

Abstract

Trade disputes over national product standards are a growing source of tension in the international trading system. The usual pattern is that a country introduces a new product standard for all sales of a good in its local market, which is justified as necessary for consumer or environmental protection. Importers into the local market, however, challenge the standard as a “disguised barrier to trade” or “green protectionism”. The paper develops a two country political economy model to explain such disputes. It is shown how the political process can lead to a “political failure” which takes the form of either too many or too few product standards and disagreement between politicians in different countries over the optimal policy. In a second step the model is used to evaluate whether two common proposals to settle or avoid such disputes, mutual recognition of standards and harmonization, can improve the political process.

Product Standards, Trade Disputes and Protectionism

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1 Introduction

One of the most remarkable economic policy developments in the post war period has been the dramatic reduction in tariff levels. This decline in tariff levels has since the early seventies, however, been partially offset by increases in non-tariff barriers to trade. Attempts to reduce such non-tariff barriers are now at the heart of most trade negotiations. The arguably most difficult issue in this area are trade disputes over national product standards. The usual pattern is that a country introduces a new product standard, which applies to all sales of a particular good in the local market, which is justified as necessary for consumer or environmental protection. Importers to the local market, however, challenge the standard as “a disguised barrier to trade” or simply “green protectionism”, with the exact meaning of these phrases clearly being hotly disputed.

One prominent example is the “Beef Hormones” dispute between the European Union and the United States. After allegations that the consumption of beef from cattle that have been treated with growth hormones could pose a risk to human health, the EU banned the sale of all hormone-treated beef in the European Union in January 1989. In the United States the hormones in question continue to be allowed and are widely used. Before the ban US exports of beef to the EU consisted mainly of varietal meats, such as kidneys and tongues, while the rest of the meat was sold on the American market. To supply the European market with hormone-free varietal meat American producers would have had to abandon the use of hormones for a large part of their cattle, which would have substantially reduced their profits on the American market and made this possibility uneconomical. As a consequence American exports of beef to the EU dropped by nearly 80 percent in the year after the ban. The United States has repeatedly challenged the ban as not based on the available scientific evidence and therefore constituting a disguised barrier to trade. The EU defends the ban on the ground that it has the right to implement whatever regulation it considers necessary to protect consumers.¹

Many similar cases have kept trade negotiators busy. The United States and

¹For a more detailed summary of this and other trade disputes over product standards see Vogel (1995). Esty (1994) also provides short summaries and Engel (1999) contains an extensive case study of the BSE crisis and a dispute between Venezuela and the United States.

Japan have, for example, for a long time argued about appropriate standards for food additives. Similarly, the member countries of the European Union had an intense struggle over emission standards for cars. The continuous introduction of new production technologies, such as for example genetically-modified food, also makes it unlikely that the number of opportunities to disagree about appropriate product standards will decline in the future.

From the anecdotal evidence one can distil at least four stylised facts. First, in most cases the disputed policy regulates a product, the consumption of which causes local damages. Second, a key feature of such disputes is uncertainty about the environmental or safety benefits of the regulations. Rarely can the scientific consensus offer near certainty about the likely damages caused by a product, in particular in the early period after initial allegations of harm. Third, the general public tends to be less informed about the scientific evidence than the government agencies which are implementing policy. Basically there is an element of asymmetric information between the government and the public. Finally, even though the regulation is applied in a non-discriminatory way to both domestically-produced and imported goods the immediate cost impact of the regulation is usually non-uniform with typically higher costs falling on importers. In the beef hormones case the non-uniform impact is apparent. In other cases the new product standard also tends to change the relative cost structures of importers and domestic producers, usually in favour of domestic firms, which is the very basis of the trade barrier argument.

The main purpose of this paper is to develop a political economy model, which builds on these stylised facts and can explain how such disputes occur. A simple two good specific factors model is introduced in which one good causes local damages with some probability. Policy making is modelled in the spirit of the political agency literature, which views the political process as a principal-agent relationship in which voters have to provide incentives for their politicians. In line with the third stylised fact it is assumed that politicians have an informational advantage in evaluating the probability of damages from consumption of the affected good. It will be shown how a political equilibrium can emerge in which domestic politicians claim that the expected damages are higher than their foreign coun-

terparts do. This divergence can either be due to an excessively strict standard in the importing country or a too lax standard in the exporting country. Both cases constitute a political failure in the sense that the economy is off the second best Pareto frontier. A second purpose of the paper is to take a first step towards analysing the implications of institutional arrangements to settle or avoid trade disputes over product standards. The effects of two frequent proposals, mutual recognition of standards and harmonisation, are addressed in detail. My principal finding is that both proposals may not improve welfare relative to decentralised standard setting.

The possibility that product standards are (ab)used as “disguised barriers to trade” has been discussed widely among policy makers, but has so far received relatively little attention in the academic literature. Notable exceptions are Esty (1994), Laplante and Garbutt (1992), Sorsa (1995) and Engel (1999) which offer some definitions of “green protectionism” and informally discuss possible responses to it. There is also a growing literature on the political economy of environmental policy. Fredriksson (1997) and Aidt (1998) are two recent contributions, which analyse the choice of emission taxes in a small open economy within a common agency framework. Hillman and Ursprung (1992, 1994) introduce an environmental lobby into a lobby model of trade policy formation. The environmental lobby tries to influence trade policy as other environmental policy instruments are assumed to be absent. In contrast in the present paper distortions to the environmental policy instrument will be at the centre of the analysis.

The political agency approach to modelling the political process was pioneered by Barro (1973). It has been further developed by Ferejohn (1986), Austen-Smith and Banks (1989), Coate and Morris (1995) and Banks and Sundaram (1998). The model of Coate and Morris (1995) is closest to the present paper. Besley and Case (1995a, 1995b) provide empirical evidence from American state elections for the explanatory power of political agency models. Alesina, Baqir and Easterly (1998) and Alesina, Danninger and Rostagno (1999) present data on public employment which support the disguised transfer mechanisms modelled by Coate and Morris (1995).

The paper is also related to the recent literature that analyses the role of the

GATT/WTO in trade policy making. Two recent contributions to this literature are Bagwell and Staiger (1999) and Maggi (1999) which investigate the role that GATT/WTO has played in the post war reductions in tariff levels. This paper can be seen as an extension of this literature to the case of non-tariff barriers to trade.

The paper is organised as follows. Section 2 outlines the two country trade model in which policy-making takes place. Section 3 describes the political system. Section 4 analyses the equilibrium policy choices. Section 5 explores the implications of institutional interventions to settle or avoid disputes over product standards. Section 6 discusses some of the assumptions of the model and the final section concludes. All proofs are in the appendix.

2 The Model

The economy is modelled as a specific factors model. Two countries, home and foreign, trade a numeraire good n and good x . There are three factors of production, a specific capital stock for the domestic and foreign x industry and labour. Each country is populated by a politician, a representative consumer and a producer. All foreign variables will be denoted with an asterisk.

2.1 Preferences and Technology

The two countries are identical except for their endowment with specific capital and only the home country will be described. The domestic representative consumer supplies L units of labour and has the quasi-linear utility function

$$U = n + u(x) - D(\theta, x_F) \tag{1}$$

with the standard properties $u' > 0$ and $u'' < 0$. The damage function D will be described in detail in the next section. The consumer maximises $n + u(x)$ subject to his budget constraint taking damages as given. The politician and producer for simplicity are assumed only to consume the numeraire good and not to suffer any damage D . The consumer price of good x is p and by the producer price is p_p .

The numeraire good is produced with a constant returns to scale technology which uses one unit of labour to produce one unit of output in both countries. Good x is produced with the technology

$$q_x = f(l_x, \bar{k}) \quad (2)$$

$$q_x^* = f(l_x^*, \bar{k}^*) \quad (3)$$

which is assumed to have constant returns to scale and diminishing returns to each factor. q_x and q_x^* denote output and l_x and l_x^* are the labour inputs into production of good x in the home and foreign country respectively. The specific capital stocks are denoted \bar{k} and \bar{k}^* and it is assumed that $\bar{k} > \bar{k}^*$. If additionally L and L^* are sufficiently large to ensure positive production in the numeraire sector in both countries, this implies that the foreign country has a comparative advantage in good x and will export it under free trade. The returns accruing to the two specific capital stocks are earned by the local producer in each country and will be denoted π and π^* .

2.2 The Externality

The key ingredient of the economic environment is the damages caused by the consumption of good x , which are modelled as a pure externality.² This externality has two important properties. First, it is only caused by the consumption of units of good x which come from foreign production, denoted x_F . This assumption is an extreme way of capturing the stylised fact introduced above that the impact of regulating the externality is generally non-uniform with higher costs falling on importers. In a more general model the externality would be caused by both

²Modelling the damage as an externality may seem puzzling for two reasons. First, as there is only one representative consumer, why doesn't she internalise the damage that she inflicts on herself? If I introduced many identical consumers that maximise $U = n + u(x) + D(\theta, mx_F)$ where m is the number of consumers, they could hardly influence damages and would therefore behave as my representative consumer. Second, in the beef hormones example damages seem to be born by the consumer directly, rather than through an externality. However, even in this case the health insurance system will spread the costs in form of a pecuniary externality. Furthermore similar results can be derived in a modified model where damages are not external but directly born by the consumer.

domestically and foreign-produced units of good x and the non-uniform impact would be generated by differing abatement costs between the domestic and foreign industry. The assumption here would then be the special case where abatement costs for the home industry are zero. Second, the damage of the externality is uncertain. Expected damage D in the home country is

$$D(\theta, x_F) = \theta x_F. \quad (4)$$

With probability θ consumption of x from foreign production causes constant marginal damages, which have by choice of units been normalised to one, and with probability $(1 - \theta)$ there is no damage. Damage is measured in units of the numeraire. Finally it is assumed that θ takes two discrete values θ_0 or θ_1 with $\theta_0 < \theta_1$. If the scientific consensus is θ_1 we are in the “high risk” state, whereas θ_0 will be called the “low risk” state. The assumption about the uncertainty is supposed to capture the idea that the scientific consensus only offers a probability estimate of the likely damage of the externality. As both states can result in the same damages, it is never possible to infer ex post the state of θ from the realized damages.

There also exists a simple abatement technology. The expected damage of foreign produced units of good x can be reduced to zero at constant costs of a units of labour per unit treated. The abatement activity can either be thought of as a separate sector or an extra production cost incurred by the foreign x industry for output shipped to a market that requires the application of the abatement technology.

2.3 Policy Instruments

There are two policy instruments in the first period. Politicians have to determine an environmental policy E and a lump sum transfer T . The environmental policy can take two forms. The first option N is to do nothing. The second option P is a product standard which requires the removal of the externality from all foreign-produced units of good x imported into the domestic market. To comply with this standard, the abatement technology needs to be operated. If the domestic politician, for example, chooses P while the foreign politician decides to do nothing,

then all foreign produced units of x that are exported to the home country are treated at per unit costs a while any units sold in the foreign market remain untreated. Finally the lump sum transfer $T \geq 0$ can be used to tax the consumer and transfer the proceeds to the local producer. In the second period the only available policy instrument is the transfer.

2.4 Welfare and Profits

The welfare consequences of implementing the product standard P in the home country can be evaluated with the following welfare function

$$W = CS + \pi - D(\theta, x_F) \quad (5)$$

where CS is consumer surplus and π are the returns to the domestic specific factor. The implications of the environmental policy for welfare and the return of the specific factors are summarised in the following lemma:

Lemma 1 *There exists a range of values for θ_0 , θ_1 and a such that: i.) in state θ_1 it is welfare maximising to implement the product standard in both countries and not to do so in state θ_0 . ii.) Implementing P in state θ_1 increases the home consumers utility and implementing N^* in state θ_0 increases the foreign consumers utility. iii.) Implementing P increases π and implementing N^* increases π^* .*

The intuition for the lemma is as follows. Implementing the product standard in the home country has effects very similar to a tariff where all tariff revenue is lost. All imports of x now have to be treated at per unit cost a which increases p and p_p in the home country. This increase in import prices is, on its own, welfare reducing. Even though the return to the domestic specific factor increases, this is outweighed by the reduction in consumer surplus as the home country imports good x . The benefit of the abatement activity is that expected damages, which are borne by the consumer, are reduced to zero.

For a given size of a there will therefore be a critical value $\tilde{\theta}_H$, below which expected damages are so small, that it is not optimal to operate the abatement technology. Similarly above this critical value expected damages are large enough

to make it worthwhile to operate the abatement technology. Furthermore increasing θ above $\tilde{\theta}_H$ will at some point result in expected damages that are so large that they outweigh the reduction in consumer surplus caused by the operation of the abatement technology. In this case implementing the product standard not only increases welfare, but also increases the domestic consumers utility.

The intuition for the foreign country runs along the same lines. Requiring the use of the abatement technology for sales in the foreign market imposes *ceteris paribus* a net cost on the foreign economy, which in this case takes the form of both a lower consumer surplus and a lower income of the foreign specific factor. For values of θ above a critical value $\tilde{\theta}_F$ expected damages are so high that the benefit of avoiding them outweighs the costs of operating the abatement technology. Below $\tilde{\theta}_F$ the opposite result holds. Furthermore reducing θ below $\tilde{\theta}_F$ will at some point make expected damages so small that implementing the abatement technology not only reduces welfare but also the consumers utility.

The critical values for the welfare effects of the standard, $\tilde{\theta}_H$ and $\tilde{\theta}_F$, will generally differ between the two countries due to standard terms of trade reasons. The product standard improves the home country's terms of trade as the import price of good x net of abatement costs declines. For the foreign country the product standard, however, results in a deterioration of the terms of trade. For the rest of this paper I assume that θ_0 , θ_1 and a are in the range characterised by lemma 1. In this range purely welfare maximising governments will implement the same policy in both countries. This result provides a very simple benchmark against which the outcome of the political equilibrium analysed in later sections can be compared. In the discussion I will return to the assumption of linear abatement and damage functions and show how relaxing them would change the analysis.

Finally a second more subtle implication of the assumption that parameters are such that lemma 1 holds is that the consumer always prefers the policy which also maximises social surplus. As the consumer will later be the decisive voter this coincidence of the consumers interest and welfare removes a straightforward tension from policy making.³

³Coate and Morris (1995) make an equivalent assumption to align the voter's preferences and social welfare.

3 The Political System

The political system is modelled in the tradition of the political agency literature. I consider a two period model. In the first period an incumbent implements policy in each country. At the end of the first period the two incumbents face an election in which the electorate in each country decides whether to re-elect the incumbent or elect a challenger. After the election second period policies are implemented and then the game ends. The structure of the domestic and foreign political system are identical. As before an asterisk denotes a foreign variable.

3.1 Politicians' Preferences

Similar to the contributions by Coate and Morris (1995) and Banks and Sundaram (1998) the model not only contains moral hazard, but also an element of adverse selection. Politicians come in two types, “good” and “bad”. A good politician is for simplicity a very straightforward person. She always implements the welfare-maximizing policy and hence chooses P in the high risk state θ_1 and N in the low risk state θ_0 . Furthermore she never makes any cash transfers.⁴

A bad politician's preferences are more complicated. His per period utility function is $v_b(W, \pi + T)$ and he discounts second period utility at rate δ . The income of the local producer enters his utility not only as one component of welfare, but also as an additional argument. His utility is assumed to be strictly increasing in W and initially increasing but later decreasing in the second argument. In other words, a bad politician also cares about welfare, but would like to transfer at least some resources to the local producer. There are no explicit microfoundations for these preferences. One possible justification would be that the bad politician is susceptible to bribes from the well-organized producer lobby.

Lemma 1 has established how welfare and profits are affected by the environmental policy and the state θ . A bad domestic politician's preferences can

⁴The very simple modeling of the good politician could be relaxed at the cost of some more complexity as for example done in Coate and Morris (1995). However, all interesting equilibria of such a more general model involve the good politician maximising welfare and not doing any cash transfers, which would have to be insured through restrictions on the good politician's preferences and equilibrium refinements.

therefore be rewritten as $v_b(W(E, E^*, \theta), \pi(E, E^*) + T)$ or simply $v_b(E, E^*, T, \theta)$. There are three further assumptions about a bad politician's preferences. The first assumption concerns a bad incumbent's willingness to do harm.

Assumption 1 (bad politicians do harm) *It is the case that $\psi_1 > 0$ and $\psi_1^* > 0$ with*

$$\begin{aligned}\psi_1 &= \{v_b(P, N^*, 0, \theta_0) - v_b(N, N^*, 0, \theta_0)\} \\ \psi_1^* &= \{v_b^*(P, N^*, 0^*, \theta_1) - v_b^*(P, P^*, 0^*, \theta_1)\}.\end{aligned}$$

This assumption says that given that no cash transfer has been made for a bad domestic (foreign) incumbent the increase in income of the local producer more than compensates the loss in welfare caused by the unwarranted (non) implementation of the environmental policy in the “low risk” state θ_0 (“high risk” state θ_1). The larger ψ_1 and ψ_1^* the stronger is a bad incumbent's incentive to implement the “wrong” environmental policy. If assumption 1 was violated, bad incumbents would not really be harmful, as they would never want to abuse the environmental policy.

The second assumption concerns a bad politician's propensity to make cash transfers. Let \hat{T} be the cash transfer that maximizes a bad domestic politician's utility if domestic welfare is W and pre-transfer income of the domestic producer is π . That is:

$$\hat{T}(W, \pi) = \arg \max v_b(W, \pi + T). \quad (6)$$

The resulting utility level will be $\hat{v}_b(E, E^*, \hat{T}, \theta)$. Similarly $\hat{T}^*(W^*, \pi^*)$ is the optimal transfer for a foreign bad politician.

Assumption 2 (the election matters) *For $(E, E^*, \theta) \in \{P, N\} \times \{P^*, N^*\} \times \{\theta_0, \theta_1\}$ it is the case that $\psi_1 > 0$ and $\psi_1^* > 0$ with*

$$\begin{aligned}\psi_2 &= \min_{E, E^*, \theta} \left\{ \delta \hat{v}_b(\hat{T}) - \left[\hat{v}_b(E, E^*, \hat{T}, \theta) - v_b(E, E^*, 0, \theta) \right] \right\} \\ \psi_2^* &= \min_{E, E^*, \theta} \left\{ \delta \hat{v}_b^*(\hat{T}^*) - \left[\hat{v}_b^*(E, E^*, \hat{T}^*, \theta) - v_b^*(E, E^*, 0^*, \theta) \right] \right\}.\end{aligned}$$

The term $\widehat{v}_b(E, E^*, \widehat{T}, \theta) - v_b(E, E^*, 0, \theta)$ in square brackets is the utility that a bad domestic politician foregoes, if he does not implement the cash transfer in the first period. The assumption states that this has to be smaller than $\delta \widehat{v}_b(\widehat{T})$, which is the discounted value of his maximum utility in the second period, when he chooses the optimal transfer and there is no environmental policy. If this assumption was violated, bad politicians would not worry about the election. Their dominant strategy would be to always do the optimal cash transfer in the first period and be voted out of office with certainty. A sufficiently high pure rent from holding office would, for example, ensure that this assumption holds, so that bad incumbents do have an incentive to try to survive the election.

The final assumption is a more technical assumption which constrains a bad incumbent's rate of substitution between welfare and the income of his local producer at different levels of welfare and income of the local producer.

Assumption 3 (“single crossing”) *It is the case that*

$$[v_b(P, P^*, 0, \theta_1) - v_b(N, P^*, 0, \theta_1)] \geq [v_b(P, N^*, 0, \theta_0) - v_b(N, N^*, 0, \theta_0)]$$

$$[v_b^*(N, N^*, 0^*, \theta_0) - v_b^*(N, P^*, 0^*, \theta_0)] \geq [v_b^*(P, N^*, 0^*, \theta_1) - v_b^*(P, P^*, 0^*, \theta_1)]$$

This assumption is similar to a single crossing assumption and states that for a bad domestic politician the increase in utility from implementing P rather than N is at least as large in the high risk state θ_1 than in the low risk state θ_0 even as the foreign incumbent's policy changes from N^* to P^* . As the foreign incumbent's environmental policy choice affects domestic welfare and profits through the terms of trade this inequality is not necessarily true for the general preferences of bad incumbents. Even though both profits and welfare increase in state θ_1 if P rather than N is chosen, these effects take place at a different point on the bad incumbent's utility function as the effects of switching from N to P in state θ_0 when $E^* = N^*$. If this assumption was not satisfied there would be the counter-intuitive possibility that a bad domestic incumbent derives more utility from implementing P in state θ_0 when N is optimal than from doing so in state θ_1 when P not only helps his producer, but also increases welfare.

3.2 Timing of Events and Information Structure

At the beginning of the first period nature moves and selects the type of politician in office in the first period. Their own type is only known to themselves and the other incumbent, but not to the voter in either country.⁵ Then voters in both countries receive a signal λ_I and λ_I^* with $0 < \lambda_I^*, \lambda_I < 1$ of the type of the incumbents which is imperfectly correlated with their type and which is also observed by both incumbents. The value of λ_I and λ_I^* is the probability that the domestic and foreign incumbent respectively are good and will be referred to as their initial reputations. Then nature moves again and selects the state θ . With probability ϕ , which is also common knowledge, the state is θ_1 and the externality is of “high risk” and with probability $(1 - \phi)$ the state is θ_0 which is the “low risk” state. A crucial assumption is that the realization of θ is only observed by the two incumbents.

This informational asymmetry between the politicians and the electorate captures the idea that the incumbents have an advantage in assessing the scientific evidence on the riskiness of the externality. They have for example the possibility to commission a study which reveals the state θ but the results of this study cannot be credibly conveyed to the voter. Furthermore the assumption that both incumbents observe the state θ ensures that any disagreement between the politicians about the optimal policy is not caused by different information about the state of nature.

After having observed the state of nature the two incumbents simultaneously implement their environmental and transfer policies. At the end of the first period the realization of the externality is observed by voters in both countries and there is an election in both countries. The voters in this election are the representative consumer in the home and foreign country. The idea is that the producer is a small group which is not decisive in the election. First period policy choices and the realisation of the externality can be summarised in the track record (E, E^*, T, T^*, D) . Given the equilibrium strategies the voters will update their beliefs about the quality of their respective incumbent according to Bayes rule for any track record that

⁵If their type was private knowledge to each incumbent, then the results of Section 4 would still go through, but some of the extensions in Section 5 would need to be modified.

occurs with a positive probability. These updated beliefs will be denoted α and α^* . The election is a contest between the incumbent and a challenger. The domestic and foreign challenger have initial reputations λ_C and λ_C^* respectively, which are the voter's beliefs of the probability that the challengers are of the good type. The challengers' reputations are drawn from a common cumulative distribution function $G(\lambda)$ which is smooth and increasing and satisfies $G(0) = 0$. The winner of the election is in office in the second period and can choose to make a transfer. Then the game ends.

3.3 Definition of Political Equilibrium

A political equilibrium in this model is a perfect Bayesian equilibrium of the game between the two incumbents, the two representative voters and the two challengers. It consists of a strategy for each of the six players which is optimal given the other players' strategies. The strategies for each incumbent specify their policy choices in both periods as a function of the realization of θ and their own and the other incumbents type. The strategies for the representative voter in each country consist of two parts. The first part is a set of beliefs about the quality of the domestic incumbent generated by Bayes rule where possible. The second part is a rule that specifies when he will re-elect the incumbent. Finally a strategy for a challenger specifies his policy choices in the second period as a function of his type.

4 Analysis of Equilibrium

The policy game will be solved backwards in the usual way. The only available second period policy is the transfer. A bad domestic politician who is no longer constrained in his behaviour by an election will maximise his utility by implementing the optimal transfer \hat{T} and attain utility $\hat{v}_b(\hat{T})$. Similarly a bad foreign politician will chose \hat{T}^* and enjoy utility $\hat{v}_b^*(\hat{T}^*)$. A good politician in contrast will not do any transfers. Voters therefore clearly prefer to have a good politician in office in the second period.

4.1 The Voter's Optimal Re-election Rule

Given that the voter is better off with a good politician in office in the second period his optimal re-election rule is to re-elect the incumbent only if his updated beliefs about the incumbents quality are higher than the initial reputation of the challenger.⁶ As the initial reputation of the challenger in each country is drawn from the distribution $G(\lambda)$, the probability that the domestic incumbent will be re-elected is $G(\alpha)$ and $G(\alpha^*)$ for the foreign incumbent.

The updated beliefs α and α^* of the domestic and foreign voter about their respective incumbents are derived from the track record and the equilibrium strategies with the help of Bayes rule. If, for example, a bad domestic (foreign) politicians equilibrium strategy is to always choose P (N^*) and not to make any transfer T (T^*) and there turn out to be positive damages, denoted \bar{D} , then the beliefs of the domestic voter about the domestic incumbent will be:

$$\alpha(P, N^*, 0, 0^*, \bar{D}) = \frac{\lambda_I [(1 - \lambda_I^*)\phi\theta_1]}{\lambda_I [(1 - \lambda_I^*)\phi\theta_1] + (1 - \lambda_I) [\lambda_I^*(1 - \phi)\theta_0 + (1 - \lambda_I^*) \{\phi\theta_1 + (1 - \phi)\theta_0\}]}$$

The numerator of this expression is the probability that a good domestic incumbent would have generated this track record. The denominator is the probability that this track record is generated at all. Similar beliefs can be derived for the foreign incumbent and the other possible track records. As usual Bayes rule can only pin down beliefs on the equilibrium path. For equilibrium strategies of bad incumbents which do not involve transfers the observation of a transfer is an out of equilibrium event. Throughout the paper I will make the fairly mild assumption that out of equilibrium beliefs are such that a incumbent is believed to be bad with probability one if he makes a transfer.

The most interesting beliefs for this paper are the beliefs for the case where the domestic incumbent claims that the externality is of “high risk” and the foreign incumbent argues that it is of “low risk”. If the underlying equilibrium strategy

⁶Even though this is how representative democracies are usually structured, this hides the deeper question why there are so few incentive instruments in the organisation of government. Tirole (1994) discusses this and related questions.

of bad domestic (foreign) politicians is to always choose P (N^*) and not to make any transfers, then believes in this case have some intuitive properties which are summarized in the following lemma.

Lemma 2 *Given strategies for a bad domestic (foreign) incumbent to always choose P (N^*) and not to make any transfers and track records $(P, N^*, 0, 0^*, \overline{D})$ or $(P, N^*, 0, 0^*, 0)$ then voter's beliefs satisfy:*

- (i) $\partial\alpha/\partial\lambda_I > 0$, $\partial\alpha/\partial\lambda_I^* < 0$ and $\partial\alpha^*/\partial\lambda_I^* > 0$, $\partial\alpha^*/\partial\lambda_I < 0$
- (ii) $\alpha(P, N^*, 0, 0^*, 0) < \alpha(P, N^*, 0, 0^*, \overline{D}) < \lambda_I$ and $\alpha^*(P, N^*, 0, 0^*, \overline{D}) < \alpha^*(P, N^*, 0, 0^*, 0) < \lambda_I^*$.

The first part of the lemma says that in this case an incumbent's chances of re-election are increasing in his own initial reputation and decreasing in the other politician's initial reputation. The reason for this is that the two incumbents are exposed to yardstick competition. Voters observe both incumbents' policy choices and know that the same policy is appropriate in both countries. It is intuitive that disagreeing with the other incumbent becomes therefore more costly, in terms of a reduced re-election probability, if your voter's initial evaluation of the other incumbent's quality increases. The second part of the lemma states that such disagreement also imposes a reputational penalty on both incumbents relative to their initial reputations and that this penalty is bigger in the case where the realised damages do not correspond to the policy choice of the incumbent. The intuition for this is that disagreement can only arise if at least one incumbent is of the bad type. So the observation of disagreement makes it more probable that one's own incumbent is bad, but not certain as disagreements can also arise between a good incumbent in one country and a bad incumbent in the other country.

4.2 Payoffs to the Politicians

A bad domestic incumbent's per period utility is $v_b(W, \pi_1 + T)$. Normalising his utility of not being in office to zero his payoff over both periods V_b is:

$$V_b = v_b(E, E^*, T, \theta) + \left[\begin{array}{l} \theta G(\alpha(E, E^*, T, T^*, \overline{D})) \\ +(1 - \theta)G(\alpha(E, E^*, T, T^*, 0)) \end{array} \right] \delta \hat{v}_b(\hat{T}) \quad (7)$$

If the bad incumbent is in office in the second period he enjoys utility $\hat{v}_b(\hat{T})$ which is discounted by δ . Second period utility will only be realised if the incumbent is re-elected, which happens with probability $G(\alpha(E, E^*, T, T^*, \bar{D}))$ if there are damages and with probability $G(\alpha(E, E^*, T, T^*, 0))$ if there are no damages. Finally first period utility as a function of the policy choices is $v_b(E, E^*, T, \theta)$.

4.3 Political Equilibrium in the First Period

The central result about first period policy-making is the following proposition:

Proposition 1 *For sufficiently high values of $\psi_1, \psi_1^*, \psi_2, \psi_2^*$ there exists a range of initial reputations λ_I and λ_I^* in which a strategy for a bad domestic (foreign) incumbent always (never) to implement the product standard and both incumbents to not make any cash transfers is a PBE.*

For the intuition of this proposition consider the incentives faced by a bad domestic incumbent in the “low risk” state θ_0 . For her implementing the product standard and doing the cash transfer are two alternative means of increasing the income of the domestic producer. Everything else equal she would prefer to use the transfer to increase the producer’s income, as implementing the product standard is distortionary in the “low risk” state and even bad incumbents do care about welfare. The political system creates, however, incentives in the opposite direction. As implementing the transfer signals to the voter with certainty, that the incumbent is of the bad type, it entails certain electoral defeat. The electoral consequences of the product standard are less severe. Implementing it in the low risk state will cause a trade dispute as both good and bad foreign incumbents will not implement the product standard in the low risk state. Lemma 2 has established that a trade dispute imposes a reputational penalty on both incumbents in the form of a decreased re-election probability relative to their initial reputations, but re-election does not become impossible.

The political equilibrium characterised in proposition 1 differs markedly from the normative prescriptions derived in lemma 1. A bad domestic incumbent, for example, will implement the product standard even in state θ_0 , when doing so

is not optimal on welfare grounds. I will define such an unwarranted implementation of the product standard “green protectionism”. The environmental policy is implemented not because of its environmental benefits, but as an indirect way to transfer resources to the domestic x industry. Such “green protectionism” is a political failure in the sense of Besley and Coate (1998) as we are below the constrained second best utility possibility frontier. Instead of implementing the in state θ_0 inefficient environmental policy the bad politician could use the available transfer policy to pay the producer of good x the equivalent of the increase in profits that he enjoys under the product standard. This would leave the producer indifferent and make the consumer better off. The politician’s first period utility would also increase as welfare increases while the producer’s income stays the same. The available policy instruments could therefore achieve a Pareto improvement but the bad politician does not find it in his best interest to bring it about due to the different effects of the two policy instruments on his re-election probability.

Similarly a bad foreign incumbent will in the equilibrium of proposition 1 not implement the product standard even in the “high risk” state θ_1 . I will call this underprovision of environmental policy “environmental dumping” and it also constitutes a political failure in the sense defined above. Rather than exposing the foreign consumer to the “high risk” externality the foreign politician could implement the product standard and compensate the producer of good 2 for the fall in profits. This would increase the foreign consumer’s utility and welfare and therefore also the foreign politician’s first period utility.

When are we going to observe a trade dispute in which the foreign incumbent accuses the domestic politician of implementing an unnecessary product standard in the equilibrium of proposition 1? At least one of the incumbents has to be bad and has to engage in either “green protectionism” or “environmental dumping”. Take the case of “green protectionism”, which occurs in state θ_0 with a bad domestic incumbent in office. Both a good and a bad foreign incumbent will not implement the environmental policy in this state and hence there will be the described disagreement. Similarly in the case of “environmental dumping”, which happens with a bad incumbent in office in the foreign country in state θ_1 , both

a good and bad domestic incumbent will implement the product standard in the domestic country in state θ_1 and the same dispute pattern will follow. To have a bad incumbent in office in the first period is on its own, however, not enough to generate a trade dispute. Take for example the combination of a bad domestic and a good foreign incumbent confronted with a “high risk” externality. In this case both incumbents will implement the product standard. The results of this discussion are summarised in the following corollary:

Corollary 1 *A trade dispute involves at least one bad incumbent and either “green protectionism” or “environmental dumping”.*

In other words this corollary says that the two political failures, green protectionism and environmental dumping, are observationally equivalent from the perspective of the voter. If there is disagreement about the appropriate environmental policy, it is clear that one incumbent is abusing the environmental policy, but it is neither clear who is guilty nor whether environmental policy is over- or underprovided.

What is the importance of the yardstick competition between the two incumbents for the results derived so far? The yardstick competition is a constraint on bad incumbents’ (mis-)behaviour. Disagreeing with a very reputable incumbent in the other country carries a high re-election penalty, as lemma 2 has established, and therefore becomes progressively less attractive. Suppose there was no yardstick competition, because voters could not observe policy choices in the other country. It can be shown that the equilibrium characterised in proposition 1 would then become an equilibrium in a larger parameter space. More precisely:

Corollary 2 *In a world without yardstick competition there exists a larger range of initial reputations λ_I and λ_I^* in which the strategies of proposition 1 form an PBE equilibrium for any given values of $\psi_1, \psi_1^*, \psi_2, \psi_2^*$.*

This corollary also allows me better to compare my proposition 1 to the results of Coate and Morris (1995). The model without yardstick competition is very close to their economic structure. My payoff structure differs slightly, but the same mechanism is operating. This corollary says that the inefficiencies that Coate and

Morris (1995) have identified are an equilibrium in a smaller range of parameters in the presence of yardstick competition between two incumbents, but they continue to exist.

5 Institutional Reform

With the model developed in the previous sections I will now address proposals to settle or avoid such trade disputes. Such interventions essentially add extra constraints to the decentralised policy making that has been analysed so far. In particular two possibilities will be discussed in some detail: Mutual recognition of standards and harmonisation. The question is whether these interventions can mitigate the political failure and improve welfare in the two countries.

5.1 Mutual Recognition of Standards

A common proposal to settle disputes over product standards is to agree on a mutual recognition of standards rule. The EU has, for example, gone a long way towards implementing this rule for intra-EU trade.⁷ A mutual recognition rule specifies that the product standard which applies to units of a good sold in the local market is also sufficient for exported units of the same good. In the context of this model this rule would specify that whatever product standard applies to units of good x sold in the foreign market will also be sufficient for exports to the home country. Some implications of this change in regime are summarised in the following proposition:

Proposition 2 *A mutual recognition makes the implementation of the product standard less likely in the domestic country and has an ambiguous welfare impact relative to the equilibrium of proposition 1.*

The intuition for this proposition is as follows. There are two opposing effects on the home country's welfare. Consider first the range of λ_I and λ_I^* in which

⁷See Vogel (1995) for an extensive discussion of the EU's efforts to eliminate non-tariff barriers to trade and the role of mutual recognition of standards in this process.

proposition 1 applies. The positive effect of the mutual recognition rule is, that there will be no more “green protectionism”. Whenever bad domestic incumbents would have implemented the product standard in state θ_0 there will now be no product standard as both good and bad foreign do not implement the standard in state θ_0 . The drawback of the mutual recognition rule is, however, that the domestic country is now going to suffer from the “environmental dumping” by the foreign country. In state θ_1 bad foreign incumbents will not implement the standard and there will therefore also be no standard in the home country. Without the mutual recognition rule both types of domestic incumbents would have implemented the standard in state θ_1 . The mutual recognition rule therefore essentially solves the problem of “green protectionism” but the domestic country now suffers from the “environmental dumping” in the foreign country. This intuition can be extended to initial reputations outside the range characterised in proposition 1. Which of these two effects dominates depends on the values of the abatement and damage costs and the probability with which bad politicians occur and it is not clear why one should dominate the other. The problem with mutual recognition is basically that it works on the implicit assumption that only politicians of the importing country can be bad, but that the political process of the exporting country is optimal, which is not true in this model. Mutual recognition is therefore not a promising intervention to increase welfare in both countries.

5.2 Harmonisation

Probably the most frequent approach to eliminating disputes over national product standards are attempts to harmonise standards. Both the European Commission and the WTO, for example, make major efforts in this direction. The traditional argument against harmonised standards is, that they do not take into account local differences in preferences and endowments. This is clearly a valid argument. However, to return to the example of the beef hormones again, it is hard to see why citizens of two areas with similar per capita incomes like the United States and the EU should have a widely different willingness to pay to avoid damage from the consumption of growth hormones. So the inefficiency created by a uniform standard could be relatively small. In the economic environment of this paper the

costs of harmonisation are zero as the same standard is optimal in both countries.

It would therefore be very attractive to delegate the setting of product standards to an independent international body which is free from the pressures of the national political process and implements P in state θ_1 and N in state θ_0 . Unfortunately there is at the moment little evidence that any international body is sufficiently isolated from political pressure to achieve this outcome.⁸ In the absence of such an institution, efforts to harmonise standards will be the outcome of negotiations between national governments. A very simple way of thinking about such a negotiation is that voters in each of the two countries exert pressure on their respective incumbent to agree on a common policy with the other countries incumbent. One way to capture this idea in the model would be that voters agree to punish their incumbent with a reduction in his re-election probability, if he has failed to agree on a common policy. What would be the implications of such an incentive to harmonise? The next proposition summarises some possibilities:

Proposition 3 *If voters punish failure to harmonise the product standard with a sufficiently strong decline in an incumbents re-election probability, then there exists both an equilibrium where the harmonised standard is on average too high and one in which the standard is on average too low.*

The intuition for this proposition is as follows. I continue to assume that good incumbents will always implement the welfare maximising policy. If a bad incumbent is confronted with a good incumbent in the other country he therefore faces the choice of either implementing the welfare maximising policy or to see his re-election prospects decline. If both incumbents are bad there are two possible harmonisation levels. For both states of θ they could either both implement the product standard or both not do so. Suppose that a bad domestic incumbent's strategy is to implement N in state θ_0 and P in state θ_1 if the foreign incumbent is good and always implement N otherwise and never to make a transfer. Suppose

⁸One piece of anecdotal evidence for this claim is that scientific advisory panels, of for example the European Commission, are usually staffed with scientists from several countries, rather than a purely meritocratic selection. Furthermore observers tend to attach great importance to the question whether the scientists of a particular country had a dissenting opinion, which would be odd, if the deliberations were purely scientific.

that at the same time a bad foreign incumbent's strategy is to choose N in state θ_0 and P in state θ_1 if the foreign incumbent is good and N otherwise and also never to make a transfer. When will these strategies form an equilibrium? It is shown in the appendix that for sufficiently high λ_I and λ_I^* voters' updated beliefs about their incumbent's quality, if they observe harmonisation, are high enough to make a deviation to a first period transfer unprofitable for bad domestic and foreign incumbents. In this range of values for λ_I and λ_I^* leaving the harmonised "consensus" will also be unprofitable for bad incumbents regardless of the state θ , if the re-election penalty for non-harmonisation is sufficiently high as first period utility with a transfer is always at least as high as without a transfer.

In this equilibrium the product standard will always be at the optimal level unless two bad incumbents are in office in the first period and the state is θ_1 . In this case there will be no product standard, even though it would be welfare maximizing to have one. On average the standard will therefore be too low. The intuition for the case where the harmonised standard may be too high runs along the same lines. Even though harmonisation may be attractive in principle it is not clear that pressure to harmonise will result in efficient outcomes in the absence of institutions that help to implement the right level of harmonisation.

6 Discussion

This paper works with a very simple economic environment. In this section we will discuss one of the restrictive assumptions that have been made. The linear damage and abatement functions and restriction on parameters have allowed me to derive very simple welfare properties that I use as a benchmark for the evaluation of the political process. It has already been noted in the discussion of lemma 1 that the operation of the abatement technology affects the terms of trade. Even though the marginal costs of cleaning one unit of foreign-produced x is the same in both countries the effective cost of abatement differs between the two countries. In the case of the home country, for example, operation of the abatement technology reduces the price of imports and the net costs of using the abatement technology are therefore lower than the constant marginal cleaning costs a . In the foreign

country the terms of trade effect runs in the opposite direction. Implementing the abatement technology for the foreign market reduces foreign demand and hence lowers the world price of the foreign countries export good. Outside the range of parameters in which lemma 1 holds this could lead to a situation in which the home country finds it worthwhile to use the abatement technology in the “high risk” state while the foreign country does not do so.

More importantly the same terms of trade effects would also influence each country’s optimal standard in a model with more general abatement and damage functions. Suppose for example that marginal damages remain constant but that damages from consuming foreign-produced units of good x can be reduced continuously by increasing the degree of abatement. In the case of the home country a tighter standard would not only reduce damages but also improve the home country’s terms of trade. The home country’s optimal degree of abatement would therefore reflect both these benefits. In contrast the foreign country’s optimal standard would be biased downwards as tightening the standard has negative terms of trade implications. The political economy effects that I have identified would, however, continue to operate in such a more general model. The only difference would be that even two good incumbents would not choose the same policy in the two countries and the benchmark against which one would compare the political process would therefore be different.

There remains, however, an empirical question as to what the main reasons for the divergence of standards across countries are. There seems to be some anecdotal evidence that politicians not only choose different product standards to indirectly influence the terms trade, but rather because of some concrete political interests. However, in the absence of more empirical evidence this remains an open question.

7 Conclusion

This paper has addressed the growing number of trade disputes over product standards. A simple two country model has been developed in which a political failure in the national political process endogenously generates disagreements between the two politicians over the appropriate level of the product standard. In a second

step two common proposals to settle such trade disputes, mutual recognition of standards and harmonisation, have been analysed in the framework to determine, whether they can potentially mitigate the political failure. Both harmonisation and a mutual recognition rule were show to have ambiguous effects on the two countries' welfare relative to a system, where both countries independently implement their standards. Krugman (1997) has speculated that “the true purpose of international negotiations is arguably not to protect us from unfair foreign competition, but to protect us from ourselves.” The two forms of international co-operation that have been analysed in this paper have, however, not found much evidence that this will be the case.

8 Appendix

Proof of Lemma 1:

There are four possible combinations of environmental policy across the two countries: (N, N^*) , (P, N^*) , (P, P^*) and (N, P^*) . Case (N, N^*) is free trade and the home country imports good x . In case (P, N^*) all imports to the domestic market are treated with the abatement technology. Assuming that the marginal abatement costs are not prohibitive, so that the foreign country continues to export good x arbitrage by consumers and producers will ensure that $p^* = p_p^* = p - a = p_p - a$. Substituting this into the world market clearing condition for good x gives:

$$d(p_p^* + a) - s(p_p^* + a) = s^*(p_p^*) - d^*(p_p^*) \quad (8)$$

where d and d^* are demand for and s and s^* are supply of good x in the domestic and foreign country respectively. Differentiating this identity yields:

$$\frac{\partial p_p^*}{\partial a} = -\frac{d' - s'}{d' - s' - s^{*'} + d^{*'}} < 0 \text{ and } > -1$$

Implementation of P therefore depresses p_p^* by less than one so that $p_p = p = p_p^* + a$ increase. It has already been argued in the main text that increasing the domestic prices is on its own welfare reducing for the domestic economy. These costs will, however, be worthwhile if the damages from imported units of x are large enough. Furthermore if expected damages are so large that they outweigh the loss in consumer surplus from implementing the product standard in the domestic country, then the policy is not only welfare increasing, but also improves the domestic consumers utility. Finally the return to the specific factor in the domestic x industry will unambiguously increase if p_p increases as wages remain equal to one due to the operation of the numeraire sector.

In case (P, P^*) foreign-produced units of good x have to go through the abatement technology regardless of their final destination. Arbitrage will now ensure that $p = p_p = p^* = p_p^* + a$. Substituting into world market clearing gives:

$$d(p) - s(p) = s^*(p) - d^*(p - a)$$

Differentiation yields:

$$\frac{\partial p}{\partial a} = -\frac{s^{*'}}{d' - s' - s^{*'} + d^{*'}} > 0 \text{ and } < 1$$

which implies that world prices of good x are higher than under free trade, but increase by less than a . It is also straightforward to check that p_p^* decreases by even more than in case (P, N^*) . As foreign wages are also always equal to one this implies that in case (P, P^*) the return of the foreign specific factor is lower than it is in the case (P, N^*) .

Furthermore consumer surplus declines as now $p^* = p_p^* + a$. The costs of implementing P^* are therefore a reduced consumer surplus and a reduced return of the specific factor. As already argued in the main text, these costs may or may not be outweighed by the reduction in expected damages from consuming untreated units of foreign-produced x . If expected damages are very small they will not even outweigh the loss in foreign consumer surplus and N^* will not only maximise welfare but will also increase the foreign consumer's utility.

Case (N, P^*) will not occur in equilibrium, but is nevertheless important as an outside option. In this case all foreign produced x that are sold on the foreign market first have to be treated with the abatement technology, while units that are exported to the home country remain untreated. A slightly simplified way of determining the effects of this policy combination is to assume that there is additionally a prohibition on imports of good x from the home country into the foreign market. In this case arbitrage will ensure that $p = p_p = p_p^* = p^* - a$. World market clearing now requires that:

$$d(p_p^*) - s(p_p^*) = s^*(p_p^*) - d^*(p_p^* + a)$$

Differentiation yields:

$$\frac{\partial p_p^*}{\partial a} = -\frac{d^{*l}}{d' - s' - s^{*l} + d^{*l}} < 0 \text{ and } > -1$$

Similar to case (P, P^*) producer prices in the foreign country fall, which implies a reduction in the return of the foreign specific factor and foreign consumer prices rise at the same time which reduces consumer surplus. The product standard therefore imposes also in this case costs on the economy, which may or may not be outweighed by the reduction in expected damages.

Relaxing the simplifying assumption that imports of x into the foreign country are prohibited does not change any of the results for case (N, P^*) , but the mechanism is different. If imports of clean domestic units of x are allowed into the foreign market, the foreign consumer would prefer to buy those rather than the more expensive foreign-produced units, that need to go through the abatement process first. The domestic consumer is at the same time indifferent between units of x from the domestic and foreign source. Suppose that the final outcome of this was that the entire output of the domestic x industry is shipped to the foreign country and the entire output of the foreign x industry goes to the home country. As demand for x is the same in both countries this would lead to a price difference between the countries equal in size to the autarky price difference. With a being non prohibitive, i.e. smaller than the autarky price, some output of the foreign x industry would therefore be treated with the abatement technology and sold in the foreign country, which implies that the same price structure prevails as before. This completes the proof.

Proof of Lemma 2:

Given the equilibrium strategies specified in the lemma the domestic and foreign voter's beliefs for the case where the domestic incumbent regulates the externality, but the foreign does not and neither makes any transfers are:

$$\begin{aligned}\alpha(P, N^*, 0, 0^*, \overline{D}) &= \frac{\lambda_I(1 - \lambda_I^*)(\phi\theta_1)}{(1 - \lambda_I^*)\phi\theta_1 + (1 - \lambda_I)(1 - \phi)\theta_0} \\ \alpha(P, N^*, 0, 0^*, 0) &= \frac{\lambda_I(1 - \lambda_I^*)\phi(1 - \theta_1)}{(1 - \lambda_I^*)\phi(1 - \theta_1) + (1 - \lambda_I)(1 - \phi)(1 - \theta_0)} \\ \alpha^*(P, N^*, 0, 0^*, \overline{D}) &= \frac{\lambda_I^*(1 - \lambda_I)(1 - \phi)\theta_0}{(1 - \lambda_I)(1 - \phi)\theta_0 + (1 - \lambda_I^*)\phi\theta_1} \\ \alpha^*(P, N^*, 0, 0^*, 0) &= \frac{\lambda_I^*(1 - \lambda_I)(1 - \phi)(1 - \theta_0)}{(1 - \lambda_I)(1 - \phi)(1 - \theta_0) + (1 - \lambda_I^*)\phi(1 - \theta_1)}\end{aligned}$$

To demonstrate part (i) note that for $\alpha(P, N^*, 0, 0^*, \overline{D})$ and $\alpha(P, N^*, 0, 0^*, 0)$ the numerator is increasing in λ_I and the denominator is decreasing in λ_I . Similarly for $\alpha^*(P, N^*, 0, 0^*, \overline{D})$ and $\alpha^*(P, N^*, 0, 0^*, 0)$ the numerator is increasing in λ_I^* and the denominator is decreasing in λ_I^* . To establish the effect of λ_I^* on $\alpha(P, N^*, 0, 0^*, \overline{D})$ and $\alpha(P, N^*, 0, 0^*, 0)$ differentiation yields

$$\begin{aligned}\frac{\partial \alpha(P, N^*, 0, 0^*, \overline{D})}{\partial \lambda_I^*} &= \frac{(-1)\lambda_I\theta_1\phi(1 - \lambda_I)(1 - \phi)\theta_0}{[(1 - \lambda_I^*)\phi\theta_1 + (1 - \lambda_I)(1 - \phi)\theta_0]^2} < 0 \\ \frac{\partial \alpha(P, N^*, 0, 0^*, 0)}{\partial \lambda_I^*} &= \frac{(-1)\lambda_I\phi(1 - \theta_0)(1 - \lambda_I)(1 - \phi)(1 - \theta_1)}{[(1 - \lambda_I^*)\phi(1 - \theta_1) + (1 - \lambda_I)(1 - \phi)(1 - \theta_0)]^2} < 0\end{aligned}$$

Similarly the effect of λ_I on $\alpha^*(P, N^*, 0, 0^*, \overline{D})$ $\alpha^*(P, N^*, 0, 0^*, 0)$ is given by:

$$\begin{aligned}\frac{\partial \alpha^*(P, N^*, 0, 0^*, \overline{D})}{\partial \lambda_I} &= \frac{(-1)\lambda_I^*\theta_0(1 - \lambda_I^*)(1 - \phi)\phi\theta_1}{[(1 - \lambda_I)(1 - \phi)\theta_0 + (1 - \lambda_I^*)\phi\theta_1]^2} < 0 \\ \frac{\partial \alpha^*(P, N^*, 0, 0^*, 0)}{\partial \lambda_I} &= \frac{(-1)\lambda_I^*\phi(1 - \theta_0)(1 - \lambda_I^*)(1 - \phi)(1 - \theta_1)}{[(1 - \lambda_I)(1 - \phi)(1 - \theta_0) + (1 - \lambda_I^*)\phi(1 - \theta_1)]^2} < 0\end{aligned}$$

To show (ii) write down $\alpha^*(P, N^*, 0, 0^*, \overline{D}) < \alpha^*(P, N^*, 0, 0^*, 0)$. After some manipulations this simplifies to $\theta_1 > \theta_0$ which is true by assumption. Similarly the inequality $\alpha(P, N^*, 0, 0^*, \overline{D}) > \alpha(P, N^*, 0, 0^*, 0)$ also simplifies to $\theta_1 > \theta_0$.

Proof of Proposition 1:

Beliefs for the case where the domestic incumbent implements P and the foreign incumbent N^* have already been derived for the proof of lemma 2. Beliefs for other possible first period track records on the equilibrium path are:

$$\alpha(N, N^*, 0, 0^*, \overline{D}) = \alpha(N, N^*, 0, 0^*, 0) = 1$$

$$\begin{aligned}\alpha(P, P^*, 0, 0^*, \overline{D}) &= \alpha(P, P^*, 0, 0^*, 0) = \lambda_I \\ \alpha^*(N, N^*, 0, 0^*, \overline{D}) &= \alpha^*(N, N^*, 0, 0^*, 0) = \lambda_I^* \\ \alpha^*(P, P^*, 0, 0^*, \overline{D}) &= \alpha^*(P, P^*, 0, 0^*, 0) = 1\end{aligned}$$

Track records $(N, P^*, 0, 0^*, \overline{D})$ and $(N, P^*, 0, 0^*, 0)$ are out of equilibrium events and therefore not constrained by Bayes rule. I will assume that beliefs in this case are equal to one, which is the most unfavourable assumption possible. Finally as noted in the main text beliefs for track records that involve positive transfers are assumed to be zero.

Define re-election functions h (h^*) for the domestic (foreign) incumbent:

$$h(E, E^*, T, T^*, \theta) = \theta G(\alpha(E, E^*, T, T^*, \overline{D})) + (1 - \theta)G(\alpha(E, E^*, T, T^*, 0)) \quad (9)$$

$$h^*(E, E^*, T, T^*, \theta) = \theta G(\alpha^*(E, E^*, T, T^*, \overline{D})) + (1 - \theta)G(\alpha^*(E, E^*, T, T^*, 0)) \quad (10)$$

which are a function of the indicated variables and λ_I and λ_I^* .

To establish the existence of the equilibrium two deviations from the equilibrium strategy have to be ruled out for each incumbent. First, given the other incumbent's strategy and the initial reputations λ_I and λ_I^* domestic (foreign) incumbents must prefer P (N^*) to N (P^*) regardless of the state θ and the other incumbents type. The payoff to the bad domestic incumbent of implementing P in state θ_0 , when both good and bad foreign incumbents implement N^* is:

$$v_b(P, N^*, 0, \theta_0) + h(P, N^*, 0, 0^*, \theta_0)\delta\widehat{v}_b(\widehat{T}) \quad (11)$$

which has to be greater than the payoff of doing N which is $v_b(N, N^*, 0, \theta_0) + \delta\widehat{v}_b(\widehat{T})$. This can be rearranged to yield:

$$h(P, N^*, 0, 0^*, \theta_0) > 1 - \frac{v_b(P, N^*, 0, \theta_0) - v_b(N, N^*, 0, \theta_0)}{\delta\widehat{v}_b(\widehat{T})} \quad (12)$$

As $h(P, E^*, 0, 0^*, \theta_0) \geq 0$ there will always be a critical value of ψ_1 (as defined in assumption 1) above which this inequality holds. The same critical value of ψ_1 will ensure that inequality (12) also holds when the state is θ_1 or $E^* = P^*$. If $E^* = N^*$ and the state is θ_1 rather than θ_0 , then the left hand side of (12) increases while the right hand side is unchanged. For $E^* = P^*$ and $\theta = \theta_1$ (which is the only other possible combination of states and strategies) we have $h(P, P^*, 0, 0^*, \theta_1) = \lambda_I > h(P, N^*, 0, 0^*, \theta_0)$ and assumption 3 implies that the right hand side of (12) has not increased.

The same method can be used to rule out that a foreign bad incumbent prefers P^* to N^* in state θ_1 when both good and bad domestic incumbents implement P . The payoff from choosing N^* is:

$$v_b^*(P, N^*, 0^*, \theta_1) + h^*(P, N^*, 0, 0^*, \theta_1)\delta\widehat{v}_b^*(\widehat{T}^*) \quad (13)$$

This has to be larger than the payoff from choosing P^* which is $v_b^*(P, P^*, 0^*, \theta_1) + \delta \widehat{v}_b^*(\widehat{T}^*)$. This yields the following inequality:

$$h^*(P, N^*, 0, 0^*, \theta_1) > 1 - \frac{v_b^*(P, N^*, 0^*, \theta_1) - v_b^*(P, P^*, 0^*, \theta_1)}{\delta \widehat{v}_b^*(\widehat{T}^*)} \quad (14)$$

As $h^*(P, N^*, 0, 0^*, \theta_1) \geq 0$ a sufficiently large ψ_1^* will ensure that this inequality holds. As in the case of the domestic incumbent the same ψ_1^* will ensure that (14) also holds when $E = P$ and $\theta = \theta_0$ or $E = N$ and $\theta = \theta_0$. In the first case the left hand side of (14) increases, while the right hand side is unchanged. In the second case the left hand side also increases and assumption 3 ensures that the right hand side does not increase.

The second possible deviation from the equilibrium strategy would be for bad incumbents to make a cash transfer in the first period. For a bad domestic incumbent in state θ_0 the payoff under the equilibrium strategy is (11), which has to be larger than $\widehat{v}_b(N, N^*, \widehat{T}, \theta_0)$, the payoff of selecting a first period cash transfer. This implies that

$$h(P, N^*, 0, 0^*, \theta_0) > \frac{\widehat{v}_b(N, N^*, \widehat{T}, \theta_0) - v_b(P, N^*, 0, \theta_0)}{\delta \widehat{v}_b(\widehat{T})} \quad (15)$$

has to hold. Assumption 1 implies that $v_b(P, N^*, 0, \theta_0) > v_b(N, N^*, 0, \theta_0)$ and a sufficiently large ψ_2 (as defined in assumption 2) will therefore ensure that this inequality is satisfied. Inequality (15) will also hold for the same ψ_2 if $E^* = N^*$ and $\theta = \theta_1$ or $E^* = P^*$ and $\theta = \theta_1$. In both these cases assumption 2 implies that the right hand side is no larger and the left hand side will be larger, as re-election becomes more probable.

Consider a bad foreign incumbents incentives to make a cash transfer. In state θ_1 his payoff under the equilibrium strategy is (13) and his payoff under the optimal cash transfer is $\widehat{v}_b^*(P, E^*, \widehat{T}^*, \theta_1)$ which implies the following inequality:

$$h^*(P, N^*, 0, 0^*, \theta_1) > \frac{\widehat{v}_b^*(P, P^*, \widehat{T}^*, \theta_1) - v_b^*(P, N^*, 0^*, \theta_1)}{\delta \widehat{v}_b^*(\widehat{T}^*)} \quad (16)$$

Assumption 1 implies that $v_b^*(P, N^*, 0^*, \theta_1) > v_b^*(P, N^*, 0^*, \theta_1)$ and a sufficiently large ψ_2^* will therefore ensure that the inequality holds. As before (16) will also hold for the same ψ_2^* if $E = N$ and $\theta = \theta_0$ or $E = P$ and $\theta = \theta_0$, as in both cases the right hand side does not increase, while the left hand side increases. This completes the proof.

Proof of Corollary 2

Let $\alpha(E, 0, D)$ denote the domestic voter's up-dated beliefs about the quality of his incumbent, if the voter can only observe the domestic policy choices and there is no transfer. Similarly let $\alpha^*(E^*, 0, D)$ be the equivalent beliefs for the foreign voter. It is straightforward to show that $\alpha(P, 0, D) = \alpha(P, N^*, 0, 0^*, D)$ if $\lambda_I^* = 0$ and that $\alpha(P, 0, D)$ is increasing in λ_I . Similarly it can be shown that $\alpha^*(N^*, 0^*, D) = \alpha^*(P, N^*, 0, 0^*, D)$ if

$\lambda_I = 0$ and that $\alpha^*(N^*, 0^*, D)$ is increasing in λ_I^* . This implies together with lemma 2 that $\alpha(P, 0, D) > \alpha(P, N^*, 0, 0^*, D)$ if $\lambda_I > 0$ and $\alpha^*(N^*, 0^*, D) > \alpha^*(P, N^*, 0, 0^*, D)$ if $\lambda_I > 0$. Now suppose that there is a trade dispute, so $E = P$ and $E^* = N^*$, and that for the set of initial reputations λ_I and λ_I^* and $\psi_1, \psi_1^*, \psi_2, \psi_2^*$ at least one of the inequalities (12), (14), (15) or (16) is binding in the case where policy choices are observable in both countries. If foreign policy is now made unobservable, then the improvement in voters' assessment of the quality of their respective incumbents will increase the left hand side of all of these inequalities while leaving everything else unchanged. For given values of $\psi_1, \psi_1^*, \psi_2, \psi_2^*$ the initial reputations λ_I and λ_I^* could therefore be even lower without violating any of the above inequalities. This completes the proof.

Proof of Proposition 2

If the domestic politician always follows the foreign incumbents decisions, then his policy choices do not convey any information. The foreign voter's beliefs are now:

$$\alpha^*(N^*, 0^*, \overline{D}) = \frac{\lambda_I^*(1 - \phi)\theta_0}{(1 - \phi)\theta_0 + (1 - \lambda_I^*)\phi\theta_1}$$

$$\alpha^*(N^*, 0^*, 0) = \frac{\lambda_I^*(1 - \phi)(1 - \theta_0)}{(1 - \phi)(1 - \theta_0) + (1 - \lambda_I^*)\phi(1 - \theta_1)}$$

$$\alpha^*(P^*, 0^*, \overline{D}) = \alpha^*(P^*, 0^*, 0) = 1$$

Note that the beliefs for track records $(N^*, 0^*, \overline{D})$ and $(N^*, 0^*, 0)$ are increasing in λ_I^* and weakly higher than the foreign voter's beliefs if he observes $(P, N^*, 0, 0^*, \overline{D})$ and $(P, N^*, 0, 0^*, 0)$ under decentralised decision making. The analysis for proposition 1 therefore implies that a strategy for a bad foreign incumbent to never implement the product standard is now an equilibrium in an even larger range of λ_I^* for any given value of ψ_1^* and ψ_2^* . Outside this range of initial reputations there exist only mixed strategy equilibria in which a bad foreign politician must be indifferent between the pure strategies that he randomises over. For this to be possible not implementing the product standard must carry a re-election penalty as bad foreign politicians otherwise always prefers to do so. To create such a penalty foreign bad politicians must in equilibrium be more likely than a good politician to implement the product standard. The same argument can be used to establish that bad domestic politicians, who ceteris paribus prefer implementation of the product standard to non-implementation, must in any equilibrium implement the product standard more frequently than a good politician.

Replacing domestic policy making through a mutual recognition rule with foreign policy making therefore strictly reduces the frequency of environmental policy. Good foreign politicians implement the same standard as good domestic politicians but no standard in state θ_0 where bad domestic incumbents would at least sometimes implement the standard. Furthermore bad foreign incumbents will implement the product

standard even less frequently than good foreign incumbents. This implies that the product standard becomes less frequent in the domestic country. The welfare impact of this change is ambiguous as has already been argued in the main text.

Proof of Proposition 3

To show that the equilibrium can involve on average to high standards take the following strategies. Good incumbents continue to always implement P and P^* in state θ_1 and N and N^* in state θ_0 . Bad domestic incumbents always implement the P in state θ_1 and N in state θ_0 if the foreign incumbent is good and N in both states if the foreign incumbent is bad and do not make transfers in either case. Bad foreign incumbents implement P^* in state θ_1 and N^* in state θ_0 if the domestic incumbent is good and N^* in both states if the domestic incumbent is bad and also do not make transfers. Given these strategies possible track records are $(N, N^*, 0, 0^*, 0)$, $(N, N^*, 0, 0^*, \bar{D})$, $(P, P^*, 0, 0^*, \bar{D})$ and $(P, P^*, 0, 0^*, 0)$. Updated beliefs for the two incumbents in these cases are:

$$\begin{aligned}\alpha(P, P^*, 0, 0^*, \bar{D}) &= \frac{\lambda_I \phi \theta_1}{\lambda_I \phi \theta_1 + (1 - \lambda_I) \lambda_I^* \phi \theta_1} \geq \lambda_I \\ \alpha(P, P^*, 0, 0^*, 0) &= \frac{\lambda_I \phi (1 - \theta_1)}{\lambda_I \phi (1 - \theta_1) + (1 - \lambda_I) \lambda_I^* \phi (1 - \theta_1)} \geq \lambda_I \\ \alpha(N, N^*, 0, 0^*, \bar{D}) &= \frac{\lambda_I (1 - \phi) \theta_0}{(1 - \phi) \theta_0 + (1 - \lambda_I) (1 - \lambda_I^*) \phi \theta_1} \\ \alpha(N, N^*, 0, 0^*, 0) &= \frac{\lambda_I (1 - \phi) (1 - \theta_0)}{(1 - \phi) (1 - \theta_0) + (1 - \lambda_I) (1 - \lambda_I^*) \phi (1 - \theta_1)} \\ \alpha^*(N, N^*, 0, 0^*, \bar{D}) &= \frac{\lambda_I^* (1 - \phi) \theta_0}{(1 - \phi) \theta_0 + (1 - \lambda_I^*) (1 - \lambda_I) \phi \theta_0} \\ \alpha^*(N, N^*, 0, 0^*, 0) &= \frac{\lambda_I^* (1 - \phi) (1 - \theta_0)}{(1 - \phi) (1 - \theta_0) + (1 - \lambda_I^*) (1 - \lambda_I) \phi (1 - \theta_1)} \\ \alpha^*(P, P^*, 0, 0^*, \bar{D}) &= \frac{\lambda_I^* \phi \theta_1}{\lambda_I^* \phi \theta_1 + (1 - \lambda_I^*) \lambda_I \phi \theta_1} \geq \lambda_I^* \\ \alpha^*(P, P^*, 0, 0^*, 0) &= \frac{\lambda_I^* \phi (1 - \theta_1)}{\lambda_I^* \phi (1 - \theta_1) + (1 - \lambda_I^*) \lambda_I \phi (1 - \theta_1)} \geq \lambda_I^*\end{aligned}$$

Note that the up-dated beliefs are increasing in each incumbents own initial reputation. Furthermore they are also either increasing in the other incumbents initial reputation or weakly larger than the incumbents own initial reputation. Two possible deviations have to be ruled out: implementing a positive transfer in the first period and changing the environmental policy away from harmonisation. Payoffs for bad domestic and foreign incumbents under the cash transfer are $\hat{v}_b(E, E^*, \hat{T}, D)$ and $\hat{v}_b^*(E, E^*, \hat{T}, D)$ respectively

in the first period and zero for the second period. Assumption 2 implies that if re-election is probable enough then the extra first period utility of a cash transfer does not outweigh the loss of second period utility due to a certain defeat in the election. Given the beliefs derived above there must therefore be a critical level of λ_I and λ_I^* above which $h(N, N^*, 0, 0^*)$, $h(P, P^*, 0, 0^*)$, $h^*(N, N^*, 0, 0^*)$, $h^*(P, P^*, 0, 0^*)$ are sufficiently high to make a first period cash transfer unattractive. In this range of λ_I and λ_I^* both incumbents will also not deviate from the harmonised standard if the re-election penalty is sufficiently large. Suppose that failure to harmonise is punished with a certain defeat in the election. As the first period utility gain from implementing a transfer is always at least as large as the gain from changing the environmental policy, this deviation can not be optimal. The implication of this is that the harmonised standard is optimal as long as at least one good incumbent is in office and too low when two bad incumbents are in office and the state is θ_1 .

To show that the harmonised standards can also be too high take the same strategies as above with one change. If two bad incumbents are in office their strategy is now that both implement the product standard regardless of the state. Beliefs in this case are:

$$\begin{aligned}\alpha(P, P^*, 0, 0^*, \overline{D}) &= \frac{\lambda_I \phi \theta_1}{\lambda_I \phi \theta_1 + (1 - \lambda_I)(1 - \lambda_I^*)(1 - \phi)\theta_0} \\ \alpha(P, P^*, 0, 0^*, 0) &= \frac{\lambda_I \phi (1 - \theta_1)}{\lambda_I \phi (1 - \theta_1) + (1 - \lambda_I)(1 - \lambda_I^*)(1 - \phi)(1 - \theta_0)} \\ \alpha(N, N^*, 0, 0^*, \overline{D}) &= \frac{\lambda_I (1 - \phi)\theta_0}{\lambda_I (1 - \phi)\theta_0 + (1 - \lambda_I)\lambda_I^* (1 - \phi)\theta_0} \geq \lambda_I \\ \alpha(N, N^*, 0, 0^*, 0) &= \frac{\lambda_I (1 - \phi)(1 - \theta_0)}{\lambda_I (1 - \phi)(1 - \theta_0) + (1 - \lambda_I)\lambda_I^* (1 - \phi)(1 - \theta_0)} \geq \lambda_I \\ \alpha^*(N, N^*, 0, 0^*, \overline{D}) &= \frac{\lambda_I^* (1 - \phi)\theta_0}{\lambda_I^* (1 - \phi)\theta_0 + (1 - \lambda_I^*)\lambda_I (1 - \phi)\theta_0} \geq \lambda_I^* \\ \alpha^*(N, N^*, 0, 0^*, 0) &= \frac{\lambda_I^* (1 - \phi)(1 - \theta_0)}{\lambda_I^* (1 - \phi)(1 - \theta_0) + (1 - \lambda_I^*)\lambda_I (1 - \phi)(1 - \theta_0)} \geq \lambda_I^* \\ \alpha^*(P, P^*, 0, 0^*, \overline{D}) &= \frac{\lambda_I^* \phi \theta_1}{\phi \theta_1 + (1 - \lambda_I^*)(1 - \lambda_I)(1 - \phi)\theta_0} \\ \alpha^*(P, P^*, 0, 0^*, 0) &= \frac{\lambda_I^* \phi (1 - \theta_1)}{\phi (1 - \theta_1) + (1 - \lambda_I^*)(1 - \lambda_I)(1 - \phi)(1 - \theta_0)}\end{aligned}$$

Beliefs in this case are again increasing in the incumbents own initial reputation and either also increasing in the other incumbents reputation or weakly larger than their own initial reputation. The same argument as in the case of downward harmonisation can therefore be applied to show that above a set of critical values for λ and λ_I^* deviations

from the equilibrium strategies are unprofitable. This establishes that a situation where the standard is either at its optimal level or too high, which happens when two bad incumbents are in office in state θ_0 , is also an equilibrium. This completes the proof.

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