



Transaction costs and environmental policy design

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ABSTRACT

This article synthesizes the growing empirical literature on transaction costs to identify pragmatic design recommendations for environmental and natural resource policies. The New Institutional Economics literature recognizes that appropriate policy choice and design will be a function of the specific characteristics of the problem. The physical and institutional determinants of both transaction costs and abatement costs should be considered in the policy design process due to potential interactions between them. Analysts also need to incorporate the extent to which the technologies, institutional environment, governance structures, or policy designs can be changed; some factors can only be adjusted to or “designed around” while others can be designed differently. This framework highlights the importance of property rights since transaction costs will be incurred to obtain or retain property rights and since the rights assignment may affect both the magnitudes and distribution of costs. Another implication is that education and extension programs or use of behavioral economics concepts to affect choices can be cost-effective in some circumstances. Policy design should take advantage of economies of scale and foster technical change. Appropriate sequencing of policy instruments may decrease transaction costs, particularly if there is potential for technical change.

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1. Introduction

For some environmental and natural resource issues, it is difficult to model cause and effect, the problem definition may change over time, and there may not be consensus about the policy goal. Examples of these so-called “wicked” problems include climate change, nonpoint source pollution, water resource scarcity, and biodiversity conservation. [Batie \(2008\)](#) contrasts these with tame problems that are well-defined, do not require stakeholder input, and can be solved by using the normal scientific methods of a discipline, e.g., creating a new vaccine. For wicked problems, improving the situation rather than coming up with an optimal solution, is what is realistic ([Batie, 2008](#)).

Design of policies and economic instruments is a relatively neglected area in applied economics according to [King \(2012a,b\)](#), and he has therefore encouraged applied economists to devote more attention to this task. While environmental economists have examined design issues regarding the incentives for, and costs and benefits of abatement (e.g., [Aldy et al., 2010](#); [Zilberman and Segerson, 2012](#)), there is relatively little literature on transaction costs¹ and design of environmental policies. However, transaction costs should be a key consideration in policy

design, especially for wicked environmental and natural resource issues, which are likely to entail high transaction costs. For example, examining several studies of the transaction costs of agri-environmental policies, [McCann et al. \(2005\)](#) found that transaction costs borne by public agencies were about 30% of the total costs of the programs. [Ofei-Mensa and Bennett \(2013–this issue\)](#) found that transaction costs per tonne of reduced CO₂ equivalent varied from \$2.5 to \$7.2, almost a three-fold difference. Reducing these costs by improving policy design is especially important given government budget deficits.

The objective of this article is to synthesize the growing theoretical and empirical literatures on transaction costs in order to identify recommendations for the design of environmental and natural resource policies. A broad and pragmatic approach is taken by incorporating insights from neoclassical economics, new institutional economics, and classical institutional economics to examine factors affecting both abatement/conservation costs and transaction costs of environmental policy. Examining both abatement costs and transaction costs is important due to potential interactions between them. Minimizing, or at least reducing, the sum of these costs for a given level of environmental quality, both in a static and dynamic sense, is the evaluation criterion used in this article.

The appropriate choice and design of a policy instrument will depend on the nature of the problem, both the physical and socio-economic context. Design of feasible policies requires consideration of the extent to which the technologies, institutional environment, governance structures, or policy designs can be changed. Some factors can only be adjusted to or “designed around” while others can be designed differently.

The next section briefly summarizes the neoclassical, new institutional and classical institutional perspectives on transaction costs and

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¹ The definition of transaction costs used in this paper is that of [Marshall \(2013–this issue\)](#) “Transaction costs are the costs of the resources used to (i) define, establish, maintain, use and change institutions and organizations, and (ii) define the problems that these institutions and organizations are intended to solve.” This definition expands on the definition in [McCann et al. \(2005\)](#) and thus is broad enough to examine the institutional environment ([North, 1990](#)).

their relevance for the design of environmental and resource policy. In the third section, physical factors that affect transaction costs and abatement costs are examined, beginning with those that are least amenable to change. The fourth section examines the effect of institutions, beginning with deeper levels such as culture. Fig. 1 presents the conceptual framework that is developed from the analysis of the physical and institutional issues. This framework will be referred to throughout the paper. The single dark arrows indicate factors that are important and also least amenable to change, i.e., laws of nature and culture. It shows that, while discussed in separate sections, there are interactions between physical and institutional factors, as indicated by arrows in both directions in the boxes (darker arrows indicate stronger effects). The concluding section provides a synthesis of insights that is then used to develop recommendations for the design of policy.

2. Alternative Perspectives on Transaction Costs and Environmental Policy Design

The institutional economics literature recognizes that there are different levels of institutions and institutional analysis with more superficial levels being nested within deeper levels. Ostrom (1990) discusses rules as nested in three levels, constitutional, collective choice, and operational. Williamson's (2000) paper examines four different levels of institutional analysis: (1) informal institutions, (2) laws and policies (similar to North's institutional environment), (3) governance structures or policy instruments, and (4) price effects. The nested institutional framework of Williamson has been used to look at water management institutions and to inform transaction cost measurement (Easter and McCann, 2010; McCann and Easter, 2004) and will be used in this paper. This section begins with the relatively superficial neoclassical treatment of transaction costs in environmental and natural resource policy analysis/design and proceeds to deeper levels of institutional analysis.

Transaction costs are increasingly being included in environmental policy design and policy analysis, often using a neoclassical framework (Cacho et al., 2013–this issue; Krutilla and Krause, 2011; McCann et al., 2005; Ofei-Mensa and Bennett, 2013–this issue; Stavins, 1995). These authors recognize that measurement of transaction costs is necessary in order for those costs to be included in policy analysis, along with the abatement costs and environmental benefits of the policy (Krutilla and Krause, 2011; McCann et al., 2005). Maximizing net benefits, rather than minimizing transaction costs is the goal, although the empirical work often uses a cost-effectiveness framework. Typologies of transaction costs have been developed to facilitate measurement but they may also enable researchers to think about design more effectively (McCann et al., 2005).

The New Institutional Economics (NIE) literature actually consists of several branches. Transaction cost economics (TCE), as developed by

Oliver Williamson (1985), primarily addresses the governance of market transactions for private goods in a developed country institutional context. Some recent literature (e.g., Bougherara et al., 2009; Boutry, 2011; Coggan et al., 2010) uses Williamson's concept of discriminating alignment to provide insights into environmental and natural resource issues. This literature usually ignores production costs (or abatement costs) to focus on transaction cost minimization. Coase's seminal paper (1960) on what has come to be known as Coasian bargaining over environmental impacts, explicitly examines the role of transaction costs in policy choice. Coase makes the point that the policy instrument chosen should depend on the nature of the problem. Under some circumstances, the assignment of property rights may enable the parties to negotiate an efficient amount of pollution. Yet another branch of NIE literature is that on collective action to resolve problems of common pool natural resource use, exemplified by the work of Elinor Ostrom (1990). Her work looks at the nature of the resource and also the social context to examine the persistence of collective action institutions. She also develops design principles for natural resource management institutions. Stallman (2011) uses Ostrom's framework to examine situations which may be amenable to collective action solutions. All three of these literatures recognize that appropriate choices, of governance structures or policies, will be a function of the specific characteristics of the problem.

Deeper levels of institutional analysis are especially relevant for the design of solutions to wicked problems (Batie, 2008). The role of the institutional environment in economic growth was examined by Douglass North (1990) and the classical institutional economics literature also addresses these fundamental issues. Classical (also referred to as old or original) institutional economics has also examined environmental and natural resource issues (e.g., Bromley, 1991; Schmid, 2004; Vatn, 2005) and it is mentioned in some seminal textbooks on environmental economics (Randall, 1981; Pierce and Turner, 1990). In this literature, property rights are an important concept affecting both the distribution and magnitudes of costs.

This brief overview and comparison of some of the literatures relating to transaction costs and institutions provide some background for readers who may not be familiar with these literatures, but a comprehensive review is beyond the scope of this paper. The rest of the paper incorporates useful concepts and insights from all of the literatures rather than being in the tradition of any single one of them. The next section examines a variety of physical factors that affect transaction costs as well as abatement/conservation costs.

3. Physical Factors Affecting Transaction Costs and Abatement Costs

It has been noted that prices reflect “the laws of nature and the laws of man”, partly due to scarcity (Hanley et al., 2001). Fundamental physical, biological, and technical factors will also affect abatement/conservation costs and transaction costs and thus should affect the choice

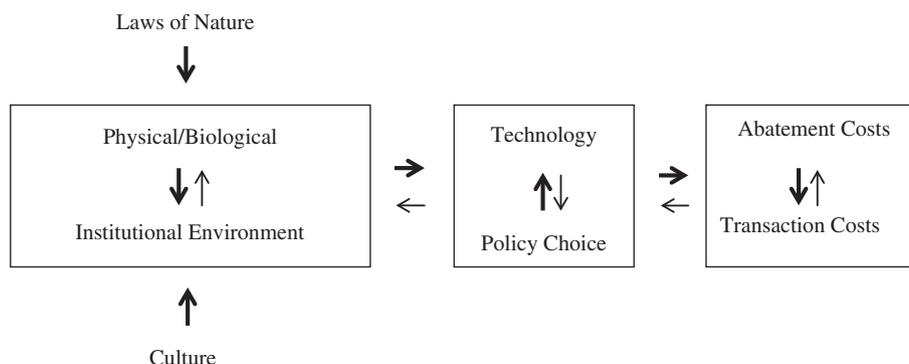


Fig. 1. Physical and institutional effects on transaction costs and abatement costs. Note: dark arrows indicate a stronger effect and arrows in both directions indicate potential interactions or feedback effects.

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