

# Could Too Little and Too Much Turn Out to be Just Right? – On The Relevance of Pioneering Environmental Policy<sup>1</sup>

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## 1. Introduction

Frequently a national “going-ahead” of environmental policy is proposed, e.g. by the German Council of Advisers on the Environment (SRU 2001). This request for a stricter environmental policy is often rationalized by the proposed prospect of advantages for national enterprises, resulting in higher domestic employment and output (Porter 1991; Porter, van der Linde 1995). Politicians take up this argument to promote environmental regulation. An opposing view holds that stricter environmental policy deteriorates competitiveness and induces capital flight. This position implies a rationale for eco-dumping.

The prospects of an environmental policy designed to improve international competitiveness and welfare of a country have been investigated in the theory of strategic environmental policy (Fees, Taistra 2001). While a negative effect on national welfare of a stricter environmental policy can be easily explained, a positive effect seems to be much less straightforward. Various theoretical models have been developed though, which show the possibility of welfare increases of stricter environmental policy.

A number of empirical studies - surveyed in Scholz and Stähler 1999 – can be identified which have looked for evidence of the impacts of environmental policy on international competitiveness. These studies did not find a strong positive or negative effect of environmental policy on international competitiveness. The question of whether environmental policy is actually used in an attempt to improve international competitiveness has remained unresolved, however. This is particularly true for the case of stricter environmental policy.

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<sup>1</sup> We are indebted for helpful comments to Susanne Droege and Klaus Jacob. All remaining insufficiencies are ours.

The present chapter looks for evidence of the existence of pioneering environmental policy, i.e. strategic environmental policy which is designed stricter than in other countries in order to gain advantages for national enterprises.. For this purpose we screen a series of case studies. We find that evidence of pioneering environmental policy is elusive. We explain this result by the restrictive nature of the conditions for the success of pioneering environmental policy as identified in different attempts to find a rationale for such policy in economic theory . We show that these conditions are actually not given in any of the case studies. We conclude by arguing that pioneering environmental policy may still be welfare enhancing as it may be instrumental to overcome the well known prisoner's dilemma in international environmental policy.

In the following section we present a definition of pioneering environmental policy and propose operational criteria for the presence of such policy. We then list the criteria for a successful pioneering environmental policy derived from the theoretical literature. Next we present the evidence from the case studies. Finally we present our argument for the welfare enhancing effects of pioneering environmental policy.

## 2. Definition and Criteria of Pioneering Environmental Policy

Pioneering environmental policy is understood to set national environmental standards in excess of their optimal level.<sup>2</sup> Such policy imposes a cost on society. It has been suggested, however, that this cost is more than offset by advantages gained by national economic agents on international markets (Porter 1991).

The state of the environment can be targeted in a multitude of ways. Basically we can distinguish between non-restrictive and restrictive policies. Among the former ones are subsidies for environmental R&D, for example. The latter ones comprise command and control policies of all kinds as well as environmental taxes and permit schemes. The debate around pioneering environmental policy relates to the apparent "puzzle" that more restrictive policies can be advantageous. Therefore we look at restrictive policies only.

Detecting pioneering environmental policy is difficult, because the optimal level of environmental policy – determined by marginal costs and benefits - is usually not known. Instead, objectives of environmental policy are derived from scientific reasoning, sometimes modified by cost and distributional considerations. Often environmental policy does not even address the state of the environment directly, but targets environmental pressures in a way which is only indirectly related to the actual state of the environment.

Therefore a precise benchmark for identifying pioneering environmental policy is not available. Nevertheless we can use a set of criteria to look for the presence of such policies. For the purpose of the present chapter we look for environmental policies

- which restrict the use of the natural environment,
- which - in comparison to environmental policy of other countries at the same time - impose more severe restrictions on agents, thus raising their costs,
- which politicians rationalize by international offsets.

## 3. Evidence of Pioneering Environmental Policy

Looking for empirical evidence of the existence or non-existence of pioneering environmental policies we screen a series of in-depth case studies. These are part of an interdisciplinary research project titled *Policy-Frameworks for the Development of Interna-*

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<sup>2</sup> Sometimes such policy is termed excessive environmental policy (Feess, Taistra 2001: p.1).

*tional Markets for Innovations of a Sustainable Economy - from Pilot Markets to Lead Markets*<sup>3</sup>, which looks at the conditions for the establishment of lead markets for environmental friendly innovations. A country (or region) is defined as a lead market for a specific technological solution

- if it is the place where this technology is developed and adopted in an early phase (a pilot market) and
- if it is in a position to shape the world markets such that this technology diffuses internationally.

One focus of the case studies is the mixture of policy instruments which has been implemented in each country to foster the generation and (international) diffusion of specific technologies. The technologies which were more closely investigated include<sup>4</sup>

- technologies with potential to substitute paper by electronic media
- fuel cells for mobile applications
- fuel cells for stationary applications
- technologies for emission reduction in Diesel powered cars
- paints with VOC (Volatile Organic Compounds)-free or VOC-reduced solvents
- technologies for paper recycling
- photovoltaic energy conversion

In the case study which deals with technologies with potential to substitute paper by electronic media environmental policy instruments do not play any role at all as the application of these technologies is motivated by non-environmental concerns. Therefore this is not a case of pioneering *environmental* policy.

Fuel cells for stationary applications and especially for mobile applications are in an early stage of product development without any broad commercial market penetration. It seems to be not yet decided which of the numerous alternative designs may become dominant in the future. The direct policy instruments involved are therefore mainly R&D-related. R&D is motivated by future strict clean air requirements. Environmental policy instruments thus have more an indirect impact defining the long-term framework conditions for these technologies. For the time being this does not restrict competitiveness of the national (local) industry. California being the region with the strictest regulation with respect to mobile fuel cells is unlikely to pursue strategic objectives as it is not home of a strong automotive industry.

In the case study about emission reduction in Diesel powered cars, on the one hand, a prominent role is taken by clean air regulation in Europe and the US and market-oriented instruments like fuel taxes and tax exemptions. On the other hand technology-forcing and the strategic behaviour of multinationals are important. The strategic R&D behaviour of a competitor (Peugeot) created a technological breakthrough, however, this was not the result of strategic environmental policy.

The case of paints with VOC-free or -reduced solvents is characterized by a variety of product -related instruments, ranging from command-and-control, market-oriented

<sup>3</sup> The research project is sponsored by the German Federal Ministry of Education and Research as part of the research program on *Frameworks for Innovation towards Sustainability (RIW)* (Grant number 07RIW1A). For intermediate results of the project see Beise et. al. 2003.

<sup>4</sup> Beside this a number of a literature based case studies were also screened for information concerning pioneering environmental policy; the technologies under investigation include fuel-efficient passenger cars, wind energy, substitutes for CFCs as coolant in refrigerators for private households, chlorine reduced pulp production, introduction of the catalytic converter for cars and black liquor gasification.

instruments to labelling and voluntary agreements. The number of internationally applied instruments has increased significantly since the beginning of the Eighties. The additional cost for users increase only marginally as a consequence of these regulations and a strategic orientation can not be identified.

The amount of paper recycling is strongly influenced by regulation on waste paper recovery. While some countries have more restrictive recovery requirements the costs are mainly borne by private households. Therefore, the competitiveness of firms is not affected. Also no strategic objectives of environmental policy are presented to justify the environmental regulation.

The photovoltaic energy conversion case has to be seen in the context of climate change protection. The promotion of renewable energy is one strategy to reduce CO<sub>2</sub>-emissions. Different instruments like R&D-subsidies, environmental taxes and guaranteed prices for energy from renewable resources ( so called renewable energy feed tariffs (REFIT)) are used to increase the installed capacity of this technology. The case of Japan deserves some closer attention. The commitment to comparably demanding CO<sub>2</sub> reduction goals in the Kyoto protocol could be viewed as imposing more severe restrictions on domestic actors than on actors in foreign countries. While in Germany REFIT's have induced a large increase in wind energy production (and to a lesser extent of photovoltaic capacity)<sup>5</sup>, Japan has decided to bet on the development of photovoltaic energy conversion.<sup>6</sup> Japan used a variety of instruments to promote photovoltaics<sup>7</sup>. Beise 2003 argues that the decision in favour of photovoltaics was to a large extent motivated by the expectations about the future success potentials for Japanese exporting firms on the world market. Given the already established competitive semiconductor industry in Japan the future gains on the world market looked more favourable for photovoltaics than for other equipment markets for the production of renewable energy. At least this could be viewed as an example of policy in the line of strategic environmental policy. Although in this case there exists a clear strategic orientation of environmental policy, cost increases for domestic companies are avoided. Instead the cost of this policy is broadly distributed to all taxpayers.

**Table 1: Presence of Criteria of Pioneering Environmental Policy**

Cases	<u>Environmental Policy</u>	Restrictive, cost inducing, competitiveness impeding	Strategic orientation
Technologies with potential to substitute paper by electronic media	-	-	-
Fuel cells for mobile applications	(X)	-	-
Fuel cells for stationary applications	(X)	-	-
Technologies for emission reduction in Diesel powered cars	X	(X)	-
Paints with VOC (Volatile Organic Compounds)-free or VOC-reduced solvents	X	(X)	-
Technologies for paper recycling	X	(X)	-
Photovoltaic energy conversion	X	(X)	X

<sup>5</sup> By using this instrument only grid-connected systems were promoted, while there is strong indication that the world market for photovoltaic systems will be dominated by the demand for stand-alone/non-grid systems.

<sup>6</sup> The natural conditions for wind energy and for photovoltaic in Japan are said to be comparable – not favouring one of the two alternative technologies.– From an international comparative perspective they are not really good for both technologies.

<sup>7</sup> Governmental and public institutions were urged to install units; photovoltaic systems were declared as building material opening up tax benefits. See Beise 2003, p. 5

The table demonstrates that it is difficult to identify examples, in which – compared to other countries at the same time- a stricter regulation is imposed, which negatively affects the costs of companies. Costs are usually broadly spread over to private households or taxpayers. Indications of a strategic motivation of environmental policy seem to be very rare.

#### 4. Why Evidence of Pioneering Environmental Policy is Elusive

A rationale for a pioneering environmental policy is given by the Porter hypothesis (Porter 1990, Porter, van der Linde 1995). It states that environmental regulation does – regularly - not reduce the profits of firms. Instead it exerts pressure, leading firms to realize previously undiscovered advantageous innovation opportunities.

At a first glance this proposition seems to suggest that firms systematically overlook profitable investment opportunities. There is a number of explanations of such behaviour.<sup>8</sup> For example, economic models can produce this result as second best outcome in principal-agent constellations under asymmetric information (Holmström, Tirole 1987). If the cost of compliance is more than offset by cost savings through innovation, the environmental policy stimulating such innovation creates a cost advantage relative to foreign competitors, but only as long as environmental policy abroad does not follow.

##### 1. Complete Offsets

If the cost of compliance is more than offset by cost savings through innovation, pioneering environmental policy is advantageous as long as environmental policy abroad does not follow.

However, many economists have remained sceptical that this is generally the case (Palmer, Oates, Portney 1995). Then the question arises if independent of such inefficiencies a pioneering environmental policies can be successful in increasing the share of domestic companies in international markets and increase national income and employment<sup>9</sup> (Stähler 1998)<sup>10</sup>.

Game theory-founded environmental economics supports the view that under incomplete competition strict environmental policy implemented in advance of other countries – even while increasing costs to regulated companies – can improve the competitiveness of domestic enterprises under certain conditions (Ecchia, Mariotti 1994; Feess, Muehlheusser 2002 (emphasizing the profits of suppliers of environmental technologies as a justification for a pioneering environmental policy); Feess, Taistra 2001; Scholz, Stähler 1999; Taistra 2000; Ulph 1996; Ulph, Ulph 1996, Ulph 1999)<sup>11, 12</sup>

<sup>8</sup> Besides plain inefficiency and manager-owner conflicts there may be bounded rationality leading to local search, incomplete information on the benefits of an innovation, a prisoners' dilemma among firms because of spillovers or asymmetric information of customers.

<sup>9</sup> The welfare effects for the national economy comprise producer rent, consumer rent, government revenues and domestic environmental quality. If firms produce for third markets only, the consumer rent becomes irrelevant from a national perspective.

<sup>10</sup> The market share of domestic companies in international markets is an indicator of sectoral competitiveness. It does not necessarily imply an increased competitiveness of the overall economy. Using this indicator corresponds to the view of strategic environmental policy as a form of industrial policy. See Scholz, Stähler 1999.

<sup>11</sup> Under certain conditions maximization of national welfare requires eco dumping instead of a pioneering environmental policy (Baret 1994).

*Different Mechanisms Are Suggested As Being Able To Explain This Result:*

Strict environmental policy can incite companies competing simultaneously in prices on oligopolistic international markets (Bertrand competition) to behave more aggressively.<sup>13</sup> Strict environmental policy increases the costs of domestic firms, firms increase their prices, and foreign firms react by increasing their prices as well: companies in both countries move towards monopoly. This increases producer rent. However, domestic overall welfare increases only if production is sold to foreign countries.

**2. Rent Shifting**

We state that pioneering environmental policy may be advantageous under simultaneous price competition on oligopolistic international markets if polluting firms export most of their output.

A strict environmental policy may induce innovations of polluting firms which c.p. reduce their unit costs.<sup>14</sup> Without strict policy the innovation is not a credible strategy. If the cost advantage of the innovation exceeds the additional costs of the pioneering policy (higher environmental taxes), firms can choose an aggressive strategy in quantities. Foreign firms – if not supported by their governments – will then reduce their production in order to avoid having to accept lower prices. In addition, foreign firms may reduce their innovation efforts.

**3. Strategic Innovation**

If innovation is feasible for polluting firms, innovation is a strategic component in competition, but the innovation is not a credible threat, the scope for the possibility of a welfare enhancing pioneering environmental policy is expanded to competition in quantities. Note that a diffusion of the policy could nullify the advantage of the domestic firms.

A stricter environmental policy chosen in a country may be advantageous if learning of polluting firms reduces unit costs. If then the environmental policy diffuses to foreign countries, domestic firms can gain market share. At this moment foreign companies have to adopt the new technology which is initially more expensive, while domestic companies, due to learning, have much lower costs. It is important that foreign environmental policy neither follows too early, i.e. before learning has become effective, nor too late, in which case domestic enterprises will bear higher costs than their foreign competitors over an extended period.<sup>15</sup>

<sup>12</sup> This corresponds to a general result of game theory: restricting the options of a player can be advantageous if this influences the decisions of other players in a way favourable for this player.

<sup>13</sup> Contrary to Barret 1994 Feess and Taistra 2001 suggest that pioneering environmental policy may be justified under Cournot competition if polluting industries are export-oriented.

<sup>14</sup> A similar effect arises if pollution is an inferior input, i.e. emissions decrease with output. This is the case if there are economies of scale in abatement. Greaker 2003 shows that the environmental agency then should choose excessive standards if two firms simultaneously compete in quantities.

<sup>15</sup> There must also be some uncertainty about the following of the foreign environmental policy, because otherwise foreign firms anticipate the following and adopt the innovation

#### 4. Learning

A pioneering environmental policy can increase welfare if domestic polluting firms display learning effects and a diffusion of the environmental policy is induced not too early and not too late.

If a domestic industry producing clean technologies (or tradable services) exists which displays increasing economies of scale, e.g. through learning effects, the authorities may set strict standards in order to increase the domestic demand for clean technologies.<sup>16</sup> This happens if the reduction in output of the polluting industry through higher standards is less important than the increase in avoidance effort per unit of output. Unit costs of the industry producing clean technology decrease and it can gain profits from selling its products to foreign polluting firms. A similar argument holds if the technology can be effectively protected by patents. These gains are higher if the strict policy is also introduced in the foreign country. If there are spillovers, foreign firms could benefit from a second mover advantage. In order to be welfare enhancing, foreign demand for output of the domestic polluting industry which has to bear the higher cost of strict regulation must have a low price elasticity.

#### 5. Advantage for Environmental Industry

A pioneering policy is justified by welfare gains if strict environmental policy increases the demand for clean technology produced by a domestic industry which displays increasing economies of scale or is able to protect its innovation by patents, and if this industry can export its products to foreign markets while the export performance of polluting firms is not impeded.

There is a number of general considerations which cast doubt on the relevance of the hypothesis that a pioneering environmental policy enhances national welfare. In particular, firms could relocate if environmental policy is tightened. Also, for innovation they could seek international co-operation. Then advantages can not be attributed to one nation only. Similarly, if multinational firms are affected, it is difficult to see how welfare of a nation is affected. In addition, it is generally assumed that in reaction to a pioneering environmental policy counter measures are not taken in other countries.

We conclude that there are a number of models in which a pioneering environmental policy - while increasing costs to regulated companies - can enhance domestic welfare. However, the conditions under which this holds are rather restrictive. Generally, precise information on whether these conditions are given is not available. Some conditions are even ambiguous: sometimes a diffusion of environmental policy to foreign countries is required, sometimes it is harmful. This may explain the hesitation of governments to actually implement pioneering environmental policies.

From a more general perspective some of the necessary prerequisites for engaging in pioneering environmental policy seem to be potentially present in the case studies.

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immediately.

<sup>16</sup> It is important that increased demand leads to innovations of *domestic* firms which can subsequently be exported. This is the core of the Lead Market Hypothesis. See Beise et al. 2003.

About 40 items, organized in a common analytical framework, are used to characterize the specifics of each of the case studies. Broader dimensions which were used for characterization include

- involved actors
- characteristics of the underlying environmental problem
- types of policy instruments
- country and market specifics
- characteristics of innovation
- impact and characteristics of (environmental) policy measures

Looking for factors which have been identified frequently in the case studies as being relevant it can be noticed that

- integration into the world market and
- technological competence

of the lead market countries are viewed as decisive factors in most cases. The relevance of technological competence is underlined by the fact that the demonstration effect of a domestic application of new technologies is considered as important for the international diffusion of the innovation. It should be noted, however, that additional incentives for exporting do not play any important role for the policy measures identified in the case studies.<sup>17</sup>

At the same time countries with lead market potential often have the image of environmental frontrunners. The international diffusion of environmental regulation, e.g. the diffusion of specific instruments between countries, from a frontrunner country to followers, has also been identified as a common pattern in many case studies.

While at a more general level the conditions for pioneering environmental policy seem to be potentially present in many case studies, a closer look shows that this actually often not the case.

If we look at the possible (theoretical) mechanisms which make strategic environmental policy advantageous from a national perspective, namely

1. complete offsets
2. rent shifting
3. strategic innovation
4. learning
5. advantage for environmental industry

the first four mechanism relate to advantages for polluting firms (as adoptors of enforced new environmental technologies) and only the last mechanism relates to the technology producing industry.

However, in almost all of the case studies the relevant mechanism which could possibly create an advantage for domestic firms is an internationally successful environmental industry.

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<sup>17</sup> Due to WTO rules direct incentives for exporting are generally problematic, so that direct measures might be avoided, perhaps sometimes substituted for by softer forms of indirect measures.

**Table 2: Potentially Advantageous Economic Mechanisms**

<b>Cases</b>	<b>Mechanisms</b>
Technologies with potential to substitute paper by electronic media	not applicable
Fuel cells for mobile applications	Environmental Industry
Fuel cells for stationary applications	Environmental Industry
Technologies for emission reduction in Diesel powered cars	Environmental Industry
Paints with VOC (Volatile Organic Compounds)-free or VOC-reduced solvents	Environmental Industry and/or learning
Technologies for paper recycling	Environmental Industry and/or learning
Photovoltaic energy conversion	Environmental Industry

Above we have identified theoretically the conditions for an environmental industry to be successful in international markets and in overcompensating disadvantages for the regulated polluting industries:

- the existence of a domestic environmental industry<sup>18</sup>
- increasing economies of scale or patent protection as prerequisite for international competitiveness of the environmental industry
- chances to export to foreign markets induced e.g. by policy diffusion
- unimpeded competitiveness of polluting firms.

The following table demonstrates that it is doubtful that all necessary conditions – as required by theoretical models – are satisfied simultaneously. Therefore politicians can not be sure that pioneering environmental regulation will benefit domestic companies. In addition it should be noted that multinational enterprises are involved in all cases under consideration and that their presence makes the idea of national advantages by means of pioneering environmental policy ambiguous.

<sup>18</sup> In two cases (clean air regulation for mobile fuel cells applications in California, regulation on VOC-free paints) strict regulation is enacted without the existence of a (strong) domestic industry.

**Table 3: Necessary Conditions for a Successful Environmental Industry**

Cases	Domestic environmental industry	Increasing economies of scale or patent protection	Export chances/ Policy diffusion	Unimpeded competitiveness of polluting firms
Technologies with potential to substitute paper by electronic media	n.a.	n.a	n.a	n.a
Fuel cells for mobile applications	-		?	-
Fuel cells for stationary applications			-	?
Technologies for emission reduction in Diesel powered cars			?	?
Paints with VOC (Volatile Organic Compounds)-free or VOC-reduced solvents			?	
Technologies for paper recycling		?	-	
Photovoltaic energy conversion			?	-

n.a.: not applicable

?: doubtful

-: missing

### 5. Can Pioneering Environmental Policy Still Be Welfare Enhancing?

The conditions under which strategic environmental policy benefits national economic agents through the mechanisms described above are rather restrictive and therefore unlikely to hold. Still such policy could be welfare enhancing.

In case of international or global environmental problems a country which maximizes national welfare has an incentive to set lower environmental standards than would be rational from an international perspective. Part of the damages arise abroad, i.e. they are external effects from the perspective of that country. Equivalently the situation may be characterized as a prisoners' dilemma in which it is rational for each country not to participate in any effort to solve the problem. In such situations the nationally efficient level of environmental standards is low or even zero.<sup>19</sup>

Coordinated policies of a number of nations could make all of them better off, justifying environmental standards stricter than the nationally efficient level. It may be difficult to agree on cooperative standards, however, as any one nation which goes ahead is likely to be worse off - unless losses are offset by gains from strategic environmental policy. Moreover, of individuals behaviour according to the principle of reciprocity has been observed: sometimes individuals behave against their self-interest if they observe others to do so. By this behaviour prisoners' dilemmas can be overcome to the benefit of all. If nations states "behave" in a similar way alleged advantages from strategic environmental policy would enable politicians to go ahead and incite other nations to follow. Even if the conditions for advantages from strategic environmental policy are not fulfilled, society would finally be better off.

<sup>19</sup> Other authors have expressed a positive view of symbolic environmental policy. Böhringer/Voigt (2003: p.249) conclude from their assessment of the Kyoto-Protocol that it is almost ineffective and thus represents symbolic policy only. They explain this as an attempt of rational governments interested in their re-election which want to satisfy a public sensible to climate change. They regard it as a success, however, that climate issues have thus been put on the international agenda. A similar view is held by Weimann, J., *ibid.* p. 234. Taistra (2001: p. 257) emphasizes the role of a pioneering policy as a step towards a later cooperative solution.

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