Policy Mix for Environmental Protection[1]
A Transaction Cost Approach

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Technical Abstract

This paper uses a transaction cost approach in order to classify the different policy options that are currently discussed in relation to the Kyoto protocol. It analyses the market as only one of the possible collective decision making processes, which are available to operationalize the concept of sustainable development. The firm, the third sector, the government, the market are analyzed as collective decision making processes. They are socially constructed in the sense that they are institutions, which are subject to change. Compared to initial and already existing institutions, the policy options for environmental protection are evaluated in the light of the associated transaction costs. The paper concludes with the recommendation for new institutional arrangements minimizing transaction costs at both the national and international level.

[1] Also available as Working Paper W81, International Academy of the Environment, Geneva, 1998

Non technical Abstract

The tool kit of environmental protection policies in the field of climate change is wide open, but the possible application of such tools, either singularly or in combination, remains unknown. The steady stream of policy recommendations leads to instruments, which are introduced more at the level debate than in practice. The Kyoto Protocol has formally added international emission trading, joint implementation and the clean development mechanism to the existing tool kit. It tries to extend instruments traditionally implemented domestically to the international level. The link between different levels of application is more subtle than is immediately apparent. This makes the implementation of instruments even more difficult, but broadens the policy options currently available on national levels such as command and control, taxation, property rights and voluntary agreements. All these instruments are widely discussed on theoretical grounds, but their implementation remains poor at both the national and international levels.

The theoretical debate highlights the fact that each instrument has advantages and disadvantages, and that the main obstacle to an efficient policy design is finding the optimal policy mix.

At the practical level, the instruments of environmental protection inspired by market incentives face important problems of social acceptability. These problems are generally seen as responsible for the modest results that have been achieved to date in applying these instruments on all operational levels.

Social acceptability problems can be usefully studied with a transaction cost approach. Transaction costs accompany the implementation of each instrument. The required policy mix therefore faces problems of competence between the different levels of the decision making process, but also problems of evaluation of the involved transaction costs. The current policy recommendations are all derived from a theoretical framework assumed to be without friction. In practice however, markets operate in sub-optimal conditions, which leads to the two following, somewhat conflicting conclusions.

The first conclusion is that the adequate theoretical reference for policy recommendations is not so much the market model, but rather the theory of the firm based on the analysis of complex organizations. In the presence of positive transaction costs, the firm (and not only competitive markets) may also efficiently allocate resources. International trade takes place not only on markets, but also within multinational firms. Therefore, the international economy cannot be solely understood in terms of markets, but has to be seen as a network of private and public actors which also have non-market connections.

The second conclusion draws our attention not so much to the policy design itself, but more to the contextual framework in which an instrument is applied. The evaluation of transaction costs, and hence the choice of policy instruments, is of such complexity that it cannot be exclusively solved by determining the most constraining form of cooperation,

but requires a decentralized structure, clearly defined in institutional terms for individual decision-making.

Explicitly taking transaction costs of each instrument into account, stakeholders are bound to the institutions, which are necessary to implement the instrument. They do not refer exclusively to the market model that is at the origin for all economic instruments, but also to other institutional arrangements, which organize economic relations. Therefore, policy making for environmental protection is based on a broader framework, e.g. not only markets seen as social institutions, but also firms, government and non government organizations are taken into account. They are all bound to institutional arrangements, which undergo a profound change as a result of the objectives set in the Kyoto protocol. The traditional target of economic growth is gradually adjusted to sustainable development through institutional change.

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Policy Mix of Environmental Protection[1], A Transaction Cost Approach[2]

The tool kit of environmental protection policies in the field of climate change is wide open, but the possible application of such tools, either singularly or in combination, remains unknown.[3] The steady stream of policy recommendations leads to instruments, which are introduced more at the level debate than in practice. The Kyoto Protocol has formally added international emission trading, joint implementation and the clean development mechanism to the existing tool kit[4]. It tries to extend instruments traditionally implemented domestically to the international level. The link between different levels of application is more subtle than is immediately apparent. This makes the implementation of instruments even more difficult, but broadens the policy options currently available on national levels such as command and control, taxation, property rights and voluntary agreements. All these instruments are widely discussed on theoretical grounds, but their implementation remains poor at both the national and international levels[5].

The theoretical debate highlights the fact that each instrument has advantages and disadvantages[6], and that the main obstacle to an efficient policy design is finding the optimal policy mix which either maximizes the expected benefits or minimizes the disadvantages of the different instruments to be combined.

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[1] Also available as Working Paper W81, International Academy of the Environment, Geneva, 1998

[2] This paper has been written during my stay as visiting professor at the International Academy of the Environment (IAE), Geneva, September 1998. It has steadily improved through discussions with staff members. Special thanks go to Sophie Linguri and Andrea Baranzini. Nicolas Wallart of the University of Geneva also made helpful comments All remaining errors go on my own account.

[3] It is striking to note that all policy dialogues organized by the International Academy for the Environment (IAE) in relation with the agreement reached in Kyoto, Japan, during December 1997, on a Protocol to the United Nations Framework Convention on Climate Change (UNFCCC) come to the same conclusion. The effect of a particular instrument should be evaluated in the context with others. See e.g.: Baranzini, A., Batruch, C., Grubb, M. and Perkaus, J. (with the collaboration of E. Haites) (1998), "International Emisssions Trading under the Kyoto Protocol" Rules, Procedures and the Participation of Domestic Background Paper C98/PD02/04, Geneva: International Academy of the Environment (IAE)

[4] A useful guide to the different emission reduction programs is Ridley, M. (1998), Lowering the cost of emission reduction: Joint implementation in the Framework Convention on Climate Change, Boston, Dordrecht, London: Kluwer Academic Publishers

[5] OECD (1997), Evaluating Economic Instruments of Environmental Policy, Paris: OECD

[6] We developed this fact elsewhere: Burgenmeier, B. (1994), « Environmental Policy: Beyond the Economic Dimension », table 9.1. p. 177 « Environmental Policy Instruments: Advantages and Disadvantages », in B. Burgenmeier, editor, Economy, Environment, and Technology, A socio-economic Approach, Armonk, New York: M.E. Sharpe Inc.

However, at the practical level, the instruments of environmental protection inspired by market incentives face important problems of social acceptability[7]. These problems are generally seen as responsible for the modest results that have been achieved to date in applying these instruments on all operational levels[8].

1. Introduction

In this paper, we maintain that social acceptability problems can be usefully studied with a transaction cost approach. Transaction costs accompany the implementation of each instrument, indeed. The required policy mix therefore faces problems of competence between the different levels of the decision making process, but also problems of evaluation of the involved transaction costs. The current policy recommendations are all derived from a theoretical framework assumed to be without friction. In practice however, markets operate in sub-optimal conditions, which leads to the two following, somewhat conflicting conclusions.

The first conclusion is that the adequate theoretical reference for policy recommendations is not so much the market model, but rather the theory of the firm based on the analysis of complex organizations[9]. In the presence of positive transaction costs, the firm (and not only competitive markets) may also efficiently allocate resources. International trade takes place not only on markets, but also within multinational firms. Therefore, the international economy cannot be solely understood in terms of markets, but has to be seen as a network of private and public actors which also have non-market connections. This, in turn, has an important consequence on the underlying behavioral assumptions. Instead of assuming substantive rationality, which enables each economic actor to use all available information in order to perform his own cost-benefit analysis, we are confronted with a more procedural form of economic rationality. This form puts emphasis on the learning capacities of organizations and on system analysis in general. Instead of exclusively promoting competition (though corrected by techniques of internalization of social costs) cooperation is a component of an operational policy mix.

The second conclusion reaffirms the importance of economic rationality in its procedural form. It draws our attention not so much to the policy design itself, but more to the

[7] The Kyoto Protocol explicitly mentions economic instruments on the international level only (article 6: joint implementation, article 12: clean development mechanism, article 17: international emission trading) leaving economic instruments as environmental taxes and voluntary agreements to a more domestically oriented implementation.

[8] see e.g. Pearce, D.W., Cline, W.R., Achanta, A.N., Fankhauser, S., Pachauri, R.K., Tol, R.S.J. and Vellinga, P. (1996) « The Social Costs of Climate Change: Greenhouse Damage and the Benefits of Control », in IPCC, « Climate Change 1995, Economic and Social Dimensions of Climate Change », Contribution of Working Group III to the second Assessment Report, New York: WMO and UNEP, Cambridge University Press

[9] This conclusion is based on either an economic and or a sociological strand of thought (e.g. Jacquemin, A. (1987) The New Industrial Organization, Market Forces and Strategic Behavior, Oxford: Clarendon Press, and Boulding, K.E. (1968) The Organizational Revolution, Chicago:Quatrangle Books

contextual framework in which an instrument is applied. The evaluation of transaction costs, and hence the choice of policy instruments, is of such complexity that it cannot be exclusively solved by determining the most constraining form of cooperation, but requires a decentralized structure, clearly defined in institutional terms for individual decision-making[10].

If bounded rationality shapes economic behavior, transaction costs are an integrated part of the cost-benefit analysis. Explicitly taking transaction costs of each instrument into account, stakeholders are bound to the institutions, which are necessary to implement the instrument. They do not refer exclusively to the market model that is at the origin for all economic instruments[11], but also to other institutional arrangements, which organize economic relations. Therefore, policy making for environmental protection is based on a broader framework, e.g. not only markets seen as social institutions, but also firms, government and non government organizations are taken into account. They are all bound to institutional arrangements, which undergo a profound change as a result of the objectives set in the Kyoto protocol. The traditional target of economic growth is gradually adjusted to sustainable development through institutional change.

This adjustment process cannot be based solely on the implementation of instruments of environment protection, but must also account for new institutional arrangements such as property rights, public or private contracts and administrations, both at the national and international level, for monitoring and controlling. Transaction costs are involved in all these new institutional arrangements. Their importance leads to a priority setting not only in terms of the different instruments, but also in the choice of the most appropriate institutional arrangements. Such an approach insists on the interdependence between social institutions and individual behavior. It serves as a guideline in the implementation of the optimal policy mix in a concrete social context.

2. The conceptual framework

The underlying model of economic policy-making refers strongly to the « second best » literature, which examines non-optimal behavior. Market failures have to be corrected by state intervention, mainly based on the « polluter pays » principle[12]. The implementation

[10] This affirmation is bound to a controversial interpretation. Economic theory deals with institutions either by a traditional approach kept alive by evolutionary economics (Hodgson, 1993), or by neo-institutional theory which is in accordance with the neoclassical approach (North, 1990). This controversy has consequences for the policy debates. If the first interpretation insists on the importance of the evolution of institutions as a pre-condition for policy making, the second counts more on economic rationality in a procedural form.

[11] A. Caron has dedicated her PhD Thesis to this conclusion, which is based on a convincing demonstration for the validation of the Coase theorem with positive transaction costs (Caron, 1998).

[12] One of the most relevant reference to this strand of thought is given by Pigou A.C. (1918), The Theory of Welfare, London: Macmillan; see also Lipsey R. G. and Lancaster K. (1956) « on the General Theory of the Second Best », Review of Economic Studies, No 1.

of this principle has raised normative problems mainly due to the reciprocal nature of the involved social costs[13].

The instruments based on this approach which internalizes the external effects in the economic calculus of market operators, (e.g. through environmental taxes) have to deal with this normative dimension. This is probably the main reason why a second approach based on property rights has been developed[14]. Once these rights on environmental goods such as fauna and flora are clearly defined, new markets can be organized, mainly based on new contracts defining the trading of property rights.

2.l. Bounded rationality

The establishment of the legal framework implies transaction costs, which in turn lead to sub-optimal market conditions. Substantive rational behavior is supposed to be limited by the practical difficulties of applying theoretically pure price signals. Herbert Simon first introduced this hypothesis of a procedural form of economic rationality in 1949[15]. In this perspective, the market becomes only one collective decision making process among others. Individual market agents, whose capabilities are limited, organize themselves more effectively not so much through competitive markets, but rather by organized cooperation. The main argument, which sustains this behavior, refers to the considerable amount of uncertainty that surrounds any economic decision. If a perfect flow of information is not at hand, conditions for profit maximization are not given. Firms content themselves with « normal » profits within their own organizational patterns. This bounded » behavior leaves room for « voluntary agreements » in order to match targets such as decreasing emissions[16].

2.2. Organizations and contracts

The formulation of organizational models which explicitly take into account transactions costs refers not only to bounded rationality, but also to opportunism in human behavior

[13] Orillard, M. (1991) « Representation of decision making processes in a complex environment » in Revue Analyse de Système; No. 17, analyses this fact by a system analysis approach, which can also be seen as a fundamental reference to ecological economics.

[14] This approach goes back to the pathbraking analysis which is widely known as the Coase theorem (Coase, 1937). It is intensively discussed in the literature and has given raise to the instruments using emission trading (see e.g. Grubb, M.J. (1998): The Trading Mechanism of the Kyoto Protocol: Core issues in Implementation » in Review of European Community and International Environmental Law, July

[15] The initial reference is Simon, H.A. (1947) Administrative Behavior, New York: Macmillan. The distinction between substantive and procedural rationality is made later (see e.g. Simon, 1976).

[16] The definition of « voluntary agreements » is still vague (see e.g. Barde, J. -P., Opschoor, J.B. (1994) From Stick to Carrot in the Environment, The OECD Oberserver, No 186). If an agreement between the firm and the government on a pollution base line can be binding, the voluntary aspect concerns more the free choice of the instrument. How to achieve the target is left to the firm.

(Willamson, 1985)[17]. This opportunistic behavior leads to strategies, which quickly adjust to new forms of regulations in order to operationalize the concept of sustainable development. These new regulations concern not only economic instruments, but also technology and social policies. The combination of these different instruments clearly responds to the three objectives contained in the concept of sustainable development.

The first objective is defined in terms of economic efficiency, which can be best achieved by economic instruments. The second concerns the ecological efficiency, which can be addressed by a technological policy or economic instruments. The third objective deals with social justice, which is mainly handled by policies of income and wealth distribution. According to the possible combinations of these different instruments, the behavioral adjustment process may take place in different institutions.

The social institution of the market uses price signals. Other social institutions like the firm, the government or non-government organizations use different signals, such as change in the organizational pattern, in legislation or in internal guidelines. Therefore, the transaction cost approach in a broader sense is not restricted to the market, but also takes account of transactions that occur in public and private bureaucracies.

As frictions accompany any transaction, the resource allocation system has to refer explicitly to the cost of running the system. In this sense, the system has the meaning of a specific collective decision-making process, leading either to correcting markets or bureaucracies. In this perspective, contracts are central to the transaction cost approach. They reflect intended strategies of the contractors, which are characterized by bounded as well as by opportunistic behavior[18]. Contracts are not only subject to markets, but also to influences from politicians, special interest groups and the civil service. In any case, they imply different kinds of transaction costs.

Therefore, transaction costs can be defined in different ways and concern different forms of economic relations. They are all bound to specific institutional arrangements. Our definition of transaction costs is twofold. On the first stage, we refer to the classical and narrow definition of Coase (op.cit.), which defines this concept by describing only the costs of making the price system of the market work. They are strictly related to an exchange taking place on the market, but they concern not only the legal framework within which the market transaction occurs (e.g. contracts and competition policy) but also the cost for market-makers, who operate as intermediates between supply and demand. If the economic agents judge all these transaction costs, which are involved with the functioning of the market to be too high, they seek non-market arrangements. Therefore, we use, at a second stage, the transaction cost approach in order to describe

[17] For recent developments of organizational theories of the firm based on a transaction cost approach, see e.g. Dietrich M. (1994) Transaction Cost Economics and Beyond, London, New York: Routledge

[18] Opportunistic behavior is fundamental to a transaction cost approach. As M. Moschandreas writes: « Failure to admit that individuals in positions of authority may exploit authority relations opportunistically implies that systems are designed without safeguards against subordinate exploitation leading to inefficiencies » (Moschandreas, 1997, p. 39)

the costs, which occur in the different institutional arrangements. The latter sustain any economic transaction, even those, organized outside the market. Therefore, in using the concept of transaction costs, we can take account of an exchange, which takes place within the organizational pattern of a firm. As all instruments of environmental protection also need an institutional support, they are accompanied by transaction costs, which differ from one instrument to another. The evaluation of the transaction costs becomes part of the policy decision. However, this evaluation raises many conceptual problems, mainly due to the different answers given to the following question:

3. What are transaction costs?

D.W. Allen (1991) who also gave his own answer, first raised this question. According to him, transaction costs only exist in a black box. Therefore, definitions of transaction costs are vague[19] and concern all the costs involved in an exchange, namely in using the market as a decentralized decision making process. They put the market model in a concrete context. They contribute to the basic idea that the market is a social construction bound to institutional arrangements.

In the tradition of the pure theory of international trade, these arrangements concern exclusively the transport cost involved in bringing supply and demand together. The related metaphor due to Charles Kindleberger is the trade of coal, where part of it is consumed in transport by the engine[20]. The difference between produced and finally supplied coal is evaluated by the equilibrium price of the coal market, where the concrete conditions of delivery, such as C.I.F. (cost, insurance, freight) or F.O.B. (Free on board) is part of the contract[21]. Therefore, the contract between the buyer and the seller includes an explicit evaluation of the transaction costs involved in an exchange.

Transaction costs inherent to the market mechanism are also relevant to instruments designed in order to correct market failures. Environmental protection, which is rooted in the tradition of market failures, raises at least three types of transaction costs due to information, negotiation and uncertainty (Coase, 1937).

3.1. Information costs

The simple market model implies perfect information about the conditions of the exchange, the nature of the good and service traded and the intention of all participants. These conditions are rarely found in practice. On an operational level, all markets are

[19] The literature proposes many classifications, which are usefully discussed by North D.C. (1998)

[20] This definition of transaction cost can be found in one of the most successful textbooks in international economics (e.g. Kindleberger, Ch.P., Lindert, P.H. (1982), International Economics, Homewood, Illinois: Irwin series in economics, 7th edition

[21] This way of evaluating transport costs in monetary terms has also inspired a method for the evaluation of environmental goods, namely the travel cost technique.

characterized by a lack of information. Moreover, information is asymmetrically distributed.

However, all information cost cannot be considered as transaction costs in the traditional and strict sense, because they may exist completely independent of any exchange. The information about characteristics of goods and services, for example implies a cost, which exists in its own right. For the policy recommendations in conformity with the market, only the information costs related to the price mechanism are taken account. They have consequences, which may be of crucial importance for the implementation of all economic instruments, which are designed in conformity with the market model. In a setting of asymmetric information, it is conceivable that competition leads to a decline in quality (Akerlof, 1970).

This theoretical result has led to quality control and to standard setting, based on criterion, which are comparable at the international level, such as ISO norms[22]. Economic incentives are now completed by international norms. Though not yet widely applied, these norms are at least accepted in principle. They are usually set through a negotiation process between different actors, which again are bound to asymmetric information, as far as knowledge of the best available technique is concerned.

However, in spite of the existence of ISO norms, multinational firms are tempted to introduce their own norms in their internal.structure. Clearly, environmental standards are a command-and-control policy and have, in spite of their different and somewhat opposing background, a complementary nature to market incentives. They also cause transactions costs, which are difficult to evaluate. If the firm applies internal norms more stringently than ISO-norms, it evaluates the transaction costs of the latter higher than the former.

The question, of who sets the norms, can be simply answered when the existence of different transaction costs according to the concrete context in which the decision is made, is explicitly factored into account. If the associated transaction costs on the market are lower than those caused by the firm, the government sets the norm to change the institutional context of the market. Otherwise, it is the firm who decides on the norms, to which it will refer.

Because of the fact that we define transaction costs as twofold, quality standards set by an international board operating outside the firms, may not be applied. The first type of transaction cost is that caused by the process of defining the standards (Williamson, op. cit.). It is at the origin of what one may call an insider-outsider problem. If the insider

[22] ISO-norms in the field of environmental management refer to the concept of total quality control (TQC) systems. In stead of inspecting or monitoring quality after the production, TQC is part of the process and contributes to decrease transaction costs. For a in-depth discussion, see e.g. Feigenbaum, A.(1983), Total Quality Control, New York: McGraw-Hill

decision is less costly in terms of transactions, the outsider decision will not be implemented in operational terms[23].

Such a situation raises the problem of the reinforcement of norms. Therefore, the second type is linked to transaction costs involved in the control and the application of the norms. This immediately leads to the question of how independent the instance of control can be. If this instance is situated inside the firm, the respect of norms is based on a voluntary agreement, which is not bound to an outside procedure of norm certification. Again, the involved transaction costs are lower than those resulting from an independent instance of control outside of the firm.

Quality control made necessary by information costs in turn cause other transaction costs, which finally decide between insider-outsider solutions for the firm. Outside the firm, these decisions are made either in the market place, by government on the executive or legislative levels, or by public administration in general. In any case, they are the result of negotiation process between private and public actors. This process also generates costs.

3.2. Negotiation costs

The market mechanism can be analyzed in legal terms. Supply and demand are expressed by a contract of selling or of buying. The negotiation process not only includes the search of a price agreement, but also conditions of exchange such as cost, insurance, freight and financing. As far as the price agreement is concerned, negotiation costs depend on the prevailing market structure. In perfect competition, the market itself takes care of this process and the negotiation costs are only due to the competition policy. In the more realistic situation of imperfect competition, this process also includes bargaining and is determined by the power play of the different actors. This opens the door to a political analysis of market behavior.

As environmental policy based on the principle of internalization not only changes the price, but also the other conditions of the contract and its institutional context, it always has a political dimension. Therefore the crucial question is not only what kind of instrument should be implemented in order to protect the environment, but how to improve the functioning of the economy by an institutional rearrangement.

The theoretical definition of efficiency refers to optimal conditions from a perspective of general interest. In practice, the observed conditions are always sub-optimal and leave room for other interpretations of economic efficiency, namely those made by the agents. This aspect was raised in the literature before the environmental debate gained

[23] This conclusion has been formalized in a model of interactions linking four agents, namely, firm, state, community and market, which explicitly takes account of transaction costs in some selected developing countries. Though the classification for these costs are not the same, as we use in this article, the authors sustain our view « that the traditional emphasis on « appropriate instruments », while ultimately correct, is premature because most developing country agencies have too many information and transactions cost problems to implement any instruments in a comprehensive manner », Afsah, S., Laplante, B., Wheeler, D. Controlling Industrial Pollution: A New Paradigm », Policy Research Working Paper No 1672, Washington: The World Bank, Policy Research Department, p.12

momentum (Simon, op. cit.) and originated from an inquiry into the nature of the firm (Coase, op. cit.). In the light of this rather historical debate, we are confronted with two different models of resource allocation: the market and the firm. Both are also seen as social constructions, in the sense that they imply specific and different institutional arrangements.

In both cases, we are confronted with negotiation costs. Those inherent in the functioning of the market must be evaluated in the light of those arising by the administration of the firm. The first type of negotiation costs increase as a function of the importance of market failures, the second may be considered as a function of the size of the firm.

If the transaction costs of the market are low, economic incentives are at the forefront of the policy discussion. Government intervention seeks then to correct the market by techniques that internalize the external costs[24]. Therefore, the agents on a national level also favor the public solution outside of the firm. Ecological tax reforms and emission trading find public support. However, on an international level the interdependence of governments adds to the transaction costs of the market, the negotiation costs occurring in the process of international cooperation. This additional aspect can be at the origin of the next step of our argument.

If the agents evaluate the negotiation costs of the concrete functioning of international markets as higher than the administrative costs which occur in running the internal organization of the firm, the institutional framework in which environmental policy is implemented is likely to be the private insider solution. Voluntary agreements have a better chance of being implemented than market based instruments[25]. Finally, if high internal administrative costs within the firm are involved, any strategy becomes difficult to be implemented. The markets may then remain unchanged and firms continue to maintain their internal organization.

3.3. Uncertainty costs

In existing markets, uncertainty costs are supposed to be lower than in new ones. This fact is a strong argument for maintaining the status quo and not implementing any environmental protection policy. However, for both technical and normative reasons, society also solves the allocation problem through non-market transactions. Applying the concept of transactions only to markets, firms and government fails to account for

[24] However, as a case study in India has shown, state intervention has to assure first pre-conditions for the running of the economic system. One of these preconditions is the availability of infrastructure. Gnanadesikan, K. (1995), « The Role of Government in Adjusting Economies, Sustainable Infrastructure Development: A Transaction cost Approach to Water Supply Systems in Tamilnadu, India », National Reports Collection, British Library, Birmingham U.K.: Development Administration Group, School of Public Policy, University of Birmingham

[25] This conclusion is discussed in detail in a paper, which «... assesses the ability of the voluntary agreement's burden sharing scheme based on inter-firm bargaining to minimize transaction costs Glachant, M. (1996), The Cost Efficiency of Voluntary Agreements for Regulating Industrial Pollution: a Coasean Approach, Paper presented at the International Conference on the Economics and Law of Voluntary Approaches in Environmental Policy, Venice, November, p.2

missing markets. The current situation has already lead to other forms of economic regulation. For the environmental debate, third sector research is becoming increasingly important, because of the importance of non-governmental organizations in promoting environmental concern. The future situation will be influenced by newly constructed markets, which may be created in environmental goods through an institutional design which includes definition of new property rights, contracts and liability rules.

Uncertainty costs are the consequence of the time-horizon involved either for the application of the existing institutional arrangements, or for new ones, which are not yet operational. Again, these institutional arrangements concern the whole economy, the market, the public and the third sector.

The longer the time horizon, the more risk and uncertainty will count as additional transaction costs[26]. The usual distinction between risk and uncertainty is due to the attribution of probabilities. Risk can be defined in terms of systematic probabilities and is therefore insurable; uncertainty is not. The transaction cost related to risk, is the insurance cost; the one related to uncertainties is social cost for the government and hence for the taxpayer, who is the insurer of last resort.

The stretching of the time horizon, which increases transaction costs, makes it even more difficult to clearly define the information and negotiation costs. In some form, contracts take into account risks and uncertainties. Financial agreements have the interest rate at their core - for environmental issues, it is mainly the fixing of the social discount rate which is at stake – and include a risk premium, which is not always explicitly mentioned. Therefore, the longer the time-horizon, the less precise the conditions of contracts.

This difficulty of less precise contracts in the longer run is one of the major problems in any environmental policy design[27]. It leads to a process of negotiation, which accompanies the whole period of the contract. But if some of the contractual conditions remain imprecisely formulated, they are not insufficiently binding for the parties. Contracts thus become more a framework for an intended agreement, to be developed incrementally. A procedural approach to policy-making is becoming of importance. Transaction costs are increasingly involved in control and monitoring mechanisms for the execution of the contract. This trend has two major consequences. The first deals with moral hazard, the second with the legal implications.

Moral hazard occurs mainly due to the inability of an insurer to define his own risks. He is therefore tempted to share his risks with a large number of agents, which raises a free

[26] The stretching of the time-horizon is one of the important characteristics of the environmental debate and has one of the most striking consequences for any policy-design, which has to take account of supplementary transaction costs (see e.g. Knight, F. H. (1924) "Some Fallacies in the Interpretation of The Quarterly Journal of Economics, Vol. 38)

[27] Less precise contracts also raise a problem of fairness, (see e.g. Frohlich. N., Oppenheimer J. (1998) "Solving Collective Action Problems Fairly: Puzzles in Policy Design", Loehman, D.T., Kilgour, D.M., editors, Designing Institutions for Environmental and Resource Management, Cheltenham, UK, Northampton MA, USA" Edward Elgar)

rider problem. The problem has its own costs and is crucial to environmental protection policy. The link between this problem and the environment has been already recognized at the early stage of public awareness, but the operational implications for policy making remain difficult to evaluate (e.g. Hardin, 1968). At the same time, adverse selection linked to asymmetric information may lead to concentrate negative risks on one insurer, who is more likely to be situated in the public than in the private domain. This trend is mainly due to the increase of highly risky situations for which the probabilities are poorly established. Of course, it also leads to increased uncertainty costs.

From a legal standpoint, control and monitoring systems have a strong normative content, which implies a device for weighting the different special interest groups. This "weighting procedure"- mainly left to international law -, is also bound to the time horizon. Decisions based on economic rationality in the short term may change over time such that the opposite becomes rational. The energy sector for example. and its related special interest groups eloquently illustrates such a change.

One of the major conclusions resulting from this kind of uncertainty is that transaction costs are a dynamic and volatile concept[28]. Decision-makers not only take them into account at the very moment of their decision, but also in anticipating future costs, namely in terms of the long ranging consequences of their decision and the related procedures. As in environmental protection, the time horizon is very long and consequently uncertainty costs are high. They may even paralyze the decision making process right from the beginning. This situation may occur in any of the above-mentioned insider-outsider solutions to policy making. It explains why the status quo is still evaluated by many stakeholders as less costly than change induced by environmental protection policy.

3.4. Indirect and contextual costs

Transaction costs grouped into the three categories discussed, are strictly related to the market mechanism. The distinction between information, negotiation and uncertainty costs has been made by Coase (1988). Our proposal to extend this typology beyond the market, in order to obtain priority setting in the decision making process, has shown that the concept of transaction costs can have a broader meaning. This extension is of particular interest to the sustainable development debate and is important in the two following directions. One extension of the transaction cost debate can be made in the direction of issues of income and wealth distribution, another one in the direction of new institutional arrangements[29]. In this sense, costs in the form of implementing a social policy dealing with equity issues, as well costs in the form of adjusting existing or creating new institutions, are indirect transaction costs.

[28] It can be theoretically demonstrated that "... in the presence of transaction costs and uncertainty the initial allocation of permits may not be neutral in terms of efficiency."(Montero, 1997, p. 27)

[29] R. Luken showed how new institutions are combined with economic instruments, e.g. permits, as part of a consistent regulatory program (Luken, A, R. (1992) Efficiency in Environmental Regulation, A Benefit-Cost Analysis of Alternative Approaches, Boston, Dordrecht, London: Kluwer, Studies in Risk and Uncertainty, second printing

On the theoretical level, issues of income and wealth distribution are usually kept distinct from the functioning of the market. These issues are analyzed by welfare theory, while the functioning of the market is addressed by micro-economic theory. Welfare theory discusses the different criterion that can be used to answer the question of whether respect distribution of income and wealth is an endogenous factor of economic growth or not. We are confronted with two main and somewhat conflicting ideas. The first one promotes growth and distributes the product only post production[30]. The second one interprets a distribution of income and wealth, which is considered as fair by a majority of citizens, as an integral part of the growth process. Instruments of environment protection have an impact on income and wealth distribution and hence on the economic growth process itself[31]. Therefore, they have to be completed by a distinctive social policy, which often takes the form of subsides, financial and technological transfers. Conceptually, these complements induce indirect transaction costs. They arise whenever the relative price changes induced by an economic instrument have a strong exclusion effect. Exclusion is contrary to the requirement of equity, and has to be corrected for by different instruments than that applied to reduce pollution.

Therefore, we are always confronted with several objectives. The ecological and economic objectives involve direct transaction costs in so far as policy recommendations are in conformity with the market. The social objective involves indirect transaction costs. All of these objectives are related to collective decision making mechanisms, which includes the firm, the market, the third sector and the State.

According to Tinbergen's rule, we need as many instruments as objectives (Tinbergen, 1952). If several instruments affect several objectives, the effectiveness of the instruments should decide their attribution. The instrument which affects one objective the most should be attributed to it. The concept of sustainable development clearly contains three objectives in terms of ecological, economic and social efficiency. In this perspective, industrial policy for example. can be attributed to the ecological objective. Economic instruments are the preferred policy option to correct market failures. Subsidies, technological and financial transfers are instruments, which contribute to achieving social objectives. As all these objectives are inter-linked, the choice of the appropriate combination of instruments can raise conflicts. Therefore, such a choice can only be made on political grounds.

In order to apply these guidelines to concrete and operational situations of policy making, changes to the prevailing institutions in place are necessary. These contextual changes

[30]This idea is forcefully expressed by neoclassical theory assessing that "more is better than less" (see e.g. Goldin, I., Winters, L. A. (1995) "Is growth sustainable?", Goldin, J., Winters, L.A., editors, The Economics of Sustainable Development, OECD, Center for Economic Policy Research: Paris

[31] Issues in income and wealth distribution are clearly part of normative economics. They can only be settled on normative grounds. Value judgments are in the domain of politics which strongly interfere with any economic policy design (see e.g. Roemer J. (1996), Theories of Distributive Justice, Cambridge, Mass.: Harvard University Press).

may intervene by way of the legal framework, the monitoring and control mechanism or newly designed institutions. Therefore, they are at the origin of indirect transaction costs and are not only a precondition for the implementation of any chosen policy option, but also a condition for further institutional adjustments, once the initial changes became effective. The need to adjust existing institutions or to create new ones may gradually become apparent.

Table 1: Attribution Rules of Policy Options for Environmental Management[32]

Decision-making Mechanism	Policy option	Dominant Transaction Costs (other than administrative costs)	
		Direct	**Indirect**
Firm	Voluntary Agreements	Negotiation Costs	Distributive Costs
Third sector	e.g. Non Governmental Action	Information Costs	Contextual Costs
Government	Command-and-Control	Information and Negotiation Costs (Standards, Norms)	Institutional Costs
Market	Incentives	Uncertainty Costs (Property Rights, Contracts)	Distributive and Contextual Costs
Status quo	« Business As Usual »[33]	Unchanged	Unchanged

The social and contextual costs are very difficult to evaluate. Nevertheless, they influence the choice of policy options, which is in reality broader than that emerging from the theoretical debate. This debate strongly recommends the promotion of market-based instruments. The explicit reference to direct and indirect transaction costs weakens this recommendation and opens the view to a large combination of instruments which also implies a collective learning process. By a process of trial and error procedures, decision-makers have to discover the optimal policy-mix by themselves. Table 1 illustrates some of the possible combinations and summarizes the policy options for environmental management in accordance with the main collective decision-making process.

[32]Table 1 summarizes the main arguments, which we discussed in this paper. Therefore, it is not complete, but presents only the most important links we made between the different instruments and the involved transaction costs.

[33] After the Kyoto Protocol, which has a clear symbolic value in making clear to all stakeholders that « business as usual » is no longer possible, this policy option is only mentioned for comparison.

4. Policy mix and transaction costs

In a recent European Study in Human Dimensions, a new approach to climate policy is put forward (Jaeger and al., 1997). The authors

> « argue that this approach should consist of putting into place a process of sequential decision-making, which is flexible, innovative and participatory. Such a process could lead beyond existing alternative of taxation and regulation as defined by a seemingly omniscient political authority. Its rationale lies in the recognition of a « cost barrier » which can be surmounted by the combination of patient multilateral negotiation, innovative business initiatives and resonance with public opinion ».[34]

In order to achieve this goal, any policy mix has to be considered in its social context. Only once it is clear what kind of institutional arrangements are necessary for the different instruments to work, can the efficiency of a policy mix be translated into practical applications. These preconditions to the implementation of environmental protection policies can be observed at either the national or international level.

4.1. National guidelines

From a national point of view, the existence of transaction costs leads to institutions that combine several elements of a regulatory program (e.g. Luken, op. cit.). Such a program includes standards, economic instruments, monitoring of compliance and an institution controlling the program. This program raises serious coordination problems between several public departments in charge of the environment. Traditionally, competencies in different offices have lead either to a single office, which has the task of coordination, or to a new office uniting the existing disparate organizational components. Neither of these two administrative arrangements have succeeded in combining economic and environmental policies. In most of the OECD countries, public administration still carefully separates the two (OECD, op. cit.).

Implementing economic instruments on a national level also leads to important financial flows, which require a specific institution for fund management. Is this perspective strong enough to promote an environmental bank independent both from the existing central bank and the public administration? Independence from public administration is necessary to strengthen the incentive, rather than the fiscal aspect of the economic instruments. Independence from the central bank is needed, to avoid interference with the monetary policy. It will be of crucial importance for an ecological tax reform, if such new institutional arrangements are clarified before the introduction of new taxes.

The political institutions and prevailing practices of consulting different actors concerned by the program mainly provide the participatory element. However, recent political experiences with environmental assessment studies, show that the usual multi-criterion analysis needs to be completed by new forms of participation, which do not necessarily fit into the established political rules.

[34] Quoted from Global Change Abstracts, the Swiss Contribution, ProClim, Forum for Climate and Global Change, Swiss Academy of Science, 98/1, p. 59

However, all these features are related to a legal framework, which in turn has to clarify the procedures of the contracts involved[35]. In the case of opposing special interest groups for example, the judge ultimately has to settle the weighting of the different arguments at stake, but his action is limited to the national jurisdiction.

4.2. Reform of international institutions

The international jurisdiction is subject to economic cooperation between sovereign states. The main institutions in this field reflecting intention to reconstruct an institutional order of free international trade and open capital markets post World War II. This order is based on three main pillars: WTO for free trade in goods, services and property rights; IMF for the international monetary system; and The World Bank for development. It has not explicitly taken account environmental issues. Therefore, the necessity of revision of the Trade and Environment Agenda is rarely contested[36]. However, an agreement on how this reform should occur remains elusive. Before any instrument for environmental protection can be implemented on the international level, the institutions of international cooperation must be critically evaluated according to two options.

The first one is the reform of the existing organizations. At the forefront of the discussion is to open the WTO to the environmental agenda. The implementation of this option is perhaps the nearest at hand, but is ambiguous. The argument for environmental protection can easily be used as a protectionist argument against trade. Economic instruments of environmental protection are then clearly adding to the existing and traditional transaction costs, which WTO seeks to reduce by definition.

The second option accepts that the prevailing architecture of international cooperation is no longer sufficient because of the dramatic change of initial conditions. Therefore, a profound reform of these institutions is necessary[37]. The reform will be based on an operational concept of sustainable development. The existing three pillars of the prevailing economic world order are redesigned according to the three dimensions of sustainable development. One pillar supports the social dimension in promoting distributional and equity issues. The economic dimension in setting non-discriminatory rules for international trade concerns constitutes another pillar. The third pillar focuses on the ecological dimension, which should be a new international institution outside the current organizations.

[35] A complete account for new institutional arrangements is given in Loehman, D.T., Kilgour, M.D. editors, (1998), Designing Institutions for Environmental and Resource Management, New Horizons in Environmental Economics, Cheltenham UK, Northhampton MA, USA: Edward Elgar, namely Chapter 3 by Stanley Reiter, "On Coordination, Externalities, and Organization"

[36] This impression has at least dominated the International Conference organized by Bellerive Foundation and Global International, in Geneva, March 1998 (Aga Khan, S., editor (1998), Policing the Global Economy, Why, How and for Whom?, London: Cameron May Ltd.

[37] We exposed this sketch of reform in Burgenmeier B. (1998) in Aga Khan (1998)p. 116-121

In terms of transaction costs[38], this new architecture minimizes distributive and contextual costs in the first pillar, uncertainty costs in the second and negotiation and information costs in the third pillar.

5. Conclusion

A transaction cost approach to the policy mix for environmental protection helps us to conceptualize the debate about the appropriate policy mix. This debate cannot be lead without clearly defining the institutional framework that supports any policy making in practice. Moreover, economic instruments cannot be exclusively linked to the market, but must be combined with other policy instruments. Each stakeholder finds this combination itself according to the related transaction costs involved. In this perspective, competitive markets are analyzed in the light of private and public organizations. Organization theory looms in the background in the form of firm behavior, and finds expression through voluntary agreements. It also can contribute to explain action of public administrations and of non-governmental organizations.

The transaction cost approach is the result of a theoretical debate. In order to introduce it in the ongoing policy debate, a considerable amount of empirical work should be done. Transaction costs of each instrument involved in the policy debate are not yet empirically well grounded. With the exception of some pioneering work in this field[39], there is an important research agenda ahead, which has to carefully examine the institutional design of each instrument in the light of the associated transaction costs.

[38] Rogers D. Congleton has not only analyzed negotiation costs in the natural sequence of international negotiations, but also the problem of enforcing environmental treaties (Congleton, 1994)

[39] See e.g. Dudek, D. J., Wiener, J. B. (1996), Joint Implementation, Transaction costs, and Climate Change, Paris: OECD and Gangadharan, L. (1997), Transactions Costs in Tradable Emission Markets: An Empirical Study of the Regional Clean Air Incentives Market in Los Angeles, Research Paper No. 591, Victoria AUS: The University of Melbourne, Department of Economics

6. References

Afsah S., Laplante, B., Wheeler, D., (1996) « Controlling Industrial Pollution: A New Paradigm », Policy Research Working Paper No 1672, Washington: The World Bank, Policy Research Department

Aga Khan, S., editor (1998), Policing the Global Economy, Why, How and for Whom?, London: Cameron May Ltd.

Akerlof, G.A. (1979) « The Market for Lemons: Quality Uncertainty and the Market Mechanism », Quarterly Journal of Economics, Vol. 89

Allen, D.W. (1991) « What are transaction costs? », Research in Law and Economics, Vol. 14

Baranzini, A., Batruch, C. Grubb, M. and Perkaus, J. (with the collaboration of E. Haites (1998), « International Emission Trading under the Kyoto Protocol: Rules, Procedures and the Participation of Domestic Entities », Background Paper CC98/PD02/04, International Academy of the environment (AIE), Geneva

Barde, J. -P., Opschoor, J.B. (1994) « From Stick to Carrot in the Environment, The OECD Oberserver, No. 186

Boulding, K.E. (1968) The Organizational Revolution, Chicago: Quatrangle Books

Burgenmeier, B. (1994) « Environmental Policy: Beyond the Economic Dimension », B. Burgenmeier editor, Economy, Environment, and Technology, A Socio-economic Approach, Armonk, New York: M.E. Sharpe Inc.

Coase, R.H. (1937) « The Nature of the Firm », Economica, No.1, Vol. 2

Caron, A. (1998) Une relecture coasienne du « problème du coût social », PhD Thesis, University Paris I- Panthéon-Sorbonne, unpublished manuscript

Congleton, R. D. (1994), "International Institutions for Environmental Protection: Transactions Costs and Environmental Treaties, Economies, Energy, Environment, Milan: Fondazione Eni Enrico Mattei

Dudek, J.D., Wiener, J.B. (1996), Joint Implementation, Transaction Costs, and Climate Change, Paris: OECD

Frohlich, N., Oppenheimer J. (1998) "Solving Collective Action Problems Fairly: Puzzles in Policy Design", Loehman, D.T., Kilgour, editors, D.M. Designing Institutions for Environmental and Resource Management, Cheltenham, UK, Northampton MA, USA" Edward Elgar)

Gangadharan, L (1997) @Transaction Costs in Tradable Emissions Markets: An Empirical Study of the Regional Clean Air Incentives Market in Los Angeles, Research Paper No 591,Victoria, AUS : The University of Melbourne, Department of Economics

Gnanadesikan, K. (1995) « The Role of Government in Adjusting Economies, Sustainable Infrastructure Development: A Transaction Cost Approach to Water Supply Systems in Tamilnadu, India », ISBN No., Birmingham U.K.: Development Administration Group, School of Public Policy, The University of Birmingham, National Reports Collection, British Library

Glachant M., (1996), The Cost Efficiency of Voluntary Agreements for Regulating Industrial Pollution: a Coasean Approach, paper presented at the International Conference on the Economics and Law of Voluntary Approaches in Environmental Policy, Venice, November

Goldin, I., Winters, L. A. (1995) "Is growth sustainable?", Goldin, J., L.A. Winters, editors, The Economics of Sustainable Development, OECD, Center for Economic Policy Research: Paris

Grubb, M.J. (1998): The Trading Mechanism of the Kyoto Protocol: Core Issues in Implementation », Review of European Community and International Environmental Law, July

Hardin, G. (1968), « The Tragedy of the Commons », Science, No162

Hodgson, G. M. (1993), Economics and Evolution, Bringing Life back into Economics, Oxford: Polity Press in association with Blackwell Publishers

Jacquemin, A. (1987) The New Industrial Organization, Market Forces and Strategic Behavior, Oxford: Clarendon Press

Jaeger, C.C., Barker, J. Edenhofer, O., Faucheux, S. Hourcarde, J.C., Kasemir, B., O'Connor, M. Parry, M., Peters, I., Ravetz, J. Rotman, J. (1997), « Procedural leadership in climate policy: a European Task », Global Environmental Change Human and Policy Dimensions, V7, N3, October

Kindleberger, Ch. P., Lindert, P.H. (1982), International Economics, Homewood, Illinois: Irwin Series in Economics, 7th edition

Knight, F. H. (1924) "Some Fallacies in the Interpretation of Social Cost", The Quarterly Journal of Economics, Vol. 38

Lipsey, R.G. and Lancaster, K. (1956), « on the General Theory of the Second Best », Review of Economics Studies, No 1

Loehman, E.T., Kilgour, D.M. editors, (1998) Designing Institutions for Environmental and Resource Management, New Horizons in Environmental Economics, Cheltenham, UK, Northhampton MA, USA: Edward Elgar, general editor W.E. Oates

Lukens, A. R. (1992), Efficiency in Environmental Regulation, A Benefit-Cost Analysis of Alternative Approaches, Boston, Dordrecht, and London: Kluwer, Studies in Risk and Uncertainty, second printing

Montero, J. - P. (1997), "Marketable pollution permits with uncertainty and transaction costs", Resource and Energy Economics, 20

Moschandreas, M. (1997) « The Role of Opportunism in Transaction Cost Economics », Journal of Economic Issues, Vol. 31, No. 1, March

North, D. C. (1990), Institutions, Institutional Change and Economic Performance, Cambridge: Cambridge, University Press, Political Economy of Institutions and Decisions series

North, D. C. (1998), « Transaction costs through time », C. Menard, editor, Transaction Cost Economics, Recent Developments, Cheltenham UK, Brookfield, US: Edward Elgar

OECD (1997), Evaluating Economic Instruments of Environmental Policy, Paris: OECD

Orillard, M. (1991) « Representation of Decision making Processes in a complex Environment », Revue Analyse de Système, No. 17

Pearce, D.W., Cline, W.R., Achantga, A.N., Fankhauser, S., Pachauri, R.K., Tol, R.S.J. and Vellinga, P. (1996) « The Social Costs of Climate Change: Greenhouse Damage and the Benefits of Control », in IPCC, « Climate Change 1995, Economic and Social Dimensions of Climate Change », Contribution of Working Group III to the second Assessment Report, New York: WMO and UNEP, Cambridge University Press

Pigou, A.C. (1918), The Theory of Welfare, London: Macmillan

ProClim, Forum for Climate and Global Change (1998) Global Change Abstracts, The Swiss Contribution, No 1, Bern: Swiss Academy of Sciences

Ridley, M. (1998), Lowering the cost of emission reduction: Joint Implementation in the framework of the Convention on Climate Change, Boston, Dordrecht, London: Kluwer Academic Publishers

Roemer, J. (1996), Theories of Distributive Justice, Cambridge, Mass.: Harvard University Press

Simon, H.A. (1947), Administrative Behavior, New York: Macmillan

Simon H. A. (1976), « From substantive to procedural rationality », in Methods and appraisal in economics, S. J. Latsis, editor, Cambridge: Cambridge University Press

Tinbergen, J. (1952), On the Theory of Economic Policy, Amsterdam: North Holland

Williamson, O.E. (1985), The Economic Institutions of Capitalism, New York: Macmillan