

Chapter 4

Strategic Delegation of Environmental Policy Making

Introduction

A common fear is that free trade erodes the environment. More trade means more production and the pollution that comes along with this causes the environment to degenerate. Moreover, it is argued that the reduction of barriers to trade provides governments with the incentive to impose laxer environmental regulation, so as to establish a cost advantage for domestic firms. Free trade may therefore lead to a ‘race to the bottom’ in taxes on pollution and emission standards.¹

Although the potential threat of a race to the bottom may in theory be large, there is little empirical support that non-cooperative environmental policy making leads to lenient policies (Antweiler et al. 2001, Wang and Winters 2001). To explain this tension between theory and evidence, this chapter develops a political economy model to analyze environmental policy making. We show that non-cooperative policy making does not necessarily result in a steep race to the bottom in environmental taxes. Building on Besley and Coate (2003), we show that if the median voter cares sufficiently

¹Surveys on the apparent tension between free trade and environmental protection are provided in Wilson (1996) and Esty (2001). See Copeland and Taylor (2004) for an extensive theoretical review of the literature.

for the environment and anticipates lenient policies, he has an incentive to strategically delegate policy making to a politician who cares more for the environment than himself. By doing so, he commits to a higher domestic environmental tax rate, which shifts polluting production to other regions. When the policy maker in the other region cares sufficiently for the environment as well, this production shift raises the tax rate abroad. Hence, by delegating policy making authority, the median voter obtains a cleaner environment and avoids part of the loss in market share.

In addition, we show that if the median voters care little for the environment they delegate policy making to a politician who cares even less for the environment than they do themselves. The reason is that commitment to a low tax rate (high subsidy) is observed by the policy maker in the other region. If this policy maker cares much for profits as well, in equilibrium he chooses a higher tax rate (lower subsidy) so as to mitigate the fall in the price on the world market. Hence, this chapter is able to explain why there may be a race to the bottom among poor regions, together with a race to the top in rich regions – phenomena that are observed in practice, see the empirical papers discussed below.

There is a considerable body of literature on the political economics of environmental policy making. The seminal papers in this field use the Brander and Spencer (1985) strategic trade insights to show that non-cooperative policy making with domestic social planners results in too low environmental taxes (e.g. Barrett 1994, Kennedy 1994, and Ulph 1996). In these papers, countries are engaged in environmental ‘beggar thy neighbor’ games in which, in the end, no firm gains market share, while at the same time the environment deteriorates. As the policy maker in these papers is a social planner, cooperation would lead to socially optimal environmental policies. The main contribution to the theoretical literature of this chapter is that, by introducing an electoral process as proxied by strategic delegation, our model shows why in some cases non-cooperative decision making produces surprisingly good results.

Hence, the main motivation for this chapter is to provide a theoretical explanation for the many recent empirical studies that fail to find evidence for

a race to the bottom when environmental policies are set non-cooperatively. In addition to the papers mentioned earlier, Hoel (1991) analyzes unilateral actions of countries in setting environmental taxes and concludes that, even in a non-cooperative environment, some countries go to great lengths to preserve the environment. As an example, he notes that Norway strongly reduced CFC-emissions in the years before the Montreal-agreement. Murdoch and Sandler (1997) argue that even though the Montreal Protocol on CFC reduction provided for a cooperative negotiating framework, the resulting reductions for many countries are no different than those that would have appeared in a non-cooperative Nash equilibrium. As a further example, List and Gerking (2000) show that environmental quality in the US did not decline under the Reagan presidency. This is remarkable because Reagan's new federalism shifted environmental policy making back to the state level. In this non-cooperative environment, one might expect environmental quality to decline. Moreover, the authors show that in the non-cooperative policy making setting of the 1980s environmental quality did in fact improve. For other federations, Olewiler (2005) finds no evidence that there is a race to the bottom in environmental policy in Canada. For the EU, in the absence of strong coordination of environmental policy (Jeppesen 2002) free trade has not led to a worsening of the environment.

Fredriksson and Millimet (2002) provide evidence that the response of individual US states to changes in environmental regulation of their neighbors is asymmetric. They show that states follow their neighbors in raising standards if these standards are already stringent. Thus, in the North-East and West of the US non-cooperative policy making leads to high levels of environmental protection. This confirms our finding that in rich states, where the median voter has strong preferences for environmental quality, non-cooperative policy making may lead to stronger environmental protection. In other areas, like the relatively poor Mid-West and South, this effect does not show up.

4.1 The model

Consider two countries that have one firm each. These firms are the only ones that sell a homogenous product $z = x + y$ in the world market, where x is the production of the home firm and y that of the foreign firm. Assume that domestic consumption is sufficiently small when compared to world consumption, so that we can ignore the effect of government policy on domestic consumers. In the world market, the two firms are engaged in Cournot competition. Inverse linear world demand is denoted by $P(x + y)$ so that before tax profits of the home firm are $\pi = P(x + y)x - cx$, where c are the constant marginal cost of production.

With respect to the timing of policy making, we model a three-stage game. In stage 3 firms maximize profits given the dominant strategy of the other firm and given the policies in the home and the foreign country. In stage 2, a policy maker decides on the optimal policy, given the policy in the other country. The policy maker is restricted to a tax per unit of production t – in case of a subsidy t is negative. Finally, in stage 1 the median voters decide on the policy preferences of their policy maker.

The home firm maximizes the profit function $\pi = P(x + y)x - cx - tx$ with respect to x . The first- and second-order condition for maximum profits are:²

$$\pi_x = P_x x + P - c - t = 0 \tag{4.1a}$$

$$\pi_{xx} = 2P_x < 0 \tag{4.1b}$$

By totally differentiating the first-order conditions for both firms, we find

²Throughout the paper subscripts denote partial derivatives.

that:

$$\frac{dx}{dt} = \frac{2}{3P_x} < 0 \quad (4.2a)$$

$$\frac{dy}{dt} = -\frac{1}{3P_x} > 0 \quad (4.2b)$$

$$\frac{dy}{dt} = -\frac{1}{2} \frac{dx}{dt} \quad (4.2c)$$

The last result also gives the optimal response of the foreign firm $dy/dx = -1/2$.³

In stage 2, the policy maker decides on the optimal tax/subsidy rate. Each citizen j has a utility function in which the arguments are the before tax profits of the home firm π^n and the environmental damage costs $D^j = \lambda^j [D(x) + \kappa D(y)]$. These damage costs are convex in x and y . The parameter κ measures the degree of pollution spill-overs from production in the other country. Further, D^j is increasing in the preferences for the environment, captured by the parameter λ^j : a citizen with a higher λ cares more for the environment relative to firm profits.

The utility of the citizen who has become the policy maker in the first stage $j = p$ is:

$$V^p = \pi^n - \lambda^p [D(x) + \kappa D(y)] \quad (4.3)$$

Making use of the linear demand curve and the results for optimal firm behavior in stage 3, the first- and second order conditions for the optimal tax set by the home policy maker are:

$$\frac{\partial V^p}{\partial t} = \left[\frac{1}{2} P_x x + P - c - \lambda^p \left(D_x - \frac{1}{2} \kappa D_y \right) \right] \frac{dx}{dt} = 0 \quad (4.4)$$

$$\frac{\partial V^p}{\partial t \partial t} = \left[P_x - \lambda^p (D_{xx} + \frac{1}{4} \kappa D_{yy}) \right] \left(\frac{dx}{dt} \right)^2 < 0 \quad (4.5)$$

The trade-off for the policy maker is apparent: given the tax level in the other country, higher home taxes reduce profits. On the other hand, higher taxes

³This means that reaction curves are downward sloping in (x, y) -space. In case the policy maker increases the tax rate, the home firm reaction curve shifts in. In the new equilibrium the increase in the home tax rate reduces x and increases y .

reduce pollution. In addition, note that even when there are perfect spill overs ($\kappa = 1$), (4.2c) ensures that an increase in the home tax rate reduces pollution. The reason is that an increase in the home tax rate reduces x by more than it increases y .

By using the implicit function theorem, from the first-order condition (4.4) for both policy makers and by imposing symmetry in equilibrium ($\lambda^p = \lambda^{p*}$ and $x = y$) it follows that:

$$\frac{dt}{d\lambda^p} = \frac{V_{tt}^p \left[\left(1 - \frac{1}{2}\kappa\right) D_z \right] \frac{dx}{dt}}{V_{tt}^2 - V_{tt^*}^2} > 0 \quad (4.6a)$$

$$\frac{dt^*}{d\lambda^p} = \frac{-V_{t^*t}^{p*} \left[\left(1 - \frac{1}{2}\kappa\right) D_z \right] \frac{dx}{dt}}{V_{tt}^2 - V_{tt^*}^2} \leq 0 \quad (4.6b)$$

where an asterisk denotes variables in the foreign country. In both equations, the denominator is positive by assumption. Clearly (4.6a) is positive because $V_{tt} < 0$ and because $\left(1 - \frac{1}{2}\kappa\right) D_z \frac{dx}{dt} < 0$.

The overall sign of (4.6b) depends on the sign of $V_{t^*t}^{p*}$ and is the crux to the argument developed in this chapter. The reason for strategic delegation is that changing the preferences of the policy maker affects the equilibrium policies in the other country. If $V_{t^*t}^{p*} > 0$, then taxes in the other region are higher when the home policy maker cares more for the environment. The reverse is true when $V_{t^*t}^{p*} < 0$. By using (4.4) and recognizing that $dx/dt < 0$ it follows that:

$$V_{t^*t}^{p*} = \left[-\frac{1}{2}P_z - \lambda^{p*}(1 - \kappa)D_{zz} \right] \frac{dy}{dt^*} \frac{dy}{dt} \quad (4.7)$$

Given that P_z and the term outside the brackets are negative, $V_{t^*t}^{p*}$ is larger than zero when λ^{p*} is sufficiently high. The intuition is that in the symmetric equilibrium, stronger preferences of the home policy maker for the environment raise the equilibrium home tax rate, and therefore lower the production of the home firm and increase equilibrium output of the firm in the other region. If the policy maker in the other region cares sufficiently for the resulting pollution, he will want to dampen this effect by setting a higher environmental tax rate himself.

The opposite happens when the policy makers care little for the environment so that the term in brackets is larger than zero. Again, stronger preferences of the policy maker increase the tax rate and reduce the production of the firm. In turn, this leads to a higher price on the world market, which raises the marginal profits of the foreign firm. When the policy maker in the other region cares much for these profits, he imposes a lower environmental tax (a higher subsidy).

Further, note that when pollution is global ($\kappa = 1$), then $V_{t^*t}^{p*}$ is always negative. The reason is that by raising the price level on the world market, a higher tax rate always reduces the incentives to tax pollution in the other region. From the environmental perspective, at the margin the policy makers are indifferent where additional production takes place, so that only marginal profits count.

4.2 Strategic delegation

In the first stage of the game, the median voter in each country selects a candidate to be the policy maker. Following Besley and Coate (2003) the median voter chooses from a set of possible candidates for which we simply assume that the optimal candidate is among them. When selecting a candidate for office, the median voter is concerned with two issues. First, once in office the policy maker selects the tax rate that maximizes her own utility. Clearly, the median voter then has an incentive to select a policy maker who has preferences for the environment that are close to those of her own. Second, as can be seen in (4.6b), the preferences of the policy maker affect the policy choice in the other country. Denoting by $j = m$ the median voter, the first-order condition that describes the preferences of the optimal candidate is:

$$\frac{\partial V^m}{\partial \lambda^p} = \frac{dt}{d\lambda^p} \left[\frac{d\pi^n}{dt} - \lambda^m \left(D_x \frac{dx}{dt} + \kappa D_y \frac{dy}{dt} \right) \right] + \frac{dt^*}{d\lambda^p} \frac{dV^m}{dt^*} = 0 \quad (4.8)$$

This condition describes the trade-off that the median voter faces. The first term shows the non-strategic effect of delegation. Selecting a person with a

stronger preference for the environment reduces net profits and improves the environment. As delegation shifts the tax rate away from the one preferred by the median voter, this entails a cost to him. The second term shows the strategic effect of the delegation: selecting a person with stronger preferences for the environment affects the tax rate in the other country.

From the first-order condition (4.4) of the policy maker in stage 2 it follows that in equilibrium $\partial\pi^n/\partial t = \lambda^p(D_x - \frac{1}{2}\kappa D_y)(dx/dt)$. Substituting this in (4.8), gives in the symmetric equilibrium:

$$\frac{dt}{d\lambda^p} \left[(\lambda^p - \lambda^m) \left(1 - \frac{1}{2}\kappa \right) D_z \frac{dx}{dt} \right] + \frac{dt^*}{d\lambda^p} \frac{\partial V^m}{\partial t^*} = 0 \quad (4.9)$$

The first term is the non-strategic effect of delegation. Delegation to a person with stronger preferences for the environment raises the home tax rate. Hence, when $\lambda^p > \lambda^m$, appointing a person who cares more for the environment incurs a cost, for environmental policy will be too restrictive for the taste of the median voter. The second term is positive ($dt^*/d\lambda^p > 0$) when the foreign policy maker cares much for the environment and is negative when he does not ($dt^*/d\lambda^p < 0$). In the two subsection below we discuss both cases.⁴

4.2.1 The political race to the bottom

When $dt^*/d\lambda^p$ is smaller than zero, the first-order condition (4.9) is satisfied only when the term in square brackets is larger than zero. Noting that $dx/dt < 0$, this is only true when $\lambda^p < \lambda^m$: the median voters delegate to policy makers who care less for the environment than themselves. In the symmetric equilibrium both median voters have the same incentive. Hence, strategic delegation enhances the race to the bottom in environmental policy making.

⁴In addition, we restrict the analysis to the case where $\partial V^m/\partial t^* > 0$, so that the utility of the median voter increases when the foreign country increases the tax rate. Certainly, there may be extreme voters who care that much for the local environment compared to firm profits that this condition is violated. When spill-overs are small, for these voters an increase in the foreign tax rate may reduce their welfare because it raises the production of the home firm. However, we rule out that this is true for the median voter.

The intuition for this result is as follows. The median voter is aware that delegation to a person who cares less for the environment than himself will result in a suboptimally high level of local pollution. However, delegation serves as a commitment to a lower tax rate. As this commitment is observed by the policy maker in the other region before he sets the tax rate, this creates an incentive for him to set a higher tax rate given the optimal strategies of the firms. The reason is that the policy maker in the other region anticipates a reduction in the net profits in the world market. As he cares much for these profits, this reduces his incentives to subsidize the foreign firm, so as to not lower the price on the world market.

4.2.2 The political race to the top

The opposite result arises when the median voters care much for the environment relative to firm profits. In this case, in (4.9) the term $dt^*/d\lambda^p$ is positive: an increase in the preferences of the home policy maker will raise the tax rate in the foreign country. Hence, the first-order condition is satisfied when $\lambda^p > \lambda^m$: the median voter delegates to a policy maker who cares more for the environment than he does himself. In the symmetric equilibrium, both median voters delegate to environmental ‘lovers’.⁵

When the median voter delegates to a person who cares more for the environment than he does himself, he is aware that the tax rate will be suboptimally high and profits too low to his taste. However, the benefits of delegation are that the commitment to a higher tax rate is observed by the foreign policy maker. Hence, this foreign policy maker anticipates a higher output by his firm. As he strongly dislikes the pollution that comes along with higher production, this increases the equilibrium foreign tax rate. Consequently, though taxes are suboptimally low because of the strategic trade argument, the political process of delegation mitigates the race to the bottom.

To speculate which regions will experience a political race to the top, the

⁵The term ‘race to the top’ refers to Vogel (1995), who argues that regulating markets may increase the incentives for exporters to raise environmental standards.

environmental Kuznets-curve suggests that when countries become richer, the environment may improve as citizens care more for clean air and water relative to profits (see e.g. Esty 2001). Hence, in our model the lambda of the median voter may increase with the income level of regions and countries. We would thus expect a political race to the top in rich countries, and a race to the bottom in poor countries. This is in line with the empirical findings of Fredriksson and Millimet (2002), who show that for the US there is a race to the top for regions with high incomes and no such effect for regions with low incomes.

4.3 Concluding Remarks

We have argued that strategic voting may explain the sometimes surprisingly good results of non-cooperative environmental policy making. This chapter could be extended in several interesting ways. First, additional competitors in the world market and entry could be incorporated. As a conjecture, we may expect that more countries and firms reduces the incentives for strategic delegation, for it's effect on foreign policy makers is smaller. In addition, we have focused on symmetric equilibria. However, countries differ in their level of economic development, comparative advantages, and industry structure and, hence, have heterogeneous preferences for environmental protection. Finally, some insights of this chapter may be applicable in other policy domains where the theoretical argument for a race to the bottom seems apparent, like tax competition and the coordination of migration issues.