

Coates, Daniel E.; Ludema, Rodney D.

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## Unilateral tariff reduction as leadership in the political economy of trade negotiations

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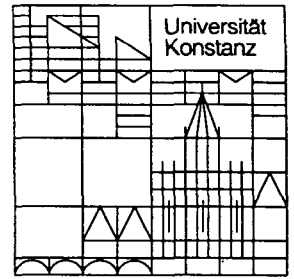
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**Sonderforschungsbereich 178**  
**„Internationalisierung der Wirtschaft“**

Diskussionsbeiträge



Juristische  
Fakultät

Fakultät für Wirtschafts-  
wissenschaften und Statistik

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Daniel E. Coates  
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**Daniel E. Coates  
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**UNILATERAL TARIFF REDUCTION  
AS LEADERSHIP IN THE POLITICAL ECONOMY  
OF TRADE NEGOTIATIONS\***

by

**Daniel E. Coates**

*U. S. General Accounting Office*

and

**Rodney D. Ludema**

*University of Western Ontario*

*December 1994*

**Abstract:** This paper develops a model of the trade liberalization process, featuring both international negotiation and special-interest-driven domestic politics. We show that a country may wish to adopt a policy of unilaterally reducing its tariff whenever political opposition in other countries stalls negotiations toward free trade, because such a policy weakens the political opposition in those countries and expedites the liberalization process. Thus a pattern emerges in which unilateral liberalization by one large country (the leader) is followed by a greater likelihood of trade reform in other countries, with deeper tariff cuts therein. Moreover, we show that this pattern may be more pronounced the larger is the leader country. These results help to explain the cases of mid-nineteenth-century Britain and mid-twentieth-century United States and to support a theory of international leadership in trade policy-making.

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## I. INTRODUCTION

This paper provides new theoretical support for an old idea, which is that a key ingredient in the establishment of a liberal world trading system is the presence of a large country acting as the leader in international trade policymaking. This idea was advanced by Kindleberger (1973, 1986) as an explanation for the contrast between the beggar-thy-neighbor policies of the Great Depression and the unusual openness and stability that marked the mid-nineteenth and the mid-twentieth centuries.<sup>1</sup> According to Kindleberger, by committing to liberal trade policies themselves, Britain and later the United States brought about these periods of openness, while during the inter-war years, British inability and US unwillingness to assume this role resulted in collapse. Although this idea has gained many adherents, it has been criticized for lack of theoretical rigor on the whole, and, where rigorous treatment has been attempted, for inconsistency with key historical facts.<sup>2</sup>

This paper presents a theory of leadership in international trade policymaking based upon a model of international trade negotiations and domestic politics. Two countries meet repeatedly in an effort to reach a tariff reduction agreement, but for the agreement to be finalized, it must first survive a special-interest-driven domestic political process, which is costly and uncertain. We show that a country (the leader) will adopt a policy of unilaterally reducing its tariff whenever political opposition in the other country stalls this liberalization process. Such a policy raises expected world welfare, which the leader can expropriate in future negotiations. The rise in expected world welfare comes in the form an increase in trade, as well as in a reduction in the cost and uncertainty of reaching future trade agreements. The latter occurs because unilateral tariff reduction reduces the "political stake" of the import-competing industry in the other country. That is, if the industry knows that

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<sup>1</sup>Kindleberger considers both trade and macroeconomic policies, whereas we consider only trade policy.

<sup>2</sup>See Conybeare (1987) and McKeown (1983) for review and criticism of this literature.

liberalization will occur whether the negotiated agreement is finalized or not, then it will spend less on political opposition.<sup>3</sup>

Thus a pattern emerges in which unilateral liberalization by the leader is followed by a greater likelihood of trade reform in other countries, with deeper tariff cuts therein. Moreover, we show that this pattern may be more pronounced the larger is the leader country. This is because the leader's commitment to unilateral liberalization is supported by the fear of a "no-commitment" equilibrium, in which the leader chooses its static optimal tariff. While this tariff benefits the leader in the short-run, it reduces the expected world welfare available in future negotiations sufficiently to deter the leader from raising its tariff. As the leader's optimal tariff rises with its size, the leader may have more incentive to commit to unilateral liberalization.

## II. SOME QUESTIONS FROM HISTORY

After more than two decades of unsuccessful attempts to negotiate lower tariffs with its trading partners,<sup>4</sup> Britain in the 1840s embarked upon a policy of unilateral trade liberalization, manifested chiefly by its 1846 repeal of the Corn Laws. In the quarter of a century that followed, numerous other countries followed suit, either with unilateral trade reforms of their own,<sup>5</sup> or with bilateral tariff agreements, such as the Cobden-Chevalier treaty of 1860 between Britain and France.

A similar pattern of events occurred one hundred years later, when at the end of World War II the United States sponsored what was to become the General

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<sup>3</sup>Although we do not model it here, the unilateral tariff reduction may also induce politically-influential factors of production to gradually exit the import-competing industry in the other country, further undermining the political opposition to free trade. We thank Robert Baldwin for this observation.

<sup>4</sup>According to McKeown (1983), "more often than not the British strategy [of concluding bilateral agreements] led other states to *increase* duties on British goods in retaliation for favors Britain had bestowed elsewhere." See also Bhagwati and Irwin (1987).

<sup>5</sup>According to Kindleberger (1975), the Netherlands, Belgium, Spain, Portugal, Denmark, Norway and Sweden all moved to free trade in the 1850s.

Agreement on Tariffs and Trade (GATT). In the first three GATT negotiating rounds, the US cut its average tariff rate by nearly 70 percent,<sup>6</sup> without substantive reciprocity from its major trading partners.<sup>7</sup> Tariff cuts agreed to by Europe and Japan in the early rounds were rendered ineffective by quantitative restrictions and exchange controls in those countries, until the late 1950s.<sup>8</sup> Thereafter, with the elimination of these restrictions and continued reciprocal tariff cuts through subsequent rounds, protection fell world wide.

These two episodes are striking in several respects. First, the countries in question were unusually large trading nations, in both cases accounting for the bulk of world's manufactured exports, but their policy actions appear to directly contravene the traditional commercial policy prescription for a large country. There can be little doubt that these countries understood the potential for, and indeed suffered, considerable terms-of-trade losses as the immediate result of their unilateral tariff reductions. In Britain, economists such as Robert Torrens and John Stuart Mill, recognizing the adverse terms-of-trade effects, were skeptical about the repeal of the Corn Laws. Empirical work by Harley and McCloskey (1981) and Irwin (1988) would appear to vindicate their concerns. Similar evidence for the US case is provided by Kreinin (1961).<sup>9</sup>

Second, in both cases the unilateral tariff reduction by the large country was followed by a wave of trade liberalization involving other countries that was not present prior to the unilateral action. It is puzzling that the other countries, who

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<sup>6</sup>Based on data of Finger (1979).

<sup>7</sup>Baldwin and Richardson (1984) point out that the US negotiators "offered greater tariff concessions than they received even on the usual measures of reciprocity." Bhagwati (1988) provides further support for this interpretation: "[A]lthough GATT was a contractarian agreement, the United States looked the other way when it came time to requiring GATT members to fulfill symmetric obligations."

<sup>8</sup>Curzon (1965), pp. 70-71.

<sup>9</sup>Examining US tariff reductions in 1955-56, Kreinin (1961, p. 314) concludes, "less than a third ... of the tariff concessions granted by the United States were passed on to the US consumer in the form of reduced import prices, while more than two-thirds ... accrued to the foreign suppliers and improved terms of trade of the exporting nations." However, this study does not go so far as to compute welfare changes.

were unwilling or unable to make tariff concessions earlier, altered their commercial policies after receiving free tariff concessions from the large country. This coincidence naturally raises the question of whether the unilateral action somehow *caused* the liberalization that followed.

Third, in both cases the large country doubtless gained from the subsequent trade liberalization, and quite possibly gained by more than any initial loss from the unilateral tariff reduction it may have suffered, as argued by Irwin (1988) for the case of Britain. Moreover, while numerous motivations underlay Britain's and the US's decisions to liberalize, evidence suggests that among them was the belief that other countries would be induced to liberalize as well. In support of the British Corn Law repeal, Lord Overstone argued, "other countries witnessing our prosperity will find it necessary to follow our example."<sup>10</sup> In the US case, Secretary of State Cordell Hull, in a December 1939 speech, argued that a liberal trade stance by the US should serve as "a cornerstone around which the nations could rebuild their commerce on liberal lines when the war ended."<sup>11</sup> On the same point, Baldwin (1984) notes, "since the late nineteenth century, the Democrats ... maintained that low US tariffs encouraged low foreign tariffs and thus indirectly stimulated US exports."

The challenge for a theory of trade policy leadership is to bring these elements together in a consistent way. Kindleberger presents no mechanism by which the unilateral tariff reduction produces liberalization in other countries, and appears to reject the idea that a leader would only lead for private gain.<sup>12</sup> Instead, Kindleberger sees the leader as supplying the public good of free trade, while letting "free riders" escape the burden of reciprocity. Others (e.g., Yarborough and Yarborough [1985]) are more explicit about the mechanism, arguing that the leader, or "hegemon," uses

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<sup>10</sup> As quoted in Irwin (1988), p. 1158. Robert Peel argued similarly (see Bhagwati [1988] p. 29), but both clearly believed that unilateral tariff reduction would benefit Britain even without foreign reciprocity.

<sup>11</sup>As quoted in Wilkinson (1960), p. 16.

<sup>12</sup>Kindleberger (1986), p. 302.



its own trade policies to enforce an open trading system by punishing countries which fail to lower tariffs.<sup>13</sup> However, aside from there being no record of such threats or punishments in the cases under investigation, this theory does not explain why a leader would give up its tariff as many as ten years before receiving substantial reciprocity from its trading partners.

An alternative approach to explaining the historical episodes above might be to deny leadership as a conscious policy of the large country, and assume instead that tariffs are determined entirely by special-interest politics.<sup>14</sup> There are many political economy models that explain why a country might adopt trade policies that are sub-optimal from a national welfare point of view, and thus a country choosing a lower-than-optimal tariff is not, by itself, a mystery. One might dismiss the fact that Britain and the US may have profited from the subsequent liberalization of other countries as coincidence, and one might dismiss the fact that prominent policymakers expressed their intention to bring about change in other countries as mere rhetoric. Even so, a political-economy explanation of the history must still address, a) why the unusually large countries, among all countries, were the first to adopt lower-than-optimal tariffs, and b) how the unilateral liberalization of those countries apparently "spilled-over" to other countries.<sup>15</sup>

Our model has a number of features in common with the approaches described above. Like the political economy approach, favorable political conditions in the leader country enable it to lower its tariff;<sup>16</sup> however, what provides the *incentive*

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<sup>13</sup>Gilpin (1975) stresses the use of military power as a means of enforcement.

<sup>14</sup> Magee, Brock and Young [1989] state "that what appears to be hegemonic behavior by the United States really comprises special-interest policies driven by US multilateral corporations."

<sup>15</sup>Most existing models are ill-suited for this because, with the exception of two recent papers (Hillman and Mosser [1992] and Grossman and Helpman [1992b]), none of the work on endogenous trade policy considers trade policy linkages between countries. Moreover, the existing models are static, and so cannot account for changes in trade policies over time except by appealing to changes in the fundamentals (e.g., tastes, technology or endowments).

<sup>16</sup>As Baldwin (1984) notes about the post-war US, "[A]bnormally favorable export opportunities, together with vigorous postwar economic recovery, vitiated protectionist pressure from industries whose underlying comparative cost position was deteriorating, and built support for liberal trade policies on the part of those sectors whose international competitive position was strong."

for the leader to do so (rather than impose its optimal tariff) is the desire affect the political outcome in the follower country. Like the hegemony literature, the mechanism by which this occurs involves what might be called punishment, except that rather than the leader punishing the follower's government with high tariffs for its failure to lower tariffs, the leader punishes the follower's import-competing industry with low tariffs. Finally, leadership in our model is observationally equivalent to that in Kindleberger's in that unilateral tariff reduction may be followed by what appears to be free-riding by the follower, but only temporarily. Thus we model something closer to the idea of Bhagwati and Irwin (1987), who describe the behavior of the US in the early GATT years as permitting "justifiable asymmetries of obligations of [other] countries on a *temporary* basis."

We consider a model of two countries, H and F, representatives from which meet to negotiate tariff reductions. The resulting trade agreement faces no opposition in H, while in F the agreement must pass through a "ratification" process (which may include anything from formal legislative ratification to public debate to back-room deal-making) before it is enacted. This process is stochastic, and industry groups can affect the probability that an agreement will be enacted by expending resources. In the event the agreement fails ratification, country H may choose to unilaterally change its tariff. A new round of tariff negotiations follows.

We investigate several variations on this model. In section III, we consider the case of a single, import-competing lobby in F that maximizes the expected value of current producer surplus net of lobby expenditure. The amount the lobby is willing to spend to defeat an agreement rises with the depth of the tariff cuts contained in the agreement and with price of imports that will prevail if ratification fails. This price can be lowered by H's unilateral tariff reduction. Thus through commitment to

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Bhagwati (1988) states: "[A] country's ability to defy sectional interests and open its markets is likely to be enhanced by the country's rise to economic power. Power reflects prosperity, and prosperity makes the embrace of antiprotectionism easier."

unilateral reduction by  $H$ , political costs (lobbying expenditure and the welfare cost of delay) fall. Such a policy raises expected world welfare, and because  $H$  expropriates the welfare gain through bargaining, the policy is in  $H$ 's interest. Country  $H$  will not renege on its commitment to unilateral tariff reduction because to do so would adversely alter firms' expectations about future agreements.

In section IV we consider the effect of country size. Using a simple endowment model we show that, for a high enough discount factor, a larger country will choose a lower unilateral tariff upon rejection of the agreement. Further, such lower unilateral tariffs will induce lower tariff proposals and a lower probability of failure of the agreement. Thus, larger countries can be expected to induce more liberalization.

In sections V and VI we consider two extensions of the basic model. Section V investigates the case in which there are two lobbies, one representing the interests of import-competing firms and the other, exporting firms. This case is of interest because  $H$ 's commitment to low unilateral tariffs, a policy designed to weaken the import-competing lobby, has the same impact on the export lobby. We demonstrate that, nevertheless, under fairly weak assumptions about the nature of political competition, unilateral liberalization continues to be the optimal commitment strategy. However, the effect on the probability of failure is less certain.

Section VI examines the case of a single, forward-looking, import-competing lobby. We find once again  $H$ 's optimal commitment strategy uses unilateral tariffs that are as low as possible, except that now they vary over time. This variability alters the results on country size: while increased size enables more effective commitment, unilateral tariffs need not fall in every period. Section VII concludes.

### III. THE MODEL

#### A. Trade and Welfare

Consider a model of two countries,  $H$  and  $F$ , that produce and consume homogeneous goods,  $X$  and  $Y$ , under conditions of perfect competition, in each of an infinite number of discrete time periods  $t = 1, 2, \dots$ . Let good  $Y$  be the numeraire, let the marginal utility of income for consumers in both countries be fixed at unity,<sup>16</sup> and suppose  $H$  exports  $X$  to  $F$ . There are no intertemporal production or consumption decisions to be made in this model; instead, all of the interesting considerations are in the determination of trade policy. Each period,  $H$  imposes a tariff on  $Y$ , which can be represented by a specific export tax  $\tau^H_t$  on  $X$ , while  $F$  imposes a specific tariff of  $\tau^F_t$  on  $X$ . The aggregate tariff on  $X$  is,  $\tau_t = \tau^H_t + \tau^F_t$ .

A country's social welfare in each period is the sum of its consumer surplus, producer surplus and tariff revenue. The welfare of country  $i$  in period  $t$  is denoted  $u^i(\tau^i_t, \tau^j_t)$ , for  $i, j = H, F, i \neq j$ . We assume that  $u^i$  is quasi-concave, with a unique, interior maximum in  $\tau^i_t$ , and is strictly decreasing in  $\tau^j_t$ , for all non prohibitive  $\tau^i_t$  and  $\tau^j_t$ . We assume that initially,  $\tau^F_0 > 0$  and  $\tau^H_0$  is chosen so as to maximize  $u^H(\tau^H, \tau^F_0)$  with respect to  $\tau^H$ .

Total world welfare is denoted by,  $w(\tau_t) = u^H(\tau^H_t, \tau^F_t) + u^F(\tau^F_t, \tau^H_t)$ . Notice that this is a function of the aggregate tariff level alone and reaches a maximum at  $\tau_t = 0$ . We assume that for  $\tau_t > 0$ ,  $w'(\tau_t) < 0$  and  $w''(\tau_t) \leq 0$ . Also, let the producers' surplus of the import-competing ( $X$ ) sector in  $F$  be  $r(\tau_t)$ , where  $r'(\tau_t) > 0$ ,  $r''(\tau_t) \geq 0$ .

#### B. The Trade Policy Formation Game

Each period, countries play a trade policy formation game consisting of three stages: a bargaining stage, a ratification stage, and unilateral action stage. At the beginning of each period, representatives from each country enter into negotiations

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<sup>16</sup> This makes all agents risk neutral, thereby eliminating any insurance role for international trade agreements.

for the reduction of trade barriers. The objective of each representative is to maximize the expected present-discounted value of social welfare in the country it represents.<sup>17</sup> We shall adopt the simplest possible bargaining model: each period  $t$ ,  $H$  offers a pair of tariffs,  $\pi^H_t$  and  $\pi^F_t$ , which  $F$  either accepts or rejects. If  $F$  rejects the offer, the tariffs remain at their initial levels,  $\tau^H_0$  and  $\tau^F_0$ , for the period, and bargaining resumes in the next period. If  $F$  accepts the offer, then the pair  $\pi^H_t, \pi^F_t$  becomes a tentative agreement, and we move to the ratification stage.

For the tentative agreement to be enacted, it must be ratified through the political process of country  $F$ . We shall abstract from the details of this process, and assume only that the outcome is influenced by a lobby  $L$ , which represents the import-competing firms in country  $F$ . Let  $z_t$  be the probability that the tentative agreement in period  $t$  fails to be ratified.  $L$  can raise  $z_t$  by expending resources (contributions, effort, etc.). Let  $k(z_t)$  be the minimum cost to  $L$  of achieving probability of failure  $z_t$ . We assume that  $k(z_t)$  is an increasing, strictly convex function, such that  $k(0) = k'(0) = 0$ , and  $k(1) \geq r(\tau_0)$ . Further, we assume that while  $H$  observes the outcome of the ratification process, it does not directly observe  $z_t$  or  $k(z_t)$ .<sup>18</sup>

If the period  $t$  agreement fails to be ratified, then  $H$  chooses its tariff unilaterally. Let  $\sigma_t$  denote the aggregate tariff resulting from  $H$ 's unilateral choice. As there is no corresponding political process in  $H$  (or rather there are no import-competing lobbies in  $H$ ), this choice is enacted with certainty. Thus in period  $t$ ,  $\tau^H_t = \sigma_t - \tau^F_0$ ,  $\tau^F_t = \tau^F_0$ , each player receives its payoff corresponding to these tariff levels, and the game is repeated in the next period. On the other hand, if the agreement is

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<sup>17</sup>None of the results of this paper would be substantively altered by using any "politically realistic" objective function, as defined by Baldwin (1987).

<sup>18</sup>This assumption has attractive feature that it generates actual (rather than just "threatened") unilateral liberalization along the equilibrium path. Whether the representative of  $F$  observes  $z_t$  or not turns out to be irrelevant, provided it cannot convey the information to  $H$ .

ratified this period, then the tariffs  $\pi^H_t$  and  $\pi^F_t$  are enacted, remain in place indefinitely, and no further proposals are made.

In other words, there are three players  $H$ ,  $F$  and  $L$ , playing a repeated game. The stage game is sequential:  $H$  chooses the pair  $\pi^H_t, \pi^F_t$ ;  $F$  chooses to accept or reject;  $L$  chooses  $z_t$ ; and finally  $H$  chooses  $\sigma_t$ . Each of these choices is a function all previous actions, i.e., upon history. A strategy is an infinite sequence of such choice functions, and a combination of three strategies, one for each player, constitutes a subgame perfect equilibrium, if at every possible history each player's strategy is optimal for the remainder of the game given the others' strategies. It is useful to think of a combination of strategies as giving rise to four infinite sequences of actions,  $\Pi^H = (\pi^H_1, \pi^H_2, \dots)$ ,  $\Pi^F = (\pi^F_1, \pi^F_2, \dots)$ ,  $Z = (z_1, z_2, \dots)$  and  $\Sigma = (\sigma_1, \sigma_2, \dots)$ , where the realization of each action is contingent upon the failure of the most recent proposal. Such sequences we shall call paths.

Generically, there is a large set of subgame perfect equilibria in games like this; however, we shall be interested in only two. The first is the Markov-strategy equilibrium, or Markov perfect equilibrium (MPE), in which each player chooses its action based only upon the state prevailing at the time of its decision, and not directly on actions taken in previous periods. This means that  $H$  makes its decisions about  $\pi^H_t$ ,  $\pi^F_t$ , and  $\sigma_t$  using no historical information, and  $F$  and  $L$  use only the values of  $\pi^H_t$  and  $\pi^F_t$  this period. By extension, each player's current action has no effect on actions taken in future periods (though they do influence the probability that future game nodes will be reached). Hence, the problem reduces to solving a one-shot game, where the expected payoffs in future periods are taken as parametric. Moreover, the MPE paths are stationary.

The second equilibrium of interest is the home country's best trigger-strategy equilibrium (TSE). In this equilibrium,  $H$  chooses the path of proposals and unilateral tariffs that gives it the highest expected long-term payoff, subject to the

condition that at no stage would it wish to deviate from that path for fear of reversion to the MPE for the rest of time. Notice that we only require that the deviant actions of  $H$  trigger reversion to the MPE. Beyond this we place no restrictions on the strategies that can be used.

The reason we focus on these equilibria is that we are attempting to model commitment on the part of  $H$ . The MPE is the natural representation of the absence of commitment, while the TSE represents  $H$ 's maximal commitment sustainable by the fear of commitment breakdown. We believe this kind of commitment best reflects the idea of leadership mentioned earlier. Further, growing support for this focus can be found in the literature on reputation effects (e.g., Fudenberg and Levine [1992], and Schmidt [1993]).<sup>19</sup>

### ***C. Ratification with a Short-Run Lobby***

Each period, if a tentative agreement is reached, the foreign lobby must decide how much to spend in an effort to defeat the agreement's ratification. The lobby is assumed to maximize the expected value of the import-competing producers' surplus net of lobbying costs. This may be justified by supposing that the lobby represents the owners of specific capital in the  $X$  sector (with, say, labor entering into production of both goods with constant returns to scale), and that the utility these capital-owners derive from consuming  $X$  is small relative to their capital income.<sup>20</sup>

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<sup>19</sup>Using a model of one long-run player facing a sequence of short-run players (see the next section), Fudenberg and Levine (1992) show that if there is a positive probability that the long-run player is a "commitment type", who always plays the strategy to which that player would most like to commit herself, then for a high enough discount factor, that player will achieve her best commitment payoff in any Nash equilibrium. Schmidt (1993) generalizes this result to two-player games of conflicting interests, where both players are long-run. With minor restrictions on the action sets, the long-run lobby case of section VII can be reduced to such a game between  $H$  and  $L$ .

<sup>20</sup>This is stronger than necessary. It is only necessary that the utility of the  $x$ -specific-capital owners be increasing and weakly convex in tariffs.

We shall consider two polar assumptions about relevant time-horizon for  $L$ . In this and the next few sections, we assume that  $L$  is a short-run player: while it is informed about all past play, it is interested in maximizing only the expected value of current producer surplus net of lobbying costs, or,

$$(1) \quad R_t = (1 - z_t)r(\pi_t) + z_t r(\sigma_t) - k(z_t).$$

The advantage of this assumption is that it implies stationary paths of tariffs in  $H$ 's best TSE, because no time-varying strategy that  $H$  can employ will induce  $L$  to play anything other than its static best response. While its primary virtue is analytical convenience, this assumption may be reasonable in cases where the specific capital depreciates rapidly and current capital owners are unable to contract with future ones. In section VI, we show how the results carry over to the case where  $L$  is a long-run player, maximizing the expected present-discounted value of the infinite stream of producer surpluses net of lobbying costs.

As long as  $\sigma_t \geq \pi_t$ , the solution to (1) is given by the first-order condition,

$$(2) \quad r(\sigma_t) - r(\pi_t) = k'(z_t),$$

otherwise  $z_t = 0$ . We denote  $L$ 's choice by  $z_t = z(\pi_t, \sigma_t)$ , and note  $\frac{\partial z}{\partial \pi_t} = \frac{-r'(\pi_t)}{k''(z_t)} \leq 0$ , and

$\frac{\partial z}{\partial \sigma_t} = \frac{r'(\sigma_t)}{k''(z_t)} \geq 0$ . The term  $r(\sigma_t) - r(\pi_t)$  can be thought of as  $L$ 's "stake" in the political

outcome. Raising  $L$ 's stake, by either raising  $\sigma_t$  or lowering  $\pi_t$ , raises the amount of resources  $L$  is willing to spend to defeat the agreement, which in turn raises the probability of failure.



### D. Equilibrium Tariffs

Each period  $H$  must decide on the levels of three tariffs, two as part of its proposal to  $F$ , and one as a response to the failure of ratification (should that occur). We can reduce this problem somewhat by considering the role of the foreign negotiator at the bargaining stage. By rejecting an agreement,  $F$  guarantees itself  $u^F(\tau^F_0, \tau^H_0)$ , and thus in any equilibrium  $F$ 's expected average discounted payoff must weakly exceed  $u^F(\tau^F_0, \tau^H_0)$ . That is,

$$(3) \quad U^F_t = E_Z(1 - \delta) \sum_{t=1}^{\infty} \delta^{t-1} u^F(\tau^F_t, \tau^H_t) \geq u^F(\tau^F_0, \tau^H_0),$$

for all  $t$ , where  $\delta \in (0, 1)$  is the discount factor, and  $E_Z$  is the expectation operator defined by the path  $Z$ . Because the TSE of interest is assumed to be best for  $H$ , (3) holds with equality in this equilibrium. In an MPE,  $F$  will accept any proposal under which  $U^F_t \geq (1 - \delta)u^F(\tau^F_0, \tau^H_0) + \delta U^F_{t+1}$ , and  $H$  will never propose anything that leaves  $U^F_t > (1 - \delta)u^F(\tau^F_0, \tau^H_0) + \delta U^F_{t+1}$ . As this is true in every period, it follows that the unique MPE payoff for  $F$  also satisfies (3) with equality. Finally, because  $H$ 's proposal consists of both  $\pi^H_t$  and  $\pi^F_t$ ,  $H$  can ensure  $U^F_t = u^F(\tau^F_0, \tau^H_0)$  for any aggregate tariff  $\pi_t$  by promising the appropriate allocation of tariff revenue. Thus the game effectively reduces to one between  $H$  and  $L$ , with  $H$  choosing  $\pi_t$  to maximize expected world welfare, and allocating the tariff revenue to ensure the participation of  $F$ .<sup>21</sup>

Given paths  $\Pi$  and  $\Sigma$ , and the corresponding path  $Z$  determined by (2), expected average world welfare in period  $t$  satisfies,

$$(4) \quad W_t = (1 - z_t)w(\pi_t) + z_t[(1 - \delta)w(\sigma_t) + \delta W_{t+1}] - (1 - \delta)k(z_t).$$

<sup>21</sup>Note that the participation of  $F$  is ensured *ex ante*. Should  $z$  take on some unexpected value, the realized welfare effect of that is borne by  $F$ . It follows that  $H$  does not learn past values of  $z$  by observing its own payoff.

The objective of  $H$  is to maximize  $W_I$ . Since the equilibrium paths are stationary, we can re-write (4), letting  $\sigma_t = \sigma$ ,  $\pi_t = \pi$  and  $W(\pi, \sigma) \equiv W_t = W_{t+1}$  for all  $t$ , as,

$$(5) \quad W(\pi, \sigma) = w(\pi) - \left( \frac{1 - \delta}{1 - \delta z} \right) \{z[w(\pi) - w(\sigma)] + k(z)\}.$$

The first term on the right-hand side of (5) is the world welfare that obtains when the agreement  $\pi$  succeeds, while the second term captures the total political cost, including the expected cost of delay, of bringing about  $\pi$ .

For the moment, hold fixed  $\sigma$  and consider  $H$ 's choice of the optimal proposal  $\pi(\sigma)$ . This satisfies the first order condition,

$$(6) \quad \left( \frac{1 - \delta}{1 - \delta z} \right) [w(\pi(\sigma)) - w(\sigma) + \delta k(z)] + (1 - \delta)k'(z) - g(\pi(\sigma), z) = 0,$$

where  $g(\pi, z) = -\frac{(1-z)w'(\pi)k''(z)}{r'(\pi)} \geq 0$ . The left-hand side of (6) represents the effect on expected world welfare of an increase in  $z$  brought on by a reduction in  $\pi$ . The term  $g(\pi, z)$  is the expected gain from increasing  $w(\pi)$ , which is balanced against the increased political costs captured by the other two terms. Also, because  $g(0, z) = 0$  and  $g(\pi, z) > 0$  for  $\pi > 0$ , (6) implies that,  $\pi(\sigma) \in (0, \sigma)$ . To ensure that the second-order condition is satisfied, we assume  $\partial g / \partial \pi \geq 0$  and  $\partial g / \partial z \leq g / (1-z)$ , which also implies  $\pi'(\sigma) \geq 0$ .<sup>22</sup>

Let  $W(\sigma) \equiv W(\pi(\sigma), \sigma)$ . This reaches a maximum at  $\sigma = 0$  and is a decreasing function of  $\sigma$ , as can be seen by differentiating (5) and using (6):

---

<sup>22</sup>Equivalent conditions are:  $w''(\pi)/w'(\pi) \geq r''(\pi)/r'(\pi)$  and  $(1-z)(k''/k') \leq 2$ .

$$(7) \quad W'(\sigma) = \frac{z(1 - \delta)w'(\sigma) - (\partial z/\partial \sigma)g(\pi(\sigma), z)}{1 - \delta z} \leq 0.$$

Intuitively, increasing  $\sigma$  lowers the world welfare that obtains when the agreement fails and raises the probability of failure, which increases political costs. By (6), the increase in political costs equals  $g(\pi(\sigma), z)$ . The result (7) is the key to understanding why  $H$  might wish to commit to a policy of *reducing* its tariff unilaterally whenever an agreement fails to be ratified. Such a policy raises expected world welfare, and because  $H$  expropriates the welfare gain through bargaining, the policy is in  $H$ 's own self-interest. It is worth noting that this argument would hold for any alternative bargaining game, provided  $H$  received at least some of the welfare gains implied by (7). Also, (7) would hold even if  $z$  were exogenous, i.e., if  $\partial z/\partial \sigma = 0$ .

Next let us consider the choice of  $\sigma$  in each of the two equilibria. In an MPE, actions taken this period have no effect on choices made in future periods. Thus at the unilateral action stage of each period the best the  $H$  can do is to maximize  $u^H(\tau^H, \tau^F_0)$ , which implies that in the MPE  $\sigma = \tau_0$ . In a TSE,  $H$  may choose any path of proposals and unilateral tariffs it wants, subject to the constraint that it would not wish to deviate from that path for fear of reversion to the MPE. This constraint can be expressed as,

$$(8) \quad (1 - \delta)u^H(\sigma - \tau^F_0, \tau^F_0) + \delta W(\sigma) \geq (1 - \delta)u^H(\tau^H_0, \tau^F_0) + \delta W(\tau_0).$$

The left-hand side of (8) is the payoff from remaining on the equilibrium path at the unilateral action stage of the current period and in all future periods, while the

right-hand side is the payoff from an optimal deviation.<sup>23</sup> In light of (7),  $H$ 's optimal choice of  $\sigma$ , call it  $\sigma^*$ , is the lowest non-negative value of  $\sigma$  satisfying (8). Thus either  $\sigma^*$  is zero or (8) holds with equality.

**Figure 1: The Optimal Unilateral Tariff**

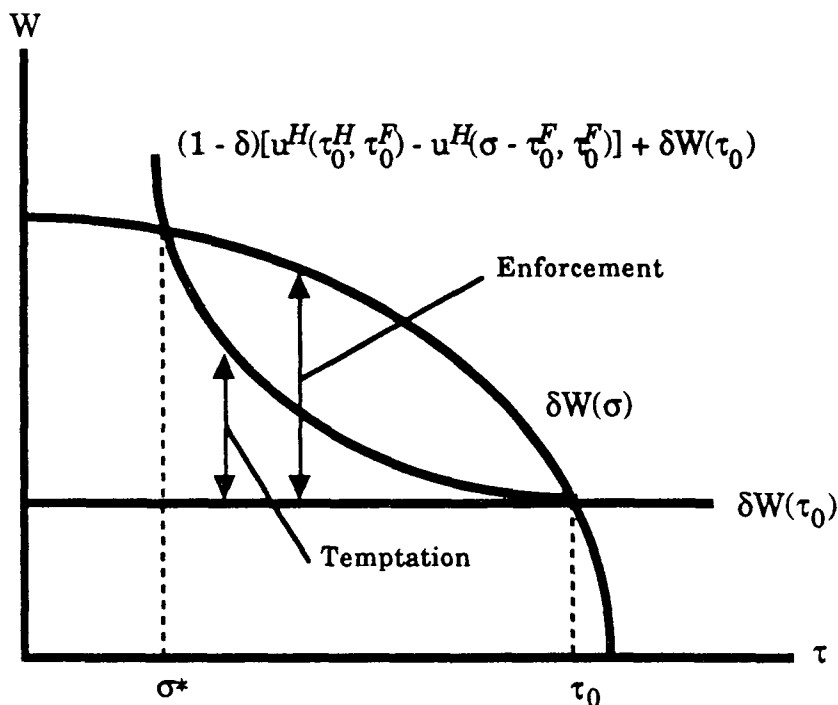


Figure 1 illustrates the optimal unilateral tariff. Constraint (8) illustrated in the familiar "temptation vs. enforcement" form. Temptation is measured by the one-period gain from deviating,  $(1 - \delta)[u^H(\tau_0^H, \tau_0^F) - u^H(\sigma - \tau_0^F, \tau_0^F)]$ , while enforcement is the long-term loss from moving to an inferior equilibrium next period,  $\delta[W(\sigma) - W(\tau_0)]$ . That these are equal at  $\sigma = \tau_0$  is obvious, but they may also be equal at other  $\sigma$ . The lowest such  $\sigma$  point is  $\sigma^*$ .

It is also possible that temptation is less than enforcement at  $\sigma = 0$ , in which case  $\sigma^* = 0$ . In this case,  $H$  proposes free trade, and then unilaterally subsidizes

<sup>23</sup>We also need to ensure that  $H$  would not wish to make a deviant proposal. This constraint is simply  $W_t \geq W_0$ , because reversion to the Markov equilibrium would occur within the same period as the deviant proposal. Thus (8) subsumes this constraint.

exports to exactly off-set  $\tau^F_0$ . This gives rise to a probability of failure of zero. This case will arise when the discount factor is at least  $\bar{\delta}$ , which is defined by,

$$(1 - \bar{\delta})[u^H(\tau^H_0, \tau^F_0) - u^H(0, \tau^F_0)] = \bar{\delta}[w(0) - W(\tau_0)].$$

#### IV. UNILATERAL TARIFFS AND COUNTRY SIZE

The previous section established that a country, which is "large" in the sense of having a positive static optimal tariff, will nevertheless benefit from committing to a low tariff, when political opposition hampers liberalization attempts in the foreign country. In this section, we attempt establish a more precise connection between country size, unilateral tariffs and trade liberalization, by introducing a simple model in which the effects of country size are transparent.

The aspect of country size most relevant to our analysis is that of monopoly power in trade, for it is the coincidence of low tariffs and apparently high monopoly power that makes the cases of Britain and the US paradoxical at first blush. It is useful to isolate this aspect of country size from the other effects country size can have on our trade model. This can be done by using an endowment model with identical linear demand functions in each country, similar to that of Bagwell and Staiger (1990).

In each period the home country is endowed with  $1 + x$  units of the good  $X$ , while the foreign country endowment is normalized to 1. Inverse demand for  $X$  in each country is given by,  $p^i_t = a - c^i_t$ , where  $c^i_t$  and  $p^i_t$  denote consumption of  $X$  and domestic relative price, respectively. Market equilibrium conditions each period are:  $c^H_t + c^F_t = 2 + x$ , and  $p^F_t = p^H_t + \tau_t$ . This gives an equilibrium volume of trade in good  $X$  of  $m_t = \frac{x - \tau_t}{2}$ .

Because the aggregate tariff appears in almost every expression, we will adopt the convention of expressing welfare in terms of the aggregate tariff and the foreign tariff. For the home country this works out to be,

$$(9) \quad u^H(\tau_t, \tau_t^F) = \frac{[2a - (1+x)](1+x)}{2} + \frac{x^2}{8} - \frac{\tau_t^F x}{2} + \frac{(x + 2\tau_t^F)\tau_t}{4} - \frac{3\tau_t^2}{8}.$$

Thus,  $\tau_0 = (1/3)(x + 2\tau_0^F)$ . World welfare and foreign producer surplus are as follows:

$$(10) \quad w(\tau_t) = a(2+x) - \frac{(2+x)^2}{4} - \frac{\tau_t^2}{4},$$

$$(11) \quad r(\tau_t) = a - \frac{(2+x)}{2} + \frac{\tau_t}{2}.$$

A convenient feature of this model is that none of the choices discussed in the previous section depend upon  $x$  directly but only indirectly through  $\tau_0$ . To see this, note that for a given  $\Pi$ ,  $\Sigma$ , and  $Z$ , and any two endowments  $x$  and  $x'$ ,

$$R_t(\Pi, \Sigma, Z; x) = (x' - x)/2 + R_t(\Pi, \Sigma, Z; x'), \text{ and}$$

$$W_t(\Pi, \Sigma, Z; x) = a(x - x') - \frac{(2+x)^2 - (2+x')^2}{4} + W_t(\Pi, \Sigma, Z; x'),$$

for all  $t$ . That is, the direct effect of changing  $x$  is simply to change all payoffs by an additive constant. However,  $x$  also affects  $\tau_0$ , and this has an important effect on the equilibrium through equation (8), which becomes,

$$(12) \quad (1 - \delta)(3/8)(\tau_0 - \sigma^*)^2 \leq \delta[W(\sigma^*) - W(\tau_0)].$$

To examine the effect the home endowment (which we shall use as our measure of country size) on the optimal unilateral tariff, the tariff proposal and the probability of failure, we need only determine whether or not increasing  $\tau_0$  relaxes the constraint (12).

**Proposition 1:** There exists  $\underline{\delta}$  and  $\underline{x}$ , such that if  $\bar{\delta} > \underline{\delta}$ , then for all  $\delta \in (\bar{\delta}, \underline{\delta})$  and  $x > \underline{x}$  the optimal unilateral tariff  $\sigma^*$ , the proposal  $\pi(\sigma^*)$ , and probability of failure  $z(\sigma^*)$  all decline as the home endowment  $x$  (and the static optimal tariff  $\tau_0$ ) rises.

**Proof:** In appendix.

Proposition 1 establishes the central predictions of our model: despite their higher static optimal tariffs, large countries may well choose lower tariffs unilaterally than their smaller counterparts. Further, such lower unilateral tariffs will induce lower tariff proposals and a lower probability of failure. Thus, the presence of a country large enough to lower its tariffs unilaterally will also be associated with more fruitful trade negotiations thereafter.

The idea behind Proposition 1 is that an increase in  $H$ 's endowment raises its static-optimal tariff, which for a given  $\sigma$ , raises both temptation (because  $\sigma$  is further away from the static optimum) and enforcement (because expected world welfare following a deviation is lower). When  $\delta$  and  $x$  are high, enforcement rises relative to the temptation. This enables a lower  $\sigma^*$  to be supported in equilibrium. Note that Proposition 1 applies only when  $\delta < \bar{\delta}$ , as otherwise  $\sigma^* = 0$ , and a marginal increase in  $x$  would have no effect on  $\sigma^*$ .

Proposition 1 is illustrated in figures 2 and 3. In figure 2, an increase in  $x$  causes  $\delta W(\tau_0)$  and the temptation curve to shift down (in gray), establishing a new  $\sigma^*$  at point C. Whether point C lies to the right or the left of A depends on how far D

is to the right of B and how "flat" is the temptation curve. As  $\delta$  and  $x$  rise, the term  $1 - \delta z(\pi(\tau_0), \tau_0)$  eventually approaches zero, and, since this term appears in the denominator of (7),  $W(\tau_0)$  becomes quite steep. Further, higher  $\delta$  flattens the temptation curve.

**Figure 2**

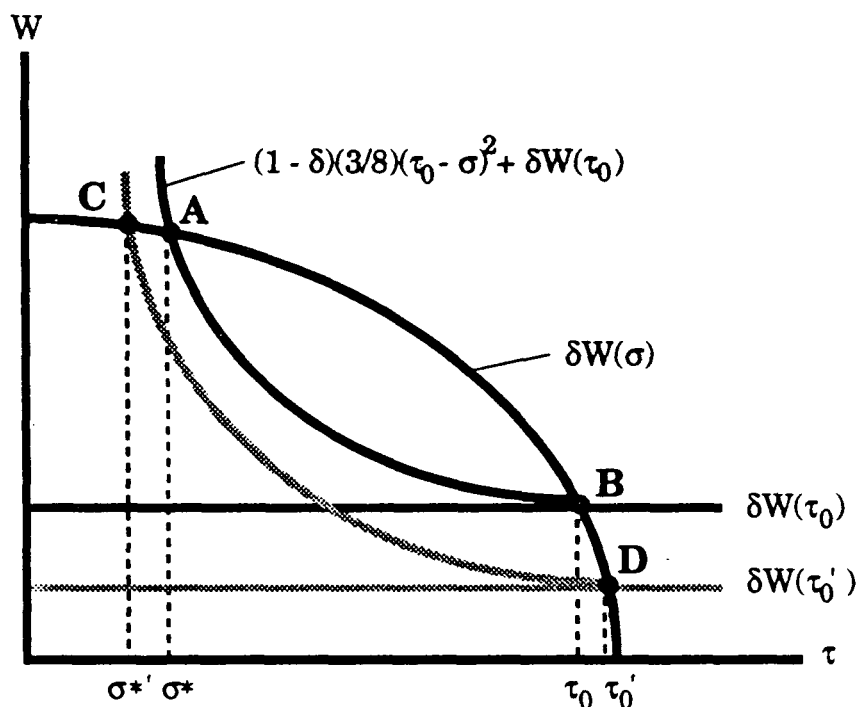
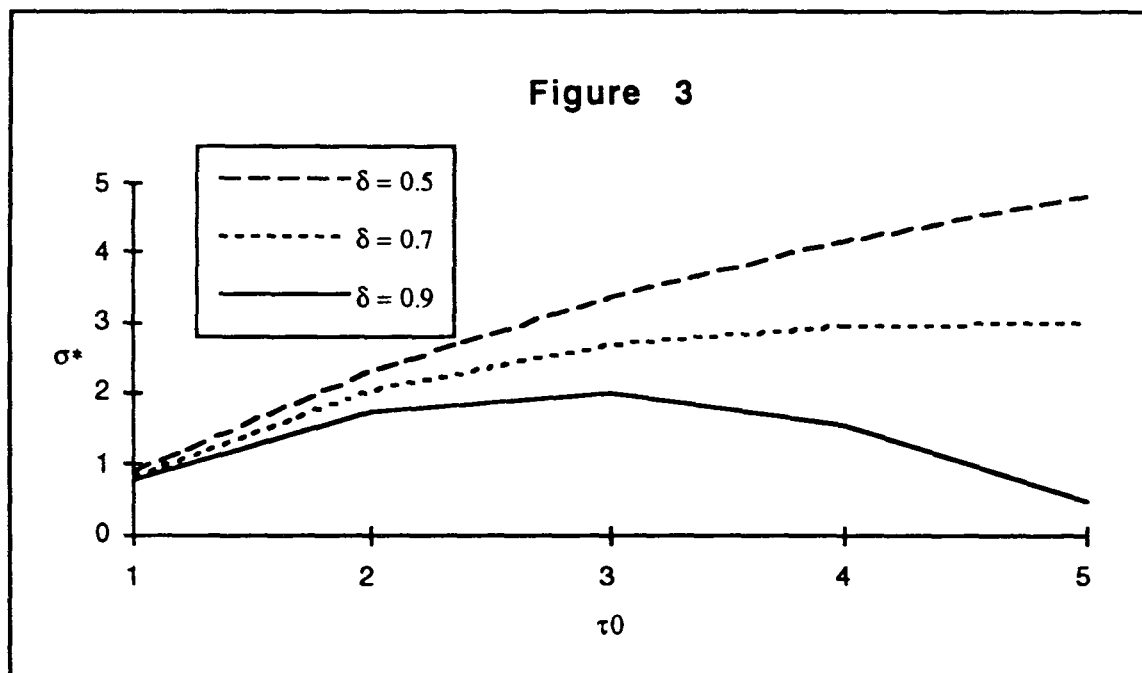


Figure 3 reports the results of simulations, using a lobbying cost function of the form  $k(z) = (\alpha\beta)^{-1}z^\alpha$ . For parameter values of  $\alpha = 2$ ,  $\beta = 0.15$ ,  $\sigma^*$  is plotted against  $\tau_0$  for three different values of  $\delta$ . As predicted by Proposition 1, for a high enough discount factor ( $\delta = 0.9$ ), countries of sufficient size will have lower optimal unilateral tariffs than smaller countries. For a lower discount factor ( $\delta = 0.5, 0.7$ ) this may not be the case. Though not plotted in Figure 3, in each case the unilateral tariff  $\sigma^*$  as a fraction of the myopic optimal tariff  $\tau_0$  is falling in  $\tau_0$ .





## V. COMPETING LOBBIES

Until now we have assumed there to be a single lobby influencing the political process in the foreign country, and because it is an anti-trade lobby, reducing its stake through a low unilateral tariff policy benefits  $H$ . However, it is questionable whether the same logic would hold if a pro-trade lobby were introduced into the political fray, because the very policy that reduces the stake of the anti-trade lobby would also reduce that of a pro-trade lobby. In this section, we demonstrate that under fairly weak assumptions about the nature of political competition, unilateral liberalization continues to be the optimal commitment strategy.

Suppose there are two lobbies in the foreign country,  $L_x$  and  $L_y$ , representing specific-capital used in the  $X$  and  $Y$  sectors, respectively. Producer surpluses in the two sectors are denoted  $r_x(\tau_t)$  and  $r_y(\tau_t)$ , with  $r_x' > 0$ ,  $r_y' < 0$ , and  $r_x'' \geq 0$ ,  $r_y'' \geq 0$ . Each period, the lobbies simultaneously choose expenditure levels,  $k_{xt}$  and  $k_{yt}$ , in an effort to alter the probability that the current tentative agreement will be ratified. Let the probability of failure be given by,

$$(13) \quad z_t = z(k_{xt}, k_{yt}),$$

where it is assumed that  $\partial z/\partial k_x > 0$  and  $\partial z/\partial k_y < 0$ . That is,  $L_x$  spends resources to raise the probability of failure, while  $L_y$  spends resources to lower it. Each lobby maximizes its expected producer surplus net of lobbying costs, taking the spending of the other lobby as given. The first-order condition for lobby  $i$  is,

$$(14) \quad (\partial z/\partial k_i)[r_i(\sigma_t) - r_i(\pi_t)] = 1.$$

The second-order condition requires that  $\partial^2 z/\partial k_x^2 < 0$  and  $\partial^2 z/\partial k_y^2 > 0$ .

From (14), we can determine comparative statics of the Nash equilibrium, though it is not possible to sign the derivatives of any of the relevant variables with respect to  $\sigma_t$  and  $\pi_t$  without further assumptions. Consider therefore the following:

$$(15) \quad \left| \frac{\partial^2 z}{\partial k_i^2} \right| > \left| \frac{\partial^2 z}{\partial k_x \partial k_y} \right|,$$

for  $i = x, y$ .<sup>24</sup> While (15) still does not allow us to sign the derivatives of  $k_{xt}$ ,  $k_{yt}$ , or  $z_t$ , with respect to  $\sigma_t$  and  $\pi_t$ , it does give us the effects of these tariffs on the total lobbying expenditure,  $K = k_x + k_y$ . These are:

$$(16) \quad \frac{dK_t}{d\pi_t} = -r_x'(\pi_t)\Delta - r_y'(\pi_t)\Gamma < 0, \quad \frac{dK_t}{d\sigma_t} = r_x'(\sigma_t)\Delta + r_y'(\sigma_t)\Gamma > 0,$$

---

<sup>24</sup>Probabilistic two-party election models commonly use the logit form,  $z_t = \frac{k_x}{k_x + k_y}$ , (see, e.g., Hillman and Ursprung [1988], Magee, Brock and Young [1989]). Condition (15) always holds for this case.

$$\text{where } \Delta \equiv \frac{\left(\frac{\partial z}{\partial k_x}\right)^2 \left(\frac{\partial^2 z}{\partial k_y^2} - \frac{\partial^2 z}{\partial k_x \partial k_y}\right)}{\left(\frac{\partial^2 z}{\partial k_x \partial k_y}\right)^2 - \frac{\partial^2 z}{\partial k_x^2} \frac{\partial^2 z}{\partial k_y^2}} > 0, \text{ and } \Gamma \equiv \frac{\left(\frac{\partial z}{\partial k_y}\right)^2 \left(\frac{\partial^2 z}{\partial k_x^2} - \frac{\partial^2 z}{\partial k_x \partial k_y}\right)}{\left(\frac{\partial^2 z}{\partial k_x \partial k_y}\right)^2 - \frac{\partial^2 z}{\partial k_x^2} \frac{\partial^2 z}{\partial k_y^2}} < 0.$$

In other words, as the stakes in the ratification game (the difference between  $\sigma_t$  and  $\pi_t$ ) rise for both lobbies, total lobbying expenditure also rises.

As in section III, consider the home country's choice of tariff proposal  $\pi_t$  in the presence of some  $\sigma_t = \sigma$  for all  $t$ . This problem is just the appropriate adaptation of (4). Again, denote the solution  $\pi = \pi(\sigma)$ , and denote the optimized value of world welfare  $W(\sigma)$ . If  $W(\sigma)$  is a decreasing function, as in section III, then it is clear that a low unilateral tariff will continue to be called for in  $H$ 's best TSE.

**Proposition 2:** Under assumption (15),  $W'(\sigma) \leq 0$ .

**Proof:** In appendix.

The intuition behind proposition 2 can be seen best by conducting the thought experiment of trying to lower  $K$  by a dollar. This can be done by either raising  $\pi$  or lowering  $\sigma$  (according to (16)), because both methods lower the political stakes of both lobbies. Now compare welfare effects of the two methods. Raising  $\pi$  lowers  $w(\pi)$ , and can either raise or lower  $z$ . However, because  $\pi$  is already chosen to maximize expected welfare, all of these effects (including the dollar reduction in  $K$ ) must add up to zero. On the other hand, lowering  $\sigma$  raises  $w(\sigma)$  and either raises or lowers  $z$ . If lowering  $\sigma$  lowers  $z$ , or at least raises it by less than when we raise  $\pi$ , then we know that lowering  $\sigma$  adds to world welfare. The reason would we expect  $z$  to rise less from a reduction in  $\sigma$  than from a rise in  $\pi$  is that the political stake for  $L_x$  ( $L_y$ ) falls by more (less) when  $\sigma$  is lowered than when  $\pi$  is raised. This is because  $\sigma$  is always greater than  $\pi$ , and the producer surplus functions are convex.

## VI. THE LONG-RUN LOBBY CASE

In this section, we consider the case of a single long-run lobby, whose objective function is the discounted present value of the entire time path of producer surpluses net of lobbying costs. This is a significant departure from the short-run lobby case, for as we shall see, it gives rise to the use of time-varying strategies. This makes the generalization of the comparative static results of the short-run lobby case problematic. We find once again that in the TSE,  $H$  uses unilateral tariffs that are as low as possible, subject to the analog of constraint (8); however, unlike in the short-run lobby case, if this constraint is relaxed by an increase in country size, unilateral tariffs need not fall in every period.

Given  $\Pi$  and  $\Sigma$ , the average expected payoff of  $L$  is now determined by,

$$(17) \quad R_t = (1 - z_t)r(\pi_t) + z_t[(1 - \delta)r(\sigma_t) + \delta R_{t+1}] - (1 - \delta)k(z_t),$$

for all  $t$ . If  $\sigma_t \geq \pi_t$  for all  $t$ ,  $L$ 's choice  $z_t$  will satisfy the first-order condition,

$$(18) \quad (1 - \delta)r(\sigma_t) + \delta R_{t+1} - r(\pi_t) = (1 - \delta)k'(z_t).$$

Differentiating (18) gives,  $\frac{\partial z_t}{\partial \pi_t} = \frac{-r'(\pi_t)}{k''(z_t)(1 - \delta)} \leq 0$ , and  $\frac{\partial z_t}{\partial \sigma_t} = \frac{r'(\sigma_t)}{k''(z_t)} \geq 0$ . Condition (18)

differs from (2) in that  $L$ 's stake now includes  $R_{t+1}$ , which is determined by the paths of future proposals and unilateral tariffs. The discount factor also enters in. As  $\delta$  rises, current lobbying costs become small relative to the long-term stake.

The MPE continues to be characterized by  $\sigma_t = \tau_0$  for all  $t$ ; however, the corresponding proposal and failure probability are slightly different. Using  $R_t = R_{t+1}$  in (17) and (18), and differentiating (4) using  $W_t = W_{t+1}$ , gives two first-order conditions which simultaneously determine the MPE proposal  $\pi(\tau_0)$  and failure probability  $z$ :

$$(19) \quad \frac{r(\tau_0) - r(\pi(\tau_0)) - \delta k(z)}{1 - \delta z} = k'(z), \text{ and}$$

$$(20) \quad \frac{w(\pi(\tau_0)) - w(\tau_0) + \delta k(z)}{1 - \delta z} = g(\pi(\tau_0), z).$$

The left-hand side of (19) is strictly decreasing in  $z_0$ , while right-hand side is nonnegative and strictly increasing in  $z$ . There is a unique solution,  $z = z(\pi, \tau_0)$ , such that if  $\pi < \tau_0$ , then  $z > 0$ ,  $\frac{\partial z}{\partial \pi} = \frac{-r'(\pi)}{k''(z)(1 - \delta z)} \leq 0$ , and  $\frac{\partial z}{\partial \tau_0} = \frac{r'(\tau_0)}{k''(z)(1 - \delta z)} \geq 0$ , otherwise  $z = 0$ . The second-order condition for (20) and  $\pi'(\tau_0) \geq 0$  follow from our earlier assumptions on  $g(\pi, z)$ .

Differentiating (4) with respect to  $\tau_0$  and using (20) gives,

$$(21) \quad W'(\tau_0) = \left( \frac{1}{1 - \delta z} \right) \left[ z(1 - \delta)w'(\tau_0) - g(1 - \delta) \left( \frac{\partial z}{\partial \tau_0} \right) + g\delta(1 - z) \left( \frac{\partial z}{\partial \pi} \right) \pi'(\tau_0) \right] \leq 0.$$

According to (21), MPE welfare falls with the static optimal tariff, just as it did in the short-run lobby case. Thus there is at least the possibility that something like proposition 1 will hold for the long-run case as well.

Next we consider TSEs. Again, the constraint that  $H$  would not wish to deviate for fear of reversion to the MPE is,

$$(22) \quad (1 - \delta)u^H(\sigma_t - \tau^F_0, \tau^F_0) + \delta W_{t+1}(\Pi, \Sigma) \geq (1 - \delta)u^H(\tau^H_0, \tau^F_0) + \delta W_0,$$

for all  $t$ , where  $W_t(\Pi, \Sigma)$  is the value of (4) given paths  $(\Pi, \Sigma)$ .

$H$ 's best TSE path  $(\Pi^*, \Sigma^*)$  will maximize  $W_1(\Pi, \Sigma)$  subject to (22). Although this solution will generally be non-stationary, we can establish the key property of the unilateral tariff path  $\Sigma^*$  quite simply:

**Proposition 3:** For any two equilibrium paths  $(\Pi, \Sigma)$  and  $(\Pi, \bar{\Sigma})$ , such that  $\Sigma \geq \bar{\Sigma} > 0$ ,<sup>25</sup>  $W_1(\Pi, \bar{\Sigma}) > W_1(\Pi, \Sigma)$  and  $W_t(\Pi, \bar{\Sigma}) \geq W_t(\Pi, \Sigma)$  for all  $t$ .

**Proof:** In Appendix.

Proposition 3 states that no matter what equilibrium path of proposals we wish to examine, using lower unilateral tariffs *at any time* raises world welfare. The intuition of the proof is that lowering  $\sigma_t$  for any  $t$  lowers the probability of failure in  $t$ , thereby lowering the expected payoff to  $L$ . A lower  $R_t$  lowers  $L$ 's stake in period  $t-1$ , which lowers  $z_{t-1}$ , and so on. All of these lower  $z$ 's at each step along given (equilibrium) path of proposals, coupled with direct welfare benefit of lower unilateral tariffs, give higher expected world welfare. The implication of proposition 3 is that  $(\Pi^*, \Sigma^*)$  involves the lowest possible unilateral tariffs, so that either (22) binds or  $\sigma^*_t = 0$  in every period.

**Corollary:** There exists some  $\bar{\delta}$ , such that if  $\delta \geq \bar{\delta}$ , then  $\sigma^*_t = \pi^*_t = z_t = 0$  for all  $t$ . Otherwise,  $\sigma^*_t > 0$  and constraint (22) binds for all  $t$ .

**Proof:** In Appendix.

For the remainder of the paper we suppose  $\delta < \bar{\delta}$  and shall attempt to further characterize  $H$ 's best TSE. Let  $\Omega$  be the set of all TSE expected payoff pairs  $(W, R)$ , and let  $V(R) \equiv \max\{W \mid (W, R') \in \Omega, R' = R\}$ .<sup>26</sup>  $H$ 's best first-period TSE payoff is,  $W_1^* = \max_R V(R)$ . Thus the key to the problem is to identify the function  $V$ . Solving (17), (18) and (22) for  $z_t$ ,  $\pi_t$ , and  $\sigma_t$  and substituting them into (4) enables us to write

<sup>25</sup>That is, at least one element in  $\bar{\Sigma}$  is strictly lower than its counterpart in  $\Sigma$ , none is greater, and all are greater than zero.

<sup>26</sup>The set  $\Omega$  is compact, because it is bounded and self-generating. For the precise argument, see Abreu, Pearce and Stachetti (1990), Theorem 4.

world welfare in any period as,  $W_t = H(R_t, R_{t+1}, W_{t+1})$ , where  $\partial H/\partial W_{t+1} > 0$ .<sup>27</sup> This implies that if  $W_t = V(R_t)$ , then  $W_{t+1}$  must equal  $V(R_{t+1})$ , and that  $V$  satisfies the Bellman's equation,

$$V(R) = \max_{R' \in \Omega} H(R, R', V(R')).$$

To solve this problem, we employ numerical techniques described by Judd (1991). We find that, along the TSE path, the proposal is highest in the first period, followed by low (even negative) values in later periods, ultimately converging to a steady-state. The intuition behind this time profile is that in periods two and following,  $H$  punishes  $L$  with decidedly unattractive proposals to lower  $R_1$ . This lowers  $L$ 's stake in the first period, making it less inclined to fight the first, relatively attractive, proposal.

But what about the effects of country size? Once again we are interested in the effects of  $\tau_0$  on the constraint,

$$(12') \quad (1 - \delta)(3/8)(\tau_0 - \sigma^*_t)^2 \leq \delta[W^*_{t+1} - W(\tau_0)].$$

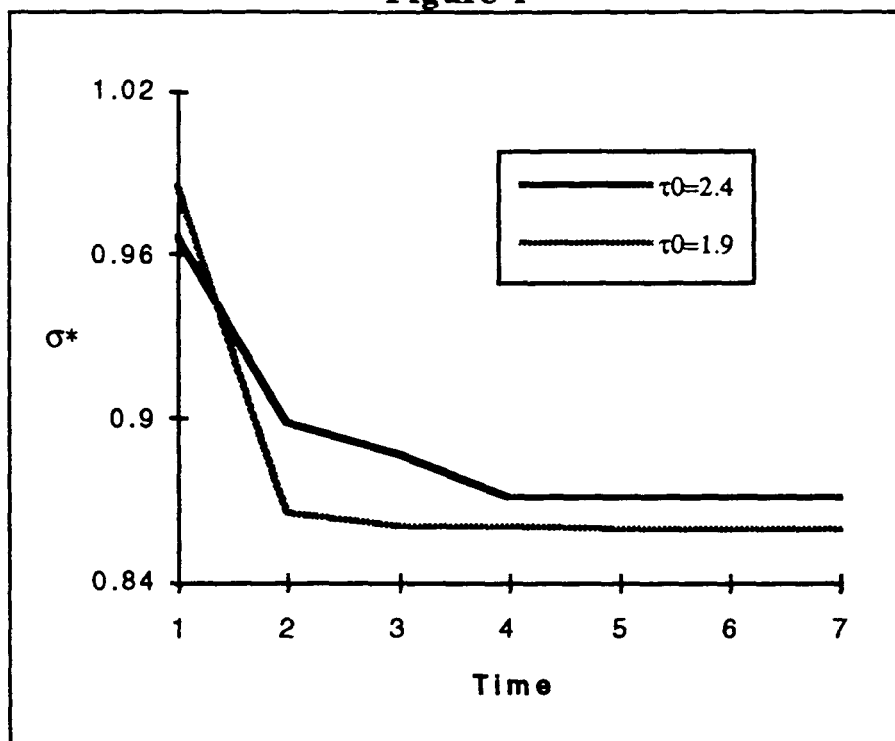
It turns out that even though, for a given  $\sigma^*_t$  and  $W^*_{t+1}$ , the constraint (12') is relaxed as  $x$  is increased for a high enough  $\delta$ ,  $\sigma^*_t$  may not fall for all  $t$ . This is because, for some  $t$ ,  $W^*_{t+1}$  may fall as well in response to the increase in  $x$ . This possibility is illustrated in figure 4, where we compute the path  $\Sigma$  for two values of  $\tau_0$ , again using  $k(z) = (\alpha\beta)^{-1}z^\alpha$ , for parameter values  $\alpha = 1.7$  and  $\beta = 0.15$ . In the first period, the optimal unilateral tariff is lower for higher  $\tau_0$ , as in the short-run lobby case, but for  $t > 1$  it is not.

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<sup>27</sup> $\partial H/\partial W_{t+1} = \frac{-\delta z_t}{uH'(\sigma_t)} \left( \frac{r'(\sigma_t)[(1-\delta)w(\sigma_t) + \delta W_{t+1} - w(\pi_t) - (1-\delta)k]}{(1-z_t)(1-\delta)k''} - \frac{w'(\pi_t)r'(\sigma_t)}{r'(\pi_t)} + w'(\sigma_t) - uH'(\sigma_t) \right)$

This is positive if  $w'(\pi_t)/r'(\pi_t) - w'(\sigma_t)/r'(\sigma_t) \geq 0$ , which is equivalent to  $g_\pi \geq 0$ .

Figure 4



## VII. CONCLUSIONS

This paper has shown that a policy of unilateral tariff reduction during trade negotiations can be welfare-improving for a large country. This policy lowers the political stakes associated with trade liberalization in the foreign country, and thereby lowers foreign political costs. The policy may (and, in the single-lobby case, must) also reduce the expected delay in reaching a trade agreement. Further, the larger and more patient is the home country the lower may be its unilateral tariff reduction. All of these results help to explain the cases of mid-nineteenth-century Britain and mid-twentieth-century United States and to support a theory of international leadership in trade policy-making.

The single, short-run lobby case provides the simplest and most forceful support for these results. When there two lobbies or a single forward-looking one, we can say less definitively about the expected delay and the effect of country size;



however, the basic point remains that unilateral tariff reduction is the optimal commitment strategy.

There are numerous other reasonable extensions of the model, which were not formally presented here, because they do not appear to significantly alter the single, short-run lobby results. It might be reasonable, for example, to assume that political opposition to trade liberalization is present in both countries, not just the foreign country. In this case, if ever political opposition were to block trade liberalization in one country but not the other, the country with the mandate to reduce tariffs would be in exactly the same position as the home country is in our model. It would have the same incentive as the home country to unilaterally exercise its mandate to reduce tariffs, perhaps even more so, as it may anticipate difficulty in having its mandate renewed in the future. Such was the position of the US in the early GATT rounds, after the Reciprocal Trade Agreements Act had authorized the President to reduce tariffs by up to 50 percent (Curzon [1965], p. 81).

Another reasonable extension might be to explicitly model inter-sectoral factor movements to capture the notion that a reallocation of foreign factors, induced by the home tariff reduction, might alter the political viability of the foreign import-competing industry over time. With dynamic adjustment of capital, we would expect a low unilateral tariff to induce capital to exit the  $X$  sector. This, by itself, may well reduce the political stake of the  $X$  sector (and raise that of the  $Y$  sector) over time.<sup>28</sup> Thus, it appears that such an approach would strengthen our results.

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<sup>28</sup>While the political stakes per unit of capital can rise or fall, the decline (rise) in the amount of  $X$ -sector ( $Y$ -sector) capital, would lead one to expect total  $X$ -sector ( $Y$ -sector) stake to fall (rise) over time. For detailed treatments of the effects of price changes on factor returns with dynamic adjustment, see Mussa (1978) and Neary (1978).

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## X. APPENDIX

### Proof of Proposition 1:

For  $\delta < \bar{\delta}$  total differentiation of (12) gives the expression,

$$(A1) \quad \frac{d\sigma^*}{d\tau_0} = \frac{\delta W'(\tau_0) + (1 - \delta)(3/4)(\tau_0 - \sigma^*)}{\delta W'(\sigma^*) + (1 - \delta)(3/4)(\tau_0 - \sigma^*)}$$

Since  $\sigma^*$  is the minimal value of  $\sigma$  subject to the constraint (7) (which is binding in this case), the Kuhn-Tucker theorem implies that there is a non-negative scalar  $\lambda$  such that,  $1 = \lambda[(1 - \delta)(3/4)(\tau_0 - \sigma^*) + \delta W'(\sigma^*)]$ . Thus for  $\delta < \bar{\delta}$ , the denominator of (A1) is positive. Next we determine the conditions for the numerator to be negative. Using (6) with the appropriate substitutions, gives the condition,

$$(A2) \quad \delta z(1/2)\tau_0 + \frac{\delta r'(\tau_0)}{k''(z)} \left( \frac{w(\pi) - w(\tau_0) + \delta k(z)}{1 - \delta z} + k'(z) \right) > (1 - \delta z)(3/4)(\tau_0 - \sigma^*).$$

As the second term on the left-hand side is positive, it is sufficient to show that  $\delta z(\pi, \tau_0) > [1 - \delta z(\pi, \tau_0)](3/2)$ . Since  $\delta z(\pi, \tau_0)$  is continuous and strictly increasing in  $\tau_0$  and  $\delta$  up to 1, there must be an  $\underline{\delta}$  and a  $\underline{x}$  at which (A2) holds. It is straightforward to show that  $z$  falls. Q.E.D.

**Proof of Proposition 2:**

$W(\sigma)$  is given by,

$$(A3) \quad W(\sigma) = [(1-z)w(\pi) + (1-\delta)zw(\sigma) - (1-\delta)K] \frac{1}{1-\delta z},$$

where  $\pi$  is chosen to satisfy the first-order condition,

$$(A4) \quad \{(1-z)w'(\pi) + [(1-\delta)w(\sigma) + \delta W(\sigma) - w(\pi)](\partial z/\partial \pi) - (1-\delta)(\partial K/\partial \pi)\} \frac{1}{1-\delta z} = 0.$$

Since  $(1-z)w'(\pi) < 0$  and under (15)  $\partial K/\partial \pi < 0$ , A4 implies:

$$(A5) \quad \frac{\partial z/\partial \pi}{\partial K/\partial \pi} > \frac{1-\delta}{(1-\delta)w(\sigma) + \delta W(\sigma) - w(\pi)} < 0.$$

Now find differentiate (A3) with respect to  $\sigma$ ,

$$(A6) \quad W'(\sigma) = \{(1-\delta)zw'(\sigma) + [(1-\delta)w(\sigma) + \delta W(\sigma) - w(\pi)](\partial z/\partial \sigma) - (1-\delta)(\partial K/\partial \sigma)\} \frac{1}{1-\delta z}.$$

Since  $(1-\delta)zw'(\sigma) < 0$  and  $(\partial K/\partial \sigma) > 0$ , a sufficient condition for A6 to be negative is:

$$\frac{\partial z/\partial \sigma}{\partial K/\partial \sigma} = \frac{(z_x)^2 r_x'(\sigma)(z_x z_{yy} - z_y z_{xy}) + (z_y)^2 r_y'(\sigma)(z_y z_{xx} - z_x z_{xy})}{(z_x)^2 r_x'(\sigma)(z_{yy} - z_{xy}) + (z_y)^2 r_y'(\sigma)(z_{xx} - z_{xy})} >$$

$$\frac{\partial z/\partial \pi}{\partial K/\partial \pi} = \frac{(z_x)^2 r_x'(\pi)(z_x z_{yy} - z_y z_{xy}) + (z_y)^2 r_y'(\pi)(z_y z_{xx} - z_x z_{xy})}{(z_x)^2 r_x'(\pi)(z_{yy} - z_{xy}) + (z_y)^2 r_y'(\pi)(z_{xx} - z_{xy})},$$

where  $z_i = \partial z/\partial k_i$  and  $z_{ij} = \partial^2 z/\partial k_i \partial k_j$ , for  $i, j = x, y$ . Cross-multiplying and simplifying gives:

$$\left( \frac{r_y'(\sigma)}{r_x'(\sigma)} - \frac{r_y'(\pi)}{r_x'(\pi)} \right) [(z_{yy} - z_{xy})(z_y z_{xx} - z_x z_{xy}) - (z_{xx} - z_{xy})(z_x z_{yy} - z_y z_{xy})] > 0.$$

Condition (15) ensures  $[(z_{yy} - z_{xy})(z_y z_{xx} - z_x z_{xy}) - (z_{xx} - z_{xy})(z_x z_{yy} - z_y z_{xy})] > 0$ . Thus, the condition becomes,

$$\frac{r_y'(\sigma)}{r_y'(\pi)} < \frac{r_x'(\sigma)}{r_x'(\pi)},$$

which holds because,  $r_x'(\tau) > 0$ ,  $r_x''(\tau) > 0$ , and  $r_y'(\tau) < 0$ ,  $r_y''(\tau) > 0$ .

Q.E.D.

**Proof of Proposition 3:**

Consider the constructed path  $\hat{\Sigma} = \{\bar{\sigma}_1, \bar{\sigma}_2, \dots, \bar{\sigma}_T, \sigma_{T+1}, \sigma_{T+2}, \dots\}$ , and suppose, without loss of generality, that  $\bar{\sigma}_T < \sigma_T$ . We wish to show that  $W_t(\Pi, \hat{\Sigma}) \geq W_t(\Pi, \Sigma)$  for all  $t$ , beginning by showing that  $R_T(\Pi, \Sigma) > R_T(\Pi, \hat{\Sigma})$ . Condition (18) along with the fact that  $R_{T+1}(\Pi, \hat{\Sigma}) = R_{T+1}(\Pi, \Sigma)$  implies that  $z_T > \hat{z}_T, k(z_T) > k(\hat{z}_T)$ . Using (17) and (18) gives,

$$(A7) \quad R_T(\Pi, \Sigma) - R_T(\Pi, \hat{\Sigma}) = (1 - \delta)[(\hat{z}_T - z_T)k'(z_T) - [k(z_T) - k(\hat{z}_T)] + \hat{z}_T[r(\sigma_T) - r(\bar{\sigma}_T)]]$$

By the Mean-Value Theorem, there is a  $\zeta \in [z_T, \hat{z}_T]$  such that  $k(z_T) - k(\hat{z}_T) = (\hat{z}_T - z_T)k'(\zeta)$ . Since  $k'(z_T) > k'(\zeta)$ , and  $r(\sigma_T) > r(\bar{\sigma}_T)$ , (A7) must be positive.

Next consider period  $T-1$ . Since  $R_T(\Pi, \hat{\Sigma}) < R_T(\Pi, \Sigma)$ , and  $r(\bar{\sigma}_{T-1})$  is not greater than  $r(\sigma_{T-1})$ , it must be that,  $R_{T-1}(\Pi, \hat{\Sigma}) < R_{T-1}(\Pi, \Sigma)$ ,  $\hat{z}_{T-1} < z_{T-1}$  and  $k(\hat{z}_{T-1}) < k(z_{T-1})$ . Backward induction implies that this is true for all  $t \leq T$ . Now since  $\hat{z}_t < z_t$  and  $k(\hat{z}_t) < k(z_t)$  for all  $t \leq T$ ,  $W_t(\Pi, \hat{\Sigma}) \geq W_t(\Pi, \Sigma)$  for all  $t \leq T$ , and  $W_1(\Pi, \hat{\Sigma}) \geq W_1(\Pi, \Sigma)$ .

Finally, note that if  $W_t(\Pi, \bar{\Sigma}) < W_t(\Pi, \Sigma)$ , then for  $\delta < 1$  there must exist  $T \geq t$  such that the path  $\hat{\Sigma}$  defined by  $T$  would give  $W_t(\Pi, \hat{\Sigma}) < W_t(\Pi, \Sigma)$  (this follows from the fact that  $W_t(\Pi, \bar{\Sigma})$  is bounded, namely by  $w(0)$  and  $W(\tau_0)$ , see Streufert [1989]), but this contradicts what we have already shown. Q.E.D.

**Proof of Corollary:**

Compare the paths  $(\Pi, \Sigma)$ , in which  $\sigma_t = 0$  for some  $t$ , with the path  $(0, 0)$ , in which  $\sigma_t = \pi_t = 0$  for all  $t$ . Notice that along  $(0, 0)$ ,  $z_t = 0$  and  $W_t(0, 0) = w(0)$  for all  $t$ . If  $(\Pi, \Sigma)$ , is an equilibrium path, then in any  $t$  such that  $\sigma_t = 0$ , it must that,  $(1 - \delta)u^H(-\tau^F_0, \tau^F_0) + \delta W_{t+1}(\Pi, \Sigma) \geq (1 - \delta)u^H(\tau^H_0, \tau^F_0) + \delta W(\tau_0)$ . Thus the path  $(0, 0)$  must also be an equilibrium, as  $w(0) \geq W_{t+1}(\Pi, \Sigma)$ . Since  $(\Pi^*, \Sigma^*)$  is defined to be the best equilibrium path, this implies that, if  $\sigma_t^* = 0$  for some  $t$ , then  $(\Pi^*, \Sigma^*) = (0, 0)$ , and if  $(0, 0)$  is not an equilibrium path, then  $\sigma_t^* > 0$  for all  $t$ . Finally, define  $\bar{\delta}$ , such that,

$$(1 - \bar{\delta})u^H(-\tau^F_0, \tau^F_0) + \bar{\delta}w(0) = (1 - \bar{\delta})u^H(\tau^H_0, \tau^F_0) + \bar{\delta}W(\tau_0) \quad \text{Q.E.D.}$$