Loss Aversion and Trade Policy*

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Abstract

We provide new survey evidence showing that loss aversion and reference dependence are important in shaping people's perception of trade policy. Under the assumption that agents' welfare functions exhibit these behavioral elements, we analyze a model with a welfare-maximizing government and with the lobbying framework of Grossman and Helpman (1994). The policy implications of the augmented models differ in three important ways. One, there is a region of compensating protection, where a decline in the world price leads to an offsetting increase in protection, such that a constant domestic price is maintained. Two, protection following a single negative price shock will be persistent. Three, irrespective of the extent of lobbying, there will be a deviation from free trade that tends to favor loss-making industries. The augmented models are more consistent with the observed structure of protection, and in particular, explain why many trade policy instruments are explicitly designed to maintain prices at a given level.

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I. Introduction

Free trade is among the most commonly expounded themes in economics, yet governments rarely implement liberal trade policies. As a result, a large literature on the political economy of trade policy has emerged over the years to explain the impediments to free trade. Most models include a characterization of individuals' preferences over the trade policy domain and define a mechanism for aggregating preferences into demand functions for actual policy.[1] Preferences are based on how trade policies affect individuals' income levels, either through factor endowments or sector-specific skills, depending if the underlying economic environment is based on a Hecksher-Ohlin or Ricardo-Viner framework.

In this paper, we provide survey evidence showing that people's trade policy preferences are not only influenced by the level of income, but also by deviations from it. Specifically, a majority of people support the implementation of protectionist policies if profit losses and salary cuts would otherwise be incurred. However, they do not support the implementation of identical policies that would increase profits and salaries by the same amount. Moreover, once a policy that increased profits and salaries is in place, a majority of people do not support removing it. Under standard preferences, all three scenarios should yield identical responses. This divergence implies that behavioral elements, such as loss aversion and reference dependence, play an important role in shaping preferences toward trade policies. (Loss aversion implies that an income loss reduces welfare more than a gain of equal magnitude increases welfare, and reference dependence indicates the presence of a critical level from which the welfare loss is measured.)

Motivated by the survey results, we, then, construct a political-economy model where the individuals' utility functions exhibit loss aversion and reference dependence. We show that the introduction of such behavioral features into individual preferences leads to important effects on trade policy formation, regardless of whether the policymaker is maximizing social welfare or is influenced by political contributions a la Grossman and Helpman (1994). Due to loss aversion, preventing losses, as opposed to

[1] The policymakers' preferences and the institutional setting of the political process are the other two elements of these models (Rodrik, 1985, p.1458).

obtaining gains, looms larger in government's objective function. Hence, all else equal, the government responds to a negative shock with protection. We refer to this as the *behavioral effect*. In contrast, the optimal policy is free trade if the government is maximizing standard social welfare. In a standard political economy model, where the government is influenced by other motivations such as lobbying, the equilibrium protection level is increasing in output since the gain from a marginal increase in the price level is directly proportional to the size of the output of the industry. Hence, a negative shock that reduces sales (for a given price level) reduces the value of protection and leads to lower equilibrium tariff level. We refer to this as the *standard effect.*

These two simple forces generate protection dynamics that are similar to those observed in many industries. If an industry experiences a negative world price shock that reduces income to below its *reference point*, the behavioral effect leads to an increase in protection while the standard effect dampens the demand for it. Initially, within a given range of world prices, the behavioral effect dominates the standard effect generating a region of *compensating protection:* trade policy *exactly* offsets the world price shock and a constant domestic price is maintained. If conditions worsen and the industry further contracts due to even lower world prices, the standard effect becomes stronger while the behavioral effect becomes less prominent due to *diminishing sensitivity to losses*. Thus, the level of protection in a declining industry is hump-shaped: first increasing then decreasing, and eventually approaching free trade as the industry continues to become less competitive.

The region of compensating protection, where trade policy is used to shelter the domestic firms from global price fluctuations, is one of the important predictions of the paper. In our model, this type of protection occurs in sectors with significant presence (output, employment, etc) but that are not very competitive in world markets. In practice, many forms of protection, including quotas, price floors, and voluntary restraint agreements, serve precisely this purpose in sectors such as agriculture, apparel and steel. They bind only when world prices fall and there is effectively free trade for prices above a certain level. Another common protectionist measure, antidumping charges, can only be initiated when the import prices fall and there is "injury" to domestic firms. Thus, the type and motivation for protection predicted by our model exhibits remarkable overlap with existing policies.

Our modified model provides explanations for some of the puzzles in recent empirical papers that aim to examine the Grossman and Helpman (1994) model. For example, both Maggi & Goldberg (1999) and Gawande & Bandyopadhyay (2000) infer from their estimation results that the government attaches "too little" weight to political contributions, as opposed to social welfare, in its decision process, to the extent that political considerations do not seem to affect policy. When loss aversion is formally introduced into the model, the theoretical relationship between the estimated coefficients of the empirical model and weights attached to the social welfare and monetary contributions changes. As a result, for the same set of estimation results, the inferred value of the weight of social welfare in government's objective function goes down to a more acceptable level.

Our enhanced model also offers additional insights into several long-standing puzzles in the literature. A prominent one is referred to as the *Anti-Trade-Bias Puzzle* by Rodrik (1995): "trade policy is systematically used to transfer resources to import-competing sectors rather than to export-oriented sectors." This is closely related to the *declining industry protectionism* where the level of protection is observed to increase as industries start to decline. As mentioned above, standard models tend to predict the opposite[2], whereas our predictions are very close to the observed policies. We also offer an explanation for another empirical regularity - *the persistence of protectionist policies*. Once in place, protection becomes difficult to remove because it gets incorporated into the reference welfare level. If a shock persists, protection becomes permanent and the industry never fully adjusts to the new market structure. Past levels of protection therefore become very important determinants of current protection.

The next section presents results from our survey and demonstrates the importance of loss aversion and reference dependence in peoples' perceptions of trade policy. Section III discusses how this model fits into the political economy literature on

[2] In the GH model lobbying leads to higher subsidies in an export sector, as compared with the tariffs that an otherwise-identical import competing sector receives [see Levy (1999) for a discussion]. The same feature holds for other political economy models such as the tariff-formation approach of Findlay &

protection. Section IV presents an analytical model where the government maximizes social welfare that features behavioral elements. In Section V, we modify this model to incorporate into the influential lobbying model of Grossman and Helpman. In Section VI we analyze the observed policy patterns and tools in light of our analytical predictions. Section VII concludes.

II. Loss Aversion in Trade Policy: An Experiment[3]

Numerous empirical studies from the behavioral literature find that the value people assign to a loss is significantly larger than the value assigned to an equivalent gain. In particular, for small or moderate gains and losses of money, the estimated value assigned to a loss is about twice as large as a similar gain (see Kahneman, Knetsch, and Thaler (1991) for a survey of the literature). Losses are also by definition time dependent, and reflect a particular reference point. For example, a firm accustomed to a high profit level will regard a low profit level as unacceptable, while a firm accustomed to a low profit level will find maintaining that level to be satisfactory.

An implication of loss aversion and reference dependence is that the value assigned to foregone gains is lower than that assigned to losses. This is reflected in many judicial outcomes, where the weight assigned to unrealized profits is typically well below the weight assigned to incurred losses. Survey evidence also bears this out. For example, faced with excess demand for a particular car model, a company that discontinues a discount of $200 is considered fair; but, a company that raises the price by $200 is considered unfair by a majority of respondents (Kahneman, Knetsch, and Thaler, 1991). This implies that imposing a surcharge (perceived as a loss) is considered less acceptable than eliminating a discount (perceived as a gain).

Loss aversion and reference dependence also have implications for people's perceptions of trade policy. Tharakan (1996, p. 1562) notes that "[p]erhaps the weakest point in the political economy analysis of protection has been the rather superficial way in which it has so far taken into account the public perception of trade relations." Indeed, very few studies examine people's sentiments on trade policy. Two exceptions are

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Wellisz (1982), political support function of Hillman (1989) and campaign contributions approach of Magee, Brock and Young (1989).

Scheve and Slaughter (2001) and Mayda and Rodrik (2003), which use survey evidence to evaluate determinants of individual preferences. They find that factor endowments guide trade preferences. But their focus is on the relationship between individual characteristics and protectionism and not on the conditions for trade barriers to be considered acceptable by a majority. Loss aversion may play a very important role in people's perceptions, as the argument for free trade relies on the same weight being given to gains and losses.

In order to test to what extent loss aversion carries over to peoples perception of trade policy, we conducted a simple survey. The following three questions were asked with each person answering only one of the questions:[4]

1. A manufacturing industry faces competition from imports. Its losses are expected to be $20 million this year and firms are expected to reduce salaries by 10%. If a tariff is placed on imports of competing goods then losses will be avoided and salaries will be maintained. The tariff will cause the price of the good, which everyone consumes, to rise from $30 to $40. Do you support the tariff?

   N= 102 Yes: 60 percent No: 40 percent

2. A manufacturing industry faces competition from imports. If a tariff is placed on imports of competing goods then profits will increase by $20 million and firms in the industry will increase salaries by 10%. The tariff will cause the price of the good, which everyone consumes, to rise from $30 to $40. Do you support the tariff?

   N= 100 Yes: 37 percent No: 63 percent

3. A manufacturing industry faces competition from imports, which are subject to a tariff. Removal of the tariff will cause profits to decline by $20 million and

[3] We would like to thank Sendhil Mullainathan for suggesting us to conduct a survey to motivate the paper.
[4] The survey was given to 303 people visiting the Washington Mall in June 2004.

salaries to fall by 10%. As a result of the tariff removal, the price of the good, which everyone consumes, will fall from $40 to $30. Do you support maintaining the tariff?

N= 101 Yes: 61 percent No: 39 percent

The first question proposes implementing a tariff to prevent losses and the second proposes using a tariff to promote gains of equal magnitude. The cost of the tariff to consumers is identical in both settings. The majority of people find it acceptable to use a tariff to *prevent* profit losses and wage cuts, but do not find it acceptable to use a tariff to *promote* profits and raises.[5] Using a two-tailed t-test and allowing for different variance across samples, the means of the two samples are different at the 1 percent level.

The third question highlights the importance of reference dependence and how loss aversion is different from risk aversion. Though the majority of people do not favor imposing a tariff in question 2, they would favor maintaining it if it were in place. This implies that tariffs, once implemented, are likely to be persistent. Note that if respondents were simply expressing risk aversion there should be no difference between the responses to questions 2 and 3 since the only difference is the reference point. Again, the means of the two samples are significantly different at the 1 percent level.

In sum, the results of this experiment imply that protection as a means of preventing losses is considered to be desirable by a majority of people, but similar protection to facilitate gains is perceived as undesirable. It also shows that once in place, a tariff that may not have been supported initially is difficult to eliminate. These effects are consistent with the structure of protection in most countries and also with Rodrik's (1995) *Anti-Trade-Bias Puzzle*.

III. The Political Economy of Trade Policy

Our analytical model builds on political economy models of lobbying for trade policy and declining industry protectionism. The first generation of political economy

[5] We also asked the question to a smaller sample with job cuts and job increases to a smaller sample and the result was maintained.

models relied on a reduced form government welfare function that places more weight on certain sectors of the economy to generate protectionist policies for them. Among these, the most prominent examples are the tariff-formation function approach of Findlay and Wellisz (1982), the political support function approach of Hillman (1989), the median-voter approach of Mayer (1984), and the campaign contributions approach of Magee, Brock and Young (1989). We do not go into details, as these are reviewed in Baldwin (1989) and Rodrik (1995) and other places. Similar government objective functions were also used in earlier studies on senescent industry protection. In one of the earliest studies, Corden (1974) uses a *conservative welfare function*, whereby the government seeks to avoid "any significant absolute reductions in real incomes of any significant section of the community" (p.107). Cordon's welfare function displays loss aversion—reductions in income have greater weight than increases—in order to generate (observed) protection for declining sectors. However, the conservative welfare function was not derived from consumer utility, but chosen because it most closely reflected protectionist policies. But perhaps more importantly, because of its ad hoc nature, it does not offer specific predictions about trade policy. Hillman (1982) and Long and Vousden (1991) use a political support function to explain why declining industries get more protection. In their models, the policymaker wants to spread the cost of a price decline in a import-competing sector over the whole population. The intuition in these models comes from risk sharing as opposed to preventing losses.

A shortcoming of this class of models is their use of a reduced-form government welfare function that essentially places more weight on certain sectors in order to generate protection for those sectors—the trade policy outcome is effectively assumed at the onset. In an influential contribution, Grossman and Helpman (1994, henceforth GH) develop a model that derives the government's objective function endogenously from micro-foundations. The preferences of lobby groups and the policymaker are explicitly specified and there is a specific lobbying game played between them. The weights that the government places on interests of different groups are derived endogenously. Although the structure of the model is more rigorous, some of its predictions are at odds with observed policy outcomes. First, the GH model predicts that if all industries are represented through lobbies, the equilibrium policy outcome will be free trade in all sectors. As a result, one needs to assume that only some of the sectors are organized to generate protection. This implies that, as with the previous models, the extra weight given to lobbying sectors is to some extent determined exogenously.[6] Second, the model predicts that export sectors should receive more protection, which runs counter to the empirical evidence. Third, according to the lobbying models, if a sector suffers a negative price shock, protection should fall. In reality, it is the sectors that face negative shocks that receive more protection. Finally, the model does not offer any insights about the persistence of protection.

Our work is also closely related to another strand of the literature that explains protection using risk aversion and incomplete insurance markets. Eaton & Grossman (1985) and Fischer & Prusa (2003) explain observed protection patterns as a form of insurance. If agents are risk averse and capital is allocated before the state of the world is known, then there will be scope for a small tariff to offset losses in a bad state. In these models, the tariff reallocates income to the losing sector, where the marginal value of income is lower. While some of the behavioral elements that we include are similar to risk aversion, there are also some important differences. First, as noted in the previous section, risk aversion does not incorporate reference dependence. This implies that some important predictions from our model—such as compensating protection—would not be part of a model with risk aversion alone. Second, because of the concavity assumption, very high levels of risk aversion would be needed to generate sizeable tariffs in a standard model. Third, risk aversion also fails to explain the differences in the responses to the questions in our survey. As noted, under risk aversion, the responses to questions 2 and 3 should have been similar. The difference is caused by a sudden change in the slope of the welfare function due to the reference point. Finally, risk aversion can not account for persistence of protection once it has been implemented. This has been identified many times in the empirical literature. However, behavioral elements can explain this observation. Especially if protection causes the reference point to shift, it becomes very difficult to remove it once it is in place.

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[6] To endogenize the lobby formation process, Mitra (1999) assumes that there are varying levels of exogenous fixed costs to form a lobby. Only the sectors for which it is cost effective will form a lobby and

IV. Analytical Model

We begin with a standard specific-factors model and incorporate standard behavioral assumptions. The key insight from the behavioral literature is that welfare is not only dependent on the current state but on the change in states. In particular, Tversky and Kahneman (2000) define three characteristics of value function that differ from standard utility theory. The first is *reference dependence*: gains and losses relative to a reference point are important. The second is *loss aversion*: losses have larger effects on welfare than corresponding gains. The third is *diminishing sensitivity*: the marginal value of gains and losses decreases with their size. The introduction of these behavioral assumptions into the objective function of the government resolves many of the incongruities between predictions of the political economy models and observed policy outcomes.

We do not address the question of why trade policy, as opposed to other less distortionary methods of intervention, is used to redistribute income. In general, a tax cum subsidy will always be more efficient. In our model, we simply assume trade policy is the only tool. We rely on other explanations having to do with feasibility of assistance and other potential distortions that direct assistance might introduce.[7]

In describing the model, we begin with the production side. There are $n+1$ consumption goods where good 0 is the numeraire and is produced with labor alone using constant returns to scale technology. The supply of labor is large enough to guarantee supply of good 0 so that its price and the wage rate are both set to 1. All other goods, indexed $1 \ldots n$, require labor and a sector specific input with fixed supply; their production technology also exhibits constant returns to scale. The rewards to the owners of the sector specific factor used in the production of good i is determined by the domestic price the good, p_i, and is denoted by $\pi_i(p_i)$. Finally, the supply of the good i is denoted by $y_i(p_i) = \pi'_i(p_i)$.

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obtain protection.

[7] Loss aversion may provide insight as to why a tariff is preferred to a tax cum subsidy. A tax will directly affect incomes and thus will reduce welfare due to loss aversion. A tariff only affects relative prices, and while this introduces a distortion, the resulting loss may be smaller than the loss due to loss aversion. This is consistent with the findings of Kahneman, Knetsch, and Thaler (1991) that the vast majority of people find nominal salary reductions less acceptable than price increases. In principle, revenue for the subsidy could be obtained via inflation, however, there are other well-known costs to inflation that might make this more costly for redistribution than a tariff (as well as infeasible due to the independency of central banks).

The economy is composed of individuals who derive utility from the consumption of these *n+1* consumption goods. In addition, each person owns a share of the sector specific factors. For simplicity, we assume that each individual owns only one type of specific factor and the ownership levels are identical across individual owners of the same factor. It is worth noting that this is not necessarily a model about capital owners, as the return to specific factors can also be thought of as a wage premium for sector-specific skills. The indirect utility function of an individual who owns specific factor *j* is

(1) $$V_{\bar{p}_j}(p) = E + s(p) - I_L h(\frac{\pi(\bar{p}_j) - \pi(p_j)}{\alpha_j N}), \quad h' > 0, h'' < 0, h(0) = 0,$$

where p is the domestic price vector, E is income from labor and specific factor ownership, $s(p)$ is the consumer surplus, α_j is the fraction of the population that owns specific factor j, and N is population size.[8]

Loss aversion is introduced through the function *h(.)*. The function is increasing in the difference between reference profits and actual profits, reflecting the extent of the loss an individual feels for receiving less than they are accustomed to ($h'(.)>0$). However the marginal increase is declining in the size of the loss ($h''(.)<0$), which represents *diminishing sensitivity* to losses. A large body of empirical evidence from the behavioral literature finds that people are risk loving in the domain of losses.[9] I_L is an indicator variable which takes the value of *1* if expected income from the specific factor falls below the reference point, i.e. $\pi(\bar{p}_j) - \pi(p_j) > 0$. Since the reward level, $\pi(p_j)$, is strictly increasing in p_j, the reference reward level corresponds to a unique reference price, denoted as $\bar{p}_j$. The shape of function *h(.)* together with the indicator variable I_L

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[8] A utility function from reference point $\pi(\bar{p})$ that corresponds to this indirect utility function is $u_{\bar{\pi}}(x) = x_0 + \sum_{i-1}^{n} u_i(x_i) - I_L h(\pi(\bar{p}_i) - \pi(p_i))$. In behavioral theory it is common to augment a utility function with the loss aversion term. Thus, we are excluding loss aversion with respect to price increases of the n goods, which would complicate the analysis dramatically. Moreover, evidence implies that people are more averse to income loss than changes in prices (Kahneman, Knetsch, and Thaler 1991).

[9] See Kahneman and Tversky (1979) for the original version of prospect theory and Rabin (1998) and Barberis and Thaler (2002) for a summary of the evidence.

imply that owners of specific factor j perceive a decline in their welfare when income falls below the reference point but do not derive any additional utility for reward levels above it.

Net individual tariff revenue can be written as the sum of the trade tax on each product multiplied by individual net imports demand:

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

where p_i* is the world price of good i, $d_i(p_i)$ is the individual demand function, and $y_i(p_i)$ is the domestic supply function of good i. The standard social welfare function without the loss aversion factor is given by

(3) $$W(p) = l + \sum_{i=1}^{n} \pi_i(p_i) + N[r(p) + s(p)]$$

where l is labor income and p is the price vector. Now, let the loss aversion for the whole country be represented by the following function:

(4) $$H(p) = -\sum_{i \in L} \alpha_i Nh(\frac{\pi(\bar{p}_i) - \pi(p_i)}{\alpha_i N})$$

where L represents the sectors with prices below their reference levels. The modified social welfare function with loss aversion is simply the sum of these two functions:

(5) $$G(p) = W(p) + H(p)$$

The government sets policy in sector i to maximize social welfare as presented in expression (5). Since the consumers' utility functions are additive, we can treat each sector i individually when finding the optimal policy. There are several different scenarios to consider:

Case 1: The world price is above the reservation price; i.e. $p_i^* \geq \bar{p}_i$: In this case, we have $H(p)$=0. The optimum domestic price is found by $G'(p_i) = W'(p_i) = 0$ which implies the optimum domestic price is the world price: $p_i^0 = p_i^*$ or the government sets the tariff at zero and free trade prevails.

Case 2: The world price is below the reservation price; i.e. $p_i^* < \bar{p}_i$: This case is shown in Figure 1 for industry i, where the domestic price, p_i, is on the x-axis. Both $W(p_i)$

and $H(p_i)$ are drawn as functions of the domestic price, p_i, for a given level of foreign price, p^*_i. $W(p_i)$ has a unique maximum at the world price level p^*_i since free trade maximizes the standard social welfare. $H(p_i)$ is convex and has negative (zero) values below (above) the reference price $\bar{p}_i$.

As can be seen from the figure, the maximum of the modified social welfare function $G(p_i) = W(p_i) + H(p_i)$ is going to be in the region $p_i^* < p_i \leq \bar{p}_i$. If p_i is less than p^*_i, then both $W(p_i)$ and $H(p_i)$ are decreasing, and G(.) cannot attain its maximum; for values larger than $\bar{p}_i$, $H(p_i)$ is zero and $W(p_i)$ is again decreasing. At $p_i = p_i^*$, we have $W'(p_i)=0$, $H'(p_i)>0$ and therefore $G'(p_i)>0$ which means $G(p_i)$ can not take its maximum value at p_i^*. The alternatives are that either there is an interior solution or a corner solution at $p_i = \bar{p}_i$. In order to analyze these two cases, we first define the first order condition:

$$\text{(6)} \qquad \frac{\partial G}{\partial p_i} = \frac{\partial W}{\partial p_i} + \frac{\partial H}{\partial p_i} = \left(p_i - p_i^*\right) m'_i(p_i) + I_L y_i(p_j) h_i'\left(\frac{\pi(\bar{p}_i) - \pi(p_i)}{\alpha_i N}\right) = 0$$

where $m_i(p_i)$ is net import demand, $m_i(p_i) = Nd_i(p_i) - y_i(p_i)$

Case 2a: FOC is satisfied in the region $p_i^* < p_i \leq \bar{p}_i$: Suppose the FOC is satisfied at point p_i^o. Since $G'(p_i^*) > 0$, p_i^o is either an inflection point or maximum. In order to rule out the inflection point case, we need to check the second-order condition is also satisfied and show that $G''(p_i^o) < 0$.[10] This scenario is presented in Figure 2. The optimal policy for the government is to choose the tariff level so that the domestic price

[10] There is a possibility that the FOC is satisfied multiple times in this region. The presence of multiple points does not change any of our results; the government simply has to find the global maximum among these. The other alternative is to impose restrictions on these functions to guarantee that FOC is satisfied only at a single point. Among the many reasonable restrictions are the following: Suppose both the FOC and SOC is satisfied at point p^0; then for all $p > p^0$, $H''+W''<0$. Another option is to assume that $H(.)$ is quadratic and the domestic supply and demand functions are linear (so that $W(.)$ is also quadratic). Then $G(.)=H(.)+W(.)$ is also quadratic and we are guaranteed to have FOC satisfied at most once in any given range and to avoid any inflection points.

level is set at p_i^o. The optimal tariff is given by the following expression which is derived from the FOC in (8):

(7) $$\tau_i^o = \frac{t}{1+t} = I_L h_i'(\frac{\pi(\bar{p}_i) - \pi(p_i^o)}{\alpha_i N})\frac{z_i^o}{e_i^o}.$$

where $z_i^o = y_i(p_i^o)/m_i(p_i^o)$ is the equilibrium ratio of domestic output to imports and $e_i^o = -m'_i(p_i^o)p_i^o/m_i(p_i^o)$ is the elasticity of import demand or of export supply.

The expression above states that only the industries where prices are below the reference point receive protection. The optimal tariff equates the marginal gain as a result of reducing sector-specific losses to the marginal loss in aggregate welfare that the tariff induces. As is standard, the tariff is increasing in the ratio of output to imports since the cost to the economy in terms of loss aversion is higher if the sector is large. In addition, it is greater for industries with a more elastic import demand (or export supply) since the welfare cost of the tariff is smaller if import demand is inelastic. There will always be a small positive tariff since *H'(p*)>0* and *W'(p*)=0*.

Case 2b: The FOC is not satisfied (or there is an inflection point) in the region $p_i^* < p_i \leq \bar{p}_i$: If the FOC is not satisfied, then we have $G'(p_i^o) > 0$ for the whole region. Alternatively, suppose the FOC is satisfied but the SOC is not, i.e. we are at an inflection point and $G'(p_i^o) = 0$ & $G''(p_i^o) = 0$. These imply, in either case, *H'(.)* is larger than or equal to *W'(.)* in absolute value at every point in the entire range. Therefore *G(.)* is increasing, reaches its maximum at $\bar{p}_i$ and we have a corner solution as depicted in Figure 3. In this case, loss aversion at $\bar{p}_i$ is so large that the marginal gain from a reduction in loss aversion is always greater than the marginal loss in standard social welfare from protection, i.e. $H'(\bar{p}_i) + W'(\bar{p}_i) > 0$. The government chooses trade policy so that domestic price is set at $\bar{p}_i$. Once the reference price is reached, however, loss aversion disappears. Any further increase in tariff simply reduces welfare and therefore never gets implemented.

Next, we show that the magnitude of difference between the world price and the reference price can determine whether you are in Case 2a or 2b.

World Prices and Domestic Protection

In this section, we evaluate how domestic protection responds to changes in world prices. For sectors where the world price is above the reference price level $\bar{p}$, the optimal policy is free trade and domestic price equals world price. In sectors where the world price is below $\bar{p}$, the optimal policy is protection and the domestic price is set above the world price. The key question is, for a given level of world price, whether the trade policy outcome is in Case 2a, where domestic price is above world price but below the reference level, or in Case 2b, where it is set exactly at the reference level.

In order to answer this question, suppose world price falls from an initial level at $\bar{p}$ to a level ε below it so that $p_i^* = \bar{p}_i - \varepsilon$. We know that $W'(\bar{p}_i - \varepsilon) = 0$ and $H'(\bar{p} - \varepsilon) > 0$, which means $H'(\bar{p}) + W'(\bar{p}) > 0$ if ε is small enough. Thus, for world prices slightly below the reference level, we are in Case 2b (corner solution) and the optimal policy is to choose the tariff that brings the domestic price to the reference level. The intuition is that the loss aversion function *H(.)* is steepest when it is close to the reference point due to diminishing sensitivity to losses. On the other hand, standard welfare function *W(.)* is flattest when close to its maximum which is at $p_i^* = \bar{p}_i - \varepsilon$ in this case. Thus, when price is slightly below the reference point, loss aversion dominates the welfare loss and it is optimal to institute compensating protection.

Next, we evaluate what happens to protection as ε increases. We observe that $W'(\bar{p}_i)$ is increasing in p_i^* (but decreasing in absolute value since it is negative). This is due to the fact that the distortion in standard social welfare declines as the magnitude of the tariff that equates price to the reference level goes down. Therefore as ε increases (or as p_i^* moves away from $\bar{p}_i$), $W'(\bar{p}_i)$ becomes more negative. In other words, the slope of the standard welfare function at the reference point, $W'(\bar{p}_i)$, becomes steeper as the reference point moves away from the world price. Then, for ε large enough or p_i^* low enough, we have $G'(\bar{p}) = H'(\bar{p}) + W'(\bar{p}) < 0$ since $H'(\bar{p}_i)$ is constant. This statement, combined with the fact that $G'(p_i^*) > 0$ implies there is a point p_i^o in between p_i^* and $\bar{p}_i$ where $G'(p_i^o; p_i^*) = 0$. In other words, as the world price p_i^* continues to decline and move away from the reference level $\bar{p}_i$, at some point we move from a corner solution to an interior solution. Furthermore, the interior solution p_i^o will also decrease as the world price declines using the same arguments. The intuition is that when the price shock is very large, the marginal loss from a *compensating* tariff is larger than the marginal gain from eliminating losses. Instead there is some tariff level such that the marginal loss in standard social welfare is exactly offset by the marginal change in the loss aversion function.

The relationship between the world price and optimal domestic price exhibits the pattern in Figure 4. Similarly the relationship between tariffs and world prices are depicted in Figure 5. Among the most important predictions of the model is the intermediate range of world prices where trade policy is used to shelter the domestic sector from world price fluctuations. In this region, denoted as $p_i^A < p_i^* < \bar{p}_i$ in both figures 4 and 5, the domestic price is set exactly at the reference level and the tariff level adjusts to keep the domestic price constant as the world price changes. For world prices below p_i^A, there is protection but not high enough to bring the domestic price to the reference level. The reason is straightforward. As the world price continues to fall, the government needs to continuously increase the tariffs to maintain a fixed domestic price level. This means the marginal cost of this tariff due distortions to standard social welfare is increasing. On the other hand, due to diminishing sensitivity to losses (*h"<0*), the marginal gain from the tariff through decreases in loss aversion is also declining. As a result, it no longer becomes optimal to maintain the reference prices and the domestic price declines as the world price declines. Furthermore, the actual protection level also declines with world prices. As the sector shrinks and the gap between the reference price and world price increases, we once again approach free trade.

The region of compensating protection predicted by the model is especially appealing, as in practice, it is the declines in world prices that generate demands for protection, especially to maintain the domestic status quo (see Section VI). Most political economy models in the literature generate results that contradict this behavior. For example, in Grossman & Helpman (1994), protection is uniformly increasing in world prices. In our model, on the other hand, declines in world prices below the reference level can trigger protection. Furthermore, protection is implemented in sectors that still have significant presence (output and employment) but are starting to lose their relative competitiveness. In the next section, we show that the result is maintained in a model with lobbying for protection.

V. Lobbying for Protection

In this section, we modify the previous framework by explicitly incorporating the influential lobbying for protection model of Grossman and Helpman (1994). We show that the results from the standard model are, in general, magnified in a model with lobbying and the basic features of the results are maintained. We continue with the specific factors model above with good *0* as the numeraire. We allow some sectors to be organized and lobby for protection as in the original GH model.

From equations 1 and 3 above, the joint welfare of the owners of specific factor *i* is defined as

$$(8)\ G_{i,L}(p) = \{\ell_i + \pi_i(p_i) + \alpha_i N[r(p)+s(p)]\} - I_L \alpha_i N h\left(\frac{\pi(\bar{p}_i) - \pi(p_i)}{\alpha_i N}\right), \quad h' > 0, h'' < 0\,,$$

We refer to this group as lobby *i* since their interests are aligned and opposed to owners of other specific factors. Recall that $\pi(\bar{p}_i)$ is the reference profit level based on price level $\bar{p}_i$. If profits fall below reference level (i.e. if I_L=1), the members of the lobby group experience a loss through the function *h(.)*, in addition to the direct income loss through a decline of $\pi_i(p_i)$, the second term in the expression above.

Since the country is small, it has no influence over the world price vector p^*, and the trade-policy vector uniquely determines domestic prices. The government cares about social welfare and values monetary political contributions which can be used for a variety of purposes including campaign spending. We adopt a linear objective function for the government:

(9) $$\Omega = \sum_{i \in O} C_i(p) + aG(p).$$

Where *G(p)* represent social welfare inclusive of loss aversion and $\Sigma_O C_i(p)$ is the sum of the contributions from the set of organized lobbies, *O*. The social welfare has a relative weight of *a* in the government's objective function and the only restriction is $a>0$. Aggregate welfare is defined in equation (5) above and incorporates behavioral elements.

The lobbying game played between the lobby and the government is identical to the GH framework and is based upon Bernheim and Whinston's (1986) menu auction. In the first stage, the lobbies simultaneously submit contribution schedules contingent on the trade-policy vector implemented by the government. Given these schedules, the government maximizes its objective function given by (9) and chooses a domestic price vector in the second stage. The equilibrium outcome is a set of contribution schedules and a domestic price vector (or the corresponding trade policy vector). Bernheim & Whinston (1986) show that the subgame-perfect Nash equilibrium of this game has some nice properties. For example, for each lobby group *i*, the equilibrium price vector maximizes the joint welfare of the that group and the government, given the contribution schedules of all other organized lobby groups. Furthermore, the contribution schedules are locally truthful so that they reveal the true preferences.[11] These imply the equilibrium domestic price vector satisfies the following:

(10) $$p^o = \arg\max \sum_{i \in O} G_i(p) + aG(p)$$

In order to find the equilibrium price vector, we first calculate the effect of change in p_j on the welfare of lobby *i*. We obtain the following from (5) and (8),

(11) $$\frac{\partial G_i}{\partial p_j} = \left(\delta_{ij} - \alpha_i\right) y_j(p_j) + \alpha_i (p_i - p_i^*) m'_j(p_j) + \delta_{ij} I_L y_j(p_j) h'(.)$$

where δ_{ij} is an indicator variable that is *1* if $i = j$ and *0* otherwise, and $m_j(p_j)$ is net import demand, $m_j(p_j) = Nd_j(p_j) - y_j(p_j)$.

[11] Bernheim & Winston and GH discuss in length why it is enough to focus on truthful contribution schedules since these are coalition-proof. We refer the reader to these papers.

Next, we sum equation (11) over the set of organized lobbies, *O*, to obtain the change in welfare for all lobbies with respect to change in price p_j,

(12) $$\sum_{i\in O}\frac{\partial G_i}{\partial p_j}=(I_j-\alpha_O)y_j(p_j)+\alpha_L(p_j-p_j^*)m'_j(p_j)+I_L I_j y_j(p_j)h'(.),$$

where I_j is an indicator variable equal to 1 if industry *j* is organized and α_O is the fraction of the total population of voters that are represented by an organized lobby.

Recall that the equilibrium condition is given by (10) and implies:

(13) $$\sum_{i\in O}\frac{\partial G_i}{\partial p_j}+a\frac{\partial G}{\partial p_j}=0,\ for\ j=1,\ \ldots,\ n$$

where *a* is the weight on social welfare. Using equations (6) and (12), first order condition is

(14)

$$(I_i-\alpha_L)y_i(p_i)+(a+\alpha_L)*(p_i-p_i^*)m'_i(p_i)+I_L(a+I_i)y_i(p_i)h'_i(\frac{\pi(\bar{p}_i)-\pi(p_i)}{\alpha_i N})=0$$

Again this FOC might not be satisfied if we are at a corner solution. In that case, the optimal tariff compensates the industry up to the reference price level (we return to this situation below). Ignoring the corner solution for the moment, the optimal trade tax t_i, defined as $t_i=(p_i-p_i^*)/p_i^*$, can be expressed as

$$t_i^o=-\frac{y_i(p_i^o)[(I_i-\alpha_L)+I_L(a+I_i)h'(\frac{\pi(\bar{p}_i)-\pi(p_i^o)}{\alpha_i N})]}{(a+\alpha_L)p_i^*m'(p_i^o)}$$

(15)

We can rewrite this condition as

(16)

$$\tau_i^o=\frac{t_i^o}{1+t_i^o}=\frac{(I_i-\alpha_L)+[I_L(a+I_i)h'(\frac{\pi(\bar{p}_i)-\pi(p_i^o)}{\alpha_i N})]}{a+\alpha_L}\left(\frac{z_i^o}{e_i^o}\right)\quad for\ i=1,2,\ldots,n$$

where $z_i^o=y_i(p_i^o)/m_i(p_i^o)$ is the equilibrium ratio of domestic output to imports and $e_i^o=-m'_i(p_i^o)p_i^o/m_i(p_i^o)$ is the elasticity of import demand or of export supply.

The expression for the equilibrium trade tax is identical to the result in GH except for the behavioral term in square brackets. Many of the insights from the GH framework are carried over. The distortion imposed (subsidy or a tax) declines as the government places more weight on social welfare, expressed through the parameter a. The size of the distortion is positively related to the ratio of domestic output to imports, z_i. If the level of domestic output of an organized sector is high, for a fixed level of import demand elasticity, then the lobby has more to gain from a marginal increase in the domestic price. The contribution schedule will reflect this and the equilibrium protection level will be higher.

The behavioral term, on the other hand, again, introduces important implications for trade policy. One consequence of the GH model is that if all sectors are organized (i.e. I_i=1 for all i) and everybody is represented by a lobby group (α_L=1), then there is free trade in equilibrium. This outcome is due to the fact that interest groups neutralize each other and the interests of the producers are exactly matched by the opposing interests of the consumers. In our setting, trade is distorted even if everybody is represented by a lobby group (i.e. I_i=1 for all i and α_L=1). If all sectors are organized, the equilibrium tariff reverts to

$$\tau_i = \frac{t_i}{1+t_i} = I_L h'(.)\left(\frac{z_i^o}{e_i^o}\right). \tag{17}$$

This tariff level is identical to expression (7) which means when all sectors are political active, the modified social welfare function in (5) is maximized. However, unlike the case in other models, the social optimum involves positive tariffs to compensate for loss aversion. Furthermore, industries with smaller domestic output and high elasticity of import demand (in absolute value) receive lower level of protection and smaller deviations from free trade.

Our modified model also provides an explanation for some of the puzzling results in the recent empirical literature on political economy of protection[12]. Maggi & Goldberg (1999) and Gawande & Bandyopadhyay (2000) aim to predict the relative weights of the forces influencing trade policy based on the GH model. In essence, they estimate

[12] We would like to thank Kishore Gawande for calling our attention to this point.

variations of equation (16), without the loss aversion factor (i.e. $I_L = 0$). For example, in both of these papers' econometric models, protection estimation equation is given by $\tau_i = \gamma \frac{z_i}{e_i} + \delta I_i \frac{z_i}{e_i} + \varepsilon_i$ where I_i is the indicator variable for being politically organized and γ and δ are the coefficients of *z/e* for unorganized and organized sectors, respectively. For example, in case of Goldberg & Maggi (1999), the weight on the social welfare in government's objective function is given from the relationship $a = (\gamma + 1)/\delta$ and they infer a value between 50 and 70 for *a* based on their estimation results. This is rather high indicating that the government attaches 50 times more weight to social welfare compared welfare of organized groups[13]. However, above estimation is not the correct specification when loss aversion is taken into account. Second, even under the above specification, the relationship between a and the estimated coefficients become $a = (\gamma + 1)/[\delta(1 + I_l h')]$ which implies the inferred value of *a* is lower for any given set of estimated coefficients[14].

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World Prices and Domestic Protection

We next explore how equilibrium trade policy and domestic prices respond to changes in the world prices, as we did in the previous section. The distinction is the presence of lobbying behavior and how it responds to changes in the external economic environment. We follow a slightly different path and first show how the protection level and domestic price level are related.

First, consider an industry where the world price is above the reference level. In the government welfare-maximizing model, the industry receives no protection. In the lobbying model, under some mild assumptions, it is straightforward to show that the equilibrium tariff rate of an organized lobby is increasing in the world price—this is the implication of the GH model that we mentioned earlier. Since loss aversion does not enter the objective function of the lobby group (hence, of the government), the standard GH effect derives the result. The reason can be easily seen from the optimal policy

[13] Gawande & Bandyopadhyay (2000) obtain even a higher number for a - around 3,000.

[14] Naturally, the empirical extension of our model needs to be tested properly and might provide further interesting results.

expression in Equation (17). Let $\tau_i = \frac{t_i}{1+t_i}$, then we can rewrite the equilibrium tariff expression as the following, given that I_L=0:

$$(18) \qquad \tau_i = \frac{(I_i - \alpha_L)}{a + \alpha_L}\left(\frac{1}{\varepsilon_y - \varepsilon_d \frac{d_i}{y_i}}\right),$$

where ε_y *and* ε_d are, respectively, the elasticity of domestic supply and demand of sector *i* (note we have $\varepsilon_y > 0,\ \varepsilon_d < 0$). An increase in the world price causes a decline in the domestic demand to supply ratio (d_i/y_i) and hence an increase in the equilibrium tariff level, assuming that the elasticities satisfy certain mild assumptions.[15] This is the region to the right of Point B in Figure 6.

Next, consider the other extreme scenario where world price is so low such that, even with protection, the equilibrium domestic price is below the reference price level. This is the interior solution we identified in the previous section. Then the equilibrium trade policy is given by the following expression which is obtained by manipulating expression (16).

$$(19) \qquad \tau_i = \frac{(I_i - \alpha_L) + [I_L(1 + aI_i)h'(\frac{\pi(\bar{p}_i) - \pi(p_i)}{\alpha_i N})]}{a + \alpha_L}\left(\frac{1}{\varepsilon_y - \varepsilon_d \frac{d_i}{y_i}}\right)$$

In this case, the GH effect, as identified in the previous paragraph, still pushes the protection level to decline when the world price declines. The loss aversion effect works in the same direction due to decreasing sensitivity to losses, expressed as *h"<0*. (Note a decline in world price causes $\pi(\bar{p}_i) - \pi(p_i)$ to increase.) Thus, in this region, the equilibrium protection moves in the same direction with the world price as well. In the welfare-maximizing model, (a=0 and α=1 and I=1) the result will be similar owing to decreasing sensitivity to losses. In Figure 6, this is presented as the region to the left of point A.

[15] For example, it is sufficient for domestic demand and supply functions to have constant elasticity.

The key issue is what happens when the domestic price is at the reference level. This is akin to the corner solution from the previous section. Equations (18) and (19), respectively, provide the equilibrium trade policies when the domestic price is above and below the reference level. We see that expression (19) has a higher value at $\bar{p}$ since h'>0. This means, when the domestic price is slightly below the reference point, the protection level is higher compared to the price slightly above reference point. Therefore the tariff level at point A is higher than the tariff level at B in Figure 6.[16]

The next step is to determine the relationship between the equilibrium trade policy and world prices. The same logic prevails as in the welfare-maximizing case from the previous section. In Figure 6, let tariff levels at points A and B be denoted as τ_A and τ_B respectively. Although the domestic price is identical at A and B, world prices are different since the world price is given by $p^*=p(1-\tau)$. More specifically, at the corresponding world prices, we have $p^*_A < p^*_B$. The relationship between world prices and trade policy for prices lower than p^*_A and higher than p^*_B is given from the discussion above and is presented in Figure 7. The question is what happens to protection for world prices *between* p^*_A and p^*_B. We know that the domestic price has to be constant at the reference level $\bar{p}$ in this range. In other words, $p^*/(1-\tau) = \bar{p}$ for $p^*_A < p^* < p^*_B$, which means that the protection level will be declining in world prices. Thus, the relationship between world prices and protection exhibits the pattern in Figure 7, where the distance between p^*_A and p^*_B depends on the extent of loss aversion, the steeper is the loss aversion function, the further apart they will be.

Figure 7 provides very interesting insights about the pattern of trade policy compared to standard political economy models where there is generally a positive correlation between the world price and the protection level. Firms still receive increasing protection when the world price is high. This can be interpreted as pertaining to sectors where domestic firms are competitive in world markets and are exporters. We

[16] The shape of the function to the right of the reference price depends on the shape of d_i/y_i. In general, it will be convex since a marginal increase in the tariff level is worth more when the industry is larger. The same intuition will hold to the left of the reference price, moreover, diminishing sensitivity to losses implies that a marginal increase in price close to the reference level is worth more than a marginal increase away from the reference price.

should note this is different than the results of the previous section where there is no protection for prices above the reference point due to absence of lobbying. However, large exporters lobby the government extensively for many export-friendly policies, that are not direct subsidies but nevertheless tied to export performance. For example, consider the U.S. Foreign Sales Corporations tax provisions (and the replacement tax plan), which effectively provide some 6,000 companies—including some of the largest exporters such as Microsoft, Boeing, and Cisco Systems—with a tax break on up to 30 percent of export earnings and are worth $4 billion to U.S. exporters.

As the world price declines, so does protection, until we reach p^*_B. This is a critical point since the corresponding domestic price is at the reference level $\bar{p}$. If the foreign price continues to decline, the government implements trade policies that exactly offset these negative shocks. The region between p^*_A and p^*_B reflects the price range for which the government perfectly shields domestic firms from negative world price shocks. This region of *compensating protection* is that same as in the previous section. The behavioral effect outweighs the standard effect (even combined with the additional effect of lobbying) when the price level is not too far below the reference level, pushing the domestic price level back to its reference level. The domestic price never rises above the reference price because agents no longer experience loss aversion when price is above $\bar{p}$.

If the world price were to fall below p^*_A, the marginal cost of protection becomes too high in terms of lost consumer surplus (recall consumer surplus is declining and concave in prices) whereas the marginal benefit is too low (since the producer surplus is increasing and convex in prices). In addition, the loss aversion exhibits declining sensitivity which operates in the same direction as the above effect. Thus, protection starts to decline as the world price continues to fall below p^*_A. At some point, it is possible that the domestic industry disappears and so does protection.

In short, when behavioral assumptions are introduced, trade policy no longer exhibits a monotonic relationship with the world price as is predicted by the GH model. In particular, the region of compensating protection found in the government-maximizing model will be maintained even though the cutoff points (such as p^*_A) naturally depend on lobbying model's parameters. This structure explains some of the puzzles that had gone unexplained. In the next section, we discuss contingent protection and the extent to which it is used to maintain prices above a given level.

VI. Trade Protection in Practice

An important prediction of loss aversion and reference dependence in both models is the region of compensating protection, where tariffs are geared toward maintaining a domestic price at a specific level. When closely observed, the vast majority of the most restrictive trade policy instruments are designed explicitly to limit the extent to which world price *declines* are transmitted to the domestic economy. Quota restrictions, voluntary export restraints, safeguards, and price floors, only bind when the world price is low and falling.[17] Other tools of temporary protection, such as antidumping duties and the escape clause, are only used in a weak price environment. In addition, in developing countries, bound tariffs are set well above actual levels so that governments have the flexibility to raise them when conditions worsen.

Empirical evidence also shows that industries experiencing losses are much more likely to receive protection than otherwise similar growth industries. Marvel and Ray (1983) and Ray (1991) find that protection is geared toward declining industries, and Trefler (1993) finds that protection is higher in ones in which import penetration has increased. In addition, countries have resisted liberalization in industries with declining employment and rising import penetration (Baldwin 1985).[18]

The most restrictive instruments of protection tend to be geared toward maintaining incomes and prices in declining sectors. We follow with some examples from the United States. Quotas are perhaps the most restrictive policies in the United States, protecting the highly "sensitive" sectors of agriculture and textiles and apparel, and can be easily manipulated to preserve prices. For example, a carefully-managed system of bilateral quotas has kept the U.S. sugar price above $0.20 a pound since 1985, despite low and highly volatile world prices (see Figure 8). The program uses a combination of tariff-rate quotas and loan guarantees to maintain the price. Because

[17] VRAs and quotas are still an anomaly since in general they transfer rents to the foreign producer as opposed to a tariff which keeps rents through the revenue generated.
[18] Baldwin (1989) remarks that loss aversion is a possible explanation.

expanding supplies and falling world prices, quotas have been declining during much of this period. A similar program is employed in Europe.

Despite their name, antidumping duties, now the leading source of contingent protection, are sought and imposed to prevent sector-specific losses and not to counteract dumping.[19] For example, the steel industry, by far the largest user of U.S. antidumping law,[20] has historically benefited from many types of protection. The policies were clearly geared toward maintaining prices—as evidenced by the 1977 trigger-price mechanism, which established a minimum import price, and a series of voluntary restraint agreements. As those types of protection were gradually eliminated by the GATT, the sector has turned to antidumping to prevent losses when prices declined. A particularly interesting feature of the steel industry, which further demonstrates that antidumping is about losses, is that during world price slumps only a *declining subsector*, the integrated producers, called for protection. From 1969 to 1999, price declines led to increased calls for protection from the old-fashioned integrated producers, where production was declining and profits were falling. In contrast, minimills, which used new electric-arc technology and experienced output and profit growth, refused to sign on to antidumping petitions. Figure 9 shows the U.S. and world prices of steel. Again, the clear picture is of one where domestic firms are sheltered from price declines. Before March of 1999, average domestic prices were kept above $350 per metric ton while the world price fluctuated between $230/ton and $450/ton. Only in recent years, as the integrated sector shrunk and many plants were shut down, protection level began to decline and domestic prices finally broke the $350/ton barrier.

Limiting losses is reflected in U.S. Trade Adjustment Assistance program as well. For example, the extent of assistance provided to farmers is based on the difference between the current price and the average price of a given product over the last five years, i.e. the industry losses. This is rather different from the estimated cost of adjusting to a more competitive environment, which is the original motivation behind the program.

In sum, the main forms of protection in use today are initiated by price declines and appear to be guided by a desire to maintain domestic prices above some reference

[19] See Tharakan (1996) for a survey of the evidence.
[20] About half of the more than 200 antidumping orders currently in force are on imported steel.

level. Only when industries decline sufficiently, does protection begin to be phased out. The elimination of the apparel quotas established decades ago under the Multi-Fiber Agreement (MFA) is a typical example of this phenomenon.

VII. Conclusion

We augment a standard government welfare-maximizing model and the Grossman-Helpman model of lobbying for protection with assumptions borrowed from behavioral economics. The G-H model is attractive because it provides micro-foundations for the abundance of lobbying and protection observed in the United States and other countries. But by employing a standard utility function, the model cannot explain why protection should be so concentrated among declining industries. This is an area where loss aversion plays an important role, as industries are noticeably more vocal when profits fall than when they rise. We find that incorporating loss aversion and reference dependence into the agent's utility function helps explain many of the interesting features of the structure and the dynamics of protectionist policies.

Of particular interest, the models produce an intermediate range of world prices for which a price decline leads to an offsetting increase in protection. We show that this region of compensating protection is increasing in the extent of loss aversion experienced by agents. This result provides intuition for why so many of the instruments of protection that have been employed around the world, such as price floors and import quantity restrictions, focus on maintaining domestic prices at a given level.

While the model does not directly address the anti-trade bias, it provides several reasons why an anti-trade bias may result. One, negative shocks may be more likely to occur in import-competing industries where comparative advantage does not lie than in the export sector where technology tends to be improving. Two, if tariffs have been in place historically for revenue reasons, then the attempt to dismantle them should be met with resistance primarily from the import-competing sectors that have the most to lose. Three, it may have to do with the perceived fairness of tariffs versus subsidies—an area we have touched on with our survey but that warrants future research.

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Figure 1: The Welfare Function and Loss Aversion

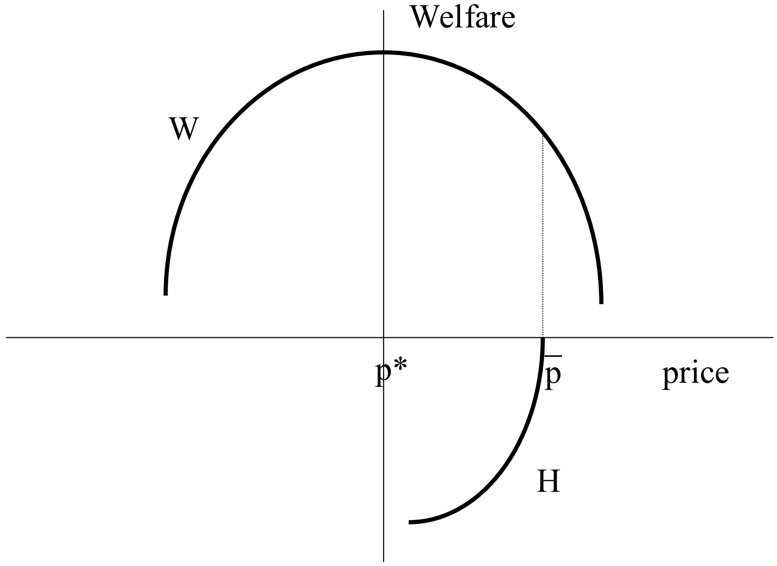


Figure 2: An Internal Solution

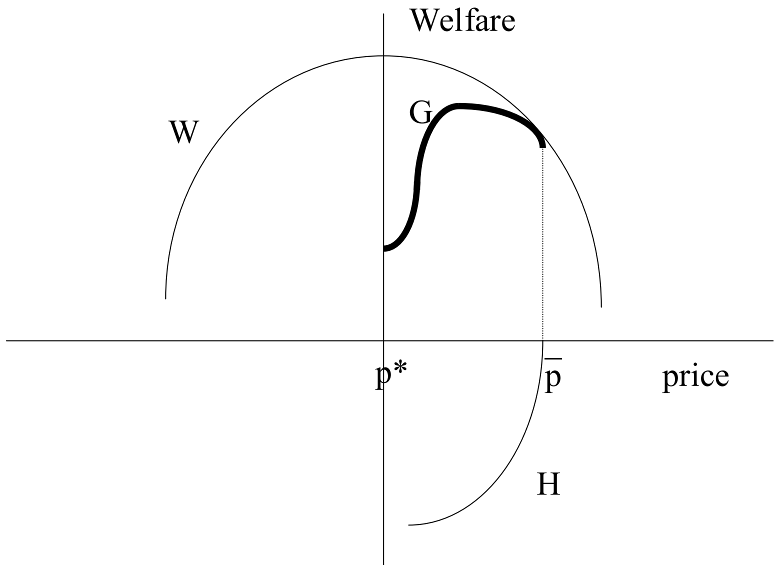


Figure 3: A Corner Solution

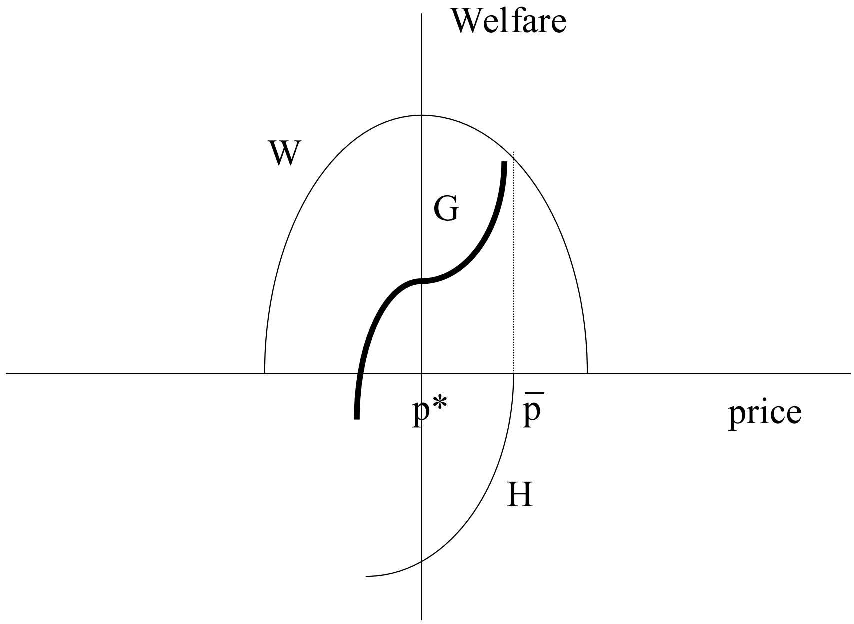


Figure 4: The Domestic Price as a Function of the World Price

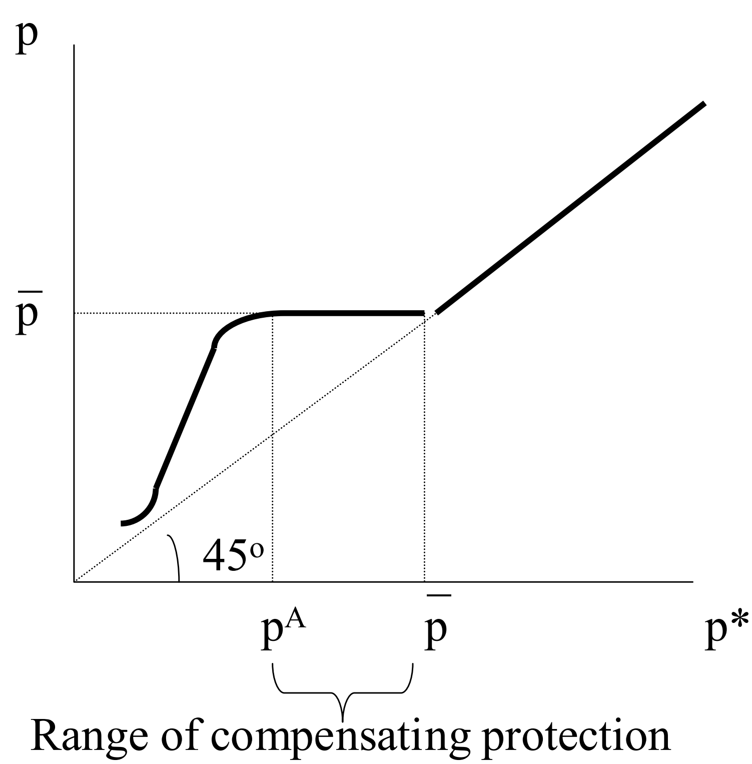


Figure 5: The Tariff as a Function of the World Price

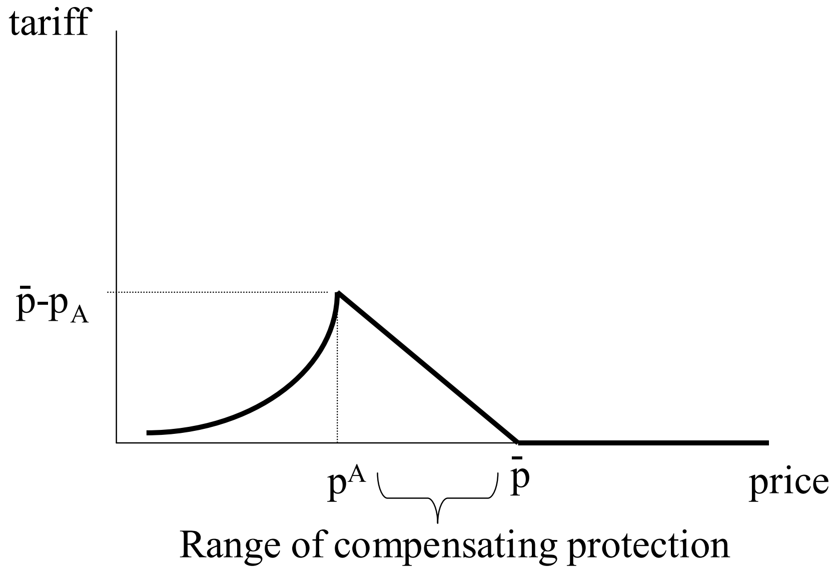


Figure 6: Tariffs and the Domestic Price With Lobbying

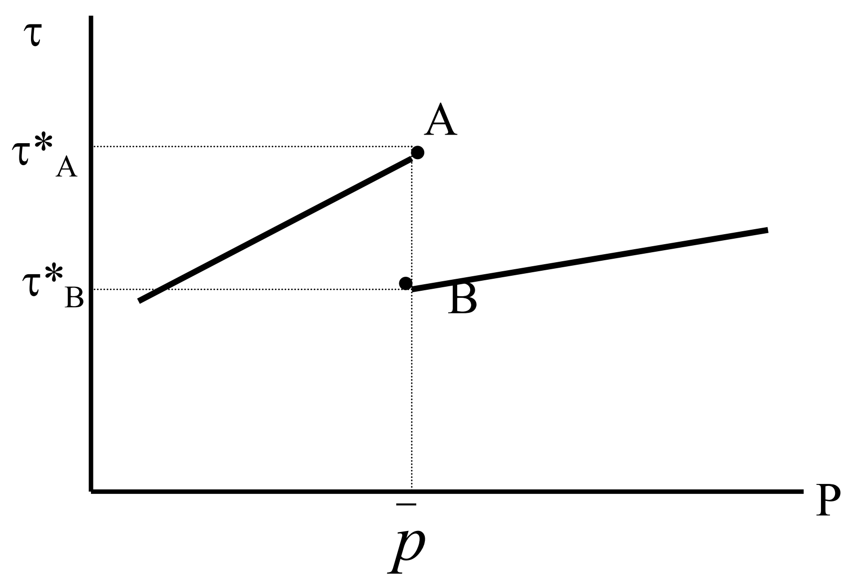


Figure 7: Tariffs and the World Price with Lobbying

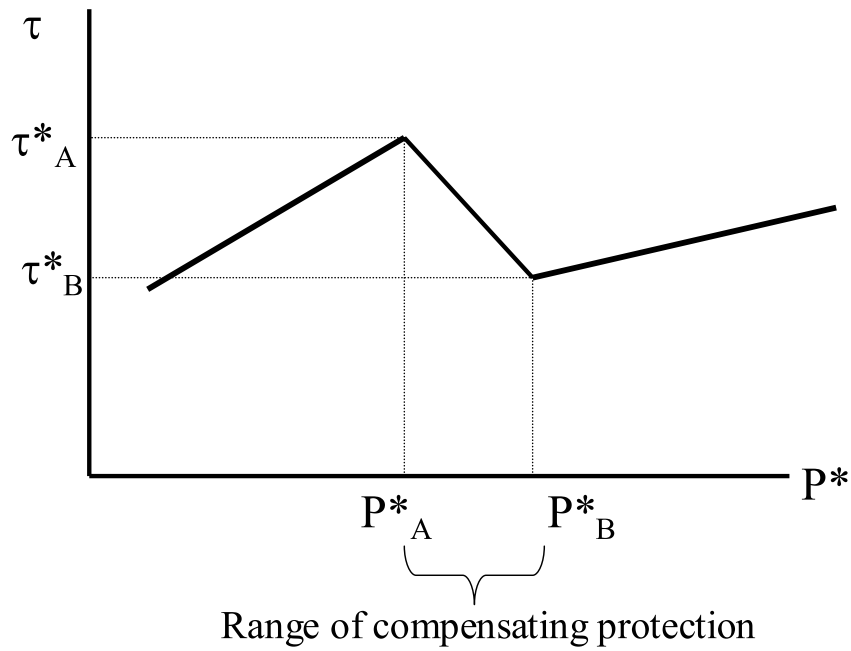
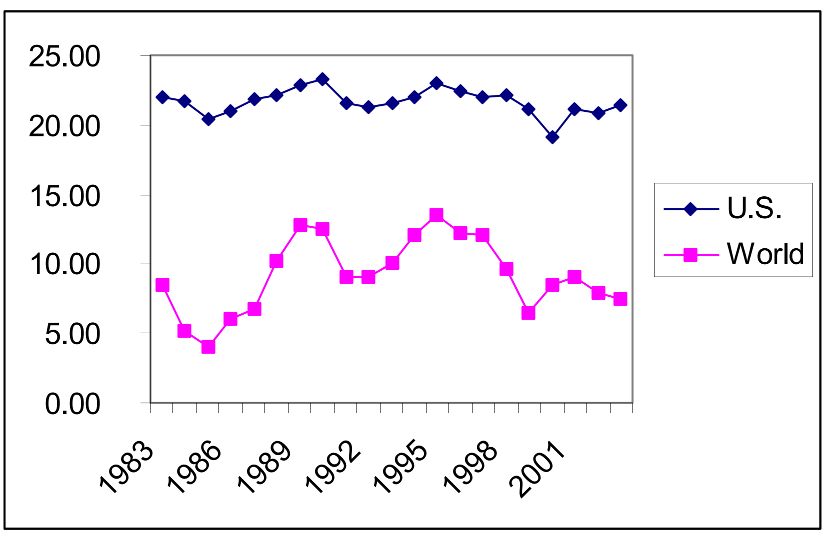


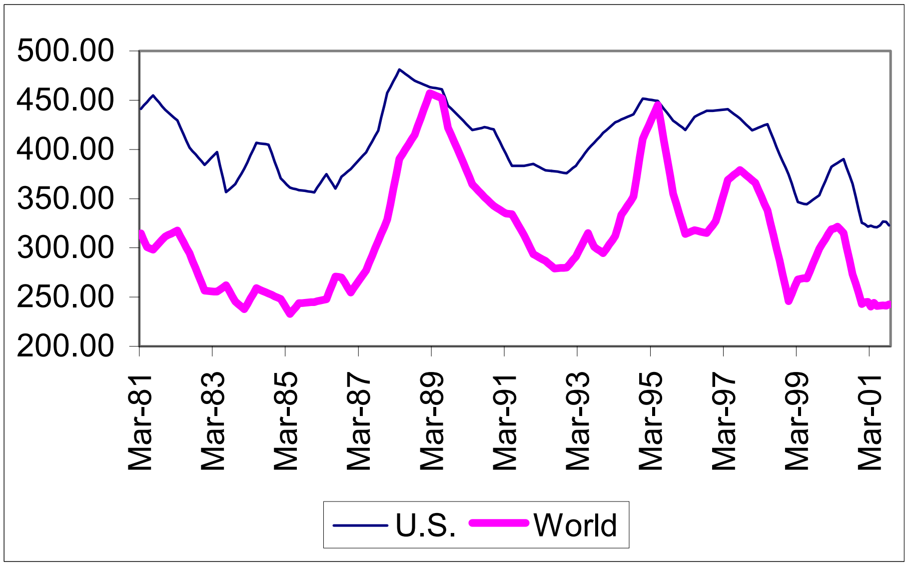
Figure 8: Raw Sugar Prices

(U.S. cents/Lb)



Average annual data calendar year
Source: U.S. Board of Trade.

Figure 9: Steel Prices
($U.S. per metric ton)



Average 12 month moving average price for beams, plate, hot-rolled, cold-rolled and rebar. Source WSD Pricetrack.