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4. Voluntary Approaches as Climate Policy Tools: Competition Issues and the Role of Market Structure

Rinaldo Brau and Carlo Carraro*

INTRODUCTION

Climate policy is by no means solely based on a single policy instrument. A wide array of tools is often implemented in different countries (see Egenhofer, 2003, for a recent overview). Voluntary approaches (VAs) are one of the policy instruments often adopted to achieve GHG emission reductions at the industry and domestic level (see ten Brink, Morère and Wallace-Jones, 2003, for a survey). The reason for the wide use of VAs in climate policy is twofold. First, firms and industries are often reluctant to accept more stringent policy tools, such as carbon taxes (see Convery, 2001). This is particularly true for energy intensive industries, where the burden of GHG emission reductions is very relevant. Second, VAs constitute a first step towards the implementation of emission trading (see ten Brink and Morère, 2000). In several cases, VAs are first used to determine the emission target to which firms and/or industries must comply. Once the target is agreed upon and set, emission trading can then be developed and implemented in order to minimize abatement costs and to achieve a more efficient allocation of these costs.[1]

However, according to economic theory, voluntary approaches have indirect effects on market structure and competition. Therefore, VAs could be adopted with the strategic objective of increasing market concentration and introducing barriers to entry. In general, a concentrated market structure has a positive effect on the environmental effectiveness of the actions undertaken within a voluntary initiative. This clearly raises a trade-off between the goal of maintaining competition in the market and the objective of exploiting the well-recognized flexibility that generally characterizes voluntary approaches. This bi-directional relationship between market structure and VAs depends and can be assessed according to the motives that move firms to adopt VAs

(that is, whether they are principally aimed at improving the environmental reputation of the products sold by adopters or at influencing policy interventions based on regulatory or economic instruments). This chapter analyses the aforementioned bi-directional relationship in order to understand to what extent climate policy can be based on VAs without harming competition in industrial markets.

It is often asserted that VAs could represent a threat to competition under certain circumstances. This caution has become publicly expressed at least since the Communication on Environmental Agreements issued by the European Commission in 1996 (CEC, 1996). Indeed, many VAs necessitate collective action and the establishment of agreements among firms. By contrast, the Communication recalls that Article 85 (1) of the EC Treaty (now article 81(1)) states that 'all agreements between undertakings, decisions by associations of undertakings and concerted practices which may affect trade between Member States and which have as their object or effect the prevention, restriction or distortion of competition within the common market' shall be prohibited because incompatible with the common market.

It is well known that Article 81(1) is tempered by the provision of Article 81(3), to which the Communication explicitly refers by allowing the Commission to weigh the restrictions on competition resulting from an environmental agreement against the environmental objectives to be attained by that agreement. However, these restrictions must be indispensable to the attainment of the environmental goal.

To discuss in depth how scholars, the European Commission and the national competition authorities have interpreted or put into practice the provisions contained in the Communication is beyond the scope of these pages.[2] Here, the focus is rather on the economic mechanisms by which the adoption of voluntary initiatives can undermine competition in the market, and on the trade-off between restrictions on competition and environmental effectiveness. Therefore, of the many facets of VAs, we would like to explore the one that relates this policy instrument to market structure and competition, leaving to some of the other contributions of this book the goal of assessing other economic effects of VAs.[3]

The aims of this chapter, although unlikely to be the most relevant when discussing VAs, play an important role in the context of climate policy. One of the obstacles to the adoption of climate policy in some countries is the fear that the introduction of GHG control measures, by increasing production costs at home, could harm the international competitiveness of domestic firms. VAs are seen as a means to overcome this obstacle, because they help in adapting the increase of production costs to the abatement capabilities of a given firm. However, by protecting firms, VAs may harm consumers. Not only because VAs may be less environmentally effective than other policy

measures – an issue which is discussed in other chapters of this book – but also because they could negatively affect competition in domestic markets. Therefore, a positive effect on international competition may translate into a negative effect on domestic competition.

The structure of the chapter is as follows. The next section shows, using results derived from the theory of oligopolistic markets, the adverse effects of VAs on competition. The following section focuses on the reverse impact of market structure on the implementation likelihood and environmental effectiveness of VAs. Finally, the last section draws some policy conclusions that could help improving the design of VAs to control GHG emissions.

IMPACT OF VOLUNTARY APPROACHES ON MARKET STRUCTURE

Most existing studies (for example, Lyon and Maxwell, 2001; Khanna, 2001; ten Brink, Morère and Wallace-Jones, 2003; see also the introductory chapter of this book) have highlighted a series of possible reasons that explain why firms and governments decide to use VAs to deal with climate change control. From the viewpoint of a public authority some reasons are:

- VAs can function as a starting point and learning process in the design and implementation of the Kyoto flexible mechanisms.
- VAs can bridge the transition period to the first commitment period, that is, VAs can represent an early action to prepare industry for the kind of carbon constraints it will face in the first and subsequent commitment periods.
- VAs are also a means to provide regulators with information regarding future allowance allocations.
- VAs can soften the possible negative effects on domestic firms' international competitiveness of adopting stringent emission abatement targets.

From the viewpoint of a firm, the main reasons can be subdivided into two groups:

1. VAs may increase market demand and therefore profits by enhancing firms' reputation for energy saving products. VAs therefore become a product improving and differentiation strategy that helps to create niche markets and/or help to identify a firm's products (see Cavaliere, this book);

2. VAs may provide firms with some regulatory gains. In this case, the increase in profits will match the avoided costs of public regulation aimed at addressing the environmental problem.[4]

Hence, in the first case, a basic assumption is that consumers attach a positive value to climate-friendly products or processes and that this value is reflected in their demand for goods. In the second case, the assumption is that public authorities are sensitive to firms' attitude towards the environment. In the following, the distinction between 'reputation enhancing VAs' on the demand side and 'regulation influencing VAs' on the supply side will be used to understand how market structure affects VAs performance and the likelihood of their being used as climate policy tools, as well as how VAs can affect those market conditions which are responsible for the distortion or the restriction of competition.

Together with the incentives to adopt VAs, there may also be incentives to restrict competition. As will be evidenced below, VAs are likely to induce some indirect effects on market structure, or be the occasion for signing binding agreements about quantities, qualities or production processes of the goods. A benevolent explanation of this kind of behaviour is that a more concentrated market structure is likely to increase the environmental effectiveness of the VA. More malicious views point out that the agreement could be 'strategically' used by firms with the deliberate aim of negatively affecting competitors' performance. In this case, the adoption of a VA would allow the firm to achieve an additional benefit in the form of competitive advantage, which in some cases could be the main explanation for a firm's VA initiative.

In order to analyse the relationship between VAs and competition, we rely on the theory of oligopolistic markets. There is at least one important reason that justifies this choice. If the analysis is aimed at understanding how changes of industry concentration affect VAs and vice versa, it becomes necessary not to assume a given level of concentration in a given market structure (this would be the case under the two polar cases of perfect competition or monopoly). In order to analyse the variability of the number and size of firms in the market, that is, of industry concentration, the focus must be on a market structure in which concentration is a variable dimension.

Market Structure and Competition in the Case of Reputation Enhancing VAs

In this case, either firms exploit the increasing demand for green products, and/or they will differentiate their products or processes in order to increase their own market demand *vis à vis* their competitors. Hence, by using their

environmental performance as a strategic variable, firms may affect market demand in two ways:

1. through the upward shift or increased slope of market demand (Carraro and Soubeyran, 1996; Garvie, 1999);
2. through product differentiation (for example, Arora and Gangopadhyay, 1995; Nadal and Morel, 2000; Bagnoli and Watts, 2003).

A possible increase in market demand induced by a VA is easy to understand. If consumers do attach value to a more stable climate, they are ready to pay a higher price for climate-friendly products or products produced using energy-saving technologies. Hence, market demand shifts upward when 'climate-friendly' products are sold in the market. All other things being equal, this increases firms' profits, thus providing firms with the opportunity to undertake costly voluntary GHG emission abatement initiatives that can be framed within a VA with the regulator.

Consumers' sensitivity to the environmental performance by firms also causes a change in the slope (that is, in price sensitivity) of market demand. In particular, Carraro and Soubeyran (1996) show that, if consumers care about the environment and environmental quality is related to firms' output (emissions), then the demand curve is generally steeper for any output level. As a consequence, if firms adopt a VA in which they commit themselves to reducing GHG emissions, they can increase their market prices without suffering excessive demand reductions. This amounts to saying that firms face a less elastic demand function and therefore their market power increases.

While the previous effects still take place at individual firm level, even when the whole industry increases its environmental performance, single firms can also use a VA to increase profits by differentiating their product or process from those of the other firms in the industry. The product differentiation effect differs from others because it is a relative effect that benefits only a subgroup of firms. The usual Hotelling's model of product differentiation can be applied to analyse firms' green differentiation strategies (see Arora and Gangopadhyay, 1995; Lutz, Lyon and Maxwell, 2000). In particular, in order to allow for product differentiation, it must be assumed that consumers display a different attitude towards 'climate-friendly' production processes or 'climate-friendly' characteristics of products. As is well known from the work by d'Aspremont and Gabszewicz (1986), if costs to consumers that cannot buy the most preferred product are non-linear, the optimal choice of firms will be to differentiate. This will lead to two types of firms in the market, one with high and the other one with low

GHG emissions per unit of output. A VA can thus be seen as the choice of firms to adopt positive, albeit different, GHG abatement levels.

Before commenting on their consequences on competition, let us stress that the above effects are only partly VA specific. On the one hand, demand can also shift upwards when a firm improves its environmental conduct because of the imposition of a standard or a tax. Therefore, upward shifts of demand are not VA specific. On the other hand, the effects of increased demand slope are more related to a firm's voluntary decision: (i) in the case of an increase in consumer awareness, as argued by Cavaliere (this book), because VAs may constitute an 'information disclosure' tool, or a way to 'convince' consumers if green products are to be considered as 'credence goods'; (ii) in the case of environmental product differentiation, because this is a direct implication of a voluntary action which is not undertaken by the industry as a whole.

The above changes in market demand induced by reputation enhancing VAs affect market structure and concentration. On the one hand, an increased demand may induce some firms to enter the market. On the other hand, an increased slope of market demand favours market concentration. Finally, product differentiation may lead some firms to exit the market. As a consequence, it is not possible to conclude that reputation-enhancing VAs always have a direct negative effect on market concentration, but VAs can certainly modify market structure.

As for entry deterrence, the intuition is that the possibility of capturing the willingness to pay for 'climate-friendly' products can lead to strategic over-investment by the incumbent firm in order to impose a quality level that cannot be afforded by the entrants. One could argue that, in this case, environmental effectiveness would be achieved. However, the so-called 'brand proliferation' phenomenon, which takes place when the same company tries to fill-in the market by occupying the largest possible number of market niches, may actually reduce a VA's environmental effectiveness. In the case of GHG emission control, we could have a firm or an industry association that, by means of a VA, enters the market with a new 'energy-saving' product, while continuing to produce an old but similar – and 'energy-intensive' – good. By doing so, the incumbent firm or cartel is deterring entry. The incumbent reduces the maximum distance in the space of the environmental characteristics – and, as a consequence, the profit level – that the entrant could obtain.[5] When participating in negotiations with incumbent firms and deciding whether to adopt a VA, the public counterpart should therefore take care not to contribute to the creation of barriers to entry against some firms that may well have been prepared to adopt a (relatively) energy-saving production process.

Market Structure and Competition in the Case of Regulation Influencing VAs

In this case, by undertaking a VA, firms avoid or postpone the introduction of a regulation that would have caused higher costs than those associated with the VA, or obtain technical or financial incentives that similarly reduce their production costs. The direct counterpart of a firm is no longer the consumers, but a public institution. As a consequence, what is expected is not a change in market conditions, but an institutional change, whether in terms of legal framework or the attitude of public opinion. In particular, when an alternative mandatory climate policy is considered feasible, the adoption of a VA is expected to produce two main effects: (i) to pre-empt the imposition of a (possibly more stringent) direct regulation, whose severity cannot be influenced; (ii) to influence the severity of the regulation.

The first effect is what actually represents a 'regulatory pre-emption' (or even a 'legislative pre-emption', when the VA replaces the establishment of a carbon tax). For example, by committing themselves to reducing GHG emissions beyond what is demanded by law, firms avoid being faced with a direct regulatory regime, that is, a condition where public authorities set the GHG emission target, or the (energy-saving) technology to be used by the firms.

Within the regulatory pre-emption hypothesis, an additional distinction can be made:

- Cases in which firms can reach a given objective at lower costs than in instances where they are forced to satisfy a compulsory standard. This effect of VAs only affects the way in which the environmental target is achieved and not the definition of this target. In this case (see Segerson, 1998) voluntary compliance only discloses more efficient practices than those implied by direct regulation.
- Cases in which a given abatement level can definitively pre-empt a regulatory intervention that would have imposed a tighter standard. In this second situation, the environmental target under the VA regime is actually lower (Lyon and Maxwell, 2001; Segerson and Miceli, 1998). This case can be seen as the extreme of a situation where carrying out a legislative action is costly and the benefits offered by the VA are always greater than the fixed costs implied by the legal intervention.

From a normative perspective, for a regulatory pre-emption to occur there must be a situation where the adoption of the VA is profitable both from a private and a social viewpoint. However, by abandoning the assumption that public bodies pursue a given social interest somehow defined, a VA may also

be undertaken whenever the public institution charged with signing VAs has a private agenda to satisfy which does not coincide with the objective of the institution (for example, the legislator) charged with implementing the environmental policy to be pre-empted. In this case, to sign a VA is, first of all, a 'shortcut' to satisfying the regulator's interests and firms may be able to sign a VA which is less stringent than a truly effective environmental policy (Hansen, 1999).[6] This third effect of a VA aimed at achieving a regulatory gain is an example of 'regulatory capture'.

The evaluation of the effects on competition of VAs aimed at achieving regulatory advantages should also take into account that the regulation that is being pre-empted by the VA may also have some effects on competition. As a matter of fact, it is by no means obvious that the effects of VAs on competition are larger or different from those of carbon taxes, R&D subsidies or tradable emissions permits. However, as the influence of these latter instruments on competition is well-known (see Carraro, Katsoulacos and Xepapadeas, 1996), in the following we will only mention those effects that seem to be specific to VAs. As was done for the reputation enhancing effects, it is likewise important to look above all for any dynamic and strategic effects.

In the case of regulation influencing VAs, their dynamic effects on competition seem to be univocally negative, particularly since they provide opportunities for tacit collusion. The existence of a regulatory threat represents an implicit tool that makes collusion among firms more difficult. As a consequence, the use of a VA aimed at pre-empting or lessening a regulatory threat provides scope for collusive strategies among firms (Brau and Carraro, 1999; Millock and Salanié, 2000).

The intuition for this result is as follows. Certainty (that is, the removal of the regulatory threat) increases the present value of future profits (not because firms are risk averse, but because profits can no longer be undermined by regulation). While this does not affect the advantages arising from breaking 'one shot' collusive behaviour, it affects the advantages from maintaining collusion over time (in the form of expected higher profits in the future).

As for strategic effects, the impact on competition depends on the type of interaction among the firms and on the initial market conditions, although these effects generally lead to an increase in the concentration index. For example, consider a VA undertaken by a generic firm, which is costly to implement and reduces the regulatory threat for all the firms entering the market. In this case, a direct effect on the latter firms is represented by an increase in the present value of their profits while keeping their output constant. However, since the adoption of the VA changes firms' relative cost structure, the initial production level is no longer optimal; firms are thus

induced to redefine their individual output levels and market shares. Economic theory in this case foresees that this indirect effect, provided that the market is already concentrated to some extent, will increase concentration (Carraro and Soubeyran, 1996).

Finally, let us consider a particular case of regulatory gain, namely the situation of 'induced regulation' discussed by Cavaliere (this book). Should induced regulation occur, the entry of competitors of an over complying firm could be deterred. Hence, there is again a negative impact of VAs on competition.

THE IMPACTS OF MARKET STRUCTURE ON VOLUNTARY APPROACHES

In order to further explore the trade-off between environmental effectiveness and the impact of VAs on market structure and competition, it is important to recognize that not only do VAs affect market structure, but, conversely, market structure also affects the existence and the environmental performance of VAs. More precisely, it is possible to demonstrate that VAs designed to reduce GHG emissions and to improve climate change control are likely to be more effective in more concentrated industries. The main results proposed in the recent literature can be summarized by the following three conclusions.

The first conclusion, (for example, Dixit and Olson, 2000; Garvie, 1999; Maxwell, Lyon and Hackett, 2000; Manzini and Mariotti, 2003), can be phrased as follows. The environmental effectiveness of VAs increases when industry is more concentrated, that is, a larger number of firms (more competition) implies less voluntary abatement of GHG emissions.

This result can be shown both for reputation enhancing and for regulation influencing VAs. The main explanation is based on the role of 'free-riding' (Garvie, 1999; Maxwell, Lyon and Hackett, 2000). If the benefits provided by the adoption of a VA – either in the form of positive demand effects or of a change in the regulator's attitude – are not fully excludable, then firms in the market have an incentive to under-supply their own level of GHG emission abatement. As is well known from general economic theory (Olson, 1965), the extent of free-riding is directly related to the number of actors in the market; and the phenomenon is even stronger when the possibility not to adhere to the VA is taken into account (Dixit and Olson, 2000).[7]

An additional explanation specifically concerns industry-wide VAs. When several firms negotiate a VA designed to reduce GHG emissions, the negotiation process between the regulator and firms is usually subject to the so-called 'toughest firm principle' (Manzini and Mariotti, 2003), according to

which the outcome of negotiations must satisfy the requirements of the firm most reluctant to abate (that is, the 'toughest' one). When firms are heterogeneous in GHG emission abatement costs, a larger number of firms makes the expected outcome of the agreement lower. In addition, the failing of negotiations is more likely, unless the regulator is willing to accept any level of voluntary abatement (Manzini and Mariotti, 2003).

A second important conclusion, (see for example Garvie, 1999; Maxwell, Lyon and Hackett, 2000), can be phrased as follows. VAs are more beneficial in terms of emission reductions if firms are allowed to co-operate on the setting of the VA. Therefore, a co-operative behaviour in addressing climate change control may help to reduce GHG emissions, but the competitiveness of the market may be reduced as well. When the potential negative impact of the collusive behaviour on competition is neutralized – for example, relying on a separate antitrust regulation (Garvie, 1999) – social welfare is increased by firms' co-operating because the free-riding incentive is offset and this leads to higher emission reductions (Garvie, 1999; Maxwell, Lyon and Hackett, 2000). Moreover, in some cases, namely where green consumerism is an influential factor or with production costs reductions related to the adoption of a VA, total output sold in the market could even be higher. This rules out the traditional negative effect that co-operation is said to have on consumers' surplus. Finally, co-operation among firms can also be beneficial because it fosters climate-related environmental innovation, thus increasing GHG emission abatement (Poyago-Theotoky, 2000).

The following third conclusion further highlights the importance of the effects of market structure on the environmental effectiveness of VAs. In very competitive markets, VAs are unlikely to be signed, which implies that either no abatement is carried out or the regulator must rely on other, possibly more costly, policy instruments to achieve the environmental goals (Segerson and Dawson, 2001). Again, the origin of the problem is the incentive to get the benefit of the VAs without paying the costs in terms of emission abatement, if some other firms in the industry sign the VA. This incentive may lead to equilibriums in which no VAs are signed. Hence, by making the adoption of VAs more difficult, high levels of competition reduce the environmental effectiveness of this policy tool.

LESSONS FOR CLIMATE POLICY

The number of VAs for climate change control and energy related issues is steadily increasing and the sophistication of the schemes is developing. As noted by Convery and Lévêque (2001), there appears to be an evolution from a situation in which firms played a leading role in setting targets (if any), to

one in which government agencies are the predominant shaper of the targets to be achieved by the voluntary approach. Furthermore, VAs have become more demanding over time in terms of quantitative targets, delivery and reporting mechanisms. However, how can climate-related VAs also take into account their possible negative impacts on market structure? How can they exploit the presence of energy-intensive concentrated industries to enhance their environmental effectiveness? Is there a way to offset the free-riding incentives that may undermine the existence of climate-related VAs?

Before answering these questions, let us summarize the main implications of the analysis carried out in the previous sections. The first general lessons that can be derived from our analysis of VAs in oligopolistic markets are that: (i) some effects of the adoption of VAs on competition are to be expected; (ii) the direction of these effects is likely to go against the objective of maintaining or increasing competition in the market. These results highlight the relevance of VAs as a potential threat to competition and seem to call for an application of Article 81(1) or 82 of the EC Treaty also in the case of climate-related VAs.

However, the relationship between VAs and competition is bi-directional, since market concentration is generally a crucial factor that favours the adoption of VAs and enhances their environmental effectiveness.

The above theoretical conclusions are also supported by the existing empirical evidence. There is indeed evidence (see ten Brink, Morère and Wallace-Jones, 2003; Brau and Carraro, 2001) that VAs, in particular industry-wide VAs, often provide incentives for firms to adopt an anti-competitive behaviour. However, the scrutiny of recent decisions taken by the European Commission and by domestic regulatory bodies (see Brau and Carraro, 2001) shows that: (i) the economic costs of reduced competition may be largely offset by the environmental benefits provided by the VA; and (ii) it is generally possible to intervene to regulate the market and modify firms' behaviour in a way that eliminates the economic costs while preserving the environmental benefits of the VA.

This latter statement is also supported by some recent theoretical advances. Consider, for example, the problem of free-riding, which may induce an industry not to sign a VA, thus preventing the achievement, at least in some cases, of important GHG emission reductions. This problem can be dealt with by introducing specific clauses in the design of the VA. For example, if the benefits in terms of increased demand or offset regulation provided by the VA are at least partially excludable – that is, only signatories get most of these benefits – and if a minimum participation constraint is imposed, then the VA will probably be adopted and it is likely to be signed by all firms in the industry (Brau, Carraro and Golfetto, 2001). If, in addition, a minimum abatement constraint is imposed, then the incentive to reduce

emissions by less than the quantity initially established is also offset and firms may be induced to 'non-cooperatively' choose the cooperative level of emission abatement. Therefore, a careful design of the VA can lead to an equilibrium outcome in which no economic costs related to anti-competitive behaviour occurs and, at the same time, the optimal emission abatement level is achieved.

Let us now analyse the implications of the above conclusions for climate policy. It is well known that climate policy focuses above all on the reduction of fossil fuel energy consumption, either by increasing energy efficiency or by increasing the use of renewable energy sources. As for this latter objective, VAs constitute an important policy tool, because they can set a framework (possibly including financial subsidies or tax exemptions) that provide firms with adequate incentives to invest in the development of renewable energy technologies. In this context, the danger of anticompetitive behaviour is real. Firms may use the VA either to create barriers to the entry of other firms and/or to collude with other firms in the same industry. Therefore, a regulator must be very careful in designing a VA in which free entry is guaranteed and where energy prices remain close to competitive levels.

As for the reduction of energy intensity, this goal can be achieved by inducing energy savings, particularly in energy-intensive industries. These industries are often characterized by a small number of firms and by an oligopolistic structure. Therefore, VAs may encourage existing anticompetitive behaviour in these industries. However, and most importantly, VAs may become more environmentally effective thanks to the concentrated structure of these industries. It may indeed be easier to undertake a VA and design its features to achieve the desired reduction of GHG emissions. Negotiations among a small number of parties may facilitate mutual understanding and trust. The high visibility of the VA may benefit emission-abating companies by increasing their market demand. Minimum abatement efforts may be more easily imposed. Technological cooperation and joint R&D investments can probably be implemented. Large companies may find it convenient to couple a VA – where an emission target is set – with an internal emission trading scheme designed to minimize abatement costs.

In this context, a conflict between climate policy and competition policy may occur. The two policies may have conflicting objectives if the adoption of a VA and the consequent environmental benefits are associated with reduced competition within the industry. In other words, if a VA is the optimal environmental policy tool to deal with a given environmental problem, an environmental regulator may prefer a concentrated industry structure in which the VA can more easily be implemented and is likely to be more effective. But a competition authority may not accept to trade-off the environmental benefits of the VA with the economic costs determined possibly by a more concentrated industry.[8]

Therefore, the many actual benefits that can be achieved from the adoption of VAs should be carefully compared with their potential costs in terms of reduced competition. The solution to this trade-off, as well as of any other economic trade-off, is well known and lies in the adoption of two instruments to achieve two objectives. For example, a regulator could intervene with a second policy tool (for example, an environmental subsidy for entrants or sanctions on collusive behaviour).[9]

As stated above, a certain degree of market concentration may be the pre-condition that favours the emergence of effective VAs. Hence, (i) if the necessary emission abatement cannot be obtained through other policy instruments, or (ii) if there is a relevant economic and environmental gain from achieving the emission abatement through a VA, then the optimal strategy could be one that accepts or even favours reduced competition in the market, for example in the form of an association or even a specific enterprise which organizes the individual activities or initiatives. For example, a specific organization could be devoted to establishing energy saving procedures and the related controls within a given industry. More generally, given its long-run time horizon, climate policy can be sequentially monitored in order to guarantee both the environmental effectiveness of the adopted VAs and their lack of negative effects on competition.

NOTES

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1. There are several examples of agreements defined with consideration for 'a priori' targets (see ten Brink, Mortère and Wallace-Jones, 2003, for an illustration). Among them: (i) Switzerland's 'Action Programme Swiss Energy 2000'; (ii) Italy's 'Climate Pact' between Government, Industry and NGOs, which specifies that VAs are to be the favoured policy tool for addressing the problem of climate change; (iii) the UK's Climate Change Levy (CCL) which defines a group of VAs as complementary measures (see de Muizon and Glachant, this book, for details); (iv) the Dutch Benchmarking agreements (see Glasbergen, this book).
2. For these interpretations and applications, the interested reader can refer to Bailey (2000), Vedder (2000) and Martinez-Lopez (2000).
3. In addition, a few surveys are worth mentioning, namely, OECD (1999), Khanna (2001) and Lyon and Maxwell (2001).

4. Although in climate change policy an important role has been played by regulatory gains not related to any serious regulatory threat (for details, see Lyon and Maxwell, this book, and Segerson and Rosi, this book).
5. Remember that according to the d'Aspremont and Gabszewicz (1986) model, the optimal strategy for firms is to differentiate.
6. See also Maxwell, Lyon and Hackett (2000), albeit with a different model.
7. However, incentives to free-ride can be offset by an appropriately designed VA. See Brau, Carraro and Golfetto (2001) and the discussion below.
8. Apparently, given the decisions by the Competition Directorate General and the Dutch Competition Authority, this is more a theoretical concern than a real behaviour. This is certainly due to the growing importance that national and European legislation devotes to the protection of the environment. Moreover, the reports by the Competition DG seem to reveal an increased confidence in dealing with the competition implications of environmental agreements: 'In respect of rebutable claims of efficiencies under Article 81(3), environmental agreements do not present greater difficulties than other categories of agreements' (CPN, 2002, p. 52).
9. We may also argue that the evidence of a 'tough' regulator, such as the Competition Directorate General has been, should induce signing firms not to insist on inserting in the agreement some clauses which do not pass the scrutiny of the Commission.

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5. Self-enforcing Voluntary Approaches with Incomplete Information and Environmental Uncertainty

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INTRODUCTION

With the diffusion of voluntary approaches (VAs), environmental protection has entered a new era. Initially, environmental policy was exclusively driven by public concerns about pollution abatement. The reason for public intervention was clear both from the point of view of theorists and policy-makers: after more than a century of widespread industrialization, the quality of the environment was deteriorating more and more because of market failures in internalizing the social costs of human activities. The need to impose environmental regulation was then perceived as an important issue by an increasing amount of the population. New economic tools like environmental taxes and subsidies were adopted, as well as environmental liability and standards, in order to achieve the public goal of pollution abatement.

The increasing concerns about environmental quality have thus modified even consumer preferences, while huge environmental regulations were creating unavoidable constraints for firms. In the meantime, technological progress has proved able to provide some economically feasible solutions for environmental problems, both as a result of demand pull and technology push (Ashford, 1999). Due both to green preferences and the regulatory threat, environmental issues are no longer just a question of negative externalities arising from private consumption and production activities, but can be internalized to a certain extent by firms and markets. In our opinion, VAs are just a tool (one of the tools) useful to support this internalization process in market economies.

A central issue concerning corporate environmentalism is the credibility of firms' claims concerning both higher environmental quality and lower pollution abatement costs. Due to asymmetric information between firms and