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Domestic Political Competition and Pro-cyclical Import Protection

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Abstract

Governments, especially in developing countries, routinely practice binding overhang (i.e. setting applied tariffs below binding WTO commitments) and frequently move applied tariffs for given products up and down over the business cycle. Moreover, applied tariffs are pro-cyclical in developing countries. We explain this phenomenon using a dynamic theory of lobbying between domestic interest groups. Applied tariffs are pro-cyclical when high-tariff interests (e.g. import-competing industries) capture the government: these groups concede lower tariffs to low-tariff interest groups (e.g. exporting firms or firms using imported intermediate inputs) during recessions because recessions lower the opportunity cost of lobbying and thereby generate a stronger lobbying threat.

1. Introduction

A striking feature of WTO tariff agreements is the lack of commitment to specific tariff levels. Rather, countries commit to upper bounds on tariffs which are known as tariff bindings. As such, countries retain flexibility when setting actual tariffs which are known as applied tariffs. A country does not violate its WTO commitments by unilaterally raising its applied tariffs as long as they remain below the tariff binding. Recent papers (e.g. Nicita et al. (2013) and Beshkar et al. (2015)) have begun to empirically document the widespread phenomenon of "binding overhang" whereby countries set applied tariffs below tariff bindings. This is especially true in developing countries where tariff bindings often far exceeded applied tariffs after the 1994 Uruguay Round (Bchir et al. (2006) and Nicita et al. (2013)). Moreover, Lake and Linask (2015) document that developing countries often use this greater flexibility by moving the applied tariff for a given product up and down over time.

While recent work has analyzed the theoretical and empirical determinants of applied tariffs and binding overhang (Bown and Crowley (2013b), Ludema and Mayda (2013), Nicita et al. (2013) and Beshkar et al. (2015)), these studies have ignored the role of the business cycle. Indeed, conventional wisdom views applied tariffs as counter-cyclical, rising in recessions (creating lower binding overhang) and falling in booms (creating higher binding overhang).[1] Nevertheless, using data for over 5,000 products in 72 developed and developing countries for 2000–2011, Lake and Linask (2015) find pro-cyclical applied tariffs and, thus, counter-cyclical binding overhang.[2] Moreover, they find that these results are completely driven by developing countries, with applied tariffs being acyclical in developed countries.

In this paper, we present, to the best of our knowledge, the first theoretical model attempting to explain the pro-cyclical applied tariffs and the counter-cyclical binding overhang empirically observed in developing countries. In our setup, the government is

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captured by either high-tariff interests (e.g. import-competing firms) or low-tariff interests (e.g. firms that export and/or use imported intermediate inputs) and implements the nominated applied tariff of the group by whom it is captured.[3] In each period, the incumbent group, i.e. the group who has captured the government and is dictating applied tariffs, faces the threat of displacement as a result of lobbying by the opposing group. To mitigate this lobbying threat, an incumbent group may nominate an applied tariff different from the ideal tariff it would implement absent any lobbying threat.

Counter-cyclical binding overhang and pro-cyclical applied tariffs emerge in equilibrium when high-tariff interests are the incumbent group. Driving this result is the time-varying opportunity cost of lobbying. Intuitively, using scarce resources for lobbying is more attractive during recessions because recessions are associated with negative productivity shocks or low prices via low aggregate demand, and these forces depress the marginal revenue product of resources used in production. Given this pro-cyclical opportunity cost of lobbying, recessions produce a stronger lobbying threat from the opposing group. To preemptively mitigate the stronger lobbying threat of the opposing group during recessions, the incumbent group makes concessions by moving the applied tariff away from its own ideal tariff and toward the ideal tariff of the opposing group. That is, applied tariffs are pro-cyclical and binding overhang is counter-cyclical when high-tariff interests are the incumbent group dictating tariff policy. Conversely, applied tariffs are counter-cyclical and binding overhang is pro-cyclical when low-tariff interests are the incumbent group. Thus, our results are consistent with the view that high-tariff interests have a dominant influence over tariff policy.

Motivated by the seminal work of Krueger (1974), Bhagwati (1982) and Acemoglu and Robinson (2001), the core version of our model assumes that lobbying by the opposing group destroys a fraction of the economy's resources. We extend the model to allow high-tariff and low-tariff interests to simultaneously and strategically choose an amount of labor for lobbying with the residual labor used to produce output. Here, recessions not only affect economic output directly but also indirectly via the endogenous allocation of labor between production and lobbying. Nevertheless, the key insight remains: the opportunity cost of lobbying is lower during recessions than booms and, therefore, tariffs are pro-cyclical when high-tariff interests dictate tariff policy. Thus, our results extend to different formalizations of lobbying; the key feature is the pro-cyclical opportunity cost of lobbying.

More broadly, the idea that the opportunity cost of initiating conflict is lower when economic conditions are less favorable is deeply rooted in the civil war literature. For example, Blattman and Miguel (2010, p.12) argue that "Their [Chassang and Padro-i Miquel (2009)] key insight is that transient economic shocks increase the immediate incentives to fight but not the discounted present value of victory. The model thus implies that in dire economic circumstances groups predate upon one another since they have less to lose than in periods where the returns to production are higher." Blattman and Miguel (2010) also discuss supporting empirical evidence including Collier and Hoeffler (2004) and Miguel et al. (2004).

Because the central mechanism we propose is that the group in control of tariff setting manipulates tariffs to pre-emptively avoid opposition lobbying, lobbying does not arise in the equilibrium of our model. Of course, superficial anecdotal evidence suggests lobbying is a pervasive phenomenon. However, in a comprehensive review of the empirical lobbying literature, de Figueiredo and Richter (2014, p.178) argue that important directions for future research include understanding "Why is there so little money in lobbying" and "... why do so few interest groups lobby." Our model suggests that part of the answers may be that interest groups who exert dominant influences over policy are willing to cede ground when facing a strong latent lobbying threat by opposition groups.

As discussed earlier in the introduction (and in the following section), applied tariffs and binding overhang appear acyclical in developed countries. While our model will not directly address why tariff cyclicality differs between developed and developing countries, the mechanism of our model may still be relevant for developed countries. But, if so, other important and offsetting mechanisms may dominate in developed countries.

Our paper complements the theoretical literature analyzing the cyclicality of tariffs. In a model of self-enforcing trade agreements that neutralize terms of trade externalities, Bagwell and Staiger (2003) show how the persistence of business cycles with pro-cyclical trade volumes implies that the cost of deviating from a reciprocal trade agreement is pro-cyclical. In turn, and in contrast to our model, trade policy is more liberal during booms.[4] According to Bagwell and Staiger (pp.1-2), the conventional domestic political economy story behind tariff cyclicality, whereby policymakers raise tariffs in response to stronger lobbying by import-competing firms during recessions, is unsatisfactory because it ignores the role of lobbying by firms favoring lower tariffs (e.g. export firms or firms using imported inputs). Indeed, this is their primary motivation for exploring a mechanism based on international interactions. Moreover, recent work by Nicita et al. (2013) and Miyagiwa et al. (2015) emphasize the role played by trade partner size and retaliation motives in international tariff wars.[5,6] Thus, while there is ample theoretical and empirical support that the mechanisms mediated through international interactions are important determinants of trade policy, our objective is to explore the role played by domestic political economy concerns. To do so, we abstract from the impact of international interactions. Indeed, by explicitly modeling the domestic interaction between high- and low-tariff interests, we address Bagwell and Staiger's criticism of the literature taking a one-sided view of domestic political economy mechanisms.

Our paper also fits into the literature proposing explanations for binding overhang.[7] Specifically, our paper provides a structural interpretation for the random political pressure variable that plays a key role in one of the two main explanations in the literature. Within the terms of trade theory of trade agreements, Bagwell and Staiger (2005), Amador and Bagwell (2013) and Beshkar et al. (2015) show that binding overhang emerges as a natural feature of an optimal trade agreement when countries have private information about a random political pressure variable representing their time-varying preference for protectionism. Thus, while countries value the ability to internalize terms of trade externalities through committing to lower tariffs, they also value the flexibility to adjust tariffs in response to realized political pressure. Interpreting the strength of the lobbying threat as the random political pressure variable, our model gives a structural foundation for this random political pressure variable and links it to the dynamics of binding overhang.[8]

2. Empirical Observations

Our model provides a potential explanation for two empirical observations in developing countries: (i) the applied tariff for a given product often moves up and down over time and (ii) contrary to the conventional wisdom, applied tariffs are pro-cyclical. Lake and Linask (2015) document these empirical observations using a sample of over 5000 products and 72 countries for the period 2000–2011 (51 developing countries, 16 developed, and five that change categories over the sample period).

While recent papers have documented that developing countries have larger binding overhang than developed countries, Lake and Linask (2015) document that developing countries also use this flexibility by adjusting tariffs more frequently than developed countries. Table 1 illustrates that 12.73% of country-product pairs in developing

Table 1. Frequency of Applied Tariff Changes at Country-Product Level

	Developing		*Developed*	
	N	%	N	%
Applied tariff only decreases	40,509	33.46	4,319	10.98
Applied tariff always unchanged	61,291	50.63	29,731	75.57
Applied tariff only increases	3,883	3.21	3,042	7.73
Applied tariff increases and decreases	15,375	12.70	2,249	5.72
Total	121,058	100	39,341	100

Notes: The sample is that described in Section 2.
A product is a HS6 category.

countries see the applied tariff both increase and decrease over the sample period compared to 5.72% of country-product pairs in developed countries.

Tables A1 and A2 in the Appendix present summary statistics as well as variable definitions and sources for the regressions in Table 2, which regress overhang (Panel A) and the applied tariff (Panel B) on the lagged business cycle ($BC_{i,t-1}$).[9,10] All regressions use the following control variables, emphasized recently as important determinants of applied tariffs and binding overhang: market power at the country-product level ($MP_{i,j}$; see, e.g., Bagwell and Staiger (2011), Ludema and Mayda (2013), Nicita et al. (2013) and Beshkar et al. (2015)), share of product level imports sourced from preferential trade agreement partners ($PTA\_IM_{i,j,t}$; see, e.g. Ludema and Mayda (2013)), and lagged import surges at the country-product level and their volatility ($\Delta IM_{i,j,t-1}$ and $sd\Delta IM_{i,j,t-1}$; see, e.g., Bown and Crowley (2013b)). All regressions also control for the lagged trend component of log real GDP ($y_{i,t-1}$) as well as year and country-sector fixed effects where a sector is a 4-digit HS category. Column (1) is the baseline specification with columns (2)-(4) presenting three robustness specifications: column (2) excludes agricultural products, column (3) includes only original WTO members and column (4) excludes the Great Recession years.[11]

The results clearly show that binding overhang is counter-cyclical and applied tariffs are pro-cyclical in developing countries but acyclical in developed countries. As expected, given that binding overhang is the tariff binding less the applied tariff, the absolute values of the point estimates for $BC_{i,t-1}$ are nearly identical across overhang and applied tariff specifications. In addition to columns (2)-(4), these results are robust to numerous robustness exercises explored extensively in Lake and Linask (2015).

3. Model

The Economy

We analyze an infinite horizon, small open economy with three groups of agents: low-tariff interests (L) and high-tariff interests (H), each producing separate goods, and workers. Low-tariff interests may be firms that export and/or use imported intermediate inputs. A growing literature documents that imported intermediate input users are also often export firms and that they experience adverse effects from protection (e.g. Amiti and Konings (2007), Kasahara and Rodrigue (2008), Konings and Vandenbussche (2013), Blonigen (2015) and Vandenbussche and Viegelahn (2015)). High-tariff

Table 2. Cyclicality of Overhang and Applied Tariffs

Panel A: Cyclicality of binding overhang

	Developing				*Developed*			
	(1)	*(2)*	*(3)*	*(4)*	*(1)*	*(2)*	*(3)*	*(4)*
$BC_{i,t-1}$	−11.482†	−12.972†	−16.910†	−14.568†	1.567	1.921	1.970	−1.014
	(5.842)	(6.078)	(6.825)	(5.996)	(2.200)	(2.441)	(2.448)	(2.273)
$MP_{i,j}$	0.007	0.007	0.013	0.008	−0.012	−0.009	−0.013	−0.012
	(0.008)	(0.007)	(0.010)	(0.007)	(0.009)	(0.008)	(0.009)	(0.009)
$PTA\_IM_{i,j,t}$	−0.179	−0.141	−0.281	−0.159	0.062	−0.174‡	0.054	0.096
	(0.184)	(0.195)	(0.207)	(0.177)	(0.141)	(0.103)	(0.146)	(0.151)
$\Delta IM_{i,j,t-1}$	0.012	0.007	0.019	0.016	−0.008	−0.002	−0.005	−0.010
	(0.014)	(0.014)	(0.016)	(0.014)	(0.008)	(0.007)	(0.009)	(0.007)
$sd\Delta IM_{i,j,t-1}$	0.103*	0.113*	0.096*	0.111*	0.097†	0.063‡	0.100†	0.089†
	(0.030)	(0.027)	(0.034)	(0.030)	(0.042)	(0.034)	(0.048)	(0.043)
$y_{i,t-1}$	6.535‡	6.943‡	13.131†	7.767‡	−1.236*	−1.320*	−1.229*	−0.873‡
	(3.897)	(4.090)	(5.827)	(4.215)	(0.423)	(0.451)	(0.425)	(0.449)
N	1000627	921492	851173	828436	366527	327342	350937	306455

Panel B: Cyclicality of applied tariff

	Developing				*Developed*			
	(1)	*(2)*	*(3)*	*(4)*	*(1)*	*(2)*	*(3)*	*(4)*
$BC_{i,t-1}$	11.793†	13.309†	17.200†	14.925†	−1.427	−1.834	−2.054	1.306
	(5.847)	(6.084)	(6.828)	(6.003)	(2.229)	(2.461)	(2.461)	(2.282)
$MP_{i,j}$	−0.006	−0.004	−0.010	−0.007	0.042	−0.009†	0.044	0.034
	(0.006)	(0.006)	(0.006)	(0.006)	(0.045)	(0.005)	(0.047)	(0.040)
$PTA\_IM_{i,j,t}$	0.258	0.200	0.366‡	0.242	0.303*	0.287*	0.317*	0.292*
	(0.181)	(0.195)	(0.202)	(0.176)	(0.073)	(0.060)	(0.075)	(0.076)
$\Delta IM_{i,j,t-1}$	−0.010	−0.006	−0.017	−0.017	−0.010	−0.003	−0.013	0.009
	(0.014)	(0.014)	(0.016)	(0.015)	(0.021)	(0.005)	(0.023)	(0.024)
$sd\Delta IM_{i,j,t-1}$	0.009	−0.015	−0.005	0.009	0.340	−0.003	0.402	0.295
	(0.023)	(0.022)	(0.024)	(0.023)	(0.249)	(0.019)	(0.291)	(0.215)
$y_{i,t-1}$	−6.801‡	−7.274‡	−13.334†	−8.137‡	1.113*	1.145†	1.157*	0.851†
	(3.883)	(4.075)	(5.821)	(4.192)	(0.413)	(0.446)	(0.414)	(0.433)
N	1000627	921492	851173	828436	366527	327342	350937	306455

Notes: The sample in Column (1) is that described in Section 2. Two-way clustered standard errors are used by clustering at the country-year and country-HS4 level. Year and country-HS4 fixed effects included. Column (2) excludes agricultural products. Column (3) excludes new WTO members. Column (4) excludes Great Recession years. See Table A2 for variable definitions and data sources.
‡ $p < 0.10$, † $p < 0.05$, * $p < 0.01$.

interests are import-competing firms, which naturally benefit from the increased domestic prices caused by tariffs. As in Grossman and Helpman (1994), workers do not lobby in our model.

The economy faces business cycle fluctuations that depress the marginal revenue product of labor used by H and L. These fluctuations could result from either aggregate demand shocks that depress prices or productivity shocks. Specifically, a boom

(B) and a recession (R) occur with respective probabilities $1-\pi$ and π. Potential real aggregate income for $\omega \in \{B, R\}$ is

$$A_\omega \bar{Y} \text{ where } A_\omega = \begin{cases} 1 \text{ if } \omega = B \\ a < 1 \text{ if } \omega = R \end{cases} \tag{1}$$

and $\frac{1}{a}$ denotes the severity of the business cycle shock.

The applied tariff, τ, determines the distribution of the economy's real aggregate income. Specifically, the one-period indirect utility of group $i \in \{H, L\}$ is given by

$$\mu_i(\tau, A_\omega) = \begin{cases} \alpha_i(\tau) A_\omega \bar{Y} \equiv u_i(\tau, A_\omega) \text{ if lobbying does not take place} \\ \phi \cdot u_i(\tau, A_\omega) \text{ if lobbying takes place} \end{cases} \tag{2}$$

with $\phi \in (0,1)$, $\alpha_i(\tau) \in (0,1)$, $\alpha_H'(\tau) > 0$ and $\alpha_L'(\tau) < 0$. Further, $\alpha_H(\tau) + \alpha_L(\tau) \leq 1$, with the inequality admitting payments to workers and efficiency costs of tariffs. When tariffs impose efficiency costs, i.e. $\alpha_H'(\tau) + \alpha_L'(\tau) < 0$, we assume $\alpha_H'(\tau) > 0$ so that the positive income redistribution effect for high-tariff interests outweighs the negative efficiency cost of a higher tariff.

Since tariffs mediate income distribution, both high- and low-tariff interests want tariff setting control. In any period, the government is captured by one of these groups, who then dictate applied tariff setting. The group not currently in control of tariff-setting can gain control via costly lobbying.[12] We assume that lobbying destroys a proportion $1-\phi$ of indirect utility in the period when lobbying takes place. Thus, ϕ represents the efficiency of lobbying with a higher ϕ implying lobbying is less costly. While the subsequent analysis only relies on lobbying being costly for both groups and not that it is equally costly, we assume lobbying is equally costly for tractability. Indeed, our results hold if costs are unequal but arbitrarily small for the group not lobbying.

Initially, we model lobbying in a highly stylized manner: the group not currently in control can choose to lobby, and any such lobbying is successful in gaining tariff-setting control. The group currently in control can only mitigate the lobbying threat by pre-emptively altering the applied tariff. This highly stylized approach abstracts from the realistic possibility of "lobbying wars" but highlights that business cycle fluctuations directly generate a pro-cyclical opportunity cost of lobbying via productivity fluctuations. When we extend the analysis in Section 5 to accommodate lobbying wars where each group simultaneously lobbies, business cycle fluctuations also affect the allocation of labor between lobbying and production. Nevertheless, due to offsetting effects on the demand for lobbying labor, whether aggregate lobbying is pro- or counter-cyclical is ambiguous and, in turn, so are the implications for the opportunity cost of lobbying. Thus, the direct productivity effect remains the key mechanism driving cyclical fluctuations in the opportunity cost of lobbying. We therefore abstract from the possibility of lobbying wars in the baseline analysis to highlight this key mechanism.

Our stylized baseline analysis puts business cycle fluctuations at center stage. However, industry characteristics such as industry concentration may impact the success of lobbying and hence tariff setting. In Section 5, we extend the analysis so that lobbying is successful with a probability that can depend on relevant industry characteristics. Lobbying thus mediates the effect of industry characteristics on the *level* of tariffs. But, these time-invariant industry characteristics do not alter the property that the opportunity cost of lobbying is lower during recessions and hence do not alter our qualitative results on the *cyclicality* of tariffs.

Ultimately, the crucial feature of our lobbying formulation, regardless of the specifics, is that the opportunity cost of lobbying is lower during recessions than booms. Intuitively, business cycle fluctuations imply that using productive resources for lobbying rather than producing output is less costly during recessions.

Role of Lobbying and Stages within Each Period

The game comprises infinite periods. Motivated by the GATT and the WTO as institutions that orchestrate lower global tariffs, we assume that the government is captured by high-tariff interests at the beginning of period one.[13] Since we focus on *temporal* fluctuations in binding overhang and applied tariffs and our results hold qualitatively for any tariff binding $\bar{\tau}_1$ in place at the beginning of the game, we take $\bar{\tau}_1$ as exogenous. Thus, our model is consistent with the view that tariff bindings were strategically negotiated during the Uruguay Round (Beshkar et al. (2015)) or that some WTO members, especially developing countries, submitted very high and somewhat arbitrarily chosen tariff bindings after the conclusion of the Uruguay Round (Nicita et al. (2013)). In either case, $\bar{\tau}_1$ can be viewed as the tariff binding in place following the Uruguay Round.

Generically, we denote the group who has captured the government at the beginning of period t by group i and the other group by group i'. The following describes the timing of events within any period.

(1) The shock to the economy, $A_{\omega,}$ is realized. If $\bar{\tau}_t=0$, production and consumption take place and the period ends.
(2) If $\bar{\tau}_t > 0$, group i decides whether to cede control of the government to group i' ($\gamma_i=1$) or not cede control ($\gamma_i=0$).
    (a) If group i does not cede control, it nominates an applied tariff τ.
    (b) If group i cedes control, group i' nominates an applied tariff τ.
(3) If group i chooses not to cede control in Stage 2, group i' chooses whether to lobby ($\rho_{i'}=1$) or not ($\rho_{i'}=0$).
    (a) If group i' lobbies, it captures the government and nominates an applied tariff τ and a tariff binding $\bar{\tau}$.
(4) The government implements the nominated applied tariff and, if relevant, the nominated tariff binding of the group who has captured the government.
(5) Production and consumption take place.

While groups do not lobby simultaneously here (section 5 considers this possibility), *both* groups strategically affect the eventual outcome. In particular, group i can preemptively avoid lobbying by group i' in two ways. First, group i can alter their nominated tariff away from their ideal tariff and towards the ideal tariff of group i'. That is, high-tariff interests (low-tariff interests) can lower (raise) the tariff below the tariff binding (above zero). Second, group i can cede control of the government, and hence applied tariff setting, to group i'. In both cases, by avoiding lobbying, group i prevents an even worse outcome where group i' sets both the tariff binding and the applied tariff. The possibility of high-tariff interests ceding control of applied tariff setting to low-tariff interests allows the possibility of non-zero tariffs when low-tariff interests control tariff-setting because ceding control may prevent low-tariff interests from lobbying and implementing a zero tariff binding.[14,15]

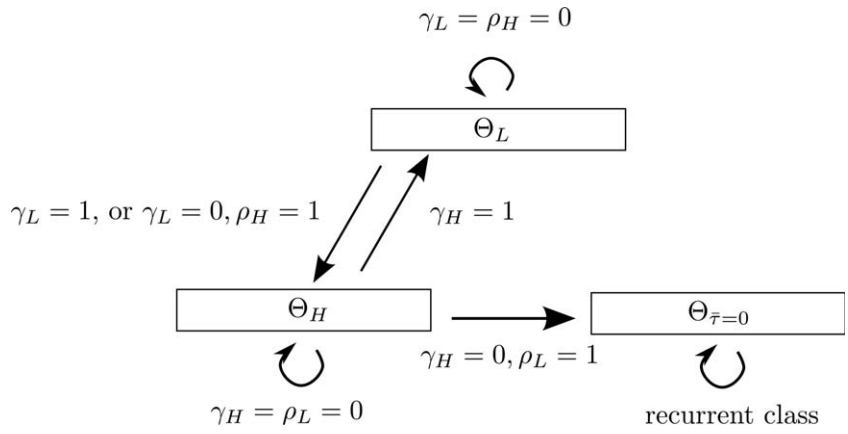

Figure 1. State transitions

States, Strategies and Equilibrium Concept

We solve for a pure strategy Markov perfect equilibrium. Except when the tariff binding is zero, i.e. $\bar{\tau}=0$, each state is a triple consisting of the state of the economy, the group who has captured the government, and the tariff binding. We let Θ denote the set of states: $\Theta_{\bar{\tau}=0}$ denotes states where the tariff binding is zero, and Θ_i for $i = H,L$ denotes states where high- or low-tariff interests have captured the government and $\bar{\tau} > 0$.[16]

A strategy for player j is a function specifying the actions taken by player j for each state $\theta \in \Theta$.[17] When player j begins the period as the opposing group, it conditions its actions on those already taken by the other group within the period. We let s_j denote a strategy for player j, $s=\left(s_j, s_{j'}\right)$ denote the strategy profile, and $\xi\left(\theta, \theta' | s\right)$ denote the transition probability from state θ to state θ' given the strategy profile s. For the Bellman equations

$$V_j(\theta)=\max_{s_j}\left\{\mu_j\left(\tau\left(\left(s_j, s_{j'}^*\right), \theta\right), A_\omega, \left(s_j, s_{j'}^*\right)\right)+\beta\sum_{\theta'\in\Theta}\xi\left(\theta, \theta' | \left(s_j, s_{j'}^*\right)\right)V_j\left(\theta'\right)\right\}$$

$$V_{j'}(\theta)=\max_{s_{j'}}\left\{\mu_{j'}\left(\tau\left(\left(s_j^*, s_{j'}\right), \theta\right), A_\omega, \left(s_j^*, s_{j'}\right)\right)+\beta\sum_{\theta'\in\Theta}\xi\left(\theta, \theta' | \left(s_j^*, s_{j'}\right)\right)V_{j'}\left(\theta'\right)\right\},$$

$s^*=(s_j^*, s_{j'}^*)$ is a Markov Perfect Equilibrium if s_j^* solves $V_j(\theta)$ for all $\theta \in \Theta$ and $s_{j'}^*$ solves $V_{j'}(\theta)$ for all $\theta \in \Theta$. Without loss of generality, we restrict attention to strategies where (i) high tariff interests nominate $\bar{\tau}$ when nominating an applied tariff or a tariff binding and (ii) low-tariff interests nominate 0 when nominating an applied tariff or a tariff binding after lobbying.[18]

Figure 1 depicts the relationship between actions and state transitions. When $\theta \in \Theta_H$ and high-tariff interests do not cede control ($\gamma_H = 0$), the resulting state depends on whether low-tariff interests lobby. If low-tariff interests lobby ($\rho_L = 1$), the government implements a zero tariff binding which, by WTO rules, remains in place forever, and the economy moves to the recurrent class of states $\Theta_{\bar{\tau}=0}$. If low-tariff

interests do not lobby ($\rho_L = 0$), high-tariff interests maintain control. When $\theta \in \Theta_H$ and high-tariff interests cede control ($\gamma_H = 1$), then low-tariff interests capture the government and the economy moves to Θ_L. $\theta \in \Theta_L$ is similar to $\theta \in \Theta_H$: if low-tariff interests cede control ($\gamma_L = 1$) then high-tariff interests capture the government and the economy moves back to Θ_H. If low-tariff interests do not cede control ($\gamma_L = 0$) then (i) low-tariff interests maintain control if high-tariff interests do not lobby ($\rho_H = 0$) but (ii) if high-tariff interests lobby ($\rho_H = 1$) then high-tariff interests capture control and the economy returns to Θ_H.

4. Equilibrium Analysis

The Incentive to Maintain Control of the Government

To begin, we present an assumption that restricts attention to non-trivial equilibria. The assumption guarantees that high- and low-tariff interests *want* to maintain control of the government whenever they can preemptively avoid lobbying by the opposing group. Thus, high-tariff interests (low-tariff interests) will not cede control to low-tariff interests (high-tariff interests) if they can instead avoid opposition lobbying by setting lower (higher) applied tariffs. Further, the assumption ensures high-tariff interests *can* maintain control during booms and that low-tariff interests *can* maintain control during booms and recessions.

Assumption 1 requires some additional notation. When high-tariff interests control tariff-setting, $\tau^*_{R,H}$ and $\tau^*_{B,H}$ are the equilibrium tariffs that high-tariff interests set in, respectively, recessions and booms; analogously, low-tariff interests set $\tau^*_{R,L}$ and $\tau^*_{B,L}$ when controlling tariff-setting. Disregarding the constraints $\tau \geq 0$ and $\tau \leq \bar{\tau}$, $\tilde{\tau}_{R,H}$ and $\tilde{\tau}_{B,H}$ denote the maximum tariffs high-tariff interests can set and still avoid lobbying by low-tariff interests; analogously, $\tilde{\tau}_{R,L}$ and $\tilde{\tau}_{B,L}$ denote the minimum tariffs low-tariff interests can set and still avoid lobbying by high-tariff interests.[19] Further, $\delta_{\omega,i}(\tau_0, \tau_1) \equiv u_i(\tau_1, A_\omega) - u_i(\tau_0, A_\omega)$ denotes the change in group i's payoff when the tariff changes from τ_0 to τ_1 and the state of the economy is ω.

Assumption 1. *(i)* $\tilde{\tau}_{B,H} \geq 0$ *and* $\tilde{\tau}_{R,H} < \bar{\tau}$

(ii) $\tilde{\tau}_{B,L} \leq \bar{\tau}$ *and* $\tilde{\tau}_{R,L} \in (0, \bar{\tau}]$

(iii) $\delta_{R,L}(\tau^*_{R,L}, \bar{\tau}) + \delta_{B,L}(\tau^*_{B,H}, 0) < 0$

(iv) $\pi\delta_{R,H}\left(\tau^*_{R,H}, \tau^*_{R,L}\right) + (1-\pi)\delta_{B,H}\left(\tau^*_{B,H}, \tau^*_{B,L}\right) < 0$

(v) $\pi\delta_{R,L}\left(\tau^*_{R,L}, 0\right) + (1-\pi)\delta_{B,L}\left(\tau^*_{B,L}, \tau^*_{B,H}\right) < 0$

Parts (i) and (ii) of Assumption 1 rule out degenerate equilibria.[20] First, $\tilde{\tau}_{B,H} \geq 0$ ($\tilde{\tau}_{B,L} \leq \bar{\tau}$) ensures high-tariff interests (low-tariff interests) *can* maintain control in some state of the economy.[21] Second, given $\tilde{\tau}_{B,H} > \tilde{\tau}_{R,H}$ and $\tilde{\tau}_{B,L} < \tilde{\tau}_{R,L}$ will follow later, $\tilde{\tau}_{R,H} < \bar{\tau}$ ($\tilde{\tau}_{R,L} > 0$) ensures high-tariff interests (low-tariff interests) cannot always maintain control by setting the applied tariff equal to their ideal tariff: tariffs *will* fluctuate. Finally, since low-tariff interests can only obtain control after high-tariff interests have control, $\tilde{\tau}_{R,L} \leq \bar{\tau}$ helps rule out the possibility of equilibrium control cycling between high-tariff interests and low-tariff interests.[22] Part (iii) also helps rule this out by requiring that low-tariff interests cannot gain from ceding control in the current period and regaining control in the subsequent period.[23] Finally, our model of lobbying is of interest only if lobbying is a possibility, i.e. both groups potentially want to lobby. Intuitively, this happens only if maintaining control of tariff setting is

beneficial. Parts (iv) and (v) of Assumption 1 guarantee this by ensuring that the continuation value of maintaining control exceeds the continuation value of ceding control ($W_i(i) > W_i(i')$ in terms of later notation).[24]

When high-tariff interests dictate applied tariff setting

Since the game begins with high-tariff interests having captured the government (and Assumption 1 in Section 4 ensures they prefer to retain control), we first derive the maximum tariffs that high-tariff interests can set and still avoid lobbying by low-tariff interests in either state of the economy. Preventing lobbying benefits high-tariff interests because (i) it averts the direct costs of lobbying, (ii) it prevents the permanent reduction in bound tariffs implied by low-tariff interests lobbying, and (iii) high-tariff interests retain the possibility of setting higher future tariffs (up to the binding). To this end, suppose high-tariff interests dictate tariff setting (i.e. $\theta \in \Theta_H$) and have not ceded control (i.e. $\gamma_H = 0$). Let $V_L(\theta|\rho_L=0,\gamma_H=0)$ and $V_L(\theta|\rho_L=1,\gamma_H=0)$ denote the choice-specific value functions for low-tariff interests and $W_i(\bar{\tau}=0)$ denote the expected continuation payoff to player i given $\theta \in \Theta_{\bar{\tau}=0}$ and prior to realization of $A_\omega \in \{A_B, A_R\}$. Similarly denote $W_i(L)$ and $W_i(H)$ given $\theta \in \Theta_L$ and $\theta \in \Theta_H$. That is, $W_i(\cdot)$ are ex-ante value functions. Then,

$$V_L(\theta|\rho_L=1,\gamma_H=0)=\phi u_L(0,A_\omega)+\beta W_L(\bar{\tau}=0) \text{ and}$$
$$V_L(\theta|\rho_L=0,\gamma_H=0)=u_L\left(\tau_{\omega,H},A_\omega\right)+\beta W_L(H)$$

represent the payoffs to low-tariff interests associated with lobbying and not lobbying given that high-tariff interests have not ceded control.

Naturally, low-tariff interests lobby if and only if $V_L(\theta|\rho_L=1,\gamma_H=0) > V_L(\theta|\rho_L=0,\gamma_H=0)$. Thus, the low-tariff interest no–lobbying condition is

$$\underbrace{u_L(\tau_{\omega,H},A_\omega)-\phi u_L(0,A_\omega)}_{\text{opportunity cost of lobbying}}-\beta\underbrace{[W_L(\bar{\tau}=0)-W_L(H)]}_{\text{future value of lobbying}}\equiv f_{\omega,L}\geq 0 \tag{3}$$

for $\omega = B,R$. While $u_L(0,A_\omega) \geq u_L\left(\tau_{\omega,H},A_\omega\right)$, lobbying destroys a proportion $(1-\phi)$ of low-tariff interests' indirect utility. Thus, $u_L\left(\tau_{\omega,H},A_\omega\right)-\phi u_L(0,A_\omega)$ represents the indirect utility that low-tariff interests forego in the current period because of lobbying.[25] Conversely, $W_L(\bar{\tau}=0)-W_L(H)$ represents the future value of lobbying by capturing the change in low-tariff interests' expected continuation payoff via lobbying. Thus, (3) says low-tariff interests lobby if and only if the future value of lobbying exceeds the opportunity cost of lobbying.

Importantly, (3) shows that, for a given tariff τ, the opportunity cost of lobbying is lower in booms than recessions. In particular, (2) implies that the opportunity cost of lobbying in recessions is scaled down from that in booms by a factor $a<1$. This captures the intuitive idea that recessions arise because of negative productivity shocks or depressed prices, making it relatively more attractive to use resources for lobbying than production in recessions.

Intuitively, the future value of lobbying for low-tariff interests stems from having a permanently zero applied tariff rather than facing the applied tariffs imposed by high-tariff interests. Since $\Theta_{\bar{\tau}=0}$ is a recurrent class, this intuition is formalized by[26]

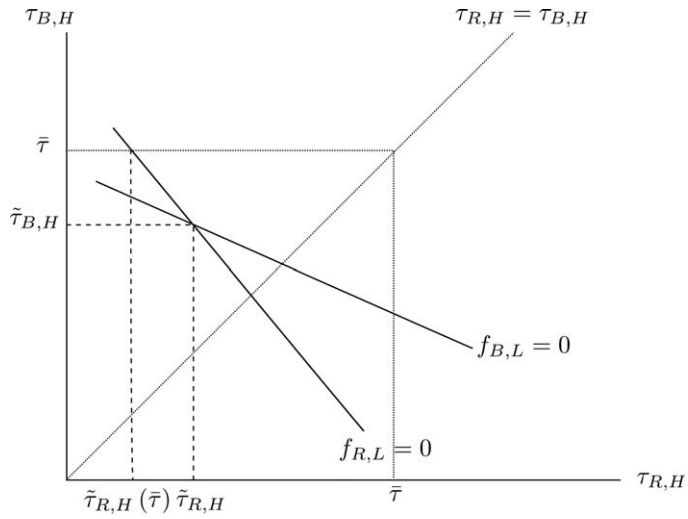

Figure 2. Exporter no-lobbying conditions

$$W_L(\bar{\tau}=0) - W_L(H) = \frac{1}{1-\beta}\left[\pi a \delta_{R,L}\left(\tau_{R,H}, 0\right) + (1-\pi)\delta_{B,L}\left(\tau_{B,H}, 0\right)\right]. \tag{4}$$

While the opportunity cost of lobbying is lower during recessions, the future value of lobbying does not depend on whether lobbying takes place in a boom or recession. Importantly, all else equal, this implies that the low-tariff interest no-lobbying condition is tighter (i.e. the lobbying threat is stronger) during recessions than booms. Because lower tariffs increase the opportunity cost and decrease the future value of lobbying for low-tariff interests, high-tariff interests mitigate the stronger low-tariff interest lobbying threat in recessions by lowering the applied tariff. Thus applied tariffs are pro-cyclical and binding overhang is counter-cyclical when high-tariff interests maintain control of the government and dictate applied tariffs.

Figure 2 illustrates the problem faced by high-tariff interests when preventing lobbying by low-tariff interests. Since the no-lobbying conditions in either state of the economy depend on the tariffs set in both states, the no-lobbying conditions are represented by loci in $\left(\tau_{R,H}, \tau_{B,H}\right)$ space. In particular, tariffs lying above the $f_{\omega,L} = 0$ locus violate the low-tariff interest no-lobbying condition in the state of the economy ω.[27] Each locus is downward sloping because a higher $\tau_{B,H}$ can accompany a lower $\tau_{R,H}$ and leave the future value of lobbying unaffected and therefore $f_{\omega,L} = 0$. However, the recession no-lobbying contour curve is steeper than the boom no-lobbying contour curve: a larger increase in $\tau_{B,H}$ can accompany a given decrease in $\tau_{R,H}$ under the recession no-lobbying condition relative to the boom no-lobbying condition.[28]

The intersection of the no-lobbying loci yield the maximum tariffs, $\tilde{\tau}_{B,H}$ and $\tilde{\tau}_{R,H}$, high-tariff interests can set while still preventing low-tariff interest lobbying in both booms and recessions. Moreover, $\tilde{\tau}_{R,H} < \tilde{\tau}_{B,H}$ because the no-lobbying condition is tighter in recessions than booms given that the opportunity cost of lobbying is higher during booms for any given tariff.[29] That is, tariffs are pro-cyclical and, hence, binding overhang is counter-cyclical. This is our main result (see Proposition 1 below).

Real world institutional features constrain the preemptive tariffs that high-tariff interests set. First, WTO rules impose $\tau_{B,H} \leq \bar{\tau}$. If the $f_{B,L} = 0$ locus in Figure 2 was higher to the extent that it intersected the $f_{R,L} = 0$ locus above $\tau_{B,H} = \bar{\tau}$, high-tariff

interests *could* prevent low-tariff interests lobbying in booms by setting an applied tariff above $\bar{\tau}$. But, given $\tau_{B,H} \leq \bar{\tau}$, high-tariff interests instead set $\tau_{B,H}=\bar{\tau}$ and the constrained applied tariff in recessions is then $\tilde{\tau}_{R,H}(\bar{\tau})$ in Figure 2.[30] Second, tariffs must be non-negative. That is, high-tariff interests can only prevent low-tariff interest lobbying in booms and recessions if the intersection of the no-lobbying loci yields $\tilde{\tau}_{R,H} \geq 0$ and $\tilde{\tau}_{B,H} \geq 0$; otherwise, low-tariff interests will lobby in some state of the economy even if high-tariff interests set a zero applied tariff.[31] Letting $\tau^*_{R,H}$ and $\tau^*_{B,H}$ denote the equilibrium tariffs that high-tariff interests set in booms and recessions, we have:

$$\tau^*_{R,H}=\begin{cases} \tilde{\tau}_{R,H} \text{ if } 0 \leq \tilde{\tau}_{R,H}, \tilde{\tau}_{B,H} \leq \bar{\tau} \\ \tilde{\tau}_{R,H}(\bar{\tau}) \text{ if } 0 \leq \tilde{\tau}_{R,H} \leq \bar{\tau} < \tilde{\tau}_{B,H} \\ 0 \text{ if } \tilde{\tau}_{R,H} < 0 \end{cases}, \text{ and } \tau^*_{B,H}=\begin{cases} \bar{\tau} \text{ if } \tilde{\tau}_{B,H} > \bar{\tau} \\ \tilde{\tau}_{B,H} \text{ if } \tilde{\tau}_{B,H} \leq \bar{\tau} \end{cases}. \quad (5)$$

Assumption 1 and the foregoing analysis produce the following Lemma.

Lemma 1. *Under Assumption 1, the only situation where a group cedes control of tariff setting is when high-tariff interests cede control during recessions. This happens if and only if the low-tariff interest no-lobbying condition during recessions fails for* $\tau_{R,H}=0$.

And, given Lemma 1, the main result of our paper now follows.

Proposition 1. *When high-tariff interests maintain control of the government during booms and recessions then applied tariffs are pro-cyclical and binding overhang is counter-cyclical. This cyclicality is strengthened when recessions are more severe. Further, high-tariff interests are more likely to maintain control of the government when recessions are less severe, when recessions are more frequent, and when lobbying is less efficient.*

The intuition behind the cyclicality is simple: recessions lower the opportunity cost of low-tariff interests lobbying and, therefore, high-tariff interests concede lower applied tariffs to preempt the stronger lobbying threat. By preventing low-tariff interests from lobbying, high-tariff interests prevent both the immediate costs of lobbying as well as the permanent imposition of tariffs bound at zero.

Proposition 1 highlights two further results: (i) tariff cyclicality is strengthened when recessions are more severe but (ii) the ability of high-tariff interests to maintain control of tariff setting is strengthened when recessions are less severe or more frequent and when lobbying is less efficient. In either state of the economy, a change in a parameter representing economic conditions (a, π, or ϕ) has direct and indirect effects on the lobbying threat of low-tariff interests. Given a state of the economy ω, each parameter can directly affect both the opportunity cost of lobbying and the future value of lobbying.[32] $\omega' \neq \omega$. An indirect effect emerges because changes in the preemptive tariff in the other state of the economy will, in turn, affect the attractiveness of lobbying in the present state.[33] The two effects, which may or may not move in the same direction, are summarized in Table 3 where D denotes the direct effect and I denotes the indirect effect.

The direct and indirect effects of more severe recessions, i.e. a lower a, move in the same direction. In *booms*, a lower a reduces the future value of low-tariff interest lobbying by lowering the present discounted value of future income (see (4)). This direct

Table 3. Direct (D) and Indirect (I) Effects of Changing Economic Conditions on Tariffs Set by High-Tariff Interests

	$\downarrow a$			$\downarrow \pi$			$\uparrow \phi$		
	D	*I*	*Net*	*D*	*I*	*Net*	*D*	*I*	*Net*
$\tau_{B,H}$	+	+	+	–	+	–	–	+	–
$\tau_{R,H}$	–	–	–	–	+	–	–	+	+/–

effect shifts the $f_{B,L} = 0$ locus in Figure 2 upward: for a given $\tau_{R,H}$, high-tariff interests can raise $\tau_{B,H}$ and still avoid low-tariff interest lobbying during booms (see (3)). In *recessions*, the same effect of a lower a is present but is outweighed by the lower a reducing the opportunity cost of lobbying for low-tariff interests. This direct effect strengthens the low-tariff interest lobbying threat and shifts the $f_{R,L} = 0$ locus shifts leftward: for a given $\tau_{B,H}$, high-tariff interests must set a lower $\tau_{R,H}$ to avoid low-tariff interests lobbying during recessions.

The indirect effects reinforce these direct effects. First, on account of the direct effect that lowered $\tau_{R,H}$, the future value of low-tariff interest lobbying falls during booms (see (4)). In turn, this relaxes the low-tariff interest no-lobbying condition during booms and allows a higher $\tau_{B,H}$ (see (3)). Second, on account of the direct effect that raised $\tau_{B,H}$, the future value of low-tariff interest lobbying rises during recessions (see (4)). In turn, this tightens the low-tariff interest no-lobbying condition during recessions and reduces $\tau_{R,H}$ (see (3)). Thus, more severe recessions increase $\tau_{B,H}$ and lower $\tau_{R,H}$, which strengthens the pro-cyclicality of applied tariffs and the counter-cyclicality of binding overhang. Further, sufficiently severe recessions could force $\tilde{\tau}_{R,H} < 0$ implying that high-tariff interests would have to cede control in recessions to avoid low-tariff interests lobbying.

The direct and indirect effect of less frequent recessions, i.e. a lower π, move in opposite directions. Nevertheless, Appendix D shows that the direct effect dominates. The direct effect of less frequent recessions increases the present discounted value of future income which strengthens the low-tariff interest lobbying threat. In turn, each $f_{\omega,L} = 0$ locus shifts leftward which, all else equal, lowers $\tau_{\omega,H}$.[34] Thus, less frequent recessions require that high-tariff interests lower $\tau_{B,H}$ and $\tau_{R,H}$. Indeed, given $\tilde{\tau}_{B,H} > \tilde{\tau}_{R,H}$, sufficiently infrequent recessions can also lead to $\tilde{\tau}_{R,H} < 0$ implying that high-tariff interests would have to cede control in recessions to prevent low-tariff interests lobbying.

Finally, low-tariff interest lobbying may be unavoidable when lobbying is sufficiently efficient, i.e. ϕ is sufficiently high. More efficient lobbying wastes fewer productive resources and, thus, reduces the opportunity cost of lobbying in booms and recessions (see (3)). The direct effect of the stronger low-tariff interest lobbying threat shifts the no-lobbying loci leftward. Appendix D shows that $\tau_{B,H}$ must fall, but the effect on $\tau_{R,H}$ is, in general, ambiguous. The direct effect is apparent: the stronger lobbying threat via more efficient lobbying lowers $\tau_{R,H}$ for any given $\tau_{B,H}$. However, an indirect effect also operates on $\tau_{R,H}$ because the lower $\tau_{B,H}$ means low-tariff interests now receive tariff concessions during booms which mitigates their lobbying threat during recessions. In general, which effect dominates is indeterminate. However, given $\tilde{\tau}_{B,H} > \tilde{\tau}_{R,H}$, continual increases in lobbying efficiency must eventually reduce $\tau_{R,H}$.

Thus, sufficiently efficient lobbying can lead to $\tilde{\tau}_{R,H} < 0$ meaning high-tariff interests cannot preemptively avoid low-tariff interests lobbying.

Before analyzing the equilibrium when high-tariff interests cede control, we address the role played by our simplifying assumption that low-tariff interests nominate a new tariff binding—which rarely takes place in current policy environments—upon successful lobbying. While this assumption affords significant analytical tractability (allowing us to derive (4)), it does not affect our qualitative results: tariff fluctuations are driven by fluctuations in the opportunity cost of lobbying yet the new tariff binding affects the future value of lobbying while leaving the opportunity cost of lobbying proportional to a and, hence, pro-cyclical. Thus, the key result of our paper, Proposition 1, is robust to assuming that low-tariff interests cannot change the tariff binding.[35]

When Low-Tariff Interests Dictate Applied Tariff Setting

Economic conditions may dictate that the only way high-tariff interests can prevent low-tariff interest lobbying is by ceding control of applied tariff setting. Lemma 1 says that this can only happen in recessions, and Proposition 1 says that this can happen with sufficiently severe recessions, sufficiently infrequent recessions, and sufficiently efficient lobbying. Thus, we now consider the impact of business cycle fluctuations when high-tariff interests have ceded control of the government to low-tariff interests, noting that Lemma 1 says that low-tariff interests will then maintain control of the government in booms and recessions.

Appendix A shows that the high-tariff interest no-lobbying conditions are analogous to the low-tariff interest no-lobbying conditions in (3). While the opportunity cost of lobbying is lower during recessions, the future value of lobbying does not depend on whether lobbying takes place in a boom or recession. Thus, all else equal, the high-tariff interest no-lobbying condition during recessions is tighter than during booms and, in turn, low-tariff interests set higher tariffs in recessions than booms to prevent lobbying by high-tariff interests. That is, when low-tariff interests maintain control of the government and thus dictate applied tariffs, applied tariffs are counter-cyclical and, in turn, binding overhang is pro-cyclical.

Proposition 2. *When low-tariff interests maintain control of the government during booms and recessions, applied tariffs are counter-cyclical and binding overhang is pro-cyclical.*

5. Extensions

Industry Characteristics and Lobbying Success

So far we assumed that the opposing group captures the government with certainty if it chooses to lobby. However, in practice, the impact of lobbying on trade policy is uncertain and depends on the industry characteristics of high- and low-tariff interests. Thus, we now assume that lobbying by the opposing group is unsuccessful with some probability q, which depends on relevant industry characteristics.[36] That is, lobbying is successful with probability $1-q$. In the event of unsuccessful lobbying by group i', group i retains control of setting the applied tariff, and the tariff binding remains unaltered.

Following earlier logic, the low-tariff interest no-lobbying conditions in (3) now become

$$\underbrace{(1-\phi)u_L(0,A_\omega)-(1-\phi q)\delta_{\omega,L}(\tau_{\omega,H},0)}_{\text{Expected opportunity cost of lobbying}} -\beta\underbrace{(1-q)[W_L(\bar{\tau}=0)-W_L(H)]}_{\text{Expected future value of lobbying}} \equiv f_{\omega,L} \geq 0 \tag{6}$$

for $\omega = B,R$. These no-lobbying conditions have a familiar form from earlier sections.

The possibility of unsuccessful lobbying has two effects on the no-lobbying conditions. First, the expected opportunity cost of lobbying is higher due to the $\phi q\delta_{\omega,L}(\tau_{\omega,H},0)$ term: the applied tariff remains at $\tau_{\omega,H}$ rather than falling to zero if lobbying is unsuccessful even though the costs of lobbying are still incurred. Second, the expected future value of lobbying falls because the gain $W_L(\bar{\tau}=0)-W_L(H)$ is now only realized upon lobbying with probability 1– q. Thus, the possibility of unsuccessful lobbying relaxes the no-lobbying conditions and allows high-tariff interests to raise preemptive tariffs. Naturally, the probability of unsuccessful lobbying and therefore the amount by which high-tariff interests can raise tariffs depends on the relevant industry characteristics.

Nevertheless, as in earlier sections, the opportunity cost of lobbying is lower in recessions than booms meaning high-tariff interests must concede lower tariffs in recessions than booms in order to prevent lobbying by low-tariff interests. Hence, our main result in Proposition 1 remains: applied tariffs are pro-cyclical and binding overhang is counter-cyclical when high-tariff interests dictate applied tariffs.

Simultaneous Lobbying

Until now, only the group not in control of tariff setting could lobby. We now consider the case of simultaneous lobbying and show that the main insights from Section 4 still emerge: because the opportunity cost of lobbying is pro-cyclical, high-tariff interests dictate pro-cyclical tariffs to mediate the threat of lobbying by low-tariff interests.

Specifically, suppose high-tariff interests are dictating applied tariffs but consider the following modification to Stage 3 of the game (see Section 3): low-tariff interests must first decide whether to initiate a lobbying war and then, if a lobbying war is initiated, high- and low-tariff interests simultaneously choose an amount of labor to hire for lobbying. As in Section 3, if low-tariff interests win the lobbying war then they capture the government and thereby nominate an applied tariff for the current period and a new tariff binding. Alternatively, if low-tariff interests are unsuccessful in winning the lobbying war then high-tariff interests maintain capture of the government and nominate the applied tariff $\tau_{\omega,H}$.

Letting $N_{S,i}$ denote the labor used for lobbying (or, equivalently, "rent-seeking") by group $i \in \{H,L\}$, let the probability that high-tariff interests win the lobbying war, and hence maintain control of the government, be

$$q(N_{S,H},N_{S,L}) = \frac{N_{S,H}}{N_S} \tag{7}$$

where $N_S = N_{S,H}+N_{S,L}$. That is, $q(\cdot)$ is the endogenous probability of unsuccessful lobbying by low-tariff interests. After the applied tariff, and potentially the tariff binding, is implemented by the government, then each group i hires an amount of production labor $N_i(w(\tau,N_S))$ at the equilibrium production wage $w(\tau,N_S)$.

When low-tariff interests initiate a lobbying war, their optimal choice of labor for lobbying is determined by the following optimization problem:[37]

$$\begin{aligned}\max_{N_{S,L}} \left(1-q\left(N_{S,H},N_{S,L}\right)\right)\left[u_L\left(0,A_\omega,N_L(\cdot),N_{S,L},N_S\right)+\beta W_L(\bar{\tau}=0)\right]\\ +q\left(N_{S,H},N_{S,L}\right)\left[u_L\left(\bar{\tau},A_\omega,N_L(\cdot),N_{S,L},N_S\right)+\beta W_L(H)\right].\end{aligned} \tag{8}$$

The one period payoff for group i is $u_i\left(\tau,A_\omega,N_i,N_{S,i},N_S\right)=F_i(N_i,K_i,A_\omega)-w(\tau,N_S)N_i-w_SN_{S,i}$ where (i) w_S denotes the equilibrium wage paid to labor used for lobbying and (ii) $F_i(\cdot,A_\omega)$ is the value of output produced by group i using labor (N_i) and capital (K_i).[38] More specifically, $F_i(\cdot,A_\omega)=p_iA_\omega f_i(N_i,K_i)$ where $f_i(\cdot)$ is a constant returns to scale production function and A_ω is a scale parameter used to capture economy-wide productivity or price shocks. Solving the first order conditions associated with low-tariff interests' choice of lobbying $N_{S,L}$ (see (8)) and high-tariff interests' choice of lobbying $N_{S,H}$, we find

$$q_i(\cdot)=\frac{1}{1+\nu} \text{ where } \nu\equiv\frac{\delta_{\omega,L}(\bar{\tau},0)+\beta[W_L(\bar{\tau}=0)-W_L(H)]}{\delta_{\omega,H}(0,\bar{\tau})+\beta[W_H(H)-W_H(\bar{\tau}=0)]}. \tag{9}$$

That is, the equilibrium probability of low-tariff interests being unsuccessful in winning the lobbying war is inversely related to the value they place on winning the lobbying war relative to the value that high-tariff interests place on winning the lobbying war.[39]

Low-tariff interests do not initiate a lobbying war if

$$\begin{aligned}u_L\left(\tau_{\omega,H},A_\omega,N_L,0,0\right)+\beta W_L(H) \quad \geq \quad & (1-q(\cdot))[u_L(0,\cdot)+\beta W_L(\bar{\tau}=0)]\\ & +q(\cdot)[u_L(\bar{\tau},\cdot)+\beta W_L(H)]\end{aligned}$$

which reduces to

$$\begin{aligned}&\underbrace{u_L\left(\tau_{\omega,H},A_\omega,N_L,0,0\right)-(1-q(\cdot))u_L(0,\cdot)-q(\cdot)u_L(\bar{\tau},\cdot)}_{\text{Expected opportunity cost of lobbying}}\\ &\geq \underbrace{\beta\,(1-q(\cdot))[W_L(\bar{\tau}=0)-W_L(H)]}_{\text{Expected future value of lobbying}}.\end{aligned} \tag{10}$$

So again we have the familiar formulation that lobbying does not take place when the (expected) opportunity cost of lobbying exceeds the (expected) future value of lobbying.

Two key questions now follow. Is the low-tariff interest no-lobbying condition tighter, i.e. the low-tariff interest lobbying threat stronger, during recessions than booms because of a lower opportunity cost of lobbying? And, if so, do pro-cyclical tariffs emerge because high-tariff interests deal with the stronger low-tariff interest lobbying threat by setting lower tariffs in recessions than booms? In previous sections, the answer to both questions was yes.

In Section 4, the opportunity cost of lobbying was proportional to A_ω (see, e.g. equations (2) and (3)) and thus lower during recessions. This could be interpreted as a "direct productivity effect": due to productivity or price shocks, the marginal revenue product of labor was low during recessions which increased the attractiveness of using scarce labor resources for non-production purposes. But, implicitly, recessions did not affect the allocation of labor between (i) the two production sectors, regardless of whether lobbying took place, and (ii) lobbying and output production. The same is true here for *fixed* levels of lobbying.[40] Thus, for fixed lobbying and hence fixed $q(\cdot)$, the direct productivity effect still implies that the opportunity cost of lobbying is lower in recessions than booms.

Therefore, all else equal, high-tariff interests still face a stronger lobbying threat from low-tariff interests in recessions than booms in the presence of simultaneous lobbying.

However, the difference between earlier sections and the current simultaneous lobbying setup is that recessions can also affect the allocation of labor between lobbying and production. That is, recessions can affect the level of labor sucked from the production sectors into lobbying. Moreover, this recession induced labor reallocation between lobbying and output production can also affect the probability that each group wins the lobbying war.

Conditional on a lobbying war, the effect of recessions on this labor reallocation mechanism is ambiguous. On the one hand, recessions lower the marginal revenue product of labor used for production and, via reduced labor demand for production, exert downward pressure on wages. All else equal, this increases labor hired for lobbying. On the other hand, recessions also shrink labor demand for lobbying by scaling down the current period benefit of gaining tariff setting, i.e. $\delta_{\omega,L}(\bar{\tau},0)$, since it is proportional to A_{ω}.[41] Thus, conditional on a lobbying war, it is unclear how recessions affect the level of labor hired for lobbying. In turn, it is unclear how recessions affect the probability of each group winning a lobbying war. Therefore, the direct productivity effect driving our earlier results remains the key insight when comparing the opportunity cost of lobbying between booms and recessions.

The second question above is whether high-tariff interests deal with a stronger lobbying threat by low-tariff interests in recessions relative to booms by lowering $\tau_{R,H}$ below $\tau_{B,H}$. A lower $\tau_{R,H}$ affects the no-lobbying conditions through three channels: directly via the opportunity cost and the future value of lobbying; indirectly via the probability of winning a lobbying war; and indirectly via the effect on the level of production labor. The direct effect is the same as previous sections: with a fixed labor allocation (between high- and low-tariff interests as well as between production and lobbying) and a fixed $q(\cdot)$, high-tariff interests neutralize the stronger lobbying threat of low-tariff interests in recessions relative to booms by lowering the recession tariff $\tau_{R,H}$ below the boom tariff $\tau_{B,H}$. This raises the opportunity cost and lowers the future value of lobbying by low-tariff interests.

But a lower $\tau_{R,H}$ can also indirectly affect the no-lobbying condition by impacting the probability of winning the lobbying war and the amount of labor used for production. First, (9) shows the impact on $q(\cdot)$ is ambiguous because a lower $\tau_{R,H}$ lowers the future value of winning the lobbying war for both high- and low-tariff interests: low-tariff interests now gain less by forcing the tariff to zero and high-tariff interests lose less if low-tariff interests force the tariff to zero. Second, all else equal, a lower $\tau_{R,H}$ reduces labor hired for lobbying via reducing the future value of lobbying. This increases output during the lobbying war and, in turn, reduces the opportunity cost of lobbying (see (10)). Therefore, it appears that these two indirect effects of a lower $\tau_{R,H}$ mitigate the direct effect of a lower $\tau_{R,H}$ discussed in the previous paragraph. That is, relative to earlier sections, a lower $\tau_{R,H}$ is less effective in eliminating low-tariff interest lobbying incentives. In turn, simultaneous lobbying should actually increase the degree of tariff procyclicality by magnifying the extent that high-tariff interests must lower $\tau_{R,H}$ to prevent lobbying by low-tariff interests.

6. Conclusion

This paper contributes to a small but growing literature analyzing why countries set their applied tariffs below the tariff bindings negotiated in the WTO. Rather than

modify or extend the traditional terms of trade-based model of trade agreements, we develop a novel, dynamic, single-country model emphasizing domestic political competition. Viewing the government as being captured by either low-tariff interests (e.g. export firms or firms using imported inputs) or high-tariff interests (e.g. import-competing firms), tariff fluctuations naturally emerge as a means for the group that has captured the government to mitigate the time-varying lobbying threat of the opposing group. As a result, binding overhang emerges in equilibrium. This framework allows us to make two distinct contributions.

First, we show that when high-tariff interests have captured the government and are dictating applied tariffs, binding overhang is counter-cyclical and applied tariffs are pro-cyclical. This matches our empirical observations that binding overhang is counter-cyclical in developing countries, where high-tariff interests have significant influence over tariff policy. Further, to our knowledge, ours is the first theory to explain the pro-cyclicality of applied tariffs. The key intuition is simple: the opportunity cost of lobbying by low-tariff interests is lower during recessions because recessions are associated with lower productivity, and so using labor for lobbying rather than producing output is relatively attractive during recessions. Thus, high-tariff interests preemptively nominate lower applied tariffs during recessions to prevent low-tariff interests from lobbying and gaining influence over tariff-setting.

Our second contribution is that we provide a structural interpretation for the existence of a random political pressure variable in terms of trade-based models of trade agreements. Such models generate binding overhang in equilibrium because exogenous *ex post* random political pressure generates *ex ante* demand for flexibility in applied tariff setting. However, we develop a model where the dynamics of domestic political competition, based on time varying opportunity costs of lobbying, lead to lobbying threats whose intensity endogenously varies over time. The time varying intensity of lobbying threats drives the dynamic fluctuations in binding overhang and can be interpreted as a random political pressure variable.

Appendix

A. High Tariff Interest No-Lobbying Condition

Following similar logic to that underlying the no-lobbying conditions in Section 4, high-tariff interests will not lobby regardless of the state of the economy if the following no-lobbying conditions hold for $\omega = H,L$:

$$\underbrace{u_H(\tau_{\omega,L}, A_\omega) - \phi u_H(\bar{\tau}, A_\omega)}_{\text{opportunity cost of lobbying}} - \beta \underbrace{[W_H(H) - W_L(H)]}_{\text{future value of lobbying}} \equiv f_{\omega,L} \geq 0\,. \tag{11}$$

The interpretation of (11) follows that of (3). In particular, the opportunity cost of lobbying during recessions is lower than during booms for a given tariff τ. Further, using Lemma 1 and the one shot deviation principle, we have:

$$W_H(H) - W_H(L) = \frac{1}{1-\beta(1-\pi)}\left[-\pi a \delta_{B,H}(0, \tau_{R,L}) + (1-\pi)\delta_{B,H}(\tau_{B,L}, \tau_{B,H})\right]. \tag{12}$$

B. Simultaneous Lobbying

Derivation of endogenous $q(\cdot)$

Before solving the low-tariff interests' optimization problem in (8), note that (i) $\frac{\partial W_L(\cdot)}{\partial N_{S,L}}=0$ because the only link between $N_{S,L}$ and the continuation payoff is via the probability of winning the current period lobbying war and (ii) low-tariff interests take wages as given. Thus, the first order condition for $N_{S,L}$ in (8) is

$$w_R=-\frac{\partial q(.)}{\partial N_{S,L}}\left[u_L\left(0,A_\omega,N_L(.),N_{S,L},N_S\right)+\beta W_L(\bar{\tau}=0)\right]$$
$$+\frac{\partial q(.)}{\partial N_{S,L}}\left[u_L\left(\bar{\tau},A_\omega,N_L(.),N_{S,L},N_S\right)+\beta W_L(H)\right]$$

which simplifies to

$$w_R=-\frac{\partial q(.)}{\partial N_{S,L}}\left[\delta_{\omega,L}(\bar{\tau},0)+\beta[W_L(\bar{\tau}=0)-W_L(H)]\right]. \tag{13}$$

Analogously, we have the following for high-tariff interests:

$$w_R=\frac{\partial q(.)}{\partial N_{S,H}}\left[\delta_{\omega,H}(0,\bar{\tau})+\beta[W_H(H)-W_H(\bar{\tau}=0)]\right]. \tag{14}$$

And we also have

$$\frac{\partial q(.)}{\partial N_{S,L}}=\frac{-N_{S,H}}{\left(N_{S,H}+N_{S,L}\right)^2}<0 \text{ and } \frac{\partial q(.)}{\partial N_{S,H}}=\frac{N_{S,L}}{\left(N_{S,H}+N_{S,L}\right)^2}>0. \tag{15}$$

Thus, given $q(\cdot)=\left(1+\frac{N_{S,L}}{N_{S,H}}\right)^{-1}$, (9) follows by equating the FOCs (13) and (14) and then using (15).

Labour market equilibrium

For each state of the economy $\omega=B,R$, 10 endogenous variables characterize labor market equilibrium when a lobbying war takes place: high-tariff interest lobbying $N_{S,H}$; low-tariff interest lobbying $N_{S,L}$; production labor used by low-tariff interests when low-tariff interests win the lobbying war, i.e. $N_L(w(0,N_S))$, and when high-tariff interests win the lobbying war, i.e. $N_L(w(\bar{\tau},N_S))$; production labor used by high-tariff interests when low-tariff interests win the lobbying war, i.e. $N_H(w(0,N_S))$, and when high-tariff interests win the lobbying war, i.e. $N_H(w(\bar{\tau},N_S))$; wages paid to labor hired for lobbying w_S; wages paid to labor hired for production when low-tariff interests win the lobbying war, i.e. $w(0,N_S)$, and when high-tariff interests win the lobbying war, i.e. $w(\bar{\tau},N_S)$; the probability that low-tariff interests are unsuccessful in winning the lobbying war $q\left(N_{S,H},N_{S,L}\right)$.

For each state of the economy $\omega=B,R$, 10 equations solve these 10 endogenous variables: two FOCs for $N_{S,H}$ and $N_{S,L}$ given by (13) and (14); two FOCs for production labor when low-tariff interests win the lobbying war, i.e. $N_H(w(0,N_S))$ and $N_L(w(0,N_S))$, whereby the wage must equal the marginal revenue product of labor; two FOCs for production labor when high-tariff interests win the lobbying war, i.e. $N_H(w(\bar{\tau},N_S))$ and $N_L(w(\bar{\tau},N_S))$, whereby the wage must equal the marginal

revenue product of labor; two full employment conditions $\bar{N}=N_S+N_H(w(\tau,N_S))+N_L(w(\tau,N_S))$ corresponding to whether low-tariff interests win the lobbying war, i.e. $\tau=0$, or high-tariff interests win the lobbying war, i.e. $\tau=\bar{\tau}$; the condition whereby workers are indifferent between being hired for lobbying or production: $w_S=q\left(N_{S,H},N_{S,L}\right)w(\bar{\tau},N_S)+\left(1-q\left(N_{S,H},N_{S,L}\right)\right)w(0,N_S)$; and, finally, (7) which defines the probability that low-tariff interests lose the lobbying war.

C. Proofs

Proof of Lemma 1

Consider a strategy profile where players never cede control if they can maintain control by nominating an applied tariff such that the no-lobbying condition of the opposing group holds. We will show there is no profitable one-shot deviation whereby the dictating group cedes control in the current period but never cedes control again. Thus, by the one shot deviation principle, it is optimal to maintain control where possible.

We begin by supposing low-tariff interests have control. Will low-tariff interests deviate and cede control? Noting that only ceding control in booms is not optimal for high-tariff interests (because $\tau^*_{B,H}>\tau^*_{R,H}$ and $a<1$ imply that $u_H(0,A_R)-u_H(\tau^*_{R,H},A_R)+\beta[W_H(L)-W_H(H)]>u_H(0,A_B)-u_H(\tau^*_{B,H},A_B)+\beta[W_H(L)-W_H(H)]$), there are two subcases to consider. First, suppose high-tariff interests cede control in recessions and booms. Thus, low-tariff interests will regain control in the following period if they cede control in the current period and hence, given that $\tau^*_{R,L}>\tau^*_{B,L}$, the maximum gain from the one-shot deviation is $\delta_{R,L}(\tau^*_{R,L},\bar{\tau})+\beta\delta_{B,L}(\tau^*_{B,H},0)$. In turn, a sufficient condition for the one-shot deviation to be unprofitable is $\delta_{R,L}(\tau^*_{R,L},\bar{\tau})+\delta_{B,L}(\tau^*_{B,H},0)<0$ which is part (iii) of Assumption 1. Second, suppose high-tariff interests cede control only in recessions. The expected benefit of the one-shot deviation for low-tariff interests when the state of the economy is ω is $\Delta\equiv\delta_{\omega,L}(\tau^*_{\omega,L},\bar{\tau})+\frac{\beta}{1-(1-\pi)\beta}[(1-\pi)\delta_{B,L}(\tau^*_{B,L},\tau^*_{B,H})+\pi\delta_{R,L}(\tau^*_{R,L},0)]$.[42] Thus, given $\delta_{\omega,L}(\tau^*_{\omega,L},\bar{\tau})<0$, a sufficient condition for $\Delta<0$ and, hence, the one-shot deviation to be unprofitable is $\pi\delta_{R,L}(\tau^*_{R,L},0)+(1-\pi)\delta_{B,L}(\tau^*_{B,L},\tau^*_{B,H})<0$ which is part (v) of Assumption 1. Therefore, given part (ii) of Assumption 1, low-tariff interests never cede control.

Now suppose high-tariff interests have control. Note, ceding control is costly for high-tariff interests: low-tariff interests nominate a zero tariff in the current period if high-tariff interests cede control and $u_H(\tau^*_{\omega,H},A_\omega)\geq u_H(0,A_\omega)$. Given we have established low-tariff interests never cede control, then the high-tariff interest continuation payoff from ceding control is $W_H(L)=\frac{1}{1-\beta}[\pi u_H(\tau^*_{R,L},A_R)+(1-\pi)u_H(\tau^*_{B,L},A_B)]$ and ceding control is unprofitable if $W_H(L)-W_H(H)<0$. If high-tariff interests can maintain control in booms and recessions then $W_H(H)\geq\frac{1}{1-\beta}\left[\pi u_H(\tau^*_{R,H},A_R)+(1-\pi)u_H(\tau^*_{B,H},A_B)\right]$. Thus, ceding control is not optimal if $\pi\delta_{R,H}(\tau^*_{R,H},\tau^*_{R,L})+(1-\pi)\delta_{B,H}(\tau^*_{B,H},\tau^*_{B,L})<0$ which is part (iv) of Assumption 1. If high-tariff interests cannot maintain control in recessions, then never ceding control in booms implies $W_H(H)-W_H(L)$ is given by (12). In turn, ceding control during booms is not optimal if $\pi\delta_{R,H}(0,\tau^*_{R,L})+(1-\pi)\delta_{B,H}(\tau^*_{B,H},\tau^*_{B,L})<0$ which is part (iv) of Assumption 1 with $\tau^*_{R,H}=0$.

Finally, part (i) of Assumption 1 implies high-tariff interests may not be able to maintain control in recessions. In this case, i.e. $\tau^*_{R,H}<0$, it is optimal for high-

tariff interests to cede control because otherwise low-tariff interests will lobby and a zero tariff binding will follow and we have $W_H(L)-W_H(\bar{\tau}=0)=\frac{1}{1-\beta}\left[\pi\delta_{R,H}(0,\tau^*_{R,L})+(1-\pi)\delta_{B,H}(0,\tau^*_{B,L})\right]>0$. □

Proof of Proposition 1

Lemma 1 implies high-tariff interests maintain control of tariff setting when possible. In this case, by construction, their optimal tariffs are given by (5). Note that the future value of low-tariff interest lobbying (see (4)) is independent of the current period state of the economy ω. Moreover, the opportunity cost of low-tariff interest lobbying (see (3)) is lower in recessions than booms for a given tariff τ because $u_L(\tau,A_R)-\phi u_L(0,A_R)=a[u_L(\tau,A_B)-\phi u_L(0,A_B)]$ and $a<1$. Thus, $f_{B,L}>f_{R,L}$ for a given tariff τ and, in turn, $f_{B,L}=f_{R,L}=0$ requires $\tau_{R,H}<\tau_{B,H}$ given $\frac{\partial f_{\omega,L}}{\partial\tau}<0$. Hence, applied tariffs are pro-cyclical and binding overhang is counter-cyclical.

For the degree of cyclicality and the likelihood of high-tariff interests maintaining control of the government, we rely on the comparative statics derived in Appendix D (see (22)). The degree of cyclicality is increasing in the severity of recessions because $\frac{\partial(\tau_{B,H}-\tau_{R,H})}{\partial a}<0$ since $\frac{\partial\tau_{B,H}}{\partial a}<0<\frac{\partial\tau_{R,H}}{\partial a}$. Moreover, high-tariff interests are more likely to maintain control of the government, i.e. $\tilde{\tau}_{R,H}>0$, under the conditions described in the proposition because $\frac{\partial\tau_{R,H}}{\partial a}>0, \frac{\partial\tau_{R,H}}{\partial\pi}>0, \frac{\partial\tau_{B,H}}{\partial\phi}<0$ and $\frac{\partial\tau_{R,H}}{\partial\phi}\lesseqgtr 0$. Note, $\frac{\partial\tau_{B,H}}{\partial\phi}<0$ and $\tilde{\tau}_{B,H}>\tilde{\tau}_{R,H}$ implies that, all else equal, $\tilde{\tau}_{R,H}<0$ is possible once ϕ is sufficiently large even if $\frac{\partial\tau_{R,H}}{\partial\phi}>0$ for some range of ϕ. □

Proof of Proposition 2

Lemma 1 implies low-tariff interests maintain control of tariff setting when possible. Note that the future value of high-tariff interest lobbying (see (12)) is independent of the current period state of the economy ω. Moreover, the opportunity cost of high-tariff interest lobbying is lower in recessions than booms for a given tariff τ because $u_H(\tau,A_R)-\phi u_H(\bar{\tau},A_R)=a[u_H(\tau,A_B)-\phi u_H(\bar{\tau},A_B)]$ and $a<1$. Thus, $f_{B,H}>f_{R,H}$ for a given tariff τ and, in turn, $f_{B,H}=f_{R,H}=0$ requires $\tau_{R,L}>\tau_{B,L}$ given $\frac{\partial f_{\omega,H}}{\partial\tau}>0$. Hence, applied tariffs are counter-cyclical and binding overhang is pro-cyclical. □

D. Comparative Statics

Totally differentiating the no-lobbying conditions, we have

$$\begin{bmatrix} f^{\tau_{B,H}}_{B,L} & f^{\tau_{R,H}}_{B,L} \\ f^{\tau_{B,H}}_{R,L} & f^{\tau_{R,H}}_{R,L} \end{bmatrix}\begin{bmatrix} d\tau_{B,H} \\ d\tau_{R,H} \end{bmatrix}+\begin{bmatrix} f^{x}_{B,L} \\ f^{x}_{R,L} \end{bmatrix}dx=\begin{bmatrix} 0 \\ 0 \end{bmatrix}$$

where x is a parameter of interest and superscripts denote partial derivatives (for example, $f^{\tau_{R,H}}_{B,L}\equiv\frac{\partial f_{B,L}}{\partial\tau_{R,H}}$). This can be written more compactly as

$$A\begin{bmatrix} d\tau_{B,H} \\ d\tau_{R,H} \end{bmatrix}+Fdx=\begin{bmatrix} 0 \\ 0 \end{bmatrix}$$

so that, using standard matrix notation,

$$\frac{\partial \tau_{B,H}}{\partial x}=\frac{A_{12}F_2-A_{22}F_1}{A_{11}A_{22}-A_{12}A_{21}} \text{ and } \frac{\partial \tau_{R,H}}{\partial x}=-\left[\frac{A_{11}F_2-A_{21}F_1}{A_{11}A_{22}-A_{12}A_{21}}\right]. \tag{16}$$

Note that

$$A_{11}=-(1+\lambda_2)\delta_{B,L}^{\tau_{B,H}}(\tau_{B,H},0)<A_{21}=-\lambda_2\delta_{B,L}^{\tau_{B,H}}(\tau_{B,H},0)<0 \tag{17}$$

$$A_{22}=-(1+\lambda_1)a\delta_{B,L}^{\tau_{R,H}}(\tau_{R,H},0)<A_{12}=-\lambda_1 a\delta_{B,L}^{\tau_{R,H}}(\tau_{R,H},0)<0 \tag{18}$$

$$F_1=f_{B,L}^{a}=-\lambda_1\delta_{B,L}(\tau_{R,H},0)<0<F_2=f_{R,L}^{a}=\frac{1}{a}\lambda_2\delta_{B,L}(\tau_{B,H},0) \tag{19}$$

$$F_1=f_{B,L}^{\pi}=F_2=f_{R,L}^{\pi}=-\frac{\beta}{1-\beta}\left[a\delta_{B,L}(\tau_{R,H},0)-\delta_{B,L}(\tau_{B,H},0)\right]>0 \tag{20}$$

$$F_1=f_{B,L}^{\phi}=-u_L(0,A_B)<F_2=f_{R,L}^{\phi}=-au_L(0,A_B)<0 \tag{21}$$

where $\lambda_1\equiv\frac{\beta}{1-\beta}\pi$ and $\lambda_2\equiv\frac{\beta}{1-\beta}(1-\pi)$ and where (20) relies on $\tau_{R,H}<\tau_{B,H}$ and $a<1$. Thus, using (17)-(21) in (16) yields

$$\frac{\partial \tau_{B,H}}{\partial a}<0<\frac{\partial \tau_{R,H}}{\partial a},\frac{\partial \tau_{B,H}}{\partial \pi}=\frac{\partial \tau_{R,H}}{\partial \pi}>0 \text{ and } \frac{\partial \tau_{B,H}}{\partial \phi}<0 \text{ but } \frac{\partial \tau_{R,H}}{\partial \phi}\lessgtr 0. \tag{22}$$

E. Figures

Table A1. Summary Statistics

	Developing					*Developed*				
	N	*Mean*	*Std. Dev.*	*Min*	*Max*	*N*	*Mean*	*Std. Dev.*	*Min*	*Max*
$v_{i,j,t}$	1,000,956	20.840	17.055	0	1485	366,670	8.748	13.406	0	340
$\tau_{i,j,t}$	1,000,956	9.963	15.038	0	3000	366,670	5.004	11.172	0	800.3
$BC_{i,t-1}$	1,000,956	−0.001	0.021	−0.135	0.067	366,670	0.001	0.017	−0.064	0.053
$MP_{i,j}$	1,000,956	−3.100	2.511	−11.279	19.687	366,670	−1.800	3.679	−11.043	21.723
$PTA\_IM_{i,j,t}$	1,000,956	0.298	0.367	0	1	366,670	0.332	0.359	0	1
$\Delta IM_{i,j,t-1}$	1,000,956	0.064	1.081	−14.094	13.858	366,670	0.048	0.797	−12.414	12.755
$sd\Delta IM_{i,j,t-1}$	1,000,956	0.844	0.741	0.000	14.467	366,670	0.586	0.613	0.000	13.182
$y_{i,t-1}$	1,000,956	27.765	3.142	21.796	35.381	366,670	28.348	3.171	21.809	34.768

Notes: See Table A2 for a description of the variables and their source.

Table A2. Variable Definitions and Sources

	Description	*Source*
Tariff variables		
$\tau_{i,j,t}$	Applied tariff of country i on product j in year t	WTO Integrated Database and UNCTAD TRAINS database (http://wits.worldbank.org/)
$v_{i,j,t}$	Tariff binding less applied tariff for country i on product j in year t	WTO Integrated Database (http://wits.worldbank.org/) and new member accession schedules (http://www.wto.org/english/tratop_e/schedules_e/goods_schedules_table_e.htm)
Covariates		
$BC_{i,t-1}$	Country i's detrended log real GDP in year $t-1$ using Hodrick Prescott (HP) filter with real GDP measured in local currency units	World Bank's World Development Indicators (http://data.worldbank.org/data-catalog/world-development-indicators); UN National Accounts Main Aggregates Database (http://unstats.un.org/unsd/snaama/introduction.asp); Penn World Tables (https://pwt.sas.upenn.edu/)
$y_{i,t-1}$	Country i's trend log real GDP in year $t-1$ using HP filter	
$MP_{i,j}$	Natural log of $\frac{1}{\eta_{i,j}}$ where $\eta_{i,j}$ is the export supply elasticity of product j from the perspective of the importer i	Nicita et al. (2013)
$PTA\_IM_{i,j,t}$	Weighted share of country i's imports of product j in year t sourced from countries who are FTA or CU partners of country i. The (time-invariant) weights use import shares in product j from a year prior to country i appearing in sample	COMTRADE (http://wits.worldbank.org/); NSF-Kellogg Institute Data Base on Economic Integration Agreements (http://kellogg.nd.edu/faculty/fellows/bergstrand.shtml); http://data.worldbank.org/indicator/FP.CPI.TOTL
$\Delta IM_{i,j,t-1}$	Change in country i log real imports of product j between years $t-1$ and $t-2$ (measured in 000's million 2010USD)	
$sd\Delta IM_{i,j,t-1}$	Standard deviation of $\Delta IM_{i,j,t-1}$ over the sample period	

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Notes

1. See, e.g. Rodrik (1995, p.687), Bagwell and Staiger (2003, p.1), Costinot (2009, p.1011) and Bown and Crowley (2013a, p.50).
2. While they do not find evidence for pro-cyclical applied tariffs, recent work by Kee et al. (2013), Rose (2013) and Gawande et al. (2014) also question the conventional wisdom of counter-cyclical applied tariffs.
3. Gawande et al. (2012) document the empirical influence exerted over trade policy by firms importing intermediate inputs.
4. The literature includes other explanations for counter-cyclicality such as maintaining budget balances (Hansen (1990)); the cyclicality of firm entry incentives (McKeown (1983) and Gallarotti (1985)); and the larger marginal employment impact of tariffs when unemployment is higher (Costinot (2009)).
5. A nascent literature discusses the impact of global supply chains, and international ownership more generally, on trade policy. See, for example, Blanchard (2007), Blanchard (2010), and Bown et al. (2016).
6. Lake and Linask (2015) also present empirical evidence that terms of trade motivations could be part of the story behind the observed pro-cyclical tariffs in developing countries. Naturally, however, this does not preclude domestic political economy considerations also playing a role.
7. For papers considering the implications of binding overhang rather than its causes see, e.g. Maggi and Rodriguez-Clare (1998), Francois and Martin (2004), Nicita et al. (2013) and Handley (2014).
8. The second explanation in the literature for binding overhang is provided by Horn et al. (2010) who show that binding overhang emerges as a feature of an optimal incomplete contract in a costly contracting environment because of the state contingent nature of binding overhang.

9. Our primary business cycle measure is de-trended log real GDP using the Hodrick-Prescott filter (as in Rose (2013)). The results are robust to using alternative filtering techniques, including the Baxter-King and Christiano-Fitzgerald filters. See Lake and Linask (2015) for a detailed description of data sources.
10. We exclude the following observations to ensure the results are unrelated to outliers, transitional WTO commitments and violation of or rectifying WTO commitments: (i) observations during the phase-in period of the Uruguay Round or the Information Technology Agreement, (ii) observations where the tariff binding changes over the sample period, (iii) observations where the magnitude of the applied tariff change lies in the top 1% of applied tariff increases or the top 1% of applied tariff decreases, (iv) observations with negative overhang and (v) observations where the applied tariff moves below the tariff binding after it had previously moved above the tariff binding.
11. We define the Great Recession years as 2009–2011 which means that we drop the years 2010 and 2011 in column (4) given that our dependent variable is the lagged business cycle.
12. As in Grossman and Helpman (1994) and Acemoglu and Robinson (2001), we assume away any collective action problems that undermine the lobbying ability of the groups.
13. The need for tariff reductions suggests tariffs are high enough that high-tariff interests have substantial influence over trade policy.
14. If high-tariff interests were unable to cede control to low-tariff interests then our anaylsis of high-tariff interests controlling tariff setting in Section 4 would be qualitatively identical. However, the analysis of low-tariff interests controlling tariff setting in Section 4 would become redundant because violation of the low-tariff interest no-lobbying condition would result in low-tariff interests lobbying and implementing a zero tariff binding.
15. The assumption that low-tariff interests nominate a new tariff binding after successfully lobbying is purely for tractability and does not qualitatively affect our main results. We return to this point after discussing high-tariff interest control of tariff setting in Section 4.
16. Because there is no possibility of setting a non-zero applied tariff when the tariff binding is 0, it no longer matters whether low- or high-tariff interests have captured the government for states in $\Theta_{\bar{\tau}=0}$.
17. As described in the discussion of stage timing in Section 3, the set of possible actions includes whether to cede control or not (γ), whether to lobby or not (ρ), a nominated applied tariff, and a nominated tariff binding.
18. Low-tariff interests would nominate $\bar{\tau}=0$ when lobbying because it maximizes their continuation payoff and the opportunity cost of lobbying is independent of the tariff nomination. Since WTO rules prohibit raising $\bar{\tau}$, high-tariff interests will only lobby to change $\bar{\tau}$ if it preemptively prevents lobbying by low-tariff interests. However, we assume the initial tariff binding $\bar{\tau}_1$ has been set such that any mutual gains high- and low-tariff interests could derive from lowering $\bar{\tau}_1$ have been exploited. Optimality of the applied tariff nominations described in the text follow because they maximize each group's current period utility but do not impact the state in the following period.
19. Equation (5) defines the relationship between the equilibrium tariffs $\tau^*_{\omega,i}$ and the tariffs $\tilde{\tau}_{\omega,i}$.
20. Graphically, parts (i) and (ii) restrict the intersection of the no-lobbying curves in Figure 2 to certain regions.
21. Given the no-lobbying conditions will be tighter in recessions than booms, tariff-setting control would continually switch between high- and low-tariff interests if this assumption were violated. In turn, the tariff would continually switch between 0 and $\bar{\tau}$.
22. Allowing the possibility of control continually shifting between high- and low-tariff interests does not qualitatively affect the analysis of high-tariff interests having tariff setting control in Section 4. However, allowing this would create two cases to consider upon high-tariff interests ceding control: (i) the case considered Section 4 where low-tariff interests dictate tariff setting and maintain control, and (ii) the case where control repeatedly switches between high- and low-tariff interests. We abstract from this latter possibility for ease of exposition.
23. To see this, note that $\delta_{R,L}(\tau^*_{R,L}, \bar{\tau}) \leq 0$ is the smallest one period loss suffered by low-tariff interests when ceding control to high-tariff interests and $\delta_{B,L}(\tau^*_{B,H}, 0) \geq 0$ is the biggest one

period gain for low-tariff interests when high-tariff interests cede control back to low-tariff interests.

24. Recall that ceding control also has future costs in that control may reside with the other group for an extended period of time.

25. Throughout the paper we assume that the opportunity cost of lobbying is positive.

26. To derive (4), note that $W_L(\bar{\tau}=0)=\frac{1}{1-\beta}(\pi a+(1-\pi))u_L(0,A_B)$ and, using the one shot deviation principle to write $W_L(H)$ to reflect that low-tariff interests never lobby in any future period, we also have $W_L(H)=\frac{1}{1-\beta}\left[\pi a u_L(\tau_{R,H},A_B)+(1-\pi)u_L(\tau_{B,H},A_B)\right]$.

27. Each locus defines a combination of tariffs that prevent lobbying in the current state not only in the current period but any future period.

28. To see this note that a lower (higher) $\tau_{R,H}$ ($\tau_{B,H}$) relaxes (tightens) $f_{\omega,L}\geq 0$ more (less) in recessions than booms because $\tau_{R,H}$ ($\tau_{B,H}$) affects both the opportunity cost and the future value of lobbying in recessions (booms) but only the latter in booms (recessions). Mathematically, letting superscripts denote partial derivatives with respect to the given variable, we have $0>\frac{\partial\tau_{B,H}}{\partial\tau_{R,H}}|_{f_{B,L}=0}=-\frac{\lambda_1 a}{(1+\lambda_2)}\frac{\delta_{B,L}^{\tau_{R,H}}(\tau_{R,H},0)}{\delta_{B,L}^{\tau_{B,H}}(\tau_{B,H},0)}>\frac{\partial\tau_{B,H}}{\partial\tau_{R,H}}|_{f_{R,L}=0}=-\frac{(1+\lambda_1)a}{\lambda_2}\frac{\delta_{B,L}^{\tau_{R,H}}(\tau_{R,H},0)}{\delta_{B,L}^{\tau_{B,H}}(\tau_{B,H},0)}$ where $\lambda_1\equiv\frac{\beta}{1-\beta}\pi$ and $\lambda_2\equiv\frac{\beta}{1-\beta}(1-\pi)$.

29. If we impose an exogenous probability of lobbying success, then the possibility of unsuccessful lobbying relaxes both no-lobbying conditions and allows high-tariff interests to raise preemptive tariffs (see the discussion of industry characteristics and the probability of lobbying success in Section 5).

30. In this situation, WTO rules constrain the tariff in booms so that it is lower than it needs to be to prevent lobbying. But, the tariff in recessions $\tilde{\tau}_{R,H}(\bar{\tau})$ is still as high as possible such that it prevents lobbying by low-tariff interests.

31. Once the no-lobbying condition of low-tariff interests is violated during recessions then, as discussed in the following section, high-tariff interests will cede control of the government to low-tariff interests. In turn, this will alter the functional form of $f_{B,L}$ in (3) because $W_L(H)$ must then embody that high-tariff interests cede control to low-tariff interests during recessions rather than high-tariff interests maintaining control forever.

32. This is captured by the shift in the $f_{\omega,L}=0$ locus and the associated effect on $\tau_{\omega,H}$ while holding $\tau_{\omega',H}$ fixed for

33. This is captured by the shift in the $f_{\omega',L}=0$ locus.

34. For the indirect effect, a lower $\tau_{\omega',H}$ reduces the future value of lobbying when the state of the economy is $\omega\neq\omega'$ and, in turn, the weaker low-tariff interest lobbying threat induces high-tariff interests to raise $\tau_{\omega,H}$.

35. Moreover, the low-tariff interest future value of lobbying is maximized by $\bar{\tau}=0$. Thus, $\bar{\tau}>0$ can only reduce the future value of lobbying and, thus, relax $f_{\omega,L}\geq 0$. This shifts both no-lobbying loci outwards in Figure 2. Implicit differentiation of (3) reveals that the shift is greater for the recession no-lobbying locus. Thus, $\tilde{\tau}_{R,H}$ must rise but the effect on $\tilde{\tau}_{B,H}$ is, in general, ambiguous.

36. For example, in the spirit of Olson (1965), q may be increasing in the concentration of group i and decreasing in the concentration of group i' (however, see recent theoretical and empirical contributions by Pecorino (1998), Mao and Zaleski (2001) and Macher et al. (2011)). Alternatively, q may be larger for expanding than contracting industries, given that expanding industries attract entrants which dissipates any benefits of lobbying (Baldwin and Robert-Nicoud (2002)).

37. High-tariff interests solve an analogous optimization problem with the appropriate substitutions: $\max_{N_{S,H}}(1-q(N_{S,H},N_{S,L}))[u_H(0,A_\omega,N_H(\cdot),N_{S,H},N_S)+\beta W_H(\bar{\tau}=0)]+q(N_{S,H},N_{S,L})[u_H(\bar{\tau},A_\omega,N_H(\cdot),N_{S,H},N_S)+\beta W_H(H)]$.

38. Note that there are three wage variables for each state of the economy $\omega=H,L$: the wage paid to labor hired for lobbying w_S, the wage paid to production labor if high-tariff interests win the lobbying war $w(\bar{\tau},N_S)$, and the wage paid to production labor if low-tariff interests win the lobbying war $w(0,N_S)$. These wages are related via the equilibrium condition that workers are indifferent between being hired for production or lobbying: $w_S=q(N_{S,H},N_{S,L})w(\bar{\tau},N_S)+(1-q(N_{S,H},N_{S,L}))w(0,N_S)$.

39. See Appendix B for a derivation of $q(\cdot)$ and a complete description of the labor market.

40. To see this, note that labor market equilibrium requires that the marginal revenue product of labor equalize between the two production sectors. But, this holds regardless of the value of A_{ω}, and hence regardless of whether the current period is a boom or recession, because the marginal revenue product of labor in each sector is proportional to A_{ω}.

41. Note $u_i(\cdot)=p_i A_{\omega} f_i^K(\cdot)K_i - w_S N_{S,i}$ where $f_i^K(\cdot)$ is the marginal product of capital. Thus, $\delta_{\omega,L}(\bar{\tau}, 0)$ is proportional to A_{ω} because $w_S=q(\cdot)w(\bar{\tau}, N_S)+(1-q(\cdot))w(0, N_S)$ where $w(\cdot)$ is proportional to A_{ω} since production wages equal the marginal revenue product of labor.

42. The interpretation of the terms in Δ is as follows: (i) the first term reflects the lost payoff due to ceding control in the current period, (ii) the second term reflects the change in the expected discounted payoff until high tariff interests cede control in the next recession, (iii) the third term reflects the expected discounted payoff gained when high-tariff interests cede control in the next recession.