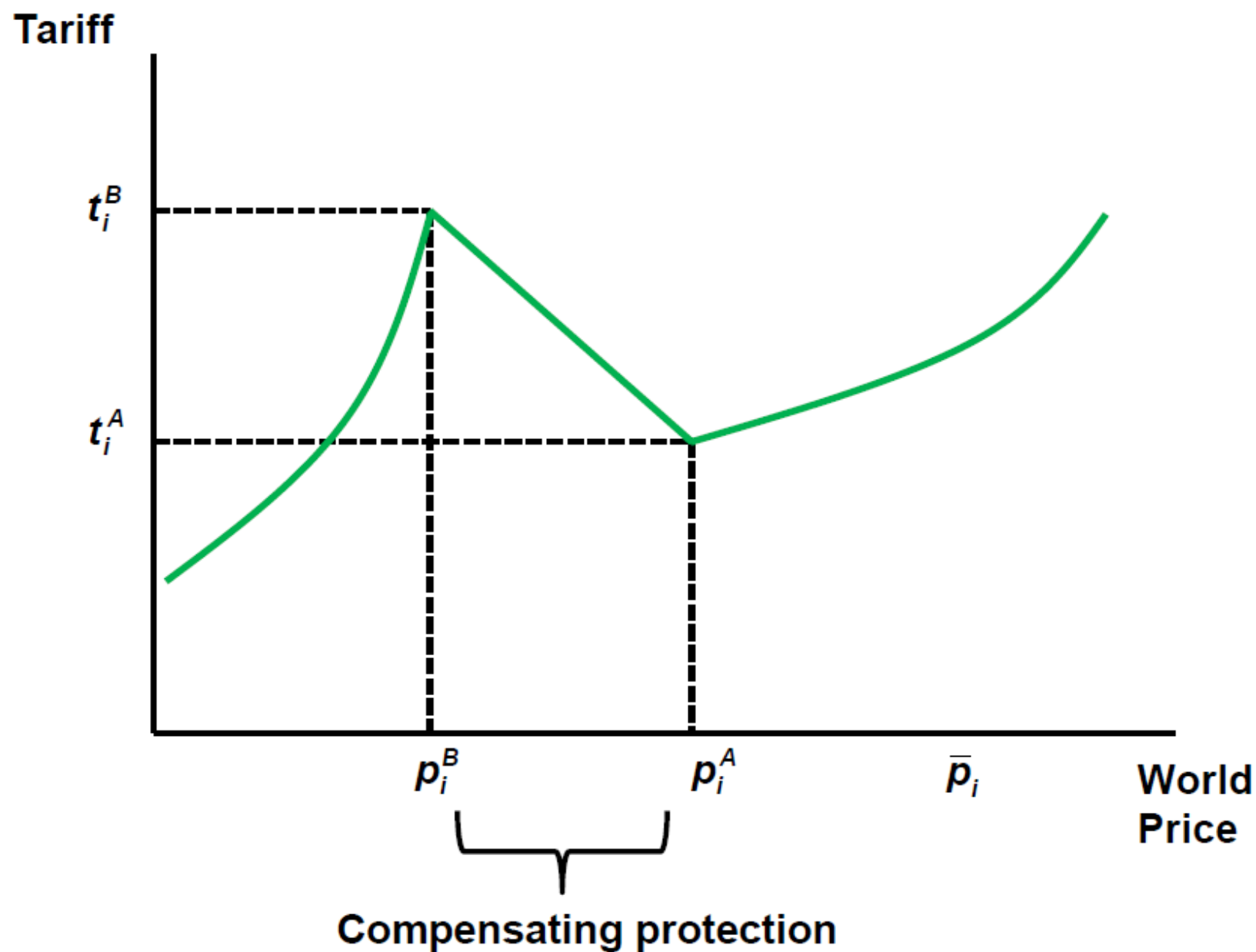
Figure 3: Domestic and World Prices



World Prices and Protection

- As ε increases, world price falls farther, and eventually switch from corner to interior solution (CASE 2); any additional decline in world price p_i^* translates into decline in domestic price p_i^0 ; i.e., distortion from tariff increases and weakening of loss aversion effect
- Figure 4 shows equilibrium protection level and world price – intermediate section of world prices where trade policy is used to shelter domestic sector
- In this region, domestic price set exactly equal to reference level, tariff level adjusting exactly to keep domestic price constant as world price falls
- Below p_i^B there is protection, but does not raise domestic price to reference level

Figure 4: Tariffs and World Prices



World Prices and Protection

- Traditional political economy models predict positive monotonic relationship between protection and world prices
- As in GH model, firms still receive increasing protection when world price is high, i.e., competitive export sectors
- Region of compensating protection show that declines in world price trigger demands for increased protection
- Protectionism implemented in sectors that still have significant output and employment, but are starting to lose relative competitiveness