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PATH-DEPENDENT CLIMATE POLICY: THE HISTORY AND FUTURE OF EMISSIONS TRADING IN EUROPE

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At the end of the 1990s, the EU was still sceptical towards emissions trading, but in 2003 it adopted a directive that enables such trading in the EU from 2005 onwards. Instead of presenting *ad hoc* explanations, we develop and apply the path dependence approach to clarify this remarkable attitude change. Sunk costs, switching costs and learning explain why politicians were initially tempted to add credit trading to existing, sub-optimal policy. Permit trading, however, is more efficient and effective. An institutional lock-in was bound to occur, but attitudes changed as a result of internal pressures, such as the pioneering role of the European Commission, and external 'shocks', such as the withdrawal of the US from the Kyoto Protocol. A full-scale institutional break-out towards efficiency is not guaranteed, though, because elements of credit trading can still enter the permit trading directive. The risk is that these elements become locked in, from which it may be difficult to escape.

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INTRODUCTION

Economists have long pleaded in favour of emissions trading, in particular for situations where an emission tax would run into problems as a result of incomplete information on abatement costs or uncertainty regarding demand elasticity. Dales (1968) is usually seen as the founding father of the tradeable emission rights concept, Montgomery (1972) as the one who provided formal proof of its efficiency and Tietenberg (1980) as the one who firmly advocated and established it in environmental economics.

The European Union (EU), however, has long made objections against the use of emissions trading in market-based climate policy.

Even as late as 1997, just before the negotiations in Kyoto, the insistence on emissions trading by the US '[. . .] was met with caution from most of the European countries [because they] feared [. . .] that trading might provide a cheap way for the US, Canada, Australia and New Zealand to 'buy' themselves out of their obligations [and because there was] [. . .] a certain mistrust of such concepts by continental European countries' (Oberthür and Ott, 1999, pp. 188–190). During the Kyoto negotiations, the EU had to accept the inclusion of emissions trading in the protocol to obtain what it perceived to be meaningful emission targets from countries such as the United States (US) and the Russian Federation. After the Kyoto deal was struck, however, the EU made an attempt to quantitatively restrict the use of emissions trading. International political pressure from various industrialized countries nevertheless forced them to reject this proposal.

While years of political effort had been expended on rejecting and limiting emissions trading, the Europeans took a surprising next step at the beginning of the new millennium. Against the background of Denmark and the United Kingdom (UK) developing domestic emissions trading schemes of their own, the next move of the EU was to design a European CO_2 emissions trading scheme for power generators and steel makers as well as cement, paper and glass manufacturers to start in 2005 and to be continued in the Kyoto Protocol's first commitment period 2008–2012. Before the summer of 2003, both the European Council and the European Parliament had accepted this directive. This means that a full-blown emissions trading scheme, as advocated by economists, is now under way in Europe. Who would have thought, a few years ago, that this could happen?

Three questions come to mind when reading this rather amazing piece of history that exhibits both impediments and incentives for evolution to efficiency. The first question is backward looking: why did the EU make such a U-turn in climate policy? The second question is forward looking: can we conclude, from an economic perspective, something like 'all's well that ends well' and 'they lived happily ever after'? In other words: will the EU implement the ideal emissions trading blue-print as developed by economists for all sectors included in this market, not only before, but also after 2012? The third question is an overlapping one: can we answer the previous questions by using an overarching theoretical framework? That is, can we avoid, or at least embed, the summing up of (more or less relevant) *ad hoc* explanations and/or projections as most authors have done so far (such as Christiansen and Wettestad, 2003, or Convery *et al*., 2003)?

To answer these questions, we will try to find out whether the path dependence approach is able to take us an analytical step further. Path dependence means that policy outcomes are dependent on the (sometimes coincidental) starting point and specific course of a historical decision-making process. According to the path dependence approach, the cost of reversing or altering previous decisions increases, and the decision-making scope decreases, as the development proceeds. As will be demonstrated, this theoretical perspective also explains why the choice for a suboptimal design might 'lock in' institutionally, rather than evolve into an optimal one, and why an institutional 'break-out' might occur. It will thus be interesting to see whether this approach can shed some new light on the history and future of market-based climate policy in Europe.

In the next section, we will not only start by roughly explaining what path dependence and lock-in mean, but we will also distinguish three strains of literature using these concepts to study institutions in climate policy. In the third section, the existing literature on path dependence will be reviewed, criticized and extended to create the rudimentary foundations of a new economic theory of institutional path dependence. In the fourth section, after

making a distinction between different types of (market-based) climate policy, it is explained why the history of market-based climate policy in Europe shows particular patterns of path dependence. In the fifth section, it is argued that sub-optimal types of market-based climate policy can be brought into the scope of the directive, or can be applied for sectors and installations not covered, which entails a risk of triggering a path-dependent process from which it may be difficult to escape after 2012. In the sixth section, conclusions are presented.

PATH DEPENDENCE AND CARBON LOCK-IN

Path dependence is more than just a recognition that 'history matters'. That element is only part of the story. The path dependence approach not only recognizes the impact of history, but also shows that a decision-making process can exhibit self-reinforcing dynamics, so that an evolution over time to the most efficient alternative not necessarily occurs.

Path dependence generally refers to situations in which decision-making processes (partly) depend on earlier choices and events. It recognizes that a choice, say, between a number of policy instruments, is not made in some historical and institutional void just by looking at the characteristics and expected effects of the alternatives, but also by taking into account how much each alternative deviates from current institutional arrangements that have developed in time. A policy outcome thus depends on the (sometimes coincidental) starting point and specific course of a historical decision-making process. The path dependence approach puts forward that a historical path of choices has the character of a branching process with a self-enforcing dynamic in which the costs of reversing previous decisions increase, and the scope for reversing them narrows sequentially, as the development proceeds.

This approach was initiated by David (1985) and Arthur (1989) to explain (a lack of) technological and economic change. It shows why and when sub-optimal technologies are difficult or impossible to replace ('lock-in') and when this is possible ('break-out') in the presence of a superior alternative. David's story of the survival of the sub-optimal QWERTY keyboard became a well-known (but also criticized) example. In the late 19th century, the QWERTY keyboard was invented for typewriters as a remedy for the problem that typebars often clashed and jammed if struck in rapid succession. Since then, various technological improvements and ergonomically superior designs have been developed, such as the sequence DHIATENSOR that would facilitate faster typing, but none was implemented. Even in the late 20th century when the typewriter was replaced by the computer, which obviously does not operate with (potentially clashing) typebars, the old-fashioned QWERTY arrangement of keys remained dominant, and it still is dominant on our keyboards today.

David and Arthur refer to large set-up costs, increasing returns, co-ordination effects and learning as the primary self-reinforcing mechanisms that contribute to such a (technological) lock-in in the presence of a superior alternative. North (1990) suggested transforming this evolutionary theory in such a way that it can be applied in an institutional context. This suggestion has been welcomed, not only in various branches of economics, such as institutional economics (e.g. Magnusson and Ottosson, 1997) and law and economics (e.g. Field, 2000), but also in fields such as political science (e.g. Pierson, 2000) and sociology (e.g. Mahoney, 2000). North (1990, p. 95) himself is convinced that all of Arthur's self-reinforcing mechanisms equally apply to institutions, although with somewhat different characteristics, and that institutions are subject to 'massive' increasing returns.

As far as we know, there are only a handful of authors in the climate change literature who

have picked up the ideas of path dependence and lock-in. In principle, it is possible to distinguish three strains of literature using these concepts to study institutions in climate policy. The first strain only or mainly considers the possibilities of institutional path dependence and 'carbon' lock-in, as it is called, to the extent that they strengthen a particular technological lock-in. Unruh (2000) falls in this group. The second strain is more or primarily interested in the institutional lock-in itself, but does not come further than either mentioning the possibility of such a lock-in or mentioning Arthur's self-reinforcing mechanisms without substantially extending, let alone questioning or altering, the arguments provided by authors such as North and Pierson. Dietz and Vollebergh (1999) and Foxon (2002) fall within this group. The third strain not only mentions the arguments behind institutional path dependence and lock-in, but also questions whether all of Arthur's technological self-reinforcing mechanisms equally apply to institutions and provides analytical extensions and remedies for the incomplete analogies observed. Woerdman (2002) falls in the latter group.

TOWARDS AN ECONOMIC THEORY OF INSTITUTIONAL PATH DEPENDENCE

Woerdman, Pierson and Mahoney have each tried to build a general theory of some form of institutional path dependence of their own. To start with the latter, Mahoney (2000, p. 514) defines path dependence as every (contingent) outcome that, on the basis of prior events or conditions, cannot be predicted by a particular theory (such as neoclassical economics). This definition, however, is too broad: it is almost always possible to find some theory that cannot explain a particular outcome. After making a legitimate case against broad definitions and concept stretching, Pierson (2000, p. 252) then claims to use a narrow definition of path dependence by defining it in terms of increasing returns. In our view, however, he actually uses a broad definition of the increasing returns concept itself. When writing about politics, Pierson (2000, pp. 251, 263) repeatedly speaks of 'increasing returns or path-dependent processes' and describes them as 'self-reinforcing or positive feedback processes'. Institutions are not typewriters, however, which makes QWERTY different from politics. In fact, contrary to what North and Pierson believe, we argue that there is an incomplete (but not absent) analogy with increasing returns to scale in an institutional setting. This point is worked out in detail by Woerdman (2002).

In an economic context, increasing returns imply a decline in unit production costs as fixed costs are spread over an increasing production volume. In other words: increasing returns in economics is about production quantities. The firm then has an advantage if it produces more of the same. In an institutional context, however, increasing returns is not about production quantities. The government can be seen as 'producing' regulation or policy and the 'production costs' are its administrative costs. The advantage for the government of building upon existing policy arrangements does not originate from producing larger quantities of (similar) rules, as a complete analogy would require. What matters, though, is that the differential administrative costs (the extra costs of adding another collection of units) decline as the institutional scale increases. This can be done by expanding an existing policy instrument (horizontally) to cover extra target groups, such as more segments of industry, or the government itself can expand the instrument (vertically) by incrementally adding another element to it, for instance by allowing the target groups a more flexible application of the instrument.

In our rudimentary economic theory of institutional path dependence, administrative costs are subdivided into the set-up costs of establishing an institutional arrangement and the running costs of continuing it. Set-up costs

are subdivided into sunk costs (of the existing arrangement) and switching costs (of a new arrangement). The former are not relevant for the decision whether or not to continue and extend the existing arrangement because they were made in the past ('bygones are forever bygones', according to economic theory), but switching costs are relevant when establishing a new one because they still have to be made. Examples of set-up costs that the government incurs are the costs of gathering and processing information, the costs of developing the required legal framework, the costs of (re)allocating property rights and the costs of dealing with lobbying efforts and cultural resistance.

Pierson (2000, p. 259) is wrong to argue that the '[. . .] sunk costs [. . .] terminology is unfortunate [because the] whole point of path dependence [. . .] is that these previous choices often are relevant to current action'. Although we agree with this general description of path dependence, we disagree that this description would undermine the use of the sunk costs terminology. The point of sunk costs is namely that, from the perspective of set-up costs, continuation of the status quo is for free. Choosing a new design and introducing it, however, is not costless (as Pierson also acknowledges). The perceived costs of switching to the superior alternative arise, as we have seen, from legal problems and cultural resistance. Of course, costs are not the nature of legal requirements or cultural values themselves, but they do perform the role of switching costs when (and to the extent that) their content is unfavourable to change. Such switching costs play a more important role in institutional change than in technological change, because institutions, in North's framework, are in essence made up of formal (legal) and informal (cultural) constraints.

Instead of set-up costs, some authors speak of political transaction costs. The problem with the latter concept, however, is that various non-market interactions in politics are neither transactions nor conceivable as taking place within a market (Ruiter, 2003). Many interactions in an institutional context are hierarchical authority regimes rather than exchange regimes, such as the government that holds (and in fact should hold) the monopoly of imposing and enforcing formal rules. Therefore, we avoid the term 'political transaction costs' and prefer to speak of switching costs. From a path dependence perspective it is interesting to note, though, that the government, as a monopolist, does not have a strong incentive to make a switch to different 'products', namely different policies. An evolution towards the optimal alternative is not guaranteed.

According to the path dependence approach, institutional evolution can come to a standstill, either temporarily or not. We call this an institutional lock-in, which refers to the dominance of sub-optimal regulation, such as a (set of) inefficient policy instrument(s), in the presence of a superior alternative. Regulation is thought to be dominant when it is (formally adopted and) effectively implemented, while its alternative is not. Superiority is defined in terms of efficiency. By doing so, we avoid any absence of institutional change being called an institutional lock-in, which would make the theory too broad and imprecise.

It follows from the analysis above that set-up costs in the form of sunk costs and switching costs contribute to an institutional lock-in. We have also demonstrated that self-reinforcing mechanisms do not arise because of increasing returns, as most authors believe, but because they generate positive feedbacks which lower the running costs (as opposed to the set-up costs) of the dominant arrangement. Next to the advantages of increasing the institutional scale, either horizontally or vertically, learning effects lower the average costs of running the established system. Such advantages could also accrue to the superior arrangement once established, but its establishment is made more difficult precisely because people benefit from learning and experience with the dominant sub-optimal arrangement. In that respect, the superior alternative must not only

exist (either in theory or in some other concrete setting), but it must also be fully or largely known by those who choose. The other side of the coin is thus that incomplete information can contribute to an institutional lock-in if a superior alternative exists (for instance when it is used in some policy setting in another country), but is not or hardly known among those who choose.

Liebowitz and Margolis (2000) make a comparable distinction between three degrees of path dependence. In the case of first degree path dependence there is no error: the outcome is optimal. There is no lock-in, because the best alternative is chosen and a superior alternative does not exist. In the case of second degree path dependence there is an error: actors think they choose the optimal path, but the outcome turns out to be sub-optimal. This happens when the superior alternative exists but is not or hardly known by those who choose at the moment the decision was made. This does not preclude, as explained above, that (some) scientists or, for instance, decision-makers in other countries are already familiar with the innovative option. The latter are in a position to refer to the sub-optimal situation as locked in. In the case of third degree path dependence there is a remediable error: the outcome is sub-optimal, while those who made the choice had sufficient information about the existence of a superior alternative.

Windrum (1999) adds that self-reinforcement of a sub-optimal technology is obtained if its problem-solving capacity is perceived to be growing or stable. A complete analogy can be made with institutions: the lock-in of a dominant sub-optimal institutional arrangement is strengthened if its problem-solving capacity (or effectiveness), for instance in the light of some policy target, is perceived to be growing or stable. 'Satisficing' rather than 'optimizing' government representatives and officials, in a situation of bounded rationality, will then be less receptive to or even indifferent about any alternative arrangements, including theoretically superior ones.

To sum up, the conditions for an institutional lock-in are the existence of a superior alternative, incomplete information and a problem-solving capacity of existing policy which is perceived to be increasing or stable, as well as large set-up costs. The conditions for an institutional break-out mirror those of a lock-in as long as they are reversible. This exercise, which is also referred to in the literature as unlocking lock-in or as exit or escape from lock-in, puts us in a position to analyse the path-dependent evolution of institutional arrangements. The chances for the superior alternative improve when information quality is enhanced and when set-up costs decrease against the background of a deteriorating problem-solving capacity of extant policy. External shocks can also provide strong pressures for policy change (Licht, 2001, p. 201).

Our first steps toward an economic theory of institutional path dependence therefore not only explain why policy-making often leads to non-decisions or incremental changes, but also formulate the conditions under which a switch to new institutions and instruments might occur.

THE PATH-DEPENDENT HISTORY OF EMISSIONS TRADING IN EUROPE

Damro and Méndez (2003) believe that the adoption of emissions trading by the Europeans is 'best explained as a process of policy transfer' from the US to the EU. We do not fully agree. At most it can be *described* as such, but other approaches and concepts are still necessary to explain what happened. Moreover, although Damro and Méndez acknowledge the role of sunk costs and learning, for instance, they fail to analyse switching costs, scale advantages, drivers of cultural change and possible institutional lock-in effects. In addition, we disagree with their characterization of emissions trading as a 'marginal change' in climate policy, which would be 'nothing more than the introduction of an

instrument' because it leaves the policy goals untouched. Here, they forget to make a distinction between (a) permit trading and (b) credit trading, the latter of which is more incremental than the former. This distinction is, in fact, necessary to understand the subtleties in the history and implementation of emissions trading in America, as many authors underline (e.g. Tietenberg *et al*., 1999), and more recently also of that in Europe. The path dependence approach provides an explanation and sheds new light on this piece of history.

Under permit trading, a government allocates emission ceilings to private parties, allowing them to trade with each other. This is also referred to as allowance trading or cap-and-trade. Under credit trading, however, one private party can sell credits to another by reducing its own emissions below a baseline, laid down in (energy-efficiency) environmental standards and possibly enforced by covenant. Credit trading is sometimes also referred to as performance standard rate trading. The distinction between these two basic types of emissions trading is crucial for our analysis, because neoclassical economists (literally) argue that permit trading is superior (e.g. Tietenberg *et al*., 1999, p. 106).

Permit trading, which incorporates emission ceilings, is efficient and effective. New-coming and growing firms have to buy permits, also referred to as 'allowances', from other firms (or from a government reserve) to cover the additional polluting activities. Those who leave the industry keep their allowances, which they can sell. The system is efficient, because every emission allowance that is used to cover the emissions has a price: either the purchase price of new allowances or the revenues that the polluter foregoes by not selling the allowances it already possesses (which are opportunity costs). Each unit of emissions therefore has a price, since each unit could be sold. Moreover, if the economy grows, the demand for allowances increases, but the supply remains constant as a result of the emission ceiling. This means not just that the emission target will be achieved, but also that the scarcity of environmental space is reflected in a higher price for carbon-intensive products, thus encouraging technological innovation and an efficient restructuring of the economy in the direction of sustainable energy use.

Credit trading, which does not incorporate emission ceilings, is less efficient and its effectiveness is uncertain. A firm can create credits voluntarily by reducing its emissions below the emission level required by the applicable voluntary or regulatory policies and measures.[1] Although companies can achieve cost savings by selling credits, the environmental scarcity under credit trading is not reflected in a price for each unit of emissions. If the economy grows, the supply of credits also increases because companies do not have an emission ceiling but have to observe an energy-efficiency standard. If an energy-intensive company wants to expand production, or if a newcomer enters the industry, it thus has a right to new emissions. These do not have to be purchased from existing polluters, or from a government reserve, within an environmental consumption space as in the permit trading system. Instead, the company receives its emission credits above and beyond the existing quantity. The consequence is that the social costs of the extra emissions are not fully reflected in the costs per unit of product and thus not in the product price. Carbon-intensive products are therefore priced too cheaply, leading to an inefficient restructuring of production.

The market transaction costs of credit trading would not differ much from permit trading, because both types make use of the information advantages of the private sector and do not require advance approval of every entitlement transfer. Nevertheless, the

[1] For instance, if the policy is a performance (or relative) standard that requires a certain quantity of CO_2 per unit of output or energy, a firm should multiply this standard by its production volume to obtain its total emission figure. If this firm emits less CO_2 than this baseline (or benchmark) figure by initiating a certain abatement project, it can sell these credits to another firm.

determination of the allowed emissions for a given year is more difficult under credit trading, because these are not given (as under permit trading), but have to be calculated on the basis of existing climate policy, for example by multiplying the performance standard by the energy use in that year, which can be done accurately only *ex post*.[2]

Despite the superiority of permit trading, seen from the viewpoint of neoclassical economics, certain member states were inclined to opt for credit trading, whether or not based on existing voluntary agreements. This fits the observation by Bressers and Huitema (1999, p. 180) that new economic instruments are often based on existing legal instruments. The incrementalism literature, however, which could be expected to provide some explanation, is predominantly normative and empirical. It explains incremental policy change by referring to factors such as conflicting interests, the power of large companies and incomplete information, but it does not offer a systematic positive theory and, although the concept of incrementalism is often used by scientists and policy-makers, it has not produced a cumulating line of research (see, e.g., Weiss and Woodhouse, 1992). The path dependence approach, in contrast, is more promising in this respect, because it does offer a systematic positive theory to explain incremental (as well as radical) policy change. Incremental change by building upon existing policy has the advantage of making use of its sunk costs, learning effects and increases in institutional scale, thereby avoiding the perceived costs of switching to a completely new policy paradigm.

This is exactly what credit trading does: it builds upon existing environmental policy and avoids the perceived switching costs of permit trading. And this is exactly what initially happened in various member states that already had some climate policy to build upon (for a country overview see IEA, 2002). In particular the Netherlands and Belgium, but to some extent also Germany, Sweden and the United Kingdom, which had already introduced energy-efficiency standards under (weak or strong) voluntary agreements for the energy-intensive industry, were tempted to make the existing framework more flexible by adding credit trading to it. Climate policy in the Netherlands is a clear case in point. Apart from the Social–Economic Council, which, in its capacity as advisor to the Dutch government, pleaded in favour of permit trading, there were various ministries as well as the so-called Vogtländer advisory committee that initially pleaded in favour of credit trading by building upon existing standards for those sectors of industry that were energy intensive and competing internationally (for a policy overview see Woerdman *et al*., 2002). The factors mentioned above, such as making use of the sunk costs and learning effects of extant policy, help to explain their position.

The aforementioned EU member states found themselves in a (as it later appeared temporary) situation of third degree path dependence in which a superior alternative is known but not chosen. The situation was different for other member states, in particular those in the South of Europe, such as Portugal, Spain and Greece. These countries hardly had any existing climate policy, let alone a well established tradition of environmental policy instruments for industry, to build upon. Also, on an overarching European level (as against individual member state level), there was virtually no existing climate policy.

The path-dependent history is illustrative: the European carbon tax as proposed in the early 1990s failed to be adopted in the Council of Ministers, which provided an institutional void, in terms of policy instruments, making the European institutions themselves less

[2] Project-based credit trading, such as Joint Implementation (JI) and the Clean Development Mechanism (CDM) as defined under Articles 6 and 12 of the Kyoto Protocol respectively, is a different story. In that case, an investor receives credits for achieved emission reductions at a (usually foreign) host. These emission reductions are measured from a baseline that estimates future emissions at the project location if the project had not taken place. These baselines have to be approved before the transaction is allowed, which increases market transaction costs.

vulnerable to third degree path dependence. Since permit trading has become the cornerstone of the directive, European climate policy, after years of uncertainty, can now be said to be en route to an institutional break-out. This still does not explain, however, how the attitudes of policy-makers in the EU have changed. The path dependence approach is capable of providing an answer, though, by focusing on the conditions of an institutional break-out. Despite its explanatory power, this will also make clear that the approach is not all embracing and benefits from other insights, for instance taken from political science.

Attitudes (which are observable) have changed, but this does not mean that values (which are unobservable) have changed as well or that market-based instruments have gained in acceptance as a result of cultural change. Political scientists emphasize that there are elements other than values in attitudes (van Deth and Scarbrough, 1995). We hypothesize that the attitudes of policy-makers in the EU have changed as a result of path-dependent internal pressures and external 'shocks' (that were difficult if not impossible to influence), which has contributed to a process of cultural change (and not just the other way around). There is significant evidence, which runs along the lines of the path dependence approach, that confirms the hypothesis.

First, the problem-solving capacity of actual and planned policies and measures, in the European regulatory tradition of standards, taxes and voluntary agreements, came under pressure. In the policy community, the perception took hold not only that the effectiveness of the existing policy framework was decreasing (see, e.g., COM, 2000b, pp. 2–4), but also that emissions trading (next to efficiency) would enhance effectiveness (see, e.g., COM, 2000a, p. 4). In the Netherlands, for instance, the greenhouse gas (GHG) emissions had risen by about 10% in 2000 relative to 1990 emissions, whereas it had pledged to stabilize emissions (COM, 2000a).

Second, existing environmental policy has sunk costs, but the perceived switching costs of permit trading were steadily decreasing. The idea became more widespread that Europe would miss the opportunity of saving costs if no use were made of trading (see, e.g., COM, 2000b, p. 3). The Commission performed the role of policy pioneer and argued in favour of starting an experimental EU-wide carbon trading scheme among large emitters by 2005, and later drafted a directive to establish such a scheme, whereas some EU member states, notably Denmark and the UK, had already started to develop domestic emissions trading schemes. This is an indication that cultural barriers towards the introduction of markets in climate policy were breaking down in some entrepreneurial policy arenas and in some countries. New interests (as opposed to the vested interests), such as emission market brokers, also pushed for the acceptance of permit trading.

Third, interlinked with the aforementioned processes, the availability, quality and dissemination of information on permit trading among policy-makers improved over time. To obtain what it perceived to be meaningful emission targets from countries such as the US and the Russian Federation, the EU accepted the inclusion of emissions trading in the Kyoto Protocol of 1997. Because, from then on, EU policy-makers had the perception that emissions trading was now a permanent part of the policy 'landscape', they started to invest more time and rigour in studying this market-based option, with which they had been largely unfamiliar (see, e.g., COM, 1999, pp. 14–16). The Commission itself later recognized that the Kyoto Protocol had put emissions trading on the political agenda of the EU (COM, 2000a, p. 7). Here, commissioners Zapfel and Vainio (2002, pp. 5–12) distinguish three phases to which no specific time periods are attached: in the first phase emissions trading was 'widely unknown and misunderstood', in the second phase there was an 'increasing understanding of the participants' and in the third

phase the EU adopted 'a proposal for a directive on EU-wide trading in GHG permits'.

Fourth, an external political shock occurred. Although in particular the Americans, but also countries such as Canada and Japan, had bargained hard, and with success, to introduce emissions trading in the Kyoto Protocol, in 2001 the US rather unexpectedly withdrew from the protocol. This meant that the EU and the rest of the world were left with an agreement full of flexibility instruments that initially were a pre-condition for the US to accept the emission reduction target that they now rejected. This *fait accompli* was exogenous to the extent that the earlier EU supplementarity proposal to quantitatively restrict emissions trading had no influence on the US decision that followed shortly after this particular proposal was made by the Europeans.

To prevent countries such as Canada and Japan, which could now make a credible threat to follow the US example, from doing so, the EU had to give up its resistance against full trading under emission ceilings for private entities. The EU wanted to keep these countries on board not only for environmental reasons, but also for political–strategic reasons, namely to show that it still regards itself as a climate leader, which does not need the US to make international climate policy succeed (see, e.g., Hanks *et al*., 2001, p. 14). The Russian Federation, however, became the next stumbling block for the EU: in 2003 it threatened not to ratify the Kyoto Protocol. Various members of the European Parliament stated that this external threat accelerated the internal co-decision procedure on EU-wide emissions trading (see, e.g., Houlder, 2003). An early agreement should stimulate Russia to ratify by signalling that the EU takes climate policy and market instruments seriously and that the Russians, although the Americans have left, can still gain from trading emissions with the Europeans. According to them, it should also stimulate the US to come back to the international climate change table.

The aforementioned (exogenous) path-dependent developments of, first, forceful US target acceptance conditions and, then, the sudden unilateral US withdrawal and the resulting threat power of other market-oriented countries pleading in favour of trading (or against the Kyoto Protocol), as well as the increasing sense of a necessity to reduce compliance costs in climate policy, have shaped the perception among an increasing number of EU politicians and civil servants that unrestricted use of emissions trading among private entities (albeit in their view, to some extent, undesirable) is *de facto* unavoidable. The unrelenting attempts of the Commission to get permit trading accepted, mainly by means of performing studies, but also by means of lobbying, were factors of internal pressure in the EU. Consequently, the attitudes of policy-makers have changed, which, in its turn, triggered a path-dependent process of cultural change, as a result of internal pressures and external 'shocks' mainly caused by (exogenous) international political developments that were difficult if not impossible to influence.

In the Northian sense of informal constraints, this provided a window of opportunity for permit trading. This 'window' was even enlarged by a path-dependent shift in formal constraints: whereas the carbon tax was a financial matter that required unanimity in the Council of (Financial) Ministers, emissions trading was an environmental issue that 'only' required a qualified majority in the co-decision procedure between the Council of (Environmental) Ministers and the European Parliament (see Christiansen and Wettestad, 2003, or Convery *et al*., 2003).

A PATH-DEPENDENT FUTURE OF EMISSIONS TRADING IN EUROPE?

Thanks to decreasing set-up costs, information improvements and a deteriorating problem-solving capacity of extant policy as well as external shocks and policy entrepreneurs, the EU has developed a directive that enables CO_2 permit trading for large emitters to start in

2005. Also outside the EU, various countries, such as Switzerland, Norway, Japan and Canada, intend to build national tradeable emission rights systems, which could eventually be linked to the EU scheme provided that they mutually recognize their transferable units.

So all's well that ends well and market-based climate policy in Europe will live happily ever after? The answer is largely, but still only partly, 'yes'. The EU will have a permit trading system, which is the most efficient and effective type of emissions trading, covering such installations with a rated thermal input exceeding 20 Megawatts in the energy, metal, cement, glass and paper sectors. This is an important achievement and, in fact, a remarkable breakout itself. Some therefore conclude that the permit-versus-credit discussion is now politically out of date, because the EU directive literally defines 'allowances' (not credits) in Article 3, authorizing the holder to emit one tonne of carbon dioxide equivalent during a specified period. However, what many observers underestimate, or even fail to recognize, is that elements of credit trading can be brought into this permit trading regime through the backdoor, for instance based on Annex III, which requires quantities of allowances to be consistent with the (technological) potential of activities to reduce emissions. Moreover, credit trading can still be used for sectors and installations that do not fall under the scope of the directive. If adopted, this could make it harder to bring those firms and activities under a permit trading regime in the future.

Furthermore, some companies and policy-makers still try to steer the national allocation plans in the direction of credit trading, for instance by linking the height of ceilings for individual companies, within the ceiling for an industry as a whole, to the size of their production. Such linkages, some of which are advocated on fairness grounds by (energy-intensive) companies, and even by some scientists (e.g. Groenenberg and Blok, 2002), are not fully efficient, as explained before. On the level of the individual firm, it is then signalled that production growth implies free emission space. Economists know, however, that no such thing exists as a 'free lunch'. The price of the extra emission space should make clear that an expansion of carbon-intensive production can lead to destroying economic value, because it would necessitate relatively expensive, additional emission reduction measures elsewhere in the economy. Morever, credit trading can still be used for installations not covered under the emissions trading directive. Hazardous or municipal waste installations are excepted, for instance, as well as the transport sector or those parts of the chemical industry that fall below the 20 MW threshold.

Will it be a problem if individual firms obtain flexibility without being subject to emission caps or if credit trading is created for installations not covered under the directive? Some contend that is it not problematic to start with credit trading, assuming that such a scheme can later be transformed into a more efficient and effective permit trading system (see, e.g., Tietenberg and Victor, 1994). On the basis of the path dependence approach, we have explained, though, that this comes at a risk. The political choice of credit trading – a sub-optimal type of emissions trading – can result in an institutional lock-in from which it may be difficult to escape in the future. Four factors can then be identified that contribute to a possible institutional lock-in of credit trading.

First, credit trading profits from the learning effects associated with building on existing environmental policy. Learning effects lower the average costs of running the established system. Second, policy-makers will be more persuaded to opt for credit trading if there is a predominant perception that the problem-solving capacity of the existing environmental laws is growing or stable. If the effort of policy-makers is directed to 'satisficing' rather than 'optimizing', they are less receptive to theoretically superior alternatives such as permit

trading. Third, credit trading can profit from network or co-ordination benefits by building on extant policy. The differential administrative costs decline as the institutional scale increases, which can be done by expanding an existing environmental instrument to cover extra target groups, such as more segments of industry, or by adding an element such as credit trading. Fourth, credit trading builds on the sunk costs of existing environmental policy. These start-up costs that have already been incurred play no role in the decision to continue current environmental policy without emission ceilings, whether or not modified to take account of credit trading. Although permit trading reduces running costs, it involves relatively high start-up costs because it implies crossing over to a new legal arrangement. Resistance by vested interests contributes to these switching costs. In contrast to permit trading, the industry does not have to purchase extra emission rights if companies seek to expand their production under a credit trading regime.

Despite its sub-optimality, there are also advantages of credit trading for politicians themselves. Permit trading sets emission ceilings by (re-)distributing property rights, while credit trading uses existing environmental policy as a baseline for the calculation of the tradable emission reductions. The switching costs of permit trading were perceived to be relatively high since it comes to replace existing environmental policy, while credit trading builds increasingly on extant policy (ineffective and inefficient as it may be). Another explanation for the political attraction of credit trading is that under permit trading a choice must be made between auctioning emission allowances or giving them away free (e.g. 'grandfathering' based on historical emissions). Under credit trading emissions are always given away free, thus lowering the political visibility of the (re-)distribution issue.

There is a risk that starting with credit trading for some installations, firms or sectors, either before or in the first commitment period of the Kyoto Protocol, triggers a path-dependent process from which it may be difficult to escape in a second commitment period after 2012. Although there are opportunities for an institutional break-out, EU member states should at least acknowledge and consider this risk when constructing their national allocation plans, because they might find themselves stuck with a differentiated, partly sub-optimal, emissions trading system after 2012 that may then be difficult if not impossible to change. In fact, any government that is involved in designing a domestic emissions trading scheme, as well as company representatives and scientists who want to contribute to the permit-versus-credit discussion, should take this risk into account.

CONCLUSION

Most authors who have written about the attitude change of European policy-makers on emissions trading have provided a list of (more or less relevant) *ad hoc* explanations without an overarching theoretical framework (e.g. Christiansen and Wettestad, 2003; Convery *et al*., 2003). We have tried to develop such a framework in this paper by sketching the rudiments of an economic theory of institutional path dependence.

The path dependence approach not only recognizes the impact of earlier choices and events on current decision-making processes. It also shows that such a historical path of choices has the character of a branching process with a self-enforcing dynamic in which the costs of reversing previous decisions increase, and the scope for reversing them sequentially narrows, as the development proceeds. Although this can result in a (temporary or permanent) institutional lock-in of sub-optimal regulation, for instance as a result of large sunk costs, switching costs and learning effects, an institutional break-out is possible, for instance when its effectiveness decreases or when external 'shocks' occur. Contrary to the

popular notion of scientists such as North (1990) and Pierson (2000), we demonstrate that the analogy of increasing returns is incomplete in this institutional setting.

The path dependence approach basically explains why decision-makers often change policy incrementally by building upon existing regulation, ineffective and inefficient as it may be. This is exactly what initially happened in market-based climate policy in Europe. Those EU member states that already had substantial extant policy to build upon, such as the Netherlands with its voluntary agreements on energy efficiency for industry, were tempted to make the existing framework more flexible by adding credit trading to it.

Permit trading, however, is superior according to economic theory. Credit trading, also referred to as performance standard rate trading, is inefficient and its effectiveness is uncertain. The environmental scarcity is not reflected in a price for each unit of emissions: when the economy grows, the supply of credits increases as well, because polluters do not have an emission ceiling. Under permit trading, also called allowance trading or cap-and-trade, polluters do have an emission ceiling. This design option is both efficient and effective: when the economy grows, the demand for emission rights increases, but the supply of such rights remains constant because of the emission ceiling.

Nevertheless, there were also member states, in particular those in the South of Europe, that hardly had any climate policy, let alone a well established tradition of environmental policy instruments for industry, to build upon. Also, on the EU level itself, there was virtually no existing climate policy: the carbon tax had failed to be adopted in the early 1990s. This provided a window of opportunity for permit trading, but it still does not explain why and how the attitudes of EU policy-makers have changed. The path dependence approach, enriched with insights from political science, provides an answer by focusing on the conditions for an institutional break-out.

The attitudes of EU policy-makers have changed as a result of path-dependent internal pressures and external 'shocks', which have contributed to a process of cultural change (and not just the other way around). First, the perception took hold that the problem-solving capacity of actual and planned policies and measures, in the European regulatory tradition of standards, taxes and voluntary agreements, was decreasing. Second, existing environmental policy has sunk costs, but the perceived switching costs of permit trading were steadily decreasing, for instance because cultural barriers concerning 'pollution rights' crumbled. Third, information on permit trading among policy-makers improved over time. Fourth, an external 'shock' occurred in the form of the withdrawal of the US from the Kyoto Protocol. From that moment in history, other countries, such as Canada, Japan and the Russian Federation, could now make a credible threat to withdraw as well if unrestricted trading were not accepted by the EU. Finally, the European Commission adopted a pioneering role, exerting internal pressure by preparing a directive that would enable permit trading in the EU from 2005 for installations of large industrial sectors.

The result is that the EU is now en route to an institutional break-out. The Europeans have developed and adopted a CO_2 permit trading scheme for power generators and steelmakers as well as cement, paper and glass manufacturers to start in 2005 and to be continued in the Kyoto Protocol's first commitment period, 2008–2012. So all's well that ends well? Not exactly. Some companies and policy-makers still try to steer the national allocation of emission rights in the inefficient direction of credit trading, for instance by linking the height of ceilings for individual companies, within the ceiling for an industry as a whole, to the size of their production. This sort of linkage is not fully efficient. It denies that an expansion of carbon-intensive production can lead to destroying economic value, because it necessitates relatively expensive, additional emission

reduction measures elsewhere in the economy. Morever, credit trading can still be used for installations not covered by the directive.

Some argue, though, that it is not problematic to start with (elements of) credit trading, assuming that it can later evolve into a permit trading system. The path dependence approach, however, emphasizes that this comes at a risk: starting with a sub-optimal type of emissions trading can result in an institutional lock-in from which it may be difficult to escape. Although there are, again, opportunities for an institutional break-out, EU member states should at least acknowledge and consider this risk when constructing their national allocation plans, because they might find themselves stuck with a differentiated, partly sub-optimal, emissions trading system after 2012 that may then be difficult if not impossible to change.

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