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Environment and trade: the implications of imperfect information and political economy

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Abstract: The last ten years have seen an upsurge in interest in the nexus of trade and environmental policies. In part this reflects the need to deal with major global pollution problems, and in part a concern that globalization may have adverse impacts on the environment. Environmentalists worry that globalization may trigger a race-to-the-bottom in environmental standards. While they would like to see upward harmonization in environmental standards, they are sceptical about the ability of supra-national agencies to achieve this. Industrialists also raise concerns about the need for a 'level playing field' in environmental regulations because of fears about the impact of environmental regulations on competitiveness. However, developing countries question whether disputes over differences in environmental regulations simply reflect a covert form of 'green protectionism'. In this paper we review what light recent developments in economic analysis (conceptual and empirical) can shed on these concerns. We quickly summarize conventional trade models in which government bodies have perfect information and are welfare maximizers, and show that this analysis does not provide much support for the concerns or proposed policy recommendations. We then turn to models of political economy and imperfect information to see whether they provide a better explanation for the concerns and policy recommendations.

1. Introduction

The links between environmental policy and international trade have been a very prominent item in public policy debates over the last decade. This prominence was fuelled by a number of concerns. The first was probably the increasing awareness of

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transboundary or even global environmental problems such as acid rain, ozone depletion and climate change. To deal with such problems required international environmental agreements (IEAs) and it was recognized that standard free-rider problems might make it difficult to get effective agreements. However, in the presence of increasing international trade these difficulties might be exacerbated by the 'leakage' problem: action to regulate pollutants by any group of countries (or individual country) might encourage production and associated pollution to switch to unregulated countries. This led to the call to back IEAs with trade measures, which raises the question of how such measures would be viewed by GATT/WTO.

A second concern was that, even with purely local pollution problems, liberalization of trade and capital flows might pose a threat to the environment. The increasingly vociferous campaign against globalization has argued that trade liberalization would first expand production, consumption and transport of goods, exacerbating damage to the environment and second make governments more concerned about the loss of competitiveness if they set tougher environmental policies than other countries. Governments might then set weaker environmental standards than warranted by environmental damage costs ('environmental dumping'), causing a 'regulatory chill' or even a 'race-to-the-bottom' in environmental standards as governments competed to attract internationally mobile capital (Esty (1994)). Environmentalists have argued that countries with tough environmental standards should be able to impose countervailing trade measures against countries with weaker standards elsewhere. However, at least if these involved production and process methods (PPM), such measures would be outlawed by GATT (as confirmed by the famous tuna–dolphin case). Fears about 'environmental dumping' also led to calls for some supra-national agency to coordinate and even harmonize environmental standards across countries, although many environmentalists were sceptical about a body such as the WTO playing this role, fearing it had been captured by transnational companies, and would always privilege free trade over the environment. The call for harmonization of environmental standards was supported by industrialists arguing for a 'level playing field', but strongly opposed by developing countries who saw this as a form of 'green protectionism', denying them an ability to exploit one source of comparative advantage – a relatively undamaged environment.

Finally there have been a large and growing number of trade disputes over national product standards. The typical pattern is that a country implements a new product regulation, which it argues to be necessary for either consumer or environmental protection, while importers to that market challenge the regulation as a 'disguised barrier to trade' or simply 'green protectionism'. The EU and the United States have, for example battled intensively over imports of genetically modified food into the EU and have spent a decade in court over hormones found in US beef exports to Europe. Supra-National Institutions, such as the WTO and the European Court of Justice, were forced to rule on such trade disputes and have frequently struck down the contested national regulations as unnecessarily trade restrictive.

This has left environmentalists with the conviction that in our increasingly globalizes world national environmental standards are at the mercy of politically unaccountable supra-national institutions, which they suspect to be willing to promote international trade at the expense of sound environmental protection.

Alongside this public debate there has been a substantial growth in the economics literature on trade and the environment. In part this reflected the natural wish for researchers to address issues of current concern, but also the development of new tools with which to address the issues.[1] There are already a number of surveys of this literature including some written by ourselves (Dean (1992), Wilson (1996), Ulph (1997a, b), Rauscher (2001), Schulze and Ursprung (2001), Sturm (2002)). However in this survey we shall give more emphasis to recent work, including some of our own, which stresses the importance of political economy aspects and informational problems, and the difficulties these might pose for resolving environmentally driven trade disputes. In the next section we give an overview of the conventional literature, which assumes welfare-maximizing governments and perfect information. In section 3 we introduce informational problems, in section 4 political economy issues, and in section 5 we argue that it is the interaction between informational problems and political economy that poses the real challenge.

2. Environmental and trade policies with welfare-maximizing governments and perfect information

In this section we summarize[2] what economic analysis has to say about first-best and second-best trade and environmental policies when governments are welfare maximizing and there is perfect information. In considering optimal policies we distinguish between what might be optimal from the perspective of an individual country acting in its own self-interest from what might be globally optimal. For ease of exposition we concentrate on pollution linked to production (PPM). Initially we ignore transboundary pollution.

We begin with the textbook model of competitive markets and a small open economy. With no transboundary pollution, optimal policies for each country would be to have free trade and Pigouvian environmental policies (policies which ensure that marginal abatement costs are equalized across all polluters and equal to marginal damage costs). Comparative advantage applies: amongst countries with the same relative endowment of other factors, those which are well-endowed with environmental resources (in a general sense – see Rauscher (2001)) will export goods which are on average 'dirty' goods, while those which have relatively scarce environments will export 'clean' goods. In general there is no reason to believe that countries will set the same environmental standards.

1 There is now a new JEL-code for this field – F18.

2 A fuller version of this section can be found in Sturm and Ulph (2002).

Turning to second-best policies, if a country had an irremovable tariff in place which encouraged too much production of a dirty good, then environmental policy should be made tougher than Pigouvian to offset this trade distortion. Similarly if there was inadequate environmental policy it might be desirable to adjust trade polices; if there was inadequate internalization of environmental damages on a good that was exported it might be better to have a tariff on exports. But trade policies will rarely be even second-best policies for dealing with environmental damage.

If markets are competitive but a country is large enough to affect its terms-of-trade, then the optimal policies for a country acting independently are to use trade policies to exploit market power and Pigouvian policies to deal with environmental problems (the policy targeting principle). Of course this outcome is not globally efficient: efficiency requires free trade and Pigouvian environmental policies. Turning to second-best policies, suppose, because of trade liberalization, a country with market power cannot impose tariffs. Then, if it is an exporter, it will set environmental policies which are tougher than Pigouvian (to restrict domestic supply and hence drive up the world price it receives), while, if it is an importer, it will set policies weaker than Pigouvian (to expand domestic supply and hence drive down the world price it pays). There is no reason to believe there will be a systematic tendency for all countries to engage in either environmental dumping or environmental protectionism. However, if a country, for some reason, is unable to set Pigouvian environmental policies, there may be a case for adjusting trade policies to reflect this, in the way analysed in the small open economy case, but again it is unlikely that trade policies are even second-best policies to address environmental problems.

Provided environmental policies properly internalize environmental damages, trade liberalization benefits all countries. If there are inadequate environmental policies, trade liberalization may not be beneficial to some countries, but, as argued, trade instruments are unlikely to be second-best ways of dealing with environmental policy failures. What about the impact on the environment? Following Grossman and Krueger (1993) and Copeland and Taylor (1994) the impact of a trade liberalization on environmental quality can be decomposed into three effects: the *composition effect* (changing the mix of goods produced); the *technique effect* (changing how goods are produced); and the *scale effect* (higher income expands demand for all normal goods, including the environment). The net impact of all three effects is ambiguous, and so it is an empirical matter how trade liberalization affects the environment. With a strong enough income effect on demand for a cleaner environment, it is possible that trade liberalization will not only raise welfare in all countries, but also lead to a cleaner environment in all countries.

Suppose now that markets are imperfectly competitive. Optimal policies from the perspective of each government are again to use trade policies to achieve trade objectives and Pigouvian environmental policy to deal with externalities. Suppose again that because of trade liberalization, trade policies cannot be used. Then it is

possible to construct models, for example, extensions of the well-known 'rent-shifting' model of Brander and Spencer (1985) to include pollution (Conrad (1993), Barrett (1994), Kennedy (1994), Ulph (1996a)) in which it will pay all governments to set weaker environmental policies than Pigouvian as a proxy for an export subsidy. While this might explain 'environmental dumping' by all governments, it is important to keep in mind that this is a second-best result. As several authors, including Walz and Wellisch (1997) and Bagwell and Staiger (2001), have stressed, the incentive to undertake strategic environmental policy only arises if trade policies are restricted.

Furthermore the conclusions of the model are by no means robust to changes in assumption from those based on the Brander–Spencer model. Allowing for different forms of market competition, for several firms in an industry to be located in the same country, or strategic behaviour by producers (e.g. investment in R&D) can imply that the second-best policies for governments acting independently would be to set policies which are tougher than Pigouvian policies. We also note that all the conclusions we have drawn for models of imperfect competition also apply when plants are internationally mobile.

However even if 'environmental dumping' was the result of imperfectly competitive markets and free trade, the appropriate policy response is to coordinate environmental policies so that all countries are better off than with environmental dumping (this will sometimes imply policies tougher than Pigouvian). However such coordination does not imply harmonization. Indeed, as noted by Ulph (1999), harmonization may be worse, for some countries, than just allowing environmental dumping to proceed. It is sometimes thought that a better approach than harmonization is to set minimum environmental standards, so that some states can set tougher standards if they wish, and so one can 'ratchet up' environmental standards in all states. But Kanbur, Keen, and van Wijnbergern (1995), and Ulph (1999) showed that minimum standards may not produce a ratchet effect: as some countries raise their environmental standards others may relax them, and the outcome, for some countries, may be worse than no policy at all.[3]

3 For all countries to benefit from minimum standards it is important that all countries toughen their environmental policies. But whether this happens depends crucially on the policy instruments used. Suppose countries use emission taxes. When one country raises its emission tax, and hence reduces domestic output, that raises profitability in other countries and encourages them to expand output. If the governments leave emission taxes unchanged, that leaves abatement unchanged and so all the extra output will just increase pollution. That will cause marginal damage costs to rise while marginal abatement costs are unchanged. So it will be optimal to also increase abatement, which requires that those countries respond by also raising their emission taxes. So with emission taxes there is a ratchet effect. But suppose governments set emission limits. If one government tightens its limits, that again reduces domestic output and increases profits in other countries, encouraging them to expand output. But now if emission limits are kept unchanged, all the associated extra pollution must be abated. So now marginal abatement costs rise, while marginal damage costs are unchanged. So it will be optimal to allow some of the associated extra pollution to be emitted. But that means other countries respond by *relaxing* their emission limits. So we do not get a ratchet effect. In technical terms emission taxes are strategic complements, while emission limits are strategic substitutes.

The analysis summarized so far has ignored transboundary pollution. There are two implications for policy. First there is the well-known free-rider problem that each state will only consider the impact of domestically generated pollution on itself, and ignore the costs it imposes on others. Dealing with this requires International Environmental Agreements, which goes beyond the scope of this survey. Second, even if a state ignores the environmental damage it imposes on other states, it will be concerned about the damage that other states impose on it, and specifically about 'leakage effects' – if it toughens its environmental standards this may simply cause production, and hence pollution, to expand elsewhere, and damage its own environment. In the small country case, there is nothing a country can do about leakage. But in the large country case or imperfectly competitive case, then there are steps a country could take. Essentially transboundary pollution introduces a 'pollution-shifting' incentive for a country to induce a bit more domestic pollution and reduce foreign pollution. It can do this through trade policies (to encourage exports or reduce imports) or by relaxing domestic environmental policies.

The analysis of the previous sections shows that (i) there is no general conclusion that liberalization of trade in goods and capital is good for welfare or the environment, although provided Pigouvian environmental policies are in place and other distortions addressed by appropriate policies, then the usual arguments for trade liberalization go through; (ii) there is no robust conclusion that competition between states will lead to a race-to-the-bottom in environmental policies. These are ultimately empirical matters. We cannot give details here, but a broad summary of the empirical literature is that there is little impact of environmental policies on trade, that trade liberalization has not had a damaging effect on the environment (and may even have improved it), and there is little evidence that states engage in environmental dumping.[4]

Our review of conventional economic analysis and empirical evidence leads to the conclusion that there are neither strong conceptual nor empirical arguments to support many of the concerns or policy recommendations that we outlined in the introduction. In particular there seems little basis for the concern that globalization will damage the environment by inducing a 'race-to-the-bottom' in environmental standards, and even if such a concern was warranted, harmonization of environmental standards is not the appropriate policy response. However this analysis has been based on the assumptions of welfare-maximizing governments and perfect information, for example about environmental damage costs in different countries. In the rest of this paper we see how far these conclusions need to be modified when we allow for asymmetric information and governments which are influenced by special interest groups. We address these issues first in isolation and then together.

4 For more detailed reviews of the empirical literature see Jeppesen, List, and Folmer (2000), Rauscher (2001) and WTO (1999).

3. Information problems

To illustrate one of the information issues we are going to be concerned with, suppose we take as given that there is trade liberalization, so we know that in both the large country case and the imperfect competition case welfare-maximizing governments acting non-cooperatively will seek to set environmental policies which differ from Pigouvian in order to gain some trade advantage. So there is a case for some supra-national agency to coordinate environmental policies to overcome the inefficiencies caused by non-cooperation, due to both strategic trade considerations and transboundary pollution. We have emphasized in the last section that comparative advantage means that it will be efficient for countries with different environmental endowments, broadly defined, to set different environmental standards. So simply observing different environmental standards tells us nothing about whether countries are distorting their environmental policies. A supra-national agency would need to know damage costs in different countries both to decide whether there are any distortions and to compute appropriate efficient cooperative environmental standards.

But standard subsidiarity arguments suggest that countries may have better information about their local damage costs than a supra-national agency might have. If this is correct,[5] does this informational asymmetry mean either that it would be better to just leave environmental policy-making at the national level, or that, if policy is set at a supra-national level the supra-national agency should just set uniform standards, which has the advantage of simplicity and not having to justify why it sets different standards in different countries? A negative response to these questions was given in Ulph (2000). The context was a federal system where imperfect competition meant that states acting non-cooperatively would engage in environmental dumping.

Ulph (2000) considered only strategic trade aspects, but Bigano (2002) shows this analysis can be extended to include transboundary pollution. States know their own damage costs, but not others, and the federal government knows only the distribution of possible damage costs, which is the same for each state. There are three possible ways environmental standards could be set. They could be set at the state level, which has the advantage that this exploits the good information held by states, but does not deal with either environmental dumping or transboundary pollution. They could be set by the federal government based just on their best guess about damage costs in each state – which in this case would be expected damage costs and would be the same for each state, so standards would be harmonized. Or they could

5 Of course this might not be true. Economies of scale or scope in collecting information may mean that a supra-national agency might be better placed to collect good damage cost data than individual national agencies. But this would just reinforce the argument for having a supra-national agency set policy. For a discussion of informational problems and the optimal level of decentralisation of environmental policies for watershed management in developing countries see Coxhead (2002).

be set by the federal government in such a way that states have incentives to truthfully reveal their information.

As Bigano (2002) has shown, the incentives for states to misrepresent their damage costs depend on the degree of transboundary pollution. If there is very little transboundary pollution, then the incentive will be for states with high damage costs to report they have low damage costs in order to be allowed to set lax environmental standards and hence get a bigger market share.[6] But if there is significant transboundary pollution, then the incentive will be for a state which suffers from transboundary pollution and has low damage costs to claim it has high damage costs to get the federal government to set tougher environmental standards on those states which pollute it. To overcome these incentives to misreport their damage costs the federal government sets appropriate environmental standards. In the case with low transboundary pollution these emission standards will differ less between states with different damage costs than they would with full information, but this does not mean harmonization. It turns out that having the federal government set standards in this sophisticated way is always the best policy, so the benefits from overcoming environmental dumping outweigh the losses caused by asymmetric information. Moreover, if the federal government uses harmonization, then, if damage costs have more than a moderate variance, harmonization is worse than setting policy at the national level. So information problems cannot justify harmonization as a means of overcoming environmental dumping. We shall return to this problem in section 5.

4. Political economy

So far we have assumed that governments seek to maximize the overall welfare of all its citizens. In this section we consider the implications of assuming that governments are prey to capture by special interest groups. Why might we be interested in this approach? As Anderson and Blackhurst (1992) note, the nexus of trade and environmental policies 'have an above average risk of being exploited by special interest groups' so this might be a more realistic description of how policies get set. But the more interesting questions are how would using this approach change the conclusions we have reached so far, and are there issues we can address with this approach that we cannot answer assuming welfare-maximizing governments? There are five sets of questions we are going to be interested in.

First, we know from the work of Buchanan and Tullock (1975) that there may be good reasons why various interest groups would lobby to have inefficient environmental policies in a closed economy. In brief, existing producers would prefer to have a given level of emissions reduction implemented through quantity constraints in which existing producers get grandfathered entitlements to emit pollution. The reason is that this effectively cartelises the industry and protects it from

6 This is the result originally derived by Ulph (2000).

new entrants. One interesting question is how these arguments carry over to an open-economy setting.

Second, it would be important to know to what extent and under which circumstances the interests of environmental and industrial lobby groups converge. It is certainly easy to find examples for situations in which the interests of environmental and industrial lobby groups are opposed. However, as noted in the introduction it is also frequently the case that both industrialists and environmentalists support a policy of harmonization of environmental policies. To what extent can political economy models illuminate the mechanisms behind these observations?

Third, our analysis of welfare-maximizing governments suggested that, as trade is liberalized, there are no robust predictions that countries will systematically weaken environmental policies to compensate. Yet there are strongly held views that this is a significant risk. Moreover recent empirical work by Barrett and Graddy (2000) suggests there is a negative correlation between environmental standards and an index of corruption. Would political economy models give a more robust prediction that trade liberalization will result in environmental dumping?

Fourth, there is a large gap between the analytical and empirical findings of section 2 that environmental policy has little impact on competitiveness and the public perception. WTO (1999) quotes the example of a *Wall Street Journal* poll in 1990 in which a third of respondents believed that their jobs were at risk from environmental regulation, when data showed that between 1987 and 1990 only about 0.1% of US layoffs could be attributed to environmental regulations. There are two ways political economy models might account for this. One is that the potential impacts on competitiveness are indeed small, and that this gap in perception just reflects the success of lobby groups in creating a public fear to influence policy. A more subtle explanation is that impacts on competitiveness are potentially larger than the data suggests, but that industrialists have been successful in ensuring that where relatively tough environmental regulations are introduced these are accompanied by subsidies or protection which mitigate most of the effects.

Finally, we have already argued that the introduction of a supra-national organization that coordinates national policies could be an obvious way to overcome the inefficiencies that are created, if national policy making results in environmental dumping. However, such a new institution would also be the subject of lobbying efforts of both environmental and industrial groups. Environmentalists, for example, are opposed to the idea that the WTO could play this role in the area of environmental policy, fearing that the WTO is prone to be captured by multinational companies. An important challenge is therefore to determine how lobbying will shape the policies of a supra-national agency and how these policy outcomes compare to national policy making.

There is now a small literature which applies political economy models to the study of trade and environment issues. Before we review this literature we briefly describe the ways in which political considerations have been integrated into environment and trade models. The most frequently used approach in the literature

have been lobbying models, which portray the political process as a strategic interaction between the government and various special interest groups, while elections do not play an explicit role. In a number of contributions the influence of lobby groups is captured through the *political support function* approach, which assumes that an incumbent has an objective function which is a weighted sum of welfare and the contributions of different interest groups. A recent rigorous reformulation of this approach was given by Grossman and Helpman (1994) in the context of trade protection and has been used extensively in the trade and environment literature.

Alongside the lobbying approach there are also a number of political economy approaches, which explicitly consider the role of elections. One such approach is the familiar *median voter model*, which is really a way of aggregating diverse individual preferences, but without explicit behaviour by special interest groups. Another approach is the *electoral competition model* in which candidates for political parties first select what platform to stand on, and then campaign contributions influence the probabilities of different candidates being elected. Finally there is the *political agency model*, which views the political process as a principal–agent relationship in which the voters as principals have to provide incentives for their political agent through elections. We now address the five questions set out above.

4.1 Efficiency of environmental policies

In an early, and relatively informal, analysis, Hoekman and Leidy (1992) and Leidy and Hoekman (1994) argued that the normal incentives for producers to favour inefficient forms of environmental regulation (quantity-based with grandfathering of pollution permits for existing producers as opposed to an emission tax) as a means of cartelising an industry, would be reinforced in an open-economy setting. They point out that getting the industry to cooperate in this cartel manner would strengthen the industry's ability to press for trade protection to offset the 'injury' caused by increased imports resulting from the tougher environmental regulations.

Using more rigorous models of lobbying behaviour based on the Grossman and Helpman (1994) model of the political support function, Aidt (1998) and Schleich (1999) reach different conclusions. Schleich (1999) considers a model in which the government can use either production or consumption taxes/subsidies to deal efficiently with environmental damages linked directly to either production or consumption, or they can use trade policies, which are inefficient. Furthermore the government is lobbied by a number of industry lobby groups. As noted above, the Grossman and Helpman (1994) approach is that the government effectively maximizes a weighted sum of lobby contributions and social welfare. An important implication of this assumption is that the government has an interest in using instruments efficiently. This mechanism drives the finding of Schleich (1999), that governments only use their efficient production or consumption taxes to internalize the environmental damages, rather than inefficient trade taxes. The trade policy instruments are only used to redistribute income between the different lobby groups.

Aidt (1998) considers a very similar model in which the government faces the choice between a tax on a polluting input and output taxes and subsidies. He also shows that only the efficient tax on the polluting input will be used to correct the environmental damages in the political equilibrium.

4.2 *Commonality of interests*

In general, the interests of environmentalists and industrialists are likely to be opposed, simply because reducing emissions reduces profitability, particularly of industry-specific capital. However this need not always be the case. Hillman and Ursprung (1992, 1994) consider commonality of interests in an electoral competition model in which the only policy instrument is trade policy and the choice is between a free-trade candidate and a protectionist candidate (who would impose a prohibitive tariff on imports). Governments can be lobbied by domestic and foreign firms and by domestic environmentalists, and the question asked by Hillman and Ursprung is how environmentalists will vote. If pollution is caused by production, and environmentalists care only about domestic pollution, then environmentalists vote for free trade, since that reduces domestic production and hence pollution. If pollution is related to consumption, or environmentalists care about pollution in both countries (Hillman and Ursprung refer to these groups as 'supergreens') or the environmentalists can coordinate their lobbying, then they will vote for protection. Rauscher (1997) using a political support function approach shows that if only one policy instrument is available then the interests of environmentalists and industrialists generally diverge, but they will converge if policies (either trade or environmental) are targeted at foreign polluters. He also allows for the possibility that there may be some kinds of specific capital, say pollution abatement capital, whose returns are increased by tougher environmental policies.

4.3 *Trade liberalization and environmental dumping*

We now turn to the question whether political economy models suggest that governments will respond to a trade liberalization by relaxing environmental policies and how the predictions of political economy models differ from the policy choices of a welfare-maximizing government. Explicit consideration of the impact of trade liberalization is provided by Frederiksson (1999) also using a Grossman–Helpman political support function approach. In his model there is a numeraire sector and a single import-competing polluting industry, and two lobby groups – an environmental group and a group representing an industry-specific factor whose return is increasing in the level of emissions, so the interests of industrialists and environmentalists are opposed. There is an exogenously given import tariff, so, as we saw in section 2, a welfare-maximizing government would impose environmental policy tougher than the Pigouvian tax to correct for the excess domestic pollution resulting from the tariff. His main finding is that in the political equilibrium the environmental policy could be higher or lower than the welfare-maximizing policy

and that trade liberalization has an ambiguous effect on the environmental policy that emerges in the political equilibrium. The intuition for this result is that the reduction in domestic output in response to the trade liberalization reduces the incentives for both groups to lobby. So, depending on parameters, environmental policy could get weaker or tougher and environmental quality could get worse or better in the wake of a trade liberalization.

Bommer and Schulze (1999) argue that Frederiksson's results depend on his assumption that lobbying is concentrated on the importing sector, while the exporting sector remains unorganized. In their model there are two sectors, which differ in their pollution intensity. Both sectors use a specific factor, which organizes as a lobby group. Trade liberalization is assumed to increase the relative price of the dirty good, which expands output of the dirty sector and, with constant emission tax, increases pollution and also increases the return on the dirty specific factor and reduces the return on the clean specific factor. They present some evidence that this assumption is a good characterization of most OECD countries. We saw in section 2 that in addition to this *composition effect* of a trade liberalization there would be technique and scale effects in which a welfare-maximizing government would tighten environmental policy in response to both the increase in emissions and an increase in income. Bommer and Schulze, using a political support function, but without the Grossman–Helpman micro-foundations, argue that there will be a further reason why a government may tighten environmental policy as trade is liberalized – to offset the distributional effects of trade liberalization on the return to the specific factor in the clean industry.

Both Frederiksson and Bommer and Schulze assume competitive industries. Johal and Ulph (2001a, 2002) use a model of imperfect competition in which, with trade liberalization, welfare-maximizing governments will engage in environmental dumping. They introduce special interest groups in an electoral competition model in which there are 'green' and 'brown' parties who give, respectively, too high or too low a weight to environmental damages relative to social welfare, and so, *ceteris paribus*, would set too tough (lax) environmental policies relative to welfare-maximizing governments. There are environmental and industrial special interest groups who can give campaign contributions to parties of their own type at home or abroad. Johal and Ulph show that if countries act non-cooperatively then, in a political equilibrium, lobbying increases the probability of electing *green* governments. There are two reasons. First, although environmentalists are assumed to care only about domestic pollution, they share with industrialists an interest in having the foreign government set tougher environmental standards, and this gives incentives for environmentalists to lobby abroad as well as at home. Second, having weak environmental policies in all countries reduces industry profits by expanding industry output, and this reduces the incentive of industrialists to lobby for brown governments.

None of these models suggest that introducing political factors leads to a strong prediction that trade liberalization will lead to environmental dumping.

4.4 *Environmental policies and competitiveness*

We have already seen that Hoekman and Leidy (1994) argued informally that, in an open economy, industrialists were more likely to press for inefficient forms of environmental regulation, since this would strengthen their ability to press for compensating trade protection. They conjecture that this could be one reason why there has been so little evidence of the impact of environmental policy on trade. They provide some evidence for this conjecture by pointing out that in the US the industries that have the highest abatement costs as a proportion of total costs account for a very high proportion of anti-dumping cases, and claim that the same is true of the EU and Australia.

The idea that political economy forces might ensure that sectors which have to bear high pollution abatement costs would be compensated through other policy instruments is pursued further in Eliste and Frederiksson (2002). They use a Grossman–Helpman type model to show that stricter environmental policy for a sector can result in an endogenous increase in transfers to this sector. They test this prediction on a cross-country dataset, which provides information on the stringency of pollution control in the agricultural sector and transfers to farmers. They find that stringent environmental policy is positively correlated with larger transfers to farmers.

4.5 *Policy coordination*

In section 2 we saw that in the case of either large-country models or models of imperfect competition, welfare-maximizing governments acting independently may have incentives to set environmental policies which differ from Pigouvian to secure some trade advantage, but, even without transboundary pollution, these policies impose externalities on other countries. Indeed all countries can end up worse off by these beggar-thy-neighbour policies. So there is a case for coordination of such policies. This is reinforced if there is transboundary pollution. But how is this argument affected if agencies in either states or some supra-national coordinating agency are influenced by special interest groups?

We know that with transboundary pollution individual states acting non-cooperatively will set too weak environmental policies, both because of free-riding problems and, in the large-country case, to reduce leakage. It is sometimes argued that the activities of green lobby groups may help to overcome this failure of coordination, by inducing governments to set tougher environmental policies than if they were welfare maximizing. Conconi (2000), using a Grossman–Helpman type model of political lobbying within large countries, shows that this presumption is only true if countries can use trade instruments to deal with leakage effects. Then indeed green lobby groups press for higher emission taxes, and uncoordinated environmental policies may give a better outcome than coordinated policies. However, if countries are unable to use trade taxes to deal with leakage effects (because of trade liberalization), then, if leakage effects are strong enough, green lobby groups may press for lower emission taxes than when non-cooperative

governments are welfare maximizing, and so this strengthens the case for coordination of environmental policies.

Conconi assumes there are only green lobbyists. Similar results are found by Schleich and Orden (2000), who extend the analysis of Schleich (1999) to consider two large countries, but with lobby groups who also press for support for industries. When governments act non-cooperatively, then the outcome is as in Schleich: governments act efficiently, using environmental policies to deal with externalities and trade policies to exploit terms of trade; but they will give discounts to sectors with organized lobby groups at the expense of sectors with no organized lobby groups. Because there is transboundary pollution, countries impose two kinds of externalities on each other: through transboundary pollution and through terms-of-trade effects. If the governments set policies cooperatively, this will affect the political equilibrium. Surprisingly they show that with cooperation there may be more environmental damage than without. The fact that governments no longer try to exploit terms-of-trade effects has ambiguous effects on environmental policies, while the fact that they internalize the damage caused in other countries unambiguously toughens policies. But these effects would apply with welfare-maximizing governments. The additional effect that comes through political models is that because cooperation brings about efficiency gains this means governments can satisfy lobby groups at a lower cost to other lobby groups. They increase output and hence specific factor returns in organized sectors, and this effect on environmental damage may outweigh other effects.

Johal and Ulph (2001a, 2002) also consider what happens when governments coordinate their policies, to overcome environmental dumping and, in the first paper, transboundary pollution. They model various asymmetries in lobbying behaviour designed to capture some of the concerns of environmentalists; there are differences in ability to influence electoral outcomes between lobby groups from different countries (e.g. northern countries have more influence than southern countries), between lobby groups of different types (e.g. industrialists have more influence than environmentalists), or between different levels of government (national and supra-national – to reflect 'democratic deficit' at the supra-national level). They show that despite these asymmetries, it is always better to have policies coordinated at the supra-national level. So the benefits of dealing with policy externalities outweigh the costs of political distortions.

None of these papers supports a general conclusion that the introduction of political influence either makes international coordination of environmental policies to deal with both environmental dumping and transboundary pollution unnecessary or so prey to political distortion as to be less desirable than leaving policy making uncoordinated.

4.6 Summary

To conclude this section we summarize what our review of this small literature tells us about the five questions we posed at the start of this section. Firstly, in an open

economy the influence of special interest groups does not lead to governments using inefficient (trade) instruments to deal with environmental problems when more efficient instruments are available. Secondly, while political economy models can provide explanations of when interests of environmentalists and industrialists coincide, there are no robust generalizations about when this occurs. Thirdly, allowing for the influence of special interest groups does not provide any stronger or more robust support for the concern that trade liberalization will lead to environmental dumping. Fourthly, there is theoretical and empirical support for the view that traded goods sectors which might be adversely affected by stringent environmental policies are successful in getting other forms of support to offset the impact of the environmental policies. Finally, there is no general support for the view that the influence of special interest groups at either the national or supra-national level makes the coordination of environmental policies either unnecessary or so distorted as to be undesirable. Such general conclusions as we have been able to draw have mostly been of a negative kind – denying the existence of strong general results. This reflects the current state of the literature: there are relatively few papers, the models are rather different and special so the conclusions they reach are model-dependent.

5. Information and political economy

We now put together the concerns of the last two sections. To see why this might be necessary, we could ask the simple question – if members of the public know that politicians are likely to be influenced by special interest groups, why do they not take steps to prevent this? One way of doing this is through the election process. Politicians who blatantly stood for policies that favoured narrow sectional interests should not get elected. Politicians who are subsequently found to have swayed their policies in the interests of certain groups may not get re-elected. If politicians value a career in politics and if elections are relatively frequent, this could act as a reasonable discipline. But of course this depends crucially on voters being able to tell when politicians have acted to favour special interests. We argued in the last section that even in political economy models, there are incentives for efficient choices of policies. But that assumes perfect information. It is frequently argued informally that one reason why governments may choose inefficient policies is because it is easier to hide the fact that they are acting to favour certain interests. Crudely, it may be easier to give certain industries trade protection on the grounds that it is offsetting potentially serious competitive effects from environmental policies than to give them protection outright.

Another way voters may try to limit the scope for special interest groups to gain favours is to limit the discretion of politicians, for example by pressing for independent agencies with tightly specified objectives which are close to welfare-maximizing policies (for example independent central banks with narrow inflation targets). But that again requires voters to be able to work out what welfare-maximizing policies would be and to know whether or not agencies have implemented

them. If politicians or their officials get access to information that is important in designing welfare-maximizing policies, then restricting their scope for manoeuvre in advance will mean that policies may not be based on the best available information. Thus, it can be argued that information problems play an important role in understanding how the political process operates and institutions might be designed to deal with these problems (see Laffont (2000) for a general discussion).

Sturm (2001) gives an example of the first approach to limiting political influence – the threat of not being re-elected. He considers the case of trade disputes over products whose consumption causes potential damage to health or the environment. One example for such a dispute would be EU/US dispute over growth hormones in beef. The paper develops a simple two-country model. Suppose that one of the goods that the home country imports from the foreign country can cause some environmental or health damages, if it is consumed. For simplicity it is assumed that the risk of damages can either be high or low and that only units of the good which have been produced in the foreign country can cause damages. Furthermore observing the *ex post* damages does not reveal perfectly what the *ex ante* level of the risk was. A crucial assumption is that only politicians in power know the true value of the risk, and that this is common knowledge to politicians in both countries, so there is no underlying *scientific* dispute between the countries.

The governments face a decision whether or not to impose a product standard on the foreign product. Imposing the standard in the home country reduces consumer surplus, raises domestic profits and eliminates the risk of damage; in the foreign country it has similar effects but lowers foreign profits. The parameters of the model are chosen in such a way that if governments were welfare maximizers, they would both agree to implement the standard if the risk was high, and not implement it if the risk was low. This ensures that any dispute is purely political. More generally there will be a range of risk values for which, in terms of expected welfare, the home country would want to impose the standard but the foreign country would not, so there could be genuine welfare differences.

In the political context, the median voter cares only about social welfare. Politicians can be either 'good' or 'bad'. Good politicians will just pursue welfare-maximizing policies – imposing the standard only if the risk is high. Bad politicians want to favour producers of the good. The efficient way to do this would be by a lump-sum transfer. But voters could detect that, and would not re-elect them, which politicians care about, and so will not do this. The other, inefficient, way of favouring producers is, in the home country to implement the product standard even in the low-risk state ('green protectionism'), and in the foreign country not to implement the standard even in the high-risk state ('environmental dumping').

Voters know that bad politicians will want to act in the manner just described. The problem is that voters do not get information on what the true risk is, which would allow them to tell when politicians were acting badly. All they can observe is whether or not politicians in the two countries have implemented the same policies. But this is a very imperfect signal. If there is a trade dispute, all voters can infer is that

at least one of the politicians must be bad. They cannot tell whether it is a high-risk state with a bad foreign politician not implementing the standard, while the home politician, who could be good or bad, does implement the standard; or a low-risk state with a bad politician at home implementing the standard while the foreign politician, who could be good or bad, does not. Equally the absence of a trade dispute does not mean both politicians are good – at least one must be good, but voters cannot tell which. Voters will use their observations of whether or not a trade dispute has taken place to decide whether or not to re-elect politicians. Sturm shows that, given the fuzziness of the signal voters get, there can be a political equilibrium in which the threat of not being re-elected is sufficiently low that bad politicians will indeed choose to act in the way described above. So this paper gives a formal demonstration of how environmental trade disputes can arise through the failure of the political process, which allows politicians who want to favour certain groups to use inefficient means of doing so because this is how they avoid detection and hence punishment at the ballot box.

In a second step the paper goes on to discuss two possible mechanisms to overcome or avoid trade disputes over product standards. One mechanism often suggested is mutual recognition of standards. This means those goods, which meet the standard of the exporting country must also be accepted by the importing country. Implementing this rule in the model would eliminate 'green protectionism' by bad home politicians, but would not eliminate 'environmental dumping' by bad foreign politicians and so may not increase welfare in the home country. Another possible mechanism would be harmonization. Given the simplifying assumptions of the model the same standard would be optimal in both countries and harmonization would therefore not entail any efficiency losses. However, the potential problem with harmonization is that there is no guarantee that the political process will only implement the harmonized standard in the high-risk state. The paper shows that the outcome of the political process could be both 'upward' harmonization (the standard is implemented in both countries even though risks are low) and 'downward' harmonization (the standard is not implemented even though risks are high).

An example of the second approach to limiting the influence of special interest groups – restricting the scope for policy discretion – is provided by Johal and Ulph (2001b, c). These papers combine the analysis of Ulph (2000), summarized in section 3, with the political economy models of Johal and Ulph (2001a, 2002) referred to in section 4.5. In addition to the question of whether to have environmental policy set at the national or supra-national level (setting policy at the supra-national level overcomes environmental dumping but the supra-national agency has less good information about national damage costs than national agencies), there is the problem that governments or agencies at both the national and supra-national levels can be captured by special interest groups. As in Sturm (2001), only national governments in power get information that tells them their true damage costs. So voters cannot tell whether lax environmental policies are a response to information that damage costs are lower than expected or an attempt to buy influence from

industrial special interests (similarly with tough environmental policies and green special interests).

Suppose now that voters try to limit the influence of special interest groups, say by requiring the creation of independent environmental agencies with narrowly drawn policy limits. Since the information available to voters at the outset is just expected damage costs, and since Johal and Ulph assume this is the same for all states, limiting politicians' discretion will imply harmonization. Note that harmonization is playing a very different role than in Ulph (2000) – it is a consequence of attempts to limit political influence, not the consequence of informational asymmetries between national and supra-national agencies. Note also that attempts to limit the influence of special interests can be made whether policy is set at the national or supra-national level.

Now there is a trade-off. Having an independent agency with narrow policy limits restricts the influence of special interest groups, but it also restricts the ability of the agency to adjust policy in the light of better information about damage costs. Not surprisingly, it will pay to limit policy discretion if the potential gain in information is smaller than the potential distortion in policies by special interest groups. But Johal and Ulph (2001b, c) show that it never pays to restrict political influence if policy is set at the supra-national level if it does not pay to restrict it when policy is set at the national level. So one cannot use the argument that because policy is being moved to the supra-national level to overcome environmental dumping as the rationale for harmonization to limit political influence if there was no such attempt to limit political influence when policy was set at the national level.

One important implication of the above analysis is that when one considers problems of imperfect information in a political setting (and we argued that the two are intimately linked), one finds not just that politicians may choose inefficient policies because that is a means of exploiting poorer information held by voters, but that overcoming the attempt by politicians to serve special interests may also involve the use of policies, such as harmonization, which are criticized by economists as being inefficient.

The above discussion has been entirely theoretical. Is there any empirical support for these models of environmental policy setting with political economy and imperfect information? List and Sturm (2002) use a model, which is similar to Sturm (2001), in which politicians may have private preferences for the environment (which may reflect their desire to benefit certain interest groups), which differ from those of potential swing voters. Faced with the prospect of re-election, politicians trim their policies to suit those of the swing voters. But if a politician faces a binding term limit (and therefore is a 'lame duck'), she is free to set policies which reflect her own preferences. This suggests that environmental policies should change when politicians enter a lame duck phase. In the US term limit legislation constrains governors in a substantial number of states to serving no more than two terms in office. List and Sturm (2002) tests their model on US data on state environmental

policies and find substantial support for the view that environmental policy changes during years in which a governor is a lame duck.

The papers in this section have provided formal analysis of the notion that asymmetries of information between politicians and voters limit the extent to which policy making can be shielded from the influence of special interest groups, but are ambivalent on the question whether apparently inefficient policies like harmonization might be supported as an indirect means of limiting political influence. However, the literature is too small and the results too dependent on rather special models to draw strong general conclusions.

6. Conclusions

In this paper we have outlined a number of concerns that have been expressed about the nexus of policies linking trade and the environment and reviewed some of the recent literature by economists to see what light it sheds on these concerns. In section 2 we reviewed the 'conventional' literature, mainly theoretical but also empirical, and showed that it did not lend strong support either to the concerns or some of the policy recommendations. In particular, while there is danger that if further trade liberalization rounds succeed in preventing governments using conventional trade instruments they may distort their environmental policies for trade purposes, there are no robust arguments for saying that this will imply environmental policies which are too lax – they may be too strong. The empirical evidence suggests that trade liberalization has not had a major damaging effect on the environment, nor have environmental policies had a marked impact on trade. One strong conclusion from this literature was that harmonization was unlikely to be desirable.

We then reviewed a much smaller literature on what we believe to be key issues in sorting out trade and environment issues – information problems and the possible capture of politicians by special interest groups. The models are too disparate at this stage to allow us to draw firm conclusions, but we would argue that they do not provide any stronger basis for the concerns outlined in the introduction. In particular they give no more reason for believing that in a world of trade liberalization there will be a systematic race to the bottom in environmental standards. There is at best ambivalent and model-specific support for the view that harmonization might be justified as a means of limiting the influence of special interest groups.

What does this imply for the discussions that will be taking place over the next few years about whether or how environmental considerations should be built into the next round of trade liberalization? Bierman (2001) argues that what is called for is an Authoritative Interpretation of Article XX which clarifies the role of trade measures in support of multilateral environmental agreements, allows countries to protect themselves against imports of goods whose consumption causes environmental damage, provided this is done in a non-discriminatory fashion, and rules out unilateral use of trade measures against countries who have different environmental standards for production and process methods. Unless multilateral environmental

agreements are interpreted very widely, it is not clear that this addresses the issue of countries distorting their environmental policies for trade or political reasons.

The fundamental challenge, as we have set out in the last half of this survey, is to discriminate between differences in environmental standards that arise through comparative advantage and differences that arise from attempts to exploit market power or favour special interests. In facing this challenge it is important to recognize that local governments may have better information about local environmental damages than supra-national agencies, and that they might use this informational advantage to favour special interest groups. Using expert scientific panels may resolve some aspects of environmental disputes, though as Sturm (2001) notes bodies of scientific experts may not be sufficiently isolated from political pressure, and in any case the disputes may be much more about how different countries value a given environmental impact. Similarly, looking for inconsistencies in the way governments apply environmental standards in areas exposed to trade and areas not exposed to trade will be a useful reality check. But governments can apply environmental policies consistently and in a non-discriminatory manner and still be engaging in either environmental dumping or green protectionism. The challenge is to design mechanisms that both get local politicians to reveal information truthfully and limit their scope for exploiting it to favour special interest groups. In some cases this may lead to adopting what normally look like inefficient policies, and we gave the example of harmonization, but stress that the literature is at too early a stage for this to be a robust conclusion. What the best intervention will look like needs a lot more careful analysis than the research to date has provided.

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