Endogenous Tariff Formation and The Political Economy of Retaliation, Liberalization and Trade Wars under Representative Democracy: A Probabilistic Voting Model

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Abstract

This paper extends the notion of endogenous tariff formation under representative democracy by allowing for strategic interaction between governments. Given the risk of tariff retaliation, the model developed suggests that the ideological distribution in the electorate within a country affects the tariff setting behavior among its trading partners. The equilibrium tariffs in a country depend on the trade-policy preferences of the ideologically neutral voters among such partners, as well as on the distribution of their sector-specific factor ownership. Ideological shifts in the population that systematically alter the political power of different voter groups, or types of factor owners, in one country thus influence the tariff setting behavior in competing trading nations. The magnitude of this effect is larger if the domestic electoral arrangements are governed by a proportional representation as compared to a majoritarian system.

Keywords: Endogenous tariff formation; Retaliation; Trade policy; Political institutions

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1 Introduction and Related Literature

In March of 2002, President Bush agreed to place steel tariffs, from 8 percent to 30 percent, on imported steel for the next three years and let U.S. steel catch up with the foreign competition. The tariffs protected steel production in states that could be vital in the 2004 presidential election: Pennsylvania, Ohio and West Virginia. To punish President Bush, Europe declared it would put taxes on goods from states that were equally important to his reelection bid—like oranges from Florida, textiles from North and South Carolina, and apples from Washington State. This trade dispute case illustrates the main point of the present paper, that the political climate in a country, mediated through economic mechanisms, partly determines the foreign tariffs imposed on domestic exports.

There is a vast literature on policy determination in representative democracies. Yang (1995), for example, investigates endogenous tariff formation, where the equilibrium tariff is shown to be a weighted mean of domestic voters' most preferred tariffs. The model abstracts from international trade relations and policy interdependence, which affect the objectives of real world governments; especially if the country is small, its trade policy choices may depend heavily on those of other countries (see, e.g., Gawande and Hansen [1999] for an empirical application on this subject). Hence, in contrast to the referred to U.S.–EU dispute, the political environment and the voting behavior in one country cannot influence trade policy outcomes elsewhere in such a setting. The current paper allows for this possibility by considering the political equilibrium protectionist behavior of one country, given the risk of a competing trading nation retaliating in response to that protection.[1] This paper thus extends the notion of endogenous tariff formation under representative democracy by incorporating a dynamic political process of protection, retaliation and trade wars, where domestic electoral competition—as well as the type of electoral rule employed—restrict foreign economic policy.

In the game-theoretic approach to trade policy, a government retaliates, liberalizes, or follows a mixed strategy to maximize its own country's welfare, rather than having its behavior determined by more fundamental individual activities such as voting or lobbying. These theories have partly focused on the actions and interactions of autonomous governments. For example, in his

[1] Gawande (1995) shows empirically that U.S. trade policy is significantly driven by retaliatory motivations against its major trading partners.

seminal paper on "Optimum Tariffs and Retaliation"(1954) Harry Johnson showed how policy interdependence could be modeled as a noncooperative equilibrium of a two-country tariff game. This strand of literature emphasizes the pure strategic interactions between governments in which firm-level behavior is either perfectly competitive or suppressed entirely. More recent contributions have demonstrated that trade policies in imperfectly competitive market structures have different welfare implications from those under perfect competition. In particular, Brander and Spencer (1984a, 1984b) use Cournot duopoly and a reciprocal-markets model to show the use of tariffs to shift profits from foreign firms to domestic claimants.

However, although the case for such strategic trade policy is appealing, the United States has rarely acted in this manner (Dixit, 1987). Indeed, as Stigler (1971), Pelzman (1976) and others have argued, governments seldom pursue policies designed to maximize social welfare. Rather, governments maximize their vote share, and in doing so, implement political decisions that reflect the objectives of the most powerful and well-organized self-interest groups. For this reason, economists have developed a wide-variety of political economy approaches to explain the formation of trade policy. Some of these models focus on the role of lobbying activity in the shaping of trade protection (see for example Findlay and Wellisz [1982]; Hillman [1982]; Magee, Brock, and Young [1989]; Grossman and Helpman [1994]), while others postulate that the tariff schedule is developed according to the preferences of the domestic electorate. Wolfgang Mayer (1984), for example, applied Duncan Black's (1948) median-voter theorem to investigate endogenous tariff formation under direct democracy. The extension from direct to representative democracy is straightforward if candidates possess perfect information. Nevertheless, if candidates possess imperfect information, which is believed typical in the real world, the equilibrium tariff is no longer the most preferred tariff of the median voter, but is a weighted mean of domestic voters', or groups' of domestic voters, individually optimal tariffs (Yang, 1995). The weights correspond to group size, and to how responsive the voters in each group are to trade policy. That is, how each group rewards policy with votes at the elections. Ideologically homogenous and politically neutral (indifferent) groups have a large number of swing voters and are more responsive to policy; they are thus more likely to reward politicians with votes, and therefore obtain a tariff closer to their bliss point. The implicit assumption made is that of a small or isolated country, one that sets trade policy without regard to the extant policies and possible reactions of its trade partners.

Therefore, this model does not take into account the extent to which international economic relations affect domestic politics. In other words, such a framework does not capture the notion of policy interdependence and the ongoing strategic interaction between governments to be observed in the international arena of trade and investment.

The present paper addresses these issues using a formulation that allows for probabilistic voting (Lindbeck and Weibull, 1987) in a trade policy setting (Gould and Woodbridge, 1998), which models the process of protectionism, liberalization and retaliation as a policy game between two trading nations: home and foreign. In doing so, the analysis introduces aspects of the political economy of trade policy into a strategic environment where interdependent firms and governments interact, hence, combining elements from the two different approaches to conduct trade policy referred to above. The purpose is to clarify how the political climate in one country restricts policy outcomes in another, and how ideological shifts in the domestic electorate influence politicians and condition their trade relations with foreign counterparts under different electoral rules.

Specifically, the following set up is considered. The market structure is characterized by a symmetric duopoly, and the equilibrium concept is that of Cournot. In each country a given fraction of the population owns a specific factor used in the exporting sector, and consequently has a direct stake in this industry. The remaining individuals are the owners of a specific factor used by the import-competing sector, and therefore have a common interest in this industry. A probabilistic voting procedure determines the countries' tariff policies. The tariff choices, in turn, affect the international economy and the welfare of voter groups or types of factor owners. On the basis of this framework it is argued that the equilibrium level of protection in the tariff setting country is a weighted mean of the sector-specific densities of the expected domestic swing voters, in accordance with the findings of Yang (1995), as well as of those of the ideologically neutral voters in competing trading nations. It follows that ideological shifts in the population that systematically alter the political power of different voter groups in a country, also influence the tariff setting behavior among its trade partners.[2] In par-

[2]Kim and Fording (2001) identify several internal and external factors causing shifts in voter ideology. With respect to domestic influences, the state of the country's national economy, primarily inflation, seems to drive movement in voter ideology in a most significant way. The direction of this relationship is, however, dependent on the ideological disposition of the incumbent government. With respect to international influences, they

ticular it is shown that increasing the mass of swing voters with a common interest in the home country's import-competing (exporting) sector increases (decreases) the politically optimal level of protection in the tariff setting foreign country. This effect becomes more pronounced if the electoral arrangements in home are governed by a proportional representation instead of a majoritarian system. Furthermore, an interesting implication of the analysis is that tariffs are higher under proportional electoral regimes as compared to majoritarian institutions if marginal (swing) districts are populated by relatively more factor owners with stakes in the exporting industry.

The remainder of the paper proceeds as follows. Section 2 outlines the basic economic model in a two-country setting, characterizes voter utility and the market structure. Section 3 describes the assumptions and timing of the trade policy game, defines the retaliation equilibrium as well as voter welfare. The equilibrium level of protection in both countries is solved for, and the trade policy effects of ideological shifts among different voter groups are then considered. Section 4 is devoted to analyzing how the results of Section 3 vary with the type of electoral rule employed in home, and Section 5 concludes the paper.

2 Formal Framework and Industry Structure

The economic model developed in this section combines the features of the specific factors approach modified as in Grossman and Helpman (1994) to characterize voter welfare, with the Gould and Woodbridge (1998) framework to model industry structure and the behavior of firms, which in turn is based on the theoretical work by Harris (1985).

2.1 Voter Utility and the Behavior of Firms

Consider trade between two countries—home and foreign—that are symmetric in terms of tastes and technology. In each country there is an exporting firm, an import-competing firm, and a firm producing a numeraire good.[3]

find significant ideological diffusion across neighboring countries of Western democracies. The effects of ideological diffusion are strongest within countries that are small relative to their neighbors. They also find that ideology is influenced by the international political environment, especially the level of East-West tension during the Cold War.

[3]As Gould and Woodbridge (1998) point out, the model could be generalized to allow for many firms in each sector. The assumption that there is a single firm in each industry

The numeraire good is manufactured from labor alone with constant returns to scale and an input-output coefficient equal to one. By assumption, the aggregate supply of labor is large enough to ensure a positive supply of this good, and, as long as the numeraire sector is active, the constant marginal product of labor fixes its economy-wide return to unity. Production of each export and import-competing good requires labor and a sector-specific input. The technologies for these goods exhibit constant returns to scale, and the specific factors are supplied inelastically.

The home (foreign) country exporting firm sends its entire export production to the foreign (home) market and engages in Cournot competition with the foreign (home) import-competing firm. The goods are imperfect substitutes in consumption, and the production possibilities of the sectors are summarized by profit functions that, at the same time, represent aggregate factor rewards of the respective specific inputs.

A large number of individuals with identical preferences but different factor endowments populate both countries. The size of the national (voting) population is normalized to unity. Following Harris (1985), each individual in the home country maximizes utility given by:[4]

$$U = m + c_Y Y + c_Y^* Y^* - \frac{d_Y Y^2}{2} - \frac{d_Y^* Y^{*2}}{2} + \Gamma_Y Y Y^*, \tag{2.1}$$

where m is consumption of the numeraire good with the price normalized to one, Y (Y^*) is the quantity of the home (foreign) produced import-competing (exporting) good supplied to the home market at the price P_Y (P_Y^*), and the nonnegative term, Γ_Y, denotes the substitutability in consumption.[5] With these preferences, an individual spending an amount E demands:[6]

$$P_Y = a - bY + \gamma_Y P_Y^*, \tag{2.2}$$

and

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is made for simplicity.

[4]The quadratic form is adopted for analytic convenience.

[5]Restrictions on the utility function include positive marginal utilities: $c_Y - d_Y Y + \Gamma_Y Y^* > 0$, $c_Y^* - d_Y^* Y^* + \Gamma_Y Y > 0$ and concavity, or $d_Y > 0$, $d_Y^* > 0$ and $d_Y d_Y^* - \Gamma_Y^2 = D > 0$.

[6]Let $c_Y = c_Y^* = c$ and $d_Y = d_Y^* = d$, then the positive parameters in the demand functions are related to the utility function parameters as follows: $a = \frac{c(d+\Gamma_Y)}{d}$, $b = \frac{D}{d}$ and $\gamma_Y = \frac{\Gamma_Y}{d} \in [0, 1)$, since $d > \Gamma_Y$.

$$P_Y^* = a - bY^* + \gamma_Y P_Y, \tag{2.3}$$

home produced import-competing goods and foreign exports respectively, and $m = E - \left[\frac{a(1+\gamma_Y)-b(Y+\gamma_Y Y^*)}{1-\gamma_Y^2}\right] Y - \left[\frac{a(1+\gamma_Y)-b(Y^*+\gamma_Y Y)}{1-\gamma_Y^2}\right] Y^*$ numeraire goods.[7] Indirect utility takes the form:

$$V = E + s(Y, Y^*, \gamma_Y), \tag{2.4}$$

where $s(\cdot) \equiv c(Y + Y^*) - \frac{d(Y^2+Y^{*2})}{2} + \Gamma_Y Y Y^* - \left[\frac{a(1+\gamma_Y)-b(Y+\gamma_Y Y^*)}{1-\gamma_Y^2}\right] Y - \left[\frac{a(1+\gamma_Y)-b(Y^*+\gamma_Y Y)}{1-\gamma_Y^2}\right] Y^*$ is the consumer surplus per capita.

The foreign country is modeled symmetrically to the home country:

$$V^* = E^* + s^*(X, X^*, \gamma_X). \tag{2.5}$$

Likewise, $s^*(\cdot) \equiv c(X+X^*) - \frac{d(X^2+X^{*2})}{2} + \Gamma_X X X^* - \left[\frac{a(1+\gamma_X)-b(X+\gamma_X X^*)}{1-\gamma_X^2}\right] X - \left[\frac{a(1+\gamma_X)-b(X^*+\gamma_X X)}{1-\gamma_X^2}\right] X^*$ is the foreign consumer surplus derived from consuming the goods produced by the home exporting firm and the foreign import-competing firm, where X (X^*) is the quantity of the home (foreign) produced exporting (import-competing) good supplied to the foreign market at the price $P_X = \frac{a(1+\gamma_X)-b(X+\gamma_X X^*)}{1-\gamma_X^2}$ $\left[P_X^* = \frac{a(1+\gamma_X)-b(X^*+\gamma_X X)}{1-\gamma_X^2}\right]$, and $\gamma_X = \frac{\Gamma_X}{d} \in [0, 1)$ reflects the substitutability in consumption.

A typical individual owns one unit of labor and derives income from wages—either by working in the exporting, import-competing or the numeraire sector—from government transfers in the form of tariff revenues redistributed uniformly to the public, and from the ownership of some domestic sector-specific factor. By assumption, claims to these specific inputs are indivisible and nontradable (e.g., claims to sector-specific human capital), and the representative individual owns at most one type. Then, clearly, those who own some of the specific factor used in a particular sector will have a direct stake in the tax applicable to trade in the good produced by the industry in question that goes beyond their general interest as consumers in trade policies that affect any domestic prices.

[7] Combining (2.2) and (2.3) yields: $P_Y = \frac{a(1+\gamma_Y)-b(Y+\gamma_Y Y^*)}{1-\gamma_Y^2}$ and $P_Y^* = \frac{a(1+\gamma_Y)-b(Y^*+\gamma_Y Y)}{1-\gamma_Y^2}$.

There is no entry into an industry, and without loss of generality marginal production costs are normalized to zero. Each firm within a sector selects an output level to maximize its profit, given the output level of its competitor, and the home (foreign) firm exporting to the foreign (home) country faces a specific tariff, t_X^* (t_Y).[8] Under these assumptions it can be shown that the equilibrium profit of the home exporting firm is:

$$\Pi_X(\beta_X^*) = \frac{(1+\gamma_X)a^2(1-\beta_X^*)^2}{b(1-\gamma_X)(2+\gamma_X)^2}, \tag{2.6}$$

and the profit of the foreign import-competing firm is:

$$\Pi_X^*(\beta_X^*) = \frac{(1+\gamma_X)a^2\left(1+\frac{\gamma_X\beta_X^*}{2}\right)^2}{b(1-\gamma_X)(2+\gamma_X)^2}, \tag{2.7}$$

where $\beta_X^* = \frac{t_X^*}{\bar{t}_X^*} \in [0,1]$ is the foreign tariff as a proportion of the prohibitive foreign tariff, $\bar{t}_X^* = \frac{a(2-\gamma_X)}{2(1-\gamma_X)}$.

In the other industry, the profit function of the home import-competing firm is:

$$\Pi_Y(\beta_Y) = \frac{(1+\gamma_Y)a^2\left(1+\frac{\gamma_Y\beta_Y}{2}\right)^2}{b(1-\gamma_Y)(2+\gamma_Y)^2}, \tag{2.8}$$

and the profit of the foreign exporting firm is:

$$\Pi_Y^*(\beta_Y) = \frac{(1+\gamma_Y)a^2(1-\beta_Y)^2}{b(1-\gamma_Y)(2+\gamma_Y)^2}, \tag{2.9}$$

where $\beta_Y = \frac{t_Y}{\bar{t}_Y} \in [0,1]$ is the home tariff as a proportion of the prohibitive home tariff, $\bar{t}_Y = \frac{a(2-\gamma_Y)}{2(1-\gamma_Y)}$.

It can be verified by inspection of (2.7) and (2.6) ([2.8] and [2.9]) that the profit of the foreign (home) import-competing firm is increasing in the foreign (home) tariff, β_X^* (β_Y), and that the profit of the home (foreign) exporting firm is decreasing in β_X^* (β_Y). An increase in the foreign (home) tariff leads foreign (home) consumers to substitute imported goods for their own domestically produced good. This substitution increases the output and profit levels of the foreign (home) import-competing firm at the expense of

[8]This paper only considers the case in which government policy is limited to an import tariff instrument.

the home (foreign) exporting firm. The larger is γ_X (γ_Y), the greater will be the substitution towards the foreign (home) produced import-competing good, and the larger will be the impact of an increased tariff on profit.

3 The Political Process of Tariff Retaliation, Liberalization and Trade Wars

The timing of the political economy game developed in this section is a modified version of the one in Gould and Woodbridge (1998).

3.1 Game Structure and Assumptions

To begin with, assume that the countries are symmetric in terms of their constitutional rules.[9] Then the following 3-stage game is to be considered. At the first stage, the foreign country through a simple-majority, two-candidate electoral contest, determines what its tariffs against the home country will be for that period. To analyze the tariff formation process, the probabilistic voting model adapted by Lindbeck and Weibull (1987) is applied. Apart from their general interest as consumers, individuals who own some of the specific factor employed in the foreign import-competing industry prefer high tariffs, since this implies a greater profit for the sector (or an increased aggregate reward to the input in question)[10], whereas owners of the factor used by the foreign exporting sector favor a relatively lower level of trade protection, because of the risk that high tariffs will cause the home country to retaliate.[11]

In the second stage, after the foreign country's politically optimal tariff is determined, the home country decides whether to threaten retaliation against

[9]The assumption of national constitutional symmetry is made for simplicity; it does not change the nature of the results.

[10]Ellingsen and Wärneryd (1999) make the point that an import-competing industry may not want maximal protection. The reason is that a high level of protection encourages inward foreign direct investment (so-called tariff-jumping), which could be even less desirable than import competition. However, in this paper such issues have been ruled out by assumption, since there is no entry into an industry.

[11]Indeed, econometric studies (using micro-level survey data) on individual trade policy preferences by Balistreri (1997), Beaulieu (2002), Scheve and Slaughter (2001) find that the type of factor ownership has been the dominant determinant of support for, or opposition to, trade barriers for both Canada and the U.S.

the foreign country or not; that is, to set $\beta_Y = 1$ or $\beta_Y = 0$.[12] Individuals who own claims to the specific input used in the home country import-competing industry always support retaliation. In contrast, the owners of the specific factor employed by the exporting sector prefer free trade when foreign tariffs are low, but favor a retaliatory response when foreign tariffs are high. The reason is that the higher are foreign tariffs, the less they will lose if the retaliation causes a trade war, and the more they will have to gain if it leads to a liberalization in the foreign country. The game ends in the second period if home does not retaliate.

In the third stage, if the home country threatens retaliation, the foreign country can either liberalize ($\beta_X^* = 0$) or raise protection and move towards autarky ($\beta_X^* = 1$). There is asymmetric information about whether the retaliation policy will be successful.

3.2 Foreign Protection, the Decision to Retaliate and Welfare

A subgame perfect equilibrium outcome of this game is solved by backward induction. Initially, assume that trade between the two countries is free of tariffs, but then the foreign country (F) decides to impose a tariff on the home country's exports. Because the trade tax reduces access of the home exporting firm to the foreign market, the home country (H) chooses in the second stage whether to retaliate (R) or not (NR), given the foreign tariff. Retaliation involves setting a prohibitive tariff ($\beta_Y = 1$), which is removed if the foreign country liberalizes. The decision not to retaliate leaves the home tariff unchanged ($\beta_Y = 0$).

Retaliation can lead to one of two outcomes at the third and final stage. Either the foreign country liberalizes, which reestablishes free trade (i.e., $\beta_X^* = 0$ and $\beta_Y = 0$), or the foreign country counter-retaliates, which leads to a trade war and autarky (that is, $\beta_X^* = 1$ and $\beta_Y = 1$). The outcome of the retaliation is unknown. Assume that home believes the probability of successful retaliation is ρ.[13] Then the expected profit of the home exporting firm is found by setting $\beta_X^* = 0$ with probability ρ, and $\beta_X^* = 1$ with probability $1 - \rho$ in (2.6):

[12] Which country initially imposes the tariff is not important. The aim is to solve for the equilibrium trade tax of one country given the risk of retaliation.

[13] This parameter could be endogenized without changing the results of the paper.

$$E\Pi_X^R = \frac{\rho(1+\gamma_X)a^2}{b(1-\gamma_X)(2+\gamma_X)^2}, \tag{3.1}$$

and the expected profit of the home import-competing firm is given by letting $\beta_Y = 0$ with probability ρ, $\beta_Y = 1$ with probability $1-\rho$ in (2.8) and rearranging terms:

$$E\Pi_Y^R = \frac{(1+\gamma_Y)a^2}{b(1-\gamma_Y)(2+\gamma_Y)^2}\left[1+(1-\rho)\gamma_Y\left(1+\frac{\gamma_Y}{4}\right)\right]. \tag{3.2}$$

The corresponding expected welfare level of the representative owner of the specific factor used by sector $j = X, Y$ in the home country is consequently:[14]

$$EW_j^R = l + \frac{E\Pi_j^R}{\alpha_j} + \rho s(\beta_Y = 0) + (1-\rho)s(\beta_Y = 1), \tag{3.3}$$

where $l = 1$ is the labor supply—and also labor income, either from working in the exporting, import-competing or the numeraire sector—of an owner of the specific input employed in industry j, and α_j represents the fraction of the voting population that owns some of this factor.

If the home country does not retaliate, the profits of the two firms are:

$$\Pi_X^{NR} = \frac{(1+\gamma_X)a^2(1-\beta_X^*)^2}{b(1-\gamma_X)(2+\gamma_X)^2}, \tag{3.4}$$

and

$$\Pi_Y^{NR} = \frac{(1+\gamma_Y)a^2}{b(1-\gamma_Y)(2+\gamma_Y)^2}. \tag{3.5}$$

The welfare function is accordingly:

$$W_j^{NR} = l + \frac{\Pi_j^{NR}}{\alpha_j} + s(\beta_Y = 0). \tag{3.6}$$

The effects of retaliation, or no retaliation, on voter welfare can thus be represented by conventional surplus measures, i.e., by changes in profits, government revenues and consumer surplus. The welfare loss of the prohibitive

[14] $EW_j^R = \rho W_j^R(\beta_X^* = \beta_Y = 0) + (1-\rho)W_j^R(\beta_X^* = \beta_Y = 1) = l + \frac{E\Pi_j^R}{\alpha_j} + \rho s(\beta_Y = 0) + (1-\rho)s(\beta_Y = 1)$. Note that government revenues from trade taxes ($t_Y Y^* = \beta_Y \bar{t}_Y Y^*$) are absent in (3.3), since $Et_Y^R Y^* = 0$.

tariff is due to the absence of imports, leaving consumers in home worse off. The gains, that shift profits from the foreign firm to domestic claimants, consist of the expected change in the profit of the home exporting firm for those who own the specific input used in this sector, and, for individuals that own the specific factor used by the import-competing industry, the marginal surplus associated with the expansion of output and profit levels following the retaliatory tariff.

Under risk neutrality, the owners of the specific factor used by the home exporting firm will prefer a policy of retaliation if and only if $\beta_X^* > 1 - \sqrt{\rho + (1-\rho)\delta\left[s(\beta_Y = 1) - s(\beta_Y = 0)\right]} \equiv b_X^*$, where $\delta \equiv \frac{\alpha_X b(1-\gamma_X)(2+\gamma_X)^2}{(1+\gamma_X)a^2} \geq 0$ (i.e., $EW_X^R > W_X^{NR} \,\forall\, \beta_X^* > b_X^*$).[15] By postulating that $\rho \geq \frac{1}{3}$ tariffs are restricted to the real vector space, and this assumption will be maintained throughout the rest of the paper.[16] Owners of the specific input employed in the import-competing sector, on the other hand, favor retaliation independently of the level of β_X^* (that is to say, $EW_Y^R > W_Y^{NR} \,\forall\, \beta_X^*$).[17] Hence, when $\beta_X^* > b_X^*$, the consensus trade policy announced by an office-seeking politician is the prohibitive tariff. In the case in which the interests of the two types of factor owners are opposed, i.e., when $\beta_X^* \leq b_X^*$, the politically optimal level of trade protection is determined by the weighted average of the owners' individual policy preferences: $\beta_Y = \tilde{\beta}_Y$. This structure is illustrated in Figure 1.

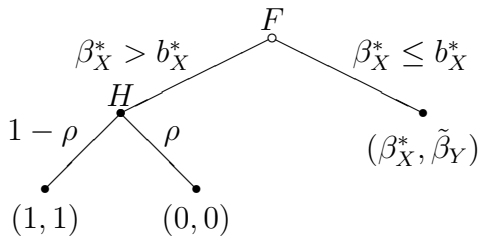

Figure 1: Timing of the game

At the first stage, the foreign country is aware of that a tariff may generate a retaliatory response, but uncertain of the tolerance level of the home

[15] $EW_X^R - W_X^{NR} = \frac{1}{\delta}\left[\rho - (1-\beta_X^*)^2\right] + (1-\rho)\left[s(\beta_Y = 1) - s(\beta_Y = 0)\right] > 0$ if and only if $\beta_X^* > b_X^*$, where $s(\beta_Y = 1) - s(\beta_Y = 0) = \frac{4a^2(1-\gamma_Y)[2+\gamma_Y(1-\gamma_Y)]\left[\gamma_Y(1-\gamma_Y^2)(2-\gamma_Y)-(1-\gamma_Y)(1-2\gamma_Y)[2+\gamma_Y(1-\gamma_Y)]\right]+a^2\gamma_Y^2(1-\gamma_Y^2)^2(2-\gamma_Y)^2}{8d(1-\gamma_Y^2)^2(1-\gamma_Y)^2(4-\gamma_Y^2)^2}$.

[16] $\rho + (1-\rho)\delta\left[s(\beta_Y = 1) - s(\beta_Y = 0)\right] \geq 0$ if $\rho \geq \frac{1}{3}$.

[17] $EW_Y^R - W_Y^{NR} = \frac{c^2(1+\gamma_Y)^2[4+\gamma_Y(20+3\gamma_Y)]}{8d[\gamma_Y(1+\gamma_Y)-2]^2} > 0$.

country. Thus, foreign does not know the critical tariff, b_X^*, but assumes that it has the following cumulative probability density: $F(b_X^*) = {b_X^*}^2$, where $b_X^* \in [0,1]$. Consequently, for a given tariff level, β_X^*, the foreign government believes that the probability of retaliation is: $P(\beta_X^* > b_X^*) = {\beta_X^*}^2$. If the home country retaliates, the foreign exporting firm is excluded from the home market and earns zero profit. If $\beta_X^* \leq b_X^*$, the foreign exporting firm will face the tariff, $\beta_Y = \tilde{\beta}_Y$, and so earns the profit $\Pi_Y^*(\tilde{\beta}_Y)$. As a result, the expected profit of the foreign exporting firm in the first stage for a given tariff, β_X^*, is found by setting $\beta_Y = 1$ with probability ${\beta_X^*}^2$, and $\beta_Y = \tilde{\beta}_Y$ with probability $1 - {\beta_X^*}^2$ in (2.9):

$$E\Pi_Y^*(\beta_X^*) = \frac{\left(1 - {\beta_X^*}^2\right)(1+\gamma_Y)a^2(1-\tilde{\beta}_Y)^2}{b(1-\gamma_Y)(2+\gamma_Y)^2}. \tag{3.7}$$

The potential for retaliation accordingly yields a negative relationship between the foreign tariff and the expected return to the specific input used in the foreign exporting sector. The first-stage welfare of a representative individual who owns some of this factor is therefore given by:

$$W_Y^* = l^* + \frac{E\Pi_Y^*(\beta_X^*)}{\alpha_Y^*} + \beta_X^* \bar{t}_X^* X + s^*(\cdot), \tag{3.8}$$

and for the typical voter with a stake in the foreign import-competing firm:

$$W_X^* = l^* + \frac{\Pi_X^*}{\alpha_X^*} + \beta_X^* \bar{t}_X^* X + s^*(\cdot), \tag{3.9}$$

where $l^* = 1$ is the labor supply—and also labor income, either from working in the exporting, import-competing or the numeraire sector—of an owner of the specific input employed by industry $j^* = X^*, Y^*$, and α_j^* represents the fraction of the foreign voting population that owns some of this factor, $\beta_X^* \bar{t}_X^* X = t_X^* X$ being the revenue from trade taxes.

3.3 Equilibrium Tariffs with Probabilistic Voting

To determine the announced tariff level a version of the Hotelling-Ledyard model (Ledyard [1984]) is used. Specifically, the formulation of the probabilistic voting model in this paper follows the framework outlined in Lindbeck and Weibull (1987).

Consider at first the second stage of the political economy game, and assume that the policy space, $\tilde{\beta}_Y \in [0,1)$, following the foreign strategy $\beta_X^* \leq$

b_X^*, is one-dimensional; elections involve the set of candidates, or parties, $\{A, B\}$, which is fixed and finite; candidates strive to maximize their vote share or, alternatively, their probability of winning; the society is inhabited by a large number of citizens, where the size of the population is normalized to unity; candidates in home simultaneously choose a position in $\tilde{\beta}_Y$; having observed the candidates' platforms, voters decide for which candidate to vote; voting is costless. In addition, the candidates' commitments to their announced trade policy platforms, ahead of the elections, are assumed to be binding.

Besides tariffs, the parties may differ in some other dimension unrelated to policy. This dimension is referred to as ideology, but it could also involve other attributes such as the personal characteristics of the party leadership. The ideological dimension is a permanent feature in that it cannot credibly be modified as part of the electoral platform. Furthermore, by assumption, voters differ in their evaluation of these features.

Formally, the population in the home country consists of groups of owners of the specific input used in industry $j = X, Y$. The fraction of the voting population that owns some of this factor is α_j, with $\sum_j \alpha_j = 1$, and an agent with stakes in sector j is said to belong to group j. At the time of the elections, voters base their voting decision both on the trade policy announcements and on the two candidates' ideologies. Specifically, voter i in group j prefers candidate A if:

$$W_j(\tilde{\beta}_{YA}) > W_j(\tilde{\beta}_{YB}) + \sigma_{ij} + \delta, \tag{3.10}$$

where $W_X(\tilde{\beta}_{YA}) = l + \frac{\Pi_X(\beta_X^*)}{\alpha_X} + \tilde{\beta}_{YA}\bar{t}_{YA}Y^* + s(\tilde{\beta}_{YA}), W_Y(\tilde{\beta}_{YA}) = l + \frac{\Pi_Y(\tilde{\beta}_{YA})}{\alpha_Y} + \tilde{\beta}_{YA}\bar{t}_{YA}Y^* + s(\tilde{\beta}_{YA})$, and $W_X(\tilde{\beta}_{YB}), W_Y(\tilde{\beta}_{YB})$ are defined analogously.

Here, σ_{ij} is an individual-specific parameter that can take on negative as well as positive values. It measures the individual ideological bias of voter i towards candidate B. A positive value of σ_{ij} implies that voter i has a bias in favor of party B, whereas voters with $\sigma_{ij} = 0$ are ideologically neutral; that is, they care only about trade policy. Assume that this parameter has group-specific uniform distributions on: $\left[-\frac{1}{2\phi_j} + \bar{\sigma}_j, \frac{1}{2\phi_j} + \bar{\sigma}_j\right]$.[18] Thus two parameters, $\bar{\sigma}_j$ and ϕ_j, fully characterize this distribution, and groups differ over both. In other words, groups differ in their average ideology, captured

[18]The properties of the equilibrium does not change for more general distributions of voters' ideological preferences.

by the group-specific means, $\bar{\sigma}_j$. But they also differ in their ideological homogeneity, a higher density, ϕ_j, being associated with a narrower distribution of σ_{ij}. The parameter δ, which measures the average (relative) popularity of candidate B in the population as a whole, can also be positive or negative. By assumption, δ is uniformly distributed on: $\left[-\frac{1}{2\psi_j}, \frac{1}{2\psi_j}\right]$. As to be seen below, this parameter generates uncertainty about the election outcome.

The timing of the tariff setting procedure is as follows. (1) The two candidates, simultaneously and noncooperatively, announce their tariffs: $\tilde{\beta}_{YA}$ and $\tilde{\beta}_{YB}$. At this stage, they know the voters' policy preferences. They also know the distributions of σ_{ij} and δ, but not yet their realized values. (2) The actual value of δ is realized and all uncertainty is resolved. (3) Elections are held. (4) The elected candidate implements the announced policy platform.

To formally study the candidates' decisions at stage (2), identify the swing voter in group j, a voter whose ideological bias, given the candidates' platforms, makes him indifferent between the two parties:

$$\sigma_j = W_j(\tilde{\beta}_{YA}) - W_j(\tilde{\beta}_{YB}) - \delta. \tag{3.11}$$

All voters i in group j with $\sigma_{ij} \leq \sigma_j$ prefer party A. Hence, given the distributional assumptions, the actual vote share of candidate A is:

$$\pi_A = \sum_j \alpha_j \phi_j \left(\sigma_j - \bar{\sigma}_j + \frac{1}{2\phi_j}\right). \tag{3.12}$$

Without loss of generality, assume that $\sum_j \alpha_j \phi_j \bar{\sigma}_j = 0$. Since σ_j depends on the realized value of δ, the vote share, π_A, is also a random variable. From the perspective of both candidates, the electoral outcome is thus a random event, related to the realization of δ. Given (3.11), the probability of winning of candidate A then becomes:

$$P_A = P\left(\pi_A \geq \frac{1}{2}\right) = \frac{1}{2} + \frac{\psi}{\phi}\left[\sum_j \alpha_j \phi_j [W_j(\tilde{\beta}_{YA}) - W_j(\tilde{\beta}_{YB})]\right], \tag{3.13}$$

where $\phi \equiv \sum_j \alpha_j \phi_j$ is the average density across groups. Obviously, candidate B wins with probability $1 - P_A$, and the unique equilibrium has both candidates converging to the same trade policy platform. Convergence follows from the two candidates facing exactly the same optimization problem.

Consistent with the results of Yang (1995), the equilibrium level of protection, announced by both candidates, is a weighted mean of the two types of factor owners' individually optimal tariffs. The weights, $\alpha_j\phi_j$, correspond to group size, α_j, but also to the group densities, ϕ_j, because these densities summarize how responsive are the voters in each group to trade policy; that is, how each type rewards policy with votes at the elections.

Taking the derivative of (3.13) with respect to $\tilde{\beta}_{YA}$, using the definition of $W_X(\tilde{\beta}_{YA})$ and $W_Y(\tilde{\beta}_{YA})$, then solving for the tariff in the political equilibrium to obtain:

$$\hat{\tilde{\beta}}_Y = \frac{2\left[(2-\gamma_Y)\phi + 2\gamma_Y\phi_Y\right]}{(12-\gamma_Y^2)\phi - 2\gamma_Y^2\phi_Y}, \tag{3.14}$$

where $\hat{\tilde{\beta}}_Y \in [0,1)$, which implies that the restriction $\alpha_Y > \frac{2\gamma_Y\phi_Y - \alpha_X\phi_X(4-\gamma_Y)}{(4-\gamma_Y)\phi_Y}$ holds by assumption.[19] Outside this parameter space, $\hat{\tilde{\beta}}_Y$ equals zero or unity in an obvious manner.

If the density, ϕ_j, is the same in both groups, $\phi_j = \phi$, which yields $\hat{\tilde{\beta}}_Y = \frac{2(2+\gamma_Y)}{12-3\gamma_Y^2} > 0$, the equilibrium level of protection is identical to the optimal strategic trade policy implied by the Brander-Spencer (1984a, 1984b) models. The reason is that both parties are trying to maximize their expected vote, and are therefore appealing to the expected swing voters in each group. If the mass of swing voters is the same, both groups get equal weight in the candidates' decision, which make them maximize the average voter's utility.

Differentiating (3.14) with respect to ϕ_X and ϕ_Y gives:

$$\frac{\partial\hat{\tilde{\beta}}_Y}{\partial\phi_X} = -\frac{8\alpha_X\gamma_Y\phi_Y(2+\gamma_Y)(3-\gamma_Y)}{\left[(2\phi_Y+\phi)\gamma_Y^2 - 12\phi\right]^2} \leq 0, \tag{3.15}$$

and

$$\frac{\partial\hat{\tilde{\beta}}_Y}{\partial\phi_Y} = \frac{8\alpha_X\gamma_Y\phi_X(2+\gamma_Y)(3-\gamma_Y)}{\left[(2\phi_Y+\phi)\gamma_Y^2 - 12\phi\right]^2} \geq 0. \tag{3.16}$$

The tariff in home is thus decreasing in the mass of ideologically neutral voters with a common interest in the exporting industry, while increasing in

[19] $\hat{\tilde{\beta}}_Y \geq 0$ if and only if $\alpha_Y > \frac{2\gamma_Y^2\phi_Y - \alpha_X\phi_X(12-\gamma_Y^2)}{(12-\gamma_Y^2)\phi_Y}$, $\hat{\tilde{\beta}}_Y < 1$ if and only if $\alpha_Y > \frac{2\gamma_Y\phi_Y - \alpha_X\phi_X(4-\gamma_Y)}{(4-\gamma_Y)\phi_Y}$, and $\frac{2\gamma_Y\phi_Y - \alpha_X\phi_X(4-\gamma_Y)}{(4-\gamma_Y)\phi_Y} \geq \frac{2\gamma_Y^2\phi_Y - \alpha_X\phi_X(12-\gamma_Y^2)}{(12-\gamma_Y^2)\phi_Y}$.

the homogeneity over the political dimension among those who own the input used by the import-competing sector. This result can be explained as follows. Since the higher trade tax reduces consumer surplus, increases government revenues, and do not raise the reward to the specific input employed in the home exporting sector, while increasing the return to the specific factor used by the import-competing industry, factor owners with stakes in the latter sector benefit from a relatively higher level of protection in the political equilibrium. In other words, and as intuition might suggest, a higher tariff, by raising the price of the import-competing good, solely benefits the owners of the input that is specific to the industry producing the good. The welfare cost, net of tariff revenue, on the other hand, is borne uniformly by both types of factor owners. Imposing a tariff thus entails a negative externality on individuals that own claims to the specific input employed in the exporting sector who do not share in the benefits but bear part of the cost. Increasing the mass of swing voters within the group of owners of the specific factor used by industry X (Y) therefore decreases (increases) the politically optimal trade tax. Furthermore, the bias towards a relatively less protectionist trade policy becomes larger the larger is this group, as more votes can be gained: $\frac{\partial \hat{\tilde{\beta}}_Y}{\partial \alpha_X} \leq 0$. It is also straightforward to verify that $\frac{\partial \hat{\tilde{\beta}}_Y}{\partial \alpha_Y} \leq 0$. This reflects the fact that increasing the fraction of the voting population who owns some of the input used in the import-competing sector, decreases the marginal surplus per factor owner associated with the expansion of output and profit levels in this industry following a higher tariff level. The per capita factor reward, or, to put it differently, the relative benefit from trade protection, is thus diluted by the number of voters in this group. As a result, these individuals support a relatively less protectionist stance in equilibrium when their own group size increases.

At the first stage, the foreign country must take the expected outcome in the second stage into account when determining its politically optimal tariff. Since the tariff formation process is modeled symmetrically in both countries, differentiating the probability of winning of candidate A^* with respect to β^*_{XA}, using the definitions of voter welfare in (3.8) and (3.9), exploiting a symmetry condition, $\gamma_Y = \gamma_X$, and rearranging terms to find the equilibrium level of protection in foreign:

$$\hat{\beta}^*_X = \frac{2\left[(2-\gamma_X)\phi^* + 2\gamma_X\phi^*_X\right]}{(12-\gamma_X^2)\phi^* - 2\gamma_X^2\phi^*_X + 8\phi^*_Y\left(\hat{\tilde{\beta}}_Y - 1\right)^2}, \tag{3.17}$$

where ϕ_j^* is the sector-specific density of foreign voters' ideological preferences, and $\phi^* \equiv \sum_j \alpha_j^* \phi_j^*$ is the average density across types of factor owners. $\hat{\beta}_X^* \in [0,1]$, which implies that the condition

$$\alpha_X^* > \max\left\{ \frac{2\gamma_X^2\phi_X^* - \alpha_Y^*\phi_Y^*(12-\gamma_X^2) - 8\phi_Y^*\left(\hat{\tilde{\beta}}_Y - 1\right)^2}{(12-\gamma_X^2)\phi_X^*}, \frac{2\gamma_X\phi_X^*(2+\gamma_X) - \alpha_Y^*\phi_Y^*[8+\gamma_X(2-\gamma_X)] - 8\phi_Y^*\left(\hat{\tilde{\beta}}_Y - 1\right)^2}{[8+\gamma_X(2-\gamma_X)]\phi_X^*} \right\}$$

binds.[20] Outside this parameter space, $\hat{\beta}_X^*$ equals zero or unity in an obvious manner. Imposing the restriction $\phi_j^* = \phi^*$, to obtain the optimal strategic trade policy in foreign: $\hat{\beta}_X^* = \frac{2(2+\gamma_X)}{12-3\gamma_X^2+8\left(\hat{\tilde{\beta}}_Y-1\right)^2} > 0$.[21]

Taking the derivative of (3.17) with respect to ϕ_X^* and ϕ_Y^* yields:

$$\frac{\partial \hat{\beta}_X^*}{\partial \phi_X^*} = \frac{8\phi_Y^*\left[(3-\gamma_X)(2+\gamma_X)\alpha_Y^* + [4+2(2-\gamma_X)\alpha_X^*]\,\Psi\right]}{\left[(2+\alpha_X^*)\gamma_X^2\phi_X^* - 8\phi_Y^*\Psi - 12\alpha_X^*\phi_X^* - (12-\gamma_X^2)\alpha_Y^*\phi_Y^*\right]^2} \geq 0, \tag{3.18}$$

and

$$\frac{\partial \hat{\beta}_X^*}{\partial \phi_Y^*} = \frac{-8\phi_X^*\left[(3-\gamma_X)(2+\gamma_X)\alpha_Y^* + [4+2(2-\gamma_X)\alpha_X^*]\,\Psi\right]}{\left[(2+\alpha_X^*)\gamma_X^2\phi_X^* - 8\phi_Y^*\Psi - 12\alpha_X^*\phi_X^* - (12-\gamma_X^2)\alpha_Y^*\phi_Y^*\right]^2} \leq 0, \tag{3.19}$$

where $\Psi \equiv \left(\hat{\tilde{\beta}}_Y - 1\right)^2 > 0$, since $\hat{\tilde{\beta}}_Y \in [0,1)$. Hence, increasing the density of swing voters among factor owners with stakes in the foreign import-competing (exporting) firm leads to a relatively higher (lower) level of trade protection in equilibrium. The explanation for this property is that the higher trade tax reduces consumer surplus, increases government revenues as well as the reward to the specific input employed by the foreign import-competing

[20] $\frac{2\gamma_X^2\phi_X^* - \alpha_Y^*\phi_Y^*(12-\gamma_X^2) - 8\phi_Y^*\left(\hat{\tilde{\beta}}_Y-1\right)^2}{(12-\gamma_X^2)\phi_X^*} > (<) \frac{2\gamma_X\phi_X^*(2+\gamma_X) - \alpha_Y^*\phi_Y^*[8+\gamma_X(2-\gamma_X)] - 8\phi_Y^*\left(\hat{\tilde{\beta}}_Y-1\right)^2}{[8+\gamma_X(2-\gamma_X)]\phi_X^*}$ if and only if $\frac{\phi_Y^*}{\phi_X^*} > (<) \frac{(3-\gamma_X)\gamma_X(2+\gamma_X)}{2(2-\gamma_X)\left(\hat{\tilde{\beta}}_Y-1\right)^2}$.

[21] If, in addition, $\phi_j = \phi$, the resulting Stackelberg equilibrium is given by: $\hat{\beta}_X^* = \frac{18(2+\gamma_X)(\gamma_X-2)^2}{9(12-3\gamma_X^2)(\gamma_X-2)^2+8(4-3\gamma_X)^2} > 0$.

industry, while reducing the expected return to the specific factor used in the exporting sector. By the same argument as before, individuals with a common interest in the import-competing firm therefore support a relatively higher level of protection, since they rationally disregard the tariff externality imposed on agents with stakes in the exporting industry.

Differentiating (3.17) with respect to $\hat{\tilde{\beta}}_Y$:

$$\frac{\partial \hat{\beta}_X^*}{\partial \hat{\tilde{\beta}}_Y} = \frac{32(1-\hat{\tilde{\beta}}_Y)\phi_Y^*\left[(2-\gamma_X)\phi^* + 2\gamma_X\phi_X^*\right]}{\left[(\gamma_X^2-12)\phi^* + 2\gamma_X^2\phi_X^* - 8\phi_Y^*\Psi\right]^2} \geq 0. \tag{3.20}$$

Consequently, increasing the politically optimal tariff in home, announced in response to the policy choice $\beta_X^* \leq b_X^*$, raises the foreign tariff in equilibrium, as this higher level of home protection reduces the incentives of the foreign government to implement a trade policy that does not induce a threat of retaliation, since the opportunity cost of a more moderate tariff setting behavior now has become relatively lower.

Substituting (3.14) into (3.17), differentiating the resulting expression with respect to ϕ_X and ϕ_Y gives:

$$\frac{\partial \hat{\beta}_X^*}{\partial \phi_X} = \frac{\partial \hat{\beta}_X^*}{\partial \Psi}\frac{\partial \Psi}{\partial \phi_X} \leq 0, \tag{3.21}$$

and

$$\frac{\partial \hat{\beta}_X^*}{\partial \phi_Y} = \frac{\partial \hat{\beta}_X^*}{\partial \Psi}\frac{\partial \Psi}{\partial \phi_Y} \geq 0, \tag{3.22}$$

because $\frac{\partial \hat{\beta}_X^*}{\partial \Psi} \leq 0$, $\frac{\partial \Psi}{\partial \phi_X} \geq 0$ and $\frac{\partial \Psi}{\partial \phi_Y} \leq 0$ (see Appendix A.1 for details). And so, increasing the mass of swing voters among owners of the specific factor used by the home country's exporting industry decreases the foreign tariff. The logic underlying this result is straightforward. As the mass of ideologically neutral voters with a common interest in the exporting sector increases, $\hat{\tilde{\beta}}_Y$ decreases by (3.15). Accordingly, it is therefore comparatively more favorable for the tariff setting foreign country to propose a trade policy that does not induce a threat of retaliation; that is, to set $\beta_X^* \leq b_X^*$. This disciplines foreign and acts to lower the equilibrium level of protection. On the other hand, the foreign tariff is raised when the ideological homogeneity increases among those that own some of the specific input employed in the home import-competing industry. The reason is that such an ideological shift

raises $\hat{\tilde{\beta}}_Y$ by (3.16), which in turn reduces the incentives of the foreign country to announce a tariff below the critical level, b_X^*, since the opportunity cost of a more moderate tariff setting behavior now has become relatively lower. As a result, the foreign tariff increases in ϕ_Y.

These findings can be summarized as follows:

Result 1: *The equilibrium tariff under representative democracy of a country facing the threat of retaliation is a weighted mean of domestic as well as foreign voters' individually optimal tariffs. When the political homogeneity among factor owners with a common interest in the competing trading nation's exporting (import-competing) sector increases, the equilibrium level of domestic protection decreases (increases).*

A brief remark: to address the policy implication of the above analysis for the U.S.–EU trade relations referred to earlier, consider the European integration—an historical process, which over the last half century has sought to unify the participating member states economically and, more recently, politically. This development has redefined the relationship among EU nations at several levels: there has been a reduction in economic differences, a harmonization of standards and regulatory policies, as well as a removal of the physical and fiscal barriers that have differentiated the national political and economic systems from one another. Intra-EU exporters benefit from the Single Market programme—launched in 1985, and formally completed at the end of 1992—as they now face one set of trade and investment laws and regulations, instead of separate rules for each member state, hence, making it easier to compete in all EU markets. As a result, for the period between 1985 and 1995, the share of intra-EU exports in total manufacturing export increased on average by 24.6 percentage, while the share of intra-EU imports increased by 10.9 percentage (Commission of the European Communities, 1996). For this reason, there are perhaps grounds for believing that periods of integration and unification systematically increase the political homogeneity among factor owners with stakes in European exporting firms relatively more as compared to among those with a common interest in the import-competing sector. If this hypothesis is correct, then consequently, by (3.15) and (3.21), bilateral tariffs between the United States and EU are reduced as the Community integration process is developed and deepened over time.

Next the model is extended to incorporate the effects of economic forces

on political outcomes through institutions, in order to take into account how differences in those institutions shape the interplay between the strategic trade policy interaction among governments and the domestic tariff formation process.

4 Electoral Rules and Trade Policy

So far the assumption has been that the symmetric electoral rule is a majority one in a single voting district. This is now relaxed to allow tariffs to be determined in a proportional system, as well as in multiple-district majoritarian elections. The basic political framework developed is a modification of the model by Persson and Tabellini (1999), which in turn is based on the probabilistic voting approach adapted by Lindbeck and Weibull (1987), and also applied in Subsection 3.3. The purpose is to analyze how the endogenous tariff formation process in a country, given the risk of retaliation, depends on the political institutions among trade partners.[22]

While the specific question of how constitutional rules influence trade policy has been neglected until recently, much of the work on comparative political economy studies aspects of fiscal policy. Persson and Tabellini (1999), for example, relate the size and composition of government spending to the political system. In a Downsian model of electoral competition and forward-looking voting it is shown that majoritarian—as opposed to proportional—elections increase competition between parties by focusing it into some key marginal districts. This leads to less public goods, less rents for politicians, more redistribution and larger government. The analysis has its trade policy counterpart in a theoretical and empirical study by Roelfsema (2004), who argues that countries with a majoritarian electoral system are more inclined to have a high level of trade protection. The reason is a higher competition intensity for swing districts if compared to countries with proportional representation. Hatfield and Hauk (2003), on the other hand, obtain the opposite result, namely that proportional systems have higher average tariffs than majoritarian institutions. This is due to that the pro-

[22]The results presented in this section are valid irrespective of the electoral system in the tariff setting foreign country by the specific structure of the trade policy game. Accordingly, the focus of attention is the type of electoral rule employed in home, and how it affects the foreign tariff formation process. The foreign tariff is thus still given by (3.17).

portional legislature weights each domestic industry by its share of workers in the tariff formation process, while under the majoritarian electoral rule the amount the tariff rises on industries in the winning coalition is less than the amount the tariff falls on those not in the winning coalition. In the present paper, for reasons soon to be seen, both outcomes are possible. Furthermore, in the above settings (both of which also apply the formulation of the probabilistic voting model outlined in Lindbeck and Weibull [1987]) there is no scope for interaction between governments, and consequently no possibility for the type of domestic electoral contest facing politicians to influence policy outcomes elsewhere. Here, in contrast, the focus is on strategic interaction between countries, which gives rise to policy interdependence. Introducing a mapping from the form of election system into trade policy choices therefore makes the endogenous tariff formation process contingent on the electoral rule employed in the competing trading nation.

4.1 Proportional (Single-District) Elections

First suppose that foreign announces $\beta_X^* \leq b_X^*$, and then consider the equilibrium tariff response of home (which as a result of the level of the foreign trade tax is determined by the weighted average of the factor owners' individual policy preferences: $\beta_Y = \tilde{\beta}_Y$) under an electoral rule where it is equally important to win votes in all voter groups, denoted $j = X, Y, Z$, representing workers employed in the exporting, import-competing or the numeraire sector (also denoted X, Y and Z, respectively). Those employed in industry X and Y own some of the factor specific to that particular sector, while a fraction α_{Z_X} $(1 - \alpha_{Z_X} = \alpha_{Z_Y})$ of the voting population working in industry Z owns the specific input used by the exporting (import-competing) firm. Individuals own at most one type of specific factor. Hence, since the intra-national income inequality is all derived from the inequality of capital ownership, those in group X (Y) have the same welfare as agents belonging to the fraction α_{Z_X} (α_{Z_Y}) of voter group Z.

Each group has a continuum of voters with unit mass, and there is only one voting district, comprising all citizens in the population. By assumption, there is perfect proportional representation in the sense that the parties obtain a seat share in perfect proportion to their vote share in the entire population. Furthermore, the party obtaining more than fifty percent of the seats earns the right to set tariffs according to its policy platform. Under this electoral rule the probability of winning of candidate A is given by:

$$P_A = P\left(\frac{1}{3}\sum_j \pi_{A,\,j} \geq \frac{1}{2}\right), \tag{4.1}$$

where the vote share of party A in group j, given the distributional assumptions in Subsection 3.3, is defined as: $\pi_{A,\,j} = \phi_j\left(\sigma_j - \bar{\sigma}_j + \frac{1}{2\phi_j}\right)$. Now individual ideology in voter group $j \neq Z$, $\sigma_{ij\neq Z}$, is uniform on: $\left[-\frac{1}{2\phi_{j\neq Z}} + \bar{\sigma}_{j\neq Z}, \frac{1}{2\phi_{j\neq Z}} + \bar{\sigma}_{j\neq Z}\right]$. Moreover, it is assumed that the distribution of individual ideology in group Z, σ_{iZ}, differs across the two types of factor owners employed in the sector: $\sigma_{iZ_X} \sim \left[-\frac{1}{2\phi_X} + \bar{\sigma}_Z, \frac{1}{2\phi_X} + \bar{\sigma}_Z\right]$ and $\sigma_{iZ_Y} \sim \left[-\frac{1}{2\phi_Y} + \bar{\sigma}_Z, \frac{1}{2\phi_Y} + \bar{\sigma}_Z\right]$. ϕ_X (ϕ_Y) consequently represents the density of ideologically neutral voters among owners of the specific input used by the exporting (import-competing) industry employed in sector X (Y) and Z.

Using (3.11), the simplifying assumption $\sum_j \phi_j\bar{\sigma}_j = 0$ where $\phi_Z\bar{\sigma}_Z \equiv \sum_{j\neq Z}\alpha_{Z_j}\phi_j\bar{\sigma}_Z$, and the fact that δ has a uniform distribution on $\left[-\frac{1}{2\psi_j}, \frac{1}{2\psi_j}\right]$ to obtain:

$$P_A = \frac{1}{2} + \frac{\psi}{3\phi}\left[\sum_j \phi_j[W_j(\tilde{\beta}_{YA}) - W_j(\tilde{\beta}_{YB})]\right], \tag{4.2}$$

where $\phi \equiv \frac{\sum_j \phi_j}{3}$ is the average density across groups, $\phi_Z W_Z \equiv \sum_{j\neq Z}\alpha_{Z_j}\phi_j W_j$, $W_X(\tilde{\beta}_{YA}) = l + \frac{\Pi_X(\beta_X^*)}{1+\alpha_{Z_X}} + \frac{\tilde{\beta}_{YA}\bar{t}_{YA}Y^*}{3} + s(\tilde{\beta}_{YA}), W_Y(\tilde{\beta}_{YA}) = l + \frac{\Pi_Y(\tilde{\beta}_{YA})}{1+\alpha_{Z_Y}} + \frac{\tilde{\beta}_{YA}\bar{t}_{YA}Y^*}{3} + s(\tilde{\beta}_{YA})$, and $W_X(\tilde{\beta}_{YB})$, $W_Y(\tilde{\beta}_{YB})$ are defined analogously.

A unique equilibrium exists in which both A and B choose the same policy. Formally, they face the same maximization problems, since candidate B wins with probability $P_B = 1 - P_A$ and $\tilde{\beta}_{YA}$, $\tilde{\beta}_{YB}$ enter (4.2) symmetrically but with opposite signs. To characterize the equilibrium trade policy under a proportional electoral system (4.2) is maximized with regard to $\tilde{\beta}_{YA}$, taking $\tilde{\beta}_{YB}$ as given, exploiting the definition of $W_X(\tilde{\beta}_{YA})$ and $W_Y(\tilde{\beta}_{YA})$:

$$\hat{\tilde{\beta}}_Y^{PRO} = \frac{2\left[3\gamma_Y\left[\phi_Y(1-\alpha_{Z_Y}) - \phi_X(1+\alpha_{Z_X})\right] - 2(1-\gamma_Y^2)\left[\phi_X(1+\alpha_{Z_X}) + \phi_Y(1+\alpha_{Z_Y})\right]\right]}{4\left[\phi_X(1+\alpha_{Z_X}) + \phi_Y(1+\alpha_{Z_Y})\right] + \gamma_Y^2\left[5\phi_X(1+\alpha_{Z_X}) + \phi_Y(5\alpha_{Z_Y}-1)\right]}, \tag{4.3}$$

where $\hat{\tilde{\beta}}_Y^{PRO} \in [0,1)$, which implies that $\frac{2(1-\gamma_Y^2)(2\phi_X+\phi_Y)+3\gamma_Y(2\phi_X-\phi_Y)}{[3\gamma_Y+2(1-\gamma_Y)](\phi_X-\phi_Y)} \leq \alpha_{Z_Y} < \frac{2(4+\gamma_Y)\phi_X+(4-5\gamma_Y)\phi_Y}{(4+\gamma_Y)(\phi_X-\phi_Y)}$ holds by assumption.[23] Outside this parameter space, $\hat{\tilde{\beta}}_Y^{PRO}$ equals zero or unity in an obvious manner.

Taking the derivative of (4.3) with respect to ϕ_X and ϕ_Y gives:

$$\frac{\partial \hat{\tilde{\beta}}_Y^{PRO}}{\partial \phi_X} = - \frac{24\gamma_Y \left[2+\gamma_Y(\gamma_Y^2+\gamma_Y-1)\right](1+\alpha_{Z_X})\phi_Y}{\left[(5\gamma_Y^2+4)(1+\alpha_{Z_X})\phi_X + \left[4(1+\alpha_{Z_Y})+\gamma_Y^2(5\alpha_{Z_Y}-1)\right]\phi_Y\right]^2} \leq 0, \quad (4.4)$$

and

$$\frac{\partial \hat{\tilde{\beta}}_Y^{PRO}}{\partial \phi_Y} = \frac{24\gamma_Y \left[2+\gamma_Y(\gamma_Y^2+\gamma_Y-1)\right](1+\alpha_{Z_X})\phi_X}{\left[(5\gamma_Y^2+4)(1+\alpha_{Z_X})\phi_X + \left[4(1+\alpha_{Z_Y})+\gamma_Y^2(5\alpha_{Z_Y}-1)\right]\phi_Y\right]^2} \geq 0. \quad (4.5)$$

So, increasing the mass of ideologically neutral voters among individuals with a common interest in the exporting (import-competing) industry decreases (increases) the politically optimal tariff. The logic behind this result can, once again, be explained in the following way: factor owners with stakes in the import-competing sector benefit from a relatively higher level of protection in the political equilibrium, since the tariff raises the price of the import-competing good and improves the profitability of the industry, whereas the welfare cost, net of tariff revenue, is borne uniformly by all citizens regardless of their type of factor ownership. Hence, increasing the mass of swing voters within the group of owners of the specific input employed in sector X (Y) decreases (increases) the politically optimal trade tax under the proportional electoral rule.

Using (4.3) in (3.17), differentiating the resulting expression with respect to ϕ_X and ϕ_Y yields:

$$\frac{\partial \hat{\beta}_X^*}{\partial \phi_X} = \frac{\partial \hat{\beta}_X^*}{\partial \Psi^{PRO}} \frac{\partial \Psi^{PRO}}{\partial \phi_X} \leq 0, \quad (4.6)$$

[23] $\hat{\tilde{\beta}}_Y^{PRO} \geq 0$ if and only if $\alpha_{Z_Y} \geq \frac{2(1-\gamma_Y^2)(2\phi_X+\phi_Y)+3\gamma_Y(2\phi_X-\phi_Y)}{[3\gamma_Y+2(1-\gamma_Y)](\phi_X-\phi_Y)}$, and $\hat{\tilde{\beta}}_Y^{PRO} < 1$ if and only if $\alpha_{Z_Y} < \frac{2(4+\gamma_Y)\phi_X+(4-5\gamma_Y)\phi_Y}{(4+\gamma_Y)(\phi_X-\phi_Y)}$.

and

$$\frac{\partial \hat{\beta}_X^*}{\partial \phi_Y} = \frac{\partial \hat{\beta}_X^*}{\partial \Psi^{PRO}} \frac{\partial \Psi^{PRO}}{\partial \phi_Y} \geq 0, \tag{4.7}$$

where $\Psi^{PRO} \equiv \left(\hat{\tilde{\beta}}_Y^{PRO} - 1\right)^2 > 0$, $\frac{\partial \hat{\beta}_X^*}{\partial \Psi^{PRO}} \leq 0$, $\frac{\partial \Psi^{PRO}}{\partial \phi_X} \geq 0$ and $\frac{\partial \Psi^{PRO}}{\partial \phi_Y} \leq 0$ (see Appendix A.2 for details). The foreign tariff is thus decreasing in the ideological homogeneity among individuals in the home country which own the specific input used by the exporting industry. Using the same argument as in Subsection 3.3, $\hat{\tilde{\beta}}_Y^{PRO}$ is falling by (4.4) as the mass of swing voters with a common interest in the sector increases. Consequently, it is therefore relatively more favorable for the tariff setting foreign country to implement a trade policy that does not induce a threat of retaliation, and this lowers the equilibrium level of protection in foreign. Conversely, the foreign trade tax is raised when the mass of swing voters increases among agents in home that own some of the specific factor employed in the import-competing industry, since such an ideology shift raises $\hat{\tilde{\beta}}_Y^{PRO}$ by (4.5), and thus makes it relatively less beneficial for the foreign country to announce a tariff below the critical point, b_X^*. Accordingly, this acts to increase the politically optimal level of foreign trade protection in equilibrium.

4.2 Majoritarian (Multiple-District) Elections

Once again suppose that foreign announces $\beta_X^* \leq b_X^*$. Now what if elections in the home country are instead conducted under plurality rule in multiple one-seat electoral districts? Specifically, assume that there are three electoral districts, each with one seat. Then add the following winning rule: earning the right to set policy requires winning at least two seats out of three. As Persson and Tabellini (1999) point out, this setting can be interpreted as a parliamentary election in which two competing parties field candidates in all three districts running on the same platform. The party winning in a majority of the districts has a majority in the assembly and can thus implement its preannounced trade policy.

Consider then the following simplifying assumption: the three electoral districts coincide with the three voter groups/sectors, $j = X, Y, Z$, in the population/economy.[24] Each district is inhabited by a continuum of citizens

[24]It can be shown that all comparative politics results generalize if groups/sectors and

with unit mass. Constituents/employees in district/industry X and Y own some of the factor specific to that particular district/sector, while a fraction α_{Z_X} $(1 - \alpha_{Z_X} = \alpha_{Z_Y})$ of the voting population belonging to/employed in district/industry Z owns the specific input used by the exporting (import-competing) firm. Individuals own at most one type of specific factor. Accordingly, in order to highlight the geographical concentration of industries, the three different sectors of the current specific factors model are associated with electoral districts, populated by individuals with stakes in either the exporting or the import-competing firm.[25]

Following Persson and Tabellini (1999), label the three groups according to their average ideology, $\bar{\sigma}_j$: $\bar{\sigma}_X < \bar{\sigma}_Z < \bar{\sigma}_Y$, where $\bar{\sigma}_Z = 0$ without loss of generality; that is, by assumption, the ideological bias toward party A in group X and toward party B in group Y are large enough so that the group-specific means, $\bar{\sigma}_X$ and $\bar{\sigma}_Y$, are sufficiently distant from zero. When these conditions are fulfilled there exists an equilibrium with policy convergence, and the entire political competition takes place in the marginal district made up of voters employed in industry Z. Party A wins district X with large enough probability, and loses district Y with large enough probability so that neither party finds it optimal to seek voters outside the marginal district, since only two districts are required for winning the election. Under these assumptions, the relevant expression for the probability of winning of candidate A is just the probability that A wins district Z. By the same argument as in Subsection 4.1, and using the definition of $\phi_Z W_Z$, this can be written as:

$$P_A = P\left(\pi_{A,\,Z} \geq \frac{1}{2}\right) = \frac{1}{2} + \frac{\psi}{\phi_Z}\left[\sum_{j \neq Z} \alpha_{Z_j}\phi_j[W_j(\tilde{\beta}_{YA}) - W_j(\tilde{\beta}_{YB})]\right], \quad (4.8)$$

where $\phi_Z \equiv \sum_{j \neq Z} \alpha_{Z_j}\phi_j$ is the average density across types of factor owners belonging to/employed in district/industry Z.[26] Compared to (4.2), this expression clearly depends only on what takes place in the marginal district.

districts do not completely overlap. See for example Persson and Tabellini (2002) for an application on public good provision.

[25]This approach is similar to the one taken by Willmann (2005). Geographic concentration is widely used as a proxy for political concentration (i.e., the spread of industry across political districts). See for instance Busch and Reinhardt (1999) for an overview of the literature on this topic.

[26]The definition implies that group Z, which on average is ideologically neutral ($\bar{\sigma}_Z = 0$),

Taking the derivative of (4.8) with respect to $\tilde{\beta}_{YA}$, and solving for the equilibrium tariff under majoritarian elections to obtain:

$$\hat{\tilde{\beta}}_Y^{MAJ} = \frac{2\left[3\gamma_Y\left[\alpha_{Z_Y}\phi_Y(1-\alpha_{Z_Y})-\alpha_{Z_X}\phi_X(1+\alpha_{Z_X})\right]-2(1-\gamma_Y^2)\phi_Z(1+\alpha_{Z_Y})\right]}{4(1+\alpha_{Z_Y})\phi_Z+\gamma_Y^2\left[5\alpha_{Z_X}\phi_X(1+\alpha_{Z_X})+\alpha_{Z_Y}\phi_Y(5\alpha_{Z_Y}-1)\right]}, \tag{4.9}$$

where $\hat{\tilde{\beta}}_Y^{MAJ} \in [0,1)$, which implies that either the condition $\frac{5\gamma_Y-4}{4+\gamma_Y} \leq \alpha_{Z_Y} \leq \frac{-[(3+2\gamma_Y)\gamma_Y-2]\phi_Y-\sqrt{[(3+2\gamma_Y)\gamma_Y-2]^2\phi_Y^2+4[(3-2\gamma_Y)\gamma_Y+2]^2\phi_X(\phi_X-\phi_Y)}}{[(3-2\gamma_Y)\gamma_Y+2](\phi_X-\phi_Y)}$ or the restriction $\alpha_{Z_Y} \geq \max\left\{\frac{5\gamma_Y-4}{4+\gamma_Y}, \frac{-[(3+2\gamma_Y)\gamma_Y-2]\phi_Y+\sqrt{[(3+2\gamma_Y)\gamma_Y-2]^2\phi_Y^2+4[(3-2\gamma_Y)\gamma_Y+2]^2\phi_X(\phi_X-\phi_Y)}}{[(3-2\gamma_Y)\gamma_Y+2](\phi_X-\phi_Y)}\right\}$ binds.[27] Outside this parameter space, $\hat{\tilde{\beta}}_Y^{MAJ}$ equals zero or unity in an obvious manner.

Subtracting (4.9) from the tariff announced under the proportional electoral regime produces:

$$\hat{\tilde{\beta}}_Y^{PRO} - \hat{\tilde{\beta}}_Y^{MAJ} = \Gamma(\alpha_{Z_X} - \alpha_{Z_Y}), \tag{4.10}$$

where $\Gamma \geq 0$ (the expression is omitted without loss of any central insights). Hence, $\hat{\tilde{\beta}}_Y^{PRO} \geq \hat{\tilde{\beta}}_Y^{MAJ}$ ($\hat{\tilde{\beta}}_Y^{PRO} \leq \hat{\tilde{\beta}}_Y^{MAJ}$) if there are relatively more factor owners employed in industry Z with stakes in the exporting (import-competing) sector. When $\alpha_{Z_X} > \alpha_{Z_Y}$ ($\alpha_{Z_X} < \alpha_{Z_Y}$) it is optimal for both candidates in a convergent electoral equilibrium to propose a relatively lower (higher) level of protection under majoritarian elections. Intuitively, such a trade policy has the same benefit to the parties as under a proportional system, namely the marginal votes gained among owners of the input used in the exporting (import-competing) firm, but the costs are smaller, as the parties do not now internalize the votes lost in nonmarginal districts. The electoral

does not necessarily have the highest density of ideologically neutral voters. Despite this possibility, the assumed ideological bias is such that all electoral competition concentrates to the marginal district.

[27] $\hat{\tilde{\beta}}_Y^{MAJ} \geq 0$ if and only if $\alpha_{Z_Y} \leq \frac{-[(3+2\gamma_Y)\gamma_Y-2]\phi_Y-\sqrt{[(3+2\gamma_Y)\gamma_Y-2]^2\phi_Y^2+4[(3-2\gamma_Y)\gamma_Y+2]^2\phi_X(\phi_X-\phi_Y)}}{[(3-2\gamma_Y)\gamma_Y+2](\phi_X-\phi_Y)}$ or $\alpha_{Z_Y} \geq \frac{-[(3+2\gamma_Y)\gamma_Y-2]\phi_Y+\sqrt{[(3+2\gamma_Y)\gamma_Y-2]^2\phi_Y^2+4[(3-2\gamma_Y)\gamma_Y+2]^2\phi_X(\phi_X-\phi_Y)}}{[(3-2\gamma_Y)\gamma_Y+2](\phi_X-\phi_Y)}$. $\hat{\tilde{\beta}}_Y^{MAJ} < 1$ if $\alpha_{Z_Y} \geq \frac{5\gamma_Y-4}{4+\gamma_Y}$.

competition is stiffer, because it is now focused on the type of factor owners that represents the largest fraction of the voting population in the district with the least average ideological bias. Since the election outcome is more sensitive to policy, the more dominant type in district Z, α_{Z_X} (α_{Z_Y}), obtains a tariff closer to its bliss point as compared to proportional representation, which translates into a relatively less (more) protectionist stance. This result confirms the findings of Roelfsema (2004), as well as those of Hatfield and Hauk (2003), because the equilibrium level of protection can be both comparatively higher and lower under the majoritarian electoral rule. The outcome depends on the relative size of the fraction of constituents in the marginal district with stakes in the exporting industry. Thus the framework developed here encompasses as special cases both these models.

Taking the derivative of (4.9) with respect to ϕ_X and ϕ_Y gives:

$$\frac{\partial \hat{\tilde{\beta}}_Y^{MAJ}}{\partial \phi_X} = - \frac{24\gamma_Y \left[2+\gamma_Y(\gamma_Y^2+\gamma_Y-1)\right](1+\alpha_{Z_Y})\alpha_{Z_X}\alpha_{Z_Y}\phi_Y}{\left[(5\gamma_Y^2+4)(1+\alpha_{Z_Y})\alpha_{Z_X}\phi_X + \left[4(1+\alpha_{Z_Y})+\gamma_Y^2(5\alpha_{Z_Y}-1)\right]\alpha_{Z_Y}\phi_Y\right]^2} \leq 0, \tag{4.11}$$

and

$$\frac{\partial \hat{\tilde{\beta}}_Y^{MAJ}}{\partial \phi_Y} = \frac{24\gamma_Y \left[2+\gamma_Y(\gamma_Y^2+\gamma_Y-1)\right](1+\alpha_{Z_Y})\alpha_{Z_X}\alpha_{Z_Y}\phi_X}{\left[(5\gamma_Y^2+4)(1+\alpha_{Z_Y})\alpha_{Z_X}\phi_X + \left[4(1+\alpha_{Z_Y})+\gamma_Y^2(5\alpha_{Z_Y}-1)\right]\alpha_{Z_Y}\phi_Y\right]^2} \geq 0. \tag{4.12}$$

As in the case with proportional elections, a higher trade tax, by raising the price of the import-competing good, exerts a negative externality on voters that own claims to the specific input used in the exporting sector, which is not internalized by factor owners with a common interest in the import-competing industry. Increasing the ideological homogeneity among the agents with stakes in the exporting (import-competing) firm therefore results in a relatively less (more) protectionist tariff policy in the political equilibrium.

By subtracting equation (4.11) from (4.4) and (4.12) from (4.5), and evaluating at $\phi_X = \phi_Y$ it can be shown that the following conditions hold:

$$\left.\frac{\partial \hat{\tilde{\beta}}_Y^{PRO}}{\partial \phi_X}\right|_{\phi_X=\phi_Y} - \left.\frac{\partial \hat{\tilde{\beta}}_Y^{MAJ}}{\partial \phi_X}\right|_{\phi_X=\phi_Y} = \\ -\frac{24\gamma_Y\left[2+\gamma_Y(\gamma_Y^2+\gamma_Y-1)\right]}{\phi_X}\left[\frac{1+\alpha_{Z_X}}{(12+9\gamma_Y^2)^2} - \frac{\alpha_{Z_X}\alpha_{Z_Y}(1+\alpha_{Z_Y})}{\left[4(1+\alpha_{Z_Y})+\gamma_Y^2(5-\alpha_{Z_Y})\right]^2}\right] \leq 0, \tag{4.13}$$

and

$$\left.\frac{\partial \hat{\tilde{\beta}}_Y^{PRO}}{\partial \phi_Y}\right|_{\phi_X=\phi_Y} - \left.\frac{\partial \hat{\tilde{\beta}}_Y^{MAJ}}{\partial \phi_Y}\right|_{\phi_X=\phi_Y} = \\ \frac{24\gamma_Y\left[2+\gamma_Y(\gamma_Y^2+\gamma_Y-1)\right]}{\phi_Y}\left[\frac{1+\alpha_{Z_X}}{(12+9\gamma_Y^2)^2} - \frac{\alpha_{Z_X}\alpha_{Z_Y}(1+\alpha_{Z_Y})}{\left[4(1+\alpha_{Z_Y})+\gamma_Y^2(5-\alpha_{Z_Y})\right]^2}\right] \geq 0. \tag{4.14}$$

Increasing the mass of swing voters which own the input used by the exporting sector thus evidently lowers the tariff under a proportional regime by more than the trade tax implied by the majoritarian electoral rule. To understand this result, note that ϕ_X represents the density of ideologically neutral voters among owners of the specific factor used by the exporting industry, and employed in sector X and Z. The political homogeneity consequently increases in both these voter groups in response to the ideological shift; by a factor of one in district X and by a factor of α_{Z_X} in Z. Hence, under majoritarian representation, such a marginal change in the political preferences is internalized for a smaller group of politically neutral agents with stakes in the exporting industry—α_{Z_X}, as compared to $1+\alpha_{Z_X}$ under proportional elections[28]—since the entire electoral competition is now focused into the marginal district made up of constituents employed in industry Z. For this reason, trade barriers are reduced relatively more with a proportional system when the homogeneity over the political dimension increases among those that own the factor used by the exporting sector. On the other hand, increasing the homogeneity among owners of the input employed

[28]This also follows from the candidates' objective functions, i.e., from (4.2) and (4.8).

in the import-competing sector raises the tariff announced by a proportional legislature by relatively more compared to the trade tax proposed by the majoritarian regime. Clearly ϕ_Y represents the density of ideologically neutral voters among factor owners with a common interest in the import-competing industry, working in sector Y as well as Z. Therefore the mass of swing voters increases in both these voter groups following such an ideological shift; by a factor of one in district Y and by a factor of α_{Z_Y} in Z. A given shift is thus internalized for a smaller group of neutral voters with a common interest in the import-competing industry under majoritarian representation—α_{Z_Y}, as compared to $1+\alpha_{Z_Y}$ under proportional elections[29]—since the electoral activity in nonmarginal districts is now disregarded by an office-seeking politician. It follows that the equilibrium level of trade protection is raised relatively more with a proportional system.

The above analysis can be seen to confirm the notion that proportional elections induce more spending on nontargeted social programs (see for example Persson and Tabellini [2002]), since policymakers typically set tariffs to accomplish redistributive objectives, and the only redistributive instrument available to politicians in this model is a trade tax that affects the welfare of two broad groups of citizens.

Substituting (4.9) into (3.17), differentiating with respect to ϕ_X and ϕ_Y to obtain:

$$\frac{\partial \hat{\beta}_X^*}{\partial \phi_X} = \frac{\partial \hat{\beta}_X^*}{\partial \Psi^{MAJ}} \frac{\partial \Psi^{MAJ}}{\partial \phi_X} \leq 0, \tag{4.15}$$

and

$$\frac{\partial \hat{\beta}_X^*}{\partial \phi_Y} = \frac{\partial \hat{\beta}_X^*}{\partial \Psi^{MAJ}} \frac{\partial \Psi^{MAJ}}{\partial \phi_Y} \geq 0, \tag{4.16}$$

where $\Psi^{MAJ} \equiv \left(\hat{\tilde{\beta}}_Y^{MAJ} - 1\right)^2 > 0$, $\frac{\partial \hat{\beta}_X^*}{\partial \Psi^{MAJ}} \leq 0$, $\frac{\partial \Psi^{MAJ}}{\partial \phi_X} \geq 0$ and $\frac{\partial \Psi^{MAJ}}{\partial \phi_Y} \leq 0$ (see Appendix A.3 for details). The general idea underlying the mechanism described by (4.15) is, using the same argument as in Subsection 4.1, that $\hat{\tilde{\beta}}_Y^{MAJ}$ is decreasing in ϕ_X by (4.11), and this raises the incentives of the foreign government to implement a trade policy that does not lead to a threat of retaliation. As a result, the foreign trade tax is reduced. In contrast, the logic behind the property in (4.16) is that $\hat{\tilde{\beta}}_Y^{MAJ}$ increases with the mass of

[29] Again, this can be seen from the structure of (4.2) and (4.8).

swing voters who own the input employed in the home import-competing industry by (4.12). This in turn decreases the opportunity cost in foreign of a more moderate tariff setting behavior, which consequently implies higher foreign trade barriers in equilibrium.

Subtracting (4.15) from (4.6) and (4.16) from (4.7), noting that $\frac{\partial \hat{\beta}_X^*}{\partial \Psi^{PRO}} = \frac{\partial \hat{\beta}_X^*}{\partial \Psi^{MAJ}} = \frac{\partial \hat{\beta}_X^*}{\partial \Psi}$, and evaluating at $\phi_X = \phi_Y$ it can be shown that the following inequalities are satisfied:

$$\frac{\partial \hat{\beta}_X^*}{\partial \Psi^{PRO}} \frac{\partial \Psi^{PRO}}{\partial \phi_X}\bigg|_{\phi_X=\phi_Y} - \frac{\partial \hat{\beta}_X^*}{\partial \Psi^{MAJ}} \frac{\partial \Psi^{MAJ}}{\partial \phi_X}\bigg|_{\phi_X=\phi_Y} =$$
$$- \frac{\partial \hat{\beta}_X^*}{\partial \Psi} \frac{\Omega}{\phi_X} \left[\frac{\alpha_{Z_X} \alpha_{Z_Y} (1+\alpha_{Z_Y}) \left[4(1+\alpha_{Z_Y}) - \gamma_Y (5\alpha_{Z_Y} - 1) \right]}{\left[4(1+\alpha_{Z_Y}) + \gamma_Y^2 (5-\alpha_{Z_Y}) \right]^3} - \frac{(12-3\gamma_Y)(1+\alpha_{Z_X})}{(12+9\gamma_Y^2)^3} \right] \leq 0, \tag{4.17}$$

and

$$\frac{\partial \hat{\beta}_X^*}{\partial \Psi^{PRO}} \frac{\partial \Psi^{PRO}}{\partial \phi_Y}\bigg|_{\phi_X=\phi_Y} - \frac{\partial \hat{\beta}_X^*}{\partial \Psi^{MAJ}} \frac{\partial \Psi^{MAJ}}{\partial \phi_Y}\bigg|_{\phi_X=\phi_Y} =$$
$$\frac{\partial \hat{\beta}_X^*}{\partial \Psi} \frac{\Omega}{\phi_Y} \left[\frac{\alpha_{Z_X} \alpha_{Z_Y} (1+\alpha_{Z_Y}) \left[4(1+\alpha_{Z_Y}) - \gamma_Y (5\alpha_{Z_Y} - 1) \right]}{\left[4(1+\alpha_{Z_Y}) + \gamma_Y^2 (5-\alpha_{Z_Y}) \right]^3} - \frac{(12-3\gamma_Y)(1+\alpha_{Z_X})}{(12+9\gamma_Y^2)^3} \right] \geq 0, \tag{4.18}$$

where $\Omega \equiv 48\gamma_Y (2+\gamma_Y)^2 \left[1 + \gamma_Y (\gamma_Y - 1) \right] \geq 0$. So, increasing the mass of ideologically neutral voters with a common interest in the home exporting (import-competing) sector lowers (raises) the foreign tariff by more under a proportional representation in home as compared to the case of majoritarian elections. The intuition for this result is straightforward. As the political homogeneity increases among factor owners that own the input employed in the exporting (import-competing) sector, the home tariff implied by a proportional electoral rule decreases (increases) by relatively more than the trade tax proposed by a majoritarian legislature (this follows from [4.13] and [4.14]). It is consequently more (less) beneficial for the tariff setting foreign country to implement a trade policy that does not provoke a retaliatory response under a proportional electoral rule, because the opportunity cost of a more moderate tariff setting behavior under this type of home regime,

following the ideological shift, becomes relatively higher (lower). This reduces (raises) the political equilibrium level of protection in foreign comparatively more in relation to the case of majoritarian representation.

The central findings in this subsection are summarized in:

Result 2: *Given the threat of tariff retaliation, when the political homogeneity among factor owners with a common interest in the competing trading nation's exporting (import-competing) sector increases, the equilibrium level of domestic protection decreases (increases) (Proposition 1 restated). This effect becomes more pronounced if the trading partner's electoral arrangements are governed by a proportional representation instead of a majoritarian system.*

As a final remark it should be noted that the main comparative statics properties of the model, summarized in Result 2, give rise to a testable hypothesis: the variance of bilateral tariffs is higher in countries with a proportional electoral rule when controlling for electoral mobility among domestic voter groups distinguished by individuals with stakes in either the exporting or the import-competing industry.

5 Conclusions

This paper has investigated endogenous tariff formation under representative democracy given the risk of tariff retaliation. Previous research does not capture how the strategic interaction between governments in the international arena shapes the interplay between the domestic electorate and politicians when forming trade policy. Introducing international trade relations into a tariff formation model, allowing for a dynamic political process of protection, retaliation, liberalization and trade wars, it is shown that tariffs depend on the policy preferences of the expected domestic swing voters, in accordance with the findings of Yang (1995), but also on those of the ideologically neutral voters among trade partners. Hence, taking policy interdependence into account in a framework with endogenous tariffs implies that ideological shifts in the population, which systematically alter the political power of different voter groups or types of factor owners in competing trading nations, influence the domestic tariff formation process. In particular, increasing the mass of swing voters with a common interest in the home country's import-

competing (exporting) sector, increases (decreases) the politically optimal trade tax in the tariff setting foreign country. This interdependency becomes more marked if the electoral arrangements in home are governed by a proportional representation as compared to a majoritarian system. Furthermore, it follows from the extension of how electoral rules affect the strategic policy interaction, that tariffs are higher under proportional electoral regimes as compared to majoritarian institutions if marginal (swing) districts are populated by relatively more factor owners with stakes in the exporting industry.

To summarize, when the risk of retaliation is taken into consideration in a model of endogenous tariff formation, electoral competition in one country—and the mechanism used to elect that country's legislature—are predicted to affect trade policy outcomes elsewhere.

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A Appendix

A.1 Determining the Sign of the Partial Derivatives in (3.21) and (3.22)

Taking the derivative of Ψ with respect to ϕ_X and ϕ_Y:

$$\frac{\partial \Psi}{\partial \phi_X} = \frac{16\alpha_X \gamma_Y \phi_Y (3-\gamma_Y)(2+\gamma_Y)^2 \left[2\gamma_Y \phi_Y - (4-\gamma_Y)\phi\right]}{\left[(2\phi_Y + \phi)\gamma_Y^2 - 12\phi\right]^3} \geq 0, \qquad \text{(A.1)}$$

and

$$\frac{\partial \Psi}{\partial \phi_Y} = \frac{-16\alpha_X \gamma_Y \phi_X (3-\gamma_Y)(2+\gamma_Y)^2 \left[2\gamma_Y \phi_Y - (4-\gamma_Y)\phi\right]}{\left[(2\phi_Y + \phi)\gamma_Y^2 - 12\phi\right]^3} \leq 0, \qquad \text{(A.2)}$$

if and only if $\alpha_Y > \frac{2\gamma_Y \phi_Y - \alpha_X \phi_X (4-\gamma_Y)}{(4-\gamma_Y)\phi_Y}$, where $\frac{2\gamma_Y \phi_Y - \alpha_X \phi_X (4-\gamma_Y)}{(4-\gamma_Y)\phi_Y} \geq \frac{2\gamma_Y^2 \phi_Y - \alpha_X \phi_X (12-\gamma_Y^2)}{(12-\gamma_Y^2)\phi_Y}$, which is satisfied whenever $\hat{\hat{\beta}}_Y < 1$, and $\hat{\hat{\beta}}_Y \in [0, 1)$.

A.2 Determining the Sign of the Partial Derivatives in (4.6) and (4.7)

Differentiating Ψ^{PRO} with respect to ϕ_X and ϕ_Y yields:

$$\frac{\partial \Psi^{PRO}}{\partial \phi_X} = \frac{\Omega(1+\alpha_{Z_X})\phi_Y \left[(4+\gamma_Y)(1+\alpha_{Z_X})\phi_X + \left[4 - 5\gamma_Y + (4+\gamma_Y)\alpha_{Z_Y}\right]\phi_Y\right]}{\left[(5\gamma_Y^2+4)(1+\alpha_{Z_X})\phi_X + \left[4(1+\alpha_{Z_Y}) + \gamma_Y^2(5\alpha_{Z_Y}-1)\right]\phi_Y\right]^3} \geq 0, \qquad \text{(A.3)}$$

and

$$\frac{\partial \Psi^{PRO}}{\partial \phi_Y} = \frac{-\Omega(1+\alpha_{Z_X})\phi_X \left[(4+\gamma_Y)(1+\alpha_{Z_X})\phi_X + \left[4 - 5\gamma_Y + (4+\gamma_Y)\alpha_{Z_Y}\right]\phi_Y\right]}{\left[(5\gamma_Y^2+4)(1+\alpha_{Z_X})\phi_X + \left[4(1+\alpha_{Z_Y}) + \gamma_Y^2(5\alpha_{Z_Y}-1)\right]\phi_Y\right]^3} \leq 0, \qquad \text{(A.4)}$$

if and only if $\alpha_{Z_Y} < \frac{2(4+\gamma_Y)\phi_X+(4-5\gamma_Y)\phi_Y}{(4+\gamma_Y)(\phi_X-\phi_Y)}$, which holds true for $\hat{\tilde{\beta}}_Y^{PRO} < 1$, and $\hat{\tilde{\beta}}_Y^{PRO} \in [0,1)$.

A.3 Determining the Sign of the Partial Derivatives in (4.15) and (4.16)

Taking the derivative of Ψ^{MAJ} with respect to ϕ_X and ϕ_Y gives:

$$\frac{\partial \Psi^{MAJ}}{\partial \phi_X} = \frac{\Omega(1+\alpha_{Z_Y})\alpha_{Z_X}\alpha_{Z_Y}\phi_Y\left[(4+\gamma_Y)(1+\alpha_{Z_Y})\alpha_{Z_X}\phi_X+\left[4-5\gamma_Y+(4+\gamma_Y)\alpha_{Z_Y}\right]\alpha_{Z_Y}\phi_Y\right]}{\left[(5\gamma_Y^2+4)(1+\alpha_{Z_Y})\alpha_{Z_X}\phi_X+\left[4(1+\alpha_{Z_Y})+\gamma_Y^2(5\alpha_{Z_Y}-1)\right]\alpha_{Z_Y}\phi_Y\right]^3} \geq 0, \tag{A.5}$$

and

$$\frac{\partial \Psi^{MAJ}}{\partial \phi_Y} = \frac{-\Omega(1+\alpha_{Z_Y})\alpha_{Z_X}\alpha_{Z_Y}\phi_X\left[(4+\gamma_Y)(1+\alpha_{Z_Y})\alpha_{Z_X}\phi_X+\left[4-5\gamma_Y+(4+\gamma_Y)\alpha_{Z_Y}\right]\alpha_{Z_Y}\phi_Y\right]}{\left[(5\gamma_Y^2+4)(1+\alpha_{Z_Y})\alpha_{Z_X}\phi_X+\left[4(1+\alpha_{Z_Y})+\gamma_Y^2(5\alpha_{Z_Y}-1)\right]\alpha_{Z_Y}\phi_Y\right]^3} \leq 0, \tag{A.6}$$

if $\alpha_{Z_Y} \geq \frac{5\gamma_Y-4}{4+\gamma_Y}$, which is fulfilled when $\hat{\tilde{\beta}}_Y^{MAJ} < 1$, and $\hat{\tilde{\beta}}_Y^{MAJ} \in [0,1)$.