CHAPTER 5

Transaction Costs of the Kyoto Mechanisms

5.1 Introduction

International permit trading under IET Article 17 ranks first in the economic hierarchy of the Kyoto Mechanisms. In the previous two chapters we have nuanced the economic hierarchy of the Kyoto Mechanisms by showing that permit trading is not as environmentally and economically superior to credit-based approaches as neo-classical economics suggests when institutional factors are taken into account. This is part of the explanation why permit trading is less politically acceptable than economists would expect. Although politicians, in particular from industrialized countries, have become less opposed to emissions trading over time and start to develop experimental domestic permit trading initiatives, the international community has already gained broad experience with AIJ and moved the (inter)national political process to the implementation stage with regard to credit trading, JI and the CDM.

In general, emissions trading simulation studies, which suggest that significant efficiency gains can be achieved relative to command-and-control regulation, ignore the possible effect of transaction costs (Krutilla, 1999; Kerr and Maré, 1997). Two recent examples of studies that ignore transaction costs are the modelling exercises by Sijm et al. (2000) and Ciorba et al. (2001). However, several authors emphasize that transaction costs play a key role in the success of a tradeable permit or credit scheme (e.g. Hahn and Hester, 1989; Tietenberg et al., 1999; Heller, 1999). Already in 1969 Arrow wrote: ‘The identification of transaction costs in different contexts and under different systems of
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resource allocation should be a major item on the research agenda of (...) the theory of resource allocation in general’ (Arrow, 1969: 48). A new branch of institutional economic research emerged, referred to as transaction cost economics (TCE), which is usually associated with Williamson (1975) and Coase (1960). In the debate on economic instruments for environmental protection there is a growing awareness of the importance of transaction costs (Bressers and Huitema, 1999; Krutilla, 1999). There is past and current anecdotal empirical evidence of the presence of transaction costs in both permit trading markets (e.g. Stavins, 1995; Tietenberg et al., 1999) and project-based credit markets (e.g. Michaelowa and Stronzik, 2002; Fichtner et al., 1999). The impact of transaction costs on the relative cost-effectiveness of the Kyoto Mechanisms can be crucial as long as the evidence is ambiguous with respect to the question which (subset of) entitlement(s) will become the cheapest (or will offer the cheapest possibilities) in the market.

One element of the theoretical superiority of permit trading, next to effectiveness and efficiency, is that it is thought to have lower transaction costs than the other flexible instruments. Some (mainly neo-classical) economists defend this opinion by arguing that, credit-based approaches like JI and the CDM require advance approval of every single trade because of the baseline problem (discussed in the third chapter), whereas transfers in a permit trading system will be automatically registered and only have to be checked at the end of the year (e.g. Hahn and Stavins, 1999; Tietenberg et al., 1999; Vrolijk and Grubb, 2000). As part of the explanation why the QWERTY keyboard persists despite the superiority of the Dvorak keyboard, Liebowitz and Margolis (2000) argue that the latter keyboard was in fact not as superior as David (1985) claimed. In a similar fashion, as part of the explanation why permit trading does not rank first in the political hierarchy of the Kyoto Mechanisms, we will criticize the economic hierarchy in this chapter by demonstrating that the transaction cost advantage of permit trading over the other Kyoto Mechanisms is not as straightforward as neo-classical economic theory suggests.

When writing about the cost-saving potential of emissions trading, Ingham (1992: 117) stresses that it is methodologically wrong to compare the costs of poorly designed emission standards with the costs of a perfectly designed tradeable permits. This argument can be extended to transaction costs and credit-based approaches. It is
incorrect to compare the transaction costs of poorly designed (project-based) credit trading schemes with the transaction costs of perfectly designed permit trading systems. However, this is exactly what happens in the aforementioned studies: the traditional view that permit trading does not require advance approval of every single transaction contrary to JI and the CDM is, to some extent, a ‘model versus muddle’ comparison. The underlying asymmetric assumption is that environmental policy (including clear emission targets for firms as well as reliable monitoring and effective enforcement mechanisms) is well-developed in the case of permit trading, but underdeveloped in the case of credit-based approaches. Moreover, it is assumed that politicians (want to and) succeed in implementing a full-scale permit trading from the start. These assumptions will be criticized and relaxed in this chapter. Because ‘frictionless ideals are useful mainly for reference purposes’ (Williamson, 1979: 261), we will take the traditional (neo-classical) argument as a reference point and introduce some ‘muddle’ elements to its analysis of permit markets as well as some ‘model’ elements to its analysis of credit markets. We will also introduce the impact of politics by modelling the differences in the political ‘muddle’ between the Kyoto Mechanisms necessary to establish them.

Building upon and extending the analysis of Woerdman (2001c), we emphasize that the traditional view in environmental economics does not take into account several institutional barriers which could raise transaction costs under IET, such as a design with a small number of traders, nor does it consider the institutional opportunities to lower transaction costs for JI and CDM projects, such as baseline standardization (which was already discussed in a different context in the third chapter). We will reflect upon these barriers and opportunities from an institutional economics perspective, for instance by considering the political transaction costs of setting up these Kyoto Mechanisms. This is supplemented with an overview and analysis of the empirical evidence of transaction costs both from existing (non-GHG) emissions trading markets and from the pilot phase for AIJ projects. Transaction costs form an institutional barrier to implementing the Kyoto Mechanisms and institutional arrangements to lower these costs are an opportunity to overcome this barrier.

This chapter is organized as follows. Section 5.2 defines the concept of transaction costs. Section 5.3 analyzes the institutional opportunities to lower transaction costs for JI and CDM projects and considers the empirical evidence of
the money spent to initiate and complete a trade) and opportunity costs (e.g. the loss of time and resources through delay and managerial attention). Furubotn and Richter (1997) subdivide transaction costs into fixed costs and variable costs of which only the latter depend on the number or volume of transactions.

As transaction costs increase, the price received by sellers is depressed relative to the price paid by purchasers (Stavins, 1995). Trade will be profitable only if the exchange rate adjusted credit or permit prices differ more than the transaction costs incurred of transferring the credit or permit (cf. Hinchy et al., 1998). Transaction costs, which are likely to be highest in the initial phases of a market for (one of) the Kyoto Mechanisms that is up and running, may greatly reduce the cost savings that are potentially achievable by reducing the number of trades that are made (e.g. Jackson, 1995; Pearce, 1995; Mullins and Baron, 1997). Due to transaction costs the degree of utilization of the Kyoto Mechanisms will be reduced (Michaelowa and Stronzik, 2002).

Secondly, from a neo-institutional economics perspective, transaction costs not only occur when property (or user) rights are transferred between parties in a market that is up and running, but transaction costs also occur in a broader sense when these rights are created (or protected) through political, administrative or judicial decisions (e.g. Allen, 2000; Krutilla, 1999). This reflects the idea that ‘(…) property rights themselves are costly (sometimes too costly) to impose (…)’ (Cole, 2000: 306). Therefore, according to North (1990: 28, 61), transaction costs not only consist of the costs to protect property rights and enforce agreements, but also of the costs to define those rights. In the second chapter we have referred to these costs as set-up costs. They are the costs involved in establishing or changing an institutional arrangement, which may also require the creation or alteration of property (or user) rights. Furubotn and Richter (1997) as well as North (1990) prefer to refer to these costs as political transaction costs, whereas Vollebergh (1994) uses the term ex ante transaction costs to reflect the idea that these are the costs of setting-up a market before (ex ante) this market is up and running. Haddad and Palmisano (2001: 442) use the term development costs and Banuri et al. (2001: 52) classify them as implementation costs,

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2 However, Vollebergh (1994) used the term ex ante transaction costs in a stricter sense to refer to the costs of obtaining information in the phase of designing economic instruments for environmental policy.
which include the costs of making changes in existing rules and regulations. In general, these costs rise as complexity increases.

The IPCC acknowledges that political transaction costs are usually not fully covered in the (predominantly neo-classical rather than institutional) economic analyses of environmental policy instruments, because they are ‘(…) different to those costs conventionally considered as transaction costs’ (Banuri et al., 2001: 52). Nevertheless, Williamson (1997a) and Dixit (1996), for instance, acknowledge that the transaction cost approach can be fruitfully applied to public administration and politics respectively. Haddad and Palmisano (2001: 442) as well as Janssen (2000) are one of the few authors (see also Eckersley, 1993) to explicitly recognize the costs of setting up the Kyoto Mechanisms. Haddad and Palmisano (2001: 441) argue that permit trading has relatively high ‘development costs’ because the associated emission ceilings are difficult to change, assuming that they are based on (inalienable) property rights. However, in the first chapter we have criticized this assumption, in a more extensive way, for instance because tradeable permits can be and frequently are user rights (e.g. Tietenberg, 2002: 5). Where we disagree with Haddad and Palmisano’s arguments, Janssen (2000) does not even explain what particular factors contribute to the set-up costs. In the next chapters, however, it is our purpose to analyze and discuss these factors in detail: examples of set-up costs from the perspective of government and administration in the field of policy preparation are the costs of gathering and processing information, the costs of developing the required legal framework, the costs of (re)allocating property (or user) rights, and the costs of dealing with lobbying efforts and cultural resistance. In each of the following sections we will first consider market transaction costs before we assess the level of such political transaction costs.

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3 For example, if the government wants to adapt to new scientific insights or to demands in society by strengthening (or raising) the emission cap, it can do so when it allocates permits for the next period (say, for the next five years) without affecting any ‘property rights’. In the permit trading market for SO2 emissions in the US, for example, a tradeable, so-called, ‘allowance’ is legally defined as a ‘limited authorization to emit sulfur dioxide’ which ‘does not constitute a property right’ and which therefore does not restrict the authority of the US ‘to terminate or limit such authorization’ (Clean Air Act Amendments (1990), Title IV, section 403 (f)).

4 Interestingly, although Dixit (1996) gives a broad definition of transaction costs and even formulates a transaction cost politics (TCP) perspective, he does not look at political transaction costs as such by ‘(…) taking for granted the existence of a governance structure that assigns initial rights and enforces (…) agreements to trade these rights’ (Dixit, 1996: 37). Also Estache and Martimort (1999), who write about politics, transaction costs and the design of regulatory institutions, do not recognize the existence of political transaction costs.
5.3 **Transaction Costs of JI and the CDM**

In general, Williamson (1997b: 7) writes that ‘(...) transaction cost economics, always and everywhere, is an exercise in comparative institutional analysis – where the relevant comparisons are between feasible alternatives (...’). In our case of comparing different flexible instruments for climate policy, some economists argue (as already pointed out in the introduction) that the market transaction costs for JI and CDM projects will be higher than for IET, since project-based flexible instruments require advance approval of every single trade, while transfers in an emissions trading system will be automatically registered and checked at the end of the year (e.g. Tietenberg, 1992; Mullins and Baron, 1997; Hahn and Stavins, 1999; Tietenberg et al., 1999; Sijm et al., 2000). This view culminates in the formulation that ‘(...) project-based mechanisms, CDM and JI, will always have higher transaction costs than emissions trading by their very nature’ (Vrolijk and Grubb, 2000: 9). We already indicated that, to some extent, this economic hierarchy of the Kyoto Mechanisms is a ‘model versus muddle’ comparison which asymmetrically assumes that environmental policy is well-developed in the case of permit trading, but underdeveloped in the case of credit-based approaches. One flaw in their line of reasoning is the supposition of the absence of institutional arrangements that lower market transaction costs for JI and CDM. In the next subsections we will not only criticize this (implicit) assumption of traditional economic studies in market-based environmental regulation, but we will also provide an overview and analysis of the empirical evidence of market transaction costs in the AIJ pilot phase.

5.3.1 **Baseline standardization, capacity-building and multilateral funds**

Market transaction costs for CDM projects are relatively high, because they must always be validated, verified and certified by operational entities accredited by the Executive Board. However, a two-track system was created for JI projects at CoP7 in Marrakesh in 2001 (CP, 2001b: 13). If a JI host country, in accordance with Protocol Articles 5 and 7, not only has a national system to estimate and register emissions and removals, but also annually submits a national inventory report, a host Party may verify
reductions as being additional. If a host Party does not meet these eligibility requirements, verification shall occur by an independent entity accredited by the so-called Article 6 Supervisory Committee. In other words: if the host Party has a weak emission registration system, a ‘slow’ track is necessary to maximize environmental integrity. However, if a host Party has a reliable emission registration system, environmental integrity is stronger so that a ‘fast’ track can be taken which keeps JI market transaction costs relatively low.

Transaction costs for JI and the CDM will decrease over time as a result of learning effects (Michaelowa, 1995; Puhl, 1998), an evolutionary factor that is underestimated in the static Coasian transaction cost framework (Nooteboom, 2000; Langlois, 1994). At least as important is the fact that there are several institutional possibilities to substantially lower the transaction costs of project-based flexible instruments. Design matters not only for IET, but also for JI and the CDM: ‘The transaction costs of (...) Joint Implementation can be significantly reduced through conscious attention to critical design elements’ (Dudek and Wiener, 1996: 3). Similarly: ‘The (...) barriers to an efficient functioning of a CDM fund can be overcome by designing it properly’ (Michaelowa and Dutschke, 1998: 36). Next to institutional arrangements that are designed to stimulate learning, it will be explained that standardizing (baseline) procedures, strengthening institutional capacity-building and developing multilateral funds are among the main options to lower these market transaction costs, although they tend to raise set-up costs.

The first option that is expected to reduce market transaction costs is the standardization of micro-baseline determination procedures (e.g. Jepma et al., 1998; Hargrave et al., 1999a), which was already discussed in the third chapter in the context of preventing baseline inflation. Baseline standardization implies the development of ‘business-as-usual’ scenarios for project categories differentiated by, for instance, region, time, project and/or technology type. These scenarios could be determined by a panel of experts. Each specific project should fit into one of the categories. The (ex ante or ex post) emission reductions of a specific project can simply be calculated by substracting the (predicted or observed) emissions from the baseline emissions of the relevant category. This makes a third party check for each baseline much easier or even unnecessary. Transaction costs are reduced because it will not be necessary anymore to
invest time and effort in constructing a baseline for each and every project. It remains necessary to verify whether the investor and host have properly calculated the emission reductions, but this will be less time-consuming than verifying case-by-case baselines.

A practical example of standardization is the matrix approach, which places pre-defined default scenarios for several project categories into a matrix. The investor and the host of a JI or CDM project look up the baseline in the matrix, for example available on the FCCC Internet homepage, to calculate the credits which will accrue from the project. Although a matrix is likely to work efficiently once it has been established, it should not be forgotten that it still takes expertise, time and money to develop the (standardized) baselines for each cell in the matrix in the first place. Baseline standardization is on the political agenda as it appeared as a policy option in the text of the Marrakesh Accords of 2001 (CP, 2001b: 46).

Additional options to reduce the transaction costs for JI and CDM projects are to standardize the GHG abatement reporting procedure, to develop standard contracts for project partners (which may be most pressing and desirable for the CDM considering the supposedly weak bargaining position of developing countries), to strengthen the institutional capacity in the host countries and/or to set up information exchange and trade facilities, such as a clearinghouse (Michaelowa and Dutschke, 1998; Dudek and Wiener, 1996). Capacity-building in host countries can make it easier, for instance, for potential project partners to find one another and for governments to monitor the emissions. Moreover, instead of a bilateral approach, a unilateral approach can be taken in which the host engages in self-financing of the emission reductions. This is expected to lower transaction costs, because a host that is also the investor will be more familiar with local conditions than a foreign investor (Black-Arbelaez et al., 2000; JIQ, 2001a). The disadvantage is that it requires substantial host country project development and financing capacities. If these are not sufficiently available in particular (developing) countries, transaction costs can be lowered via a multilateral approach by clustering several GHG emission reduction projects in a portfolio. These are implemented by specialized intermediaries transferring the funds to individual subprojects, which can be particularly relevant for small-scale (CDM) projects (e.g. Ghosh, 1999; Michaelowa and Dutschke, 1998). Without multilateral funds, small projects are less attractive than large
projects, because their start-up costs and operational costs are more or less similar in absolute terms (e.g. EcoSecurities, 2000).

In practice, for instance, the Executive Board of the World Bank has established and approved the so-called Prototype Carbon Fund (PCF) in order to reduce transaction costs (JIQ, 1999). The PCF is a pilot activity, operational since 2000 and scheduled to terminate in 2012, which facilitates learning-by-doing with investments restricted to a maximum of $180 million. It is a mutual fund in which (private and public) investors pool capital to be invested in GHG emission reduction projects in co-operation with potential host countries for AIJ, JI and the CDM. The credits acquired through these projects will be returned to the investors. In 2001 the multilateral PCF was ready to invest $145 million in JI and CDM projects on behalf of 6 countries and 17 companies (JIQ, 2001b).

Although the CDM seems to offer the largest low-cost potential (as demonstrated in the previous chapter as well as in studies by other authors like Trexler and Kosloff, 1998), the informational, institutional and infrastructural constraints are higher in developing countries than in Annex B countries (e.g. Karani, 1997). This generally makes the transaction costs for CDM projects higher than for JI Article 6 projects (Sokona and Nanasta, 2000), also given the adaptation tax and the relatively strong sustainability requirements under CDM Article 12. However, with respect to potentially lowering the transaction costs of GHG emission reduction projects implemented in and in co-operation with developing countries, several authors (e.g. Aslam, 1999; Dutschke and Michaelowa, 1999) mention the possibility of designing the CDM as either a simple project exchange, a clearinghouse (similar to a broker) or a multilateral fund (similar to the PCF) in which the credits, initially accruing to the CDM, are distributed to the investors according to their share. The United Nations Industrial Development Organization (UNIDO) already provides manuals on guidelines for technology transfer as well as procedures for project accreditation and verification with the explicit aim to reduce transaction costs for CDM projects (ENB, 1999).

If projects are to be compared systematically with permit trading markets under the assumption of well-designed environmental policy, similar ideal ‘model’ circumstances must be assumed for such projects as well (where some economists asymmetrically tend to assume ‘muddle’ circumstances). If the Kyoto Protocol will be
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effectively implemented in Central and Eastern Europe, the transaction costs for JI projects could be lower than several researchers predict, as we will explain below. Various studies have argued that JI has a baseline problem (in essence similar to the CDM) assuming that a choice has to be made between several seemingly ‘reasonable’ baselines for each individual project (e.g. SEVEN/JIN, 1997). However, the host country of a JI project has committed itself to an assigned amount (contrary to a CDM host country), which implies that a Central or Eastern European government has to define environmental policy targets for its domestic emitters. If it has done so, the JI baseline to calculate the additional emission reductions could be derived from the defined environmental policy for the host firm or sector involved.5 This would also be in line with the requirement formulated in the Marrakesh Accords of 2001 that the project-specific JI baseline shall take into account relevant national and/or sectoral policies (CP, 2001b: 18).

For instance, if the policy in a JI host country is a performance standard which requires a certain quantity of CO₂ per unit of output or energy, the baseline (or: benchmark) emissions for the host firm can be calculated by multiplying this standard with its expected production volume or energy use. If the host firm emits less CO₂ than this baseline figure because a JI project is implemented, emission reductions are achieved for which the investor can obtain ERUs. If the host invests in the project itself (self-financing of emission reductions) we speak of credit trading (or: unilateral JI). This would not necessarily require a pre-approval of each transaction: the scheme can be designed in such a way that compliance is checked at the end of the year, similar to permit trading schemes. This also means that the transaction costs of credit trading and (‘fast’ track) JI will not diverge as much from permit trading as traditional economic literature suggests.

5 However, the assertion that calculating additionality is less problematic for JI and the associated transaction costs may thus be lower than frequently assumed does not mean that the administration does not have to check those baselines. The government must demand that project developers determine and report their baselines. Baseline inflation is not in the interest of both Parties under the double bookkeeping of assigned amounts, but is still in the interest of the investors. If the investors of JI projects would succeed in claiming too many emission reductions, the host countries would have to compensate for this at home later on (Jepma, 1999b). Nevertheless, apart from committing fraud, inflating the baselines is almost impossible when they are deducted from, say, performance standards and other verifiable figures such as production volume or energy use.
The fact that credit trading and JI can use existing environmental policy as the baseline from which to calculate the (tradeable) emission reductions also means that they have relatively low set-up costs compared to instruments that instead require an explicit (re)allocation of property (or user) rights. Nevertheless, the political transaction costs of establishing credit trading in industrialized countries are likely to be lower than those of establishing JI in countries with economies in transition where environmental policy and emission monitoring are still in their infancy. The political and market transaction costs of the CDM are higher because environmental policy and institutional capacity is less developed in non-Annex I countries than in Annex I countries. But once these flexible instruments have been set up, their market transaction costs can be lowered through the institutional opportunities offered by baseline standardization, capacity-building and multilateral funds.

5.3.2 Empirical evidence of transaction costs in AIJ projects

In general, empirical (case) studies have been successful in confirming the presence and relevance of transaction costs in markets (e.g. Masten, 1996). The case of market-based climate policy is no exception, although data availability is not abundant and data quality is not always satisfactory. The impact of transaction costs is that they raise costs for the traders involved, which lowers the trading volume or even prevents transactions from occurring (Michaelowa and Stronzik, 2002: 11).

From an empirical point of view, Palmisano (1996) claims that transaction costs in early project-based credit markets in the US governing air pollution control (notably the so-called ‘offset’, ‘bubble’ and ‘netting’ policies in which an emission growth at one source could be compensated by an emission decline at another source) have not prevented trading. According to the IPCC there is ‘abundant anecdotal evidence’ indicating the prevalence of significant transaction costs in some of these early US credit trading programmes (e.g. Fisher et al., 1996: 423), although it should be emphasized that the evidence is ‘rather mixed’ (Jepma and Munasinghe, 1998: 306). From a theoretical point of view, Palmisano (1996) expects that transaction costs in a market for carbon credits will be lower than in those markets, given the potentially larger financial magnitude of carbon trades. In addition, it could be stressed that the
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early US emissions trading programs of the past contained specific trade restrictions and regulatory uncertainties that increased transaction costs, but which do not have to be copied to a future carbon trading market (e.g. Tietenberg, 1999; Ingham, 1992).

Interestingly, without considering permit market transaction costs, Haites (2000) presents a trading model in which the reference case assumes transaction costs of 25% for the CDM and 15% for JI. He also performs two sensitivity analyses in which transaction costs are assumed to be 50% for the CDM and 35% for JI as well as 10% for both JI and the CDM respectively. These quantitative figures reflect the perception of many economists about the magnitude of transaction costs of credit-based approaches and can therefore be used as a theoretical reference point for the (incomplete) empirical figures found in the studies discussed below.

Empirical data of transaction costs for GHG emission reduction projects can be found in the pilot phase for Activities Implemented Jointly (AIJ), which started in 1995 and, although initially scheduled to be completed earlier, has been extended after 2000 by the CoP because of positive learning experiences (e.g. CP, 2001b: 46). The aim of the pilot phase is to gain experience with the potential environmental, institutional and cost-effectiveness aspects of GHG emission reduction projects. The typical characteristic of this pilot phase (contrary to JI and the CDM) is the absence of crediting, since Parties are not allowed to use the reductions achieved through AIJ projects for the fulfillment of commitments under the FCCC. The AIJ projects give some indication of the level of JI and CDM transaction costs.

Michaelowa and Stronzik (2002) are one of the few authors that provide an overview of empirical data on AIJ transaction costs. They only report the transaction cost figures of 51 Swedish AIJ projects carried out in the Baltic states, because this is ‘(…) the only AIJ programme with a consistent reporting of transaction costs (…)’ (Michaelowa and Stronzik, 2002: 16). They do not list figures from other AIJ projects, because these projects differ too much in their definition of transaction costs. The average transaction costs (resulting from technical assistance and administration) are 20.5% of total project costs for energy efficiency projects and about 14% for renewable energy projects. Moreover, taking into account the starting dates of the projects, the authors indicate that these costs have declined over time (from about 17% in 1994 to 13% in 1998 for energy efficiency projects and from about 18% in 1993 to 14% in 1998
for renewable energy projects). Michaelowa and Stronzik (2002) show that the transaction costs of renewable energy projects are smaller than those of energy efficiency projects, primarily because the former are larger in terms of emission reductions generated.

In 1997 the Nordic Council of Ministers assessed the transaction costs of ten AIJ projects in Eastern Europe. Total transaction costs, including JI specific transaction costs such as baseline determination and GHG emission reduction monitoring, ranged from 12% to 19% of the total initial investment in energy sector projects, and from 15% to 30% in smaller and more complex industrial sector projects. The transaction costs for the JI acceptance procedure ranged from 1% to 8% (JIQ, 1996; JIQ, 1997). In a case study, Fichtner et al. (1999) calculated the transaction costs for six selected AIJ projects from all over the world, which appeared to range from 1% to 15% of the total project costs. Furthermore, countries which have concentrated their AIJ investments in the same country, region or sector, have been able to reduce transaction costs (Schwarze, 1998; Ellis, 1999b).

However, when drawing a parallel between AIJ on the one hand and JI and CDM on the other hand, one has to keep in mind that the above-mentioned studies are limited to about fifty, ten and six pilot phase projects respectively. Since no credits may accrue from AIJ, depriving investors from the essential incentive to participate, the number of projects is likely to be smaller under the pilot phase than under JI or CDM as the first commitment period approaches. This delays possible learning effects, thereby preventing transaction costs to decline further. In addition, in the AIJ pilot phase baseline determination has not been standardized, while the establishment of standardized baselines, if developed and agreed upon, would substantially lower transaction costs for such projects as we have seen in the previous subsection. Therefore, one might argue that the transaction costs of AIJ projects are likely to be an upper bound for the transaction costs of JI and CDM projects.

### 5.4 Transaction Costs of IET

The claim that the transaction costs of permit trading will be lower than for credit-based approaches like JI and the CDM, since the latter face a baseline problem that requires
formal approval of each transfer contrary to the former (e.g. Tietenberg et al., 1999),
looses validity if the underlying assumption of full-scale firm-to-firm trading in a
perfect world is relaxed and if the set-up costs of such a scheme are taken into account.
They act as institutional barriers raising the (market and political) transaction costs of
emissions trading. By considering these costs we introduce and model the political
‘muddle’ when establishing permit markets. It is also instructive to look at empirical
data on market transaction costs in already existing (domestic) permit trading markets,
such as the US SO\textsubscript{2} allowance trading scheme.

5.4.1 Incremental design, set-up costs and thin markets

The idea that IET have lower market transaction costs than JI and CDM assumes that
the neoclassical (international) firm-to-firm trading blueprint is implemented in reality.
This blueprint presupposes, among other things, perfect competition, a downstream
emissions trading system with many participants, the absence of market power and
perfect international enforcement in the case of non-compliance of nation states.
However, relatively few markets meet the assumptions of perfect competition (e.g.
Helpman and Krugman, 1989; Stavins, 1995) and transaction costs will increase if the
FCCC Parties set various rules on emissions trading to cope with the complex problems
of an imperfect world. This also underlines the possibility that institutions may actually
come about that raise transaction costs (Noo teboom, 2000: 100), for instance because
some institutional arrangements are primarily established to meet policy goals other
than cost-effectiveness (such as environmental integrity or equity). It is thus too simple
to refer to such cost-raising institutions as ‘government failure’ by only considering the
efficiency criterion as Estache and Martimort (1999: 3) do. Other criteria play a role in
politics as well (e.g. Dixit, 1996: 147; Fisher et al., 1996: 405).

For example, Zhang (1998c) proposes to tackle the ‘hot air’ problem by
imposing a transaction tax on emissions trading with countries, particularly in Central
and Eastern Europe, whose negotiated emissions budget is probably larger than their
business-as-usual emissions. Another example is the proposal of the EU, made prior to
CoP6, to place a quantitative restriction on the use of the Kyoto Mechanisms implying
that 50\% of the Kyoto commitments should be achieved domestically (SBSTA/SBI,
2000), not only to restrict ‘hot air’ trading, but also for other reasons that will be highlighted in the last few chapters of this book. Such a ceiling on trade would have limited the supply of hot air to about one-third of its potential magnitude (Baron et al., 1999), but it would also have raised transaction costs as it requires a pre-approval of each trade to make sure that a transaction does not fall behind the national threshold (Zhang, 2000a: 323). However, after fierce opposition from other industrialized countries, the EU gave up its proposal at CoP6 Part II in 2001 to prevent that these countries would follow the US by leaving the Protocol.

The CoP could also decide, for instance, that IET under Article 17 must satisfy various rules on liability, risk insurance and compliance in order to ensure effective enforcement (cf. Jepma et al., 1998). An example, already decided upon, is the requirement that each Annex B Party shall maintain a commitment period reserve, which should not drop below 90% of its assigned amount (or 100% of 5 times its most recently reviewed inventory whichever is lowest), to restrict the discretion to oversell (CP, 2001b: 54). An Annex B country is allowed to trade more units only if and to the extent that its reviewed emissions are lower than 90% of its assigned amount. Checking whether this is the case raises transaction costs. Another example, not (or not yet) fully established, is buyer liability (as discussed in the third chapter), which not only strengthens effectiveness (if buyers have a stronger willingness to comply than sellers and if the enforcement system is weak (Klaassen and Nentjes, 2002)), but also raises transaction costs because the permit buyer has to check whether the seller is in compliance as the former will be held liable for the non-compliance of the latter. In general, some argue that rules governing the trading system can have a ‘dramatic effect’ on transaction costs (e.g. Mullins and Baron, 1997: 31), for instance because it will make finding an acceptable buyer or seller more difficult. The aforementioned examples of such rules also underline once more that implementing the Kyoto Mechanisms requires trade-offs to be made between the economy (in this case transaction costs) and the environment.

Considering the dynamics of the political process, Heller (1998: 114) points out that ‘(...) transactional costs of political mobilisation are associated with displacing embedded policies (...)’. Only a few authors acknowledge that any welfare assessment of permit trading needs to be adjusted by taking into account the transaction costs
thrown-up by the political process itself (e.g. Heyes and Dijkstra, 1999), such as the
time-consuming lobbying process of negotiating an acceptable permit allocation
(notably grandfathering versus auctioning) for the regulated emitters (Woerdman,
2000b). Clearly, the transaction costs of a permit trading scheme rise if they are defined
in a broader sense to incorporate the costs of establishing such a regulatory regime
triggered by (re)distributing the pollution rights (Krutilla, 1999). These costs of
developing, choosing and implementing an institutional arrangement, which are referred
to above as set-up costs or political transaction costs, are likely to increase as the
(re)distribution of property or user rights deviates more from the status quo (e.g. Rolph,
1983; Welch, 1983; Krutilla, 1999), for instance because this would intensify the rent-
seeking activities by lobby groups. A consideration of set-up costs reflects the neo-
institutional economic viewpoint that transaction costs are all costs of human interaction
over time (North, 1997: 149).

It has been indicated before that permit trading has relatively high set-up costs
(as will be demonstrated in detail in several of the next chapters), because there are
specific legal problems and issues of cultural resistance that arise from its explicit
(re)allocation of property (or user) rights. Also grandfathered permits imply a large
deviation from the status quo because of the implied wealth transfer (Welch, 1983).
Contrary to permit trading, as has been demonstrated in the previous section (as well as
in previous chapters), credit trading and JI are institutional arrangements with relatively
low set-up costs, because they can use existing environmental policy as the baseline
from which to calculate the (tradeable) emission reductions.

Various proponents of permit trading create the impression that if the ‘cost
barrier’ of setting up the scheme is taken, permit trading will have lower market
transaction costs than the project-based flexible instruments. However, a low-cost
trading scheme can not simply be presumed, since its efficiency and transaction costs
critically depend on its design. On the one hand, transaction costs can be low if transfers
are automatically registered and checked at the end of the year (e.g. Tietenberg et al.,
1999). On the other hand, transaction costs may rise if Annex B Parties do not
implement the downstream trading ‘blueprint’ in which both large and small emitters
receive permits. Instead, which is ignored in many transaction cost studies that treat IET
either as an ideal model or as a black box (e.g. Michaelowa and Stronzik, 2002), these
countries can design and implement domestic permit trading systems with a limited number of participants (e.g. Zhang, 1998c), for instance to deal with uncertainties and complexities by following a step-by-step approach as desired by the EU (COM, 2000a: 10). Nentjes et al. (1995: 55) write that the theoretical possibility of the presence of (high) transaction costs seems to be irrelevant when the market for tradeable carbon permits is designed in such a way that the number of participants is large. Consequently, if the permit market is designed for a relatively small number of traders, transaction costs may increase. In general, since transaction costs will decrease as the number of traders increases (e.g. Tietenberg, 1992; Stavins, 1995), transaction costs will increase as the number of traders decreases (e.g. Heister et al., 1992; Pearce, 1995). However, there are important exceptions to this general rule. Firstly, transaction costs do not have to increase when there are fewer traders if this also means that transactions become larger, which lowers the transaction costs per tonne of carbon traded. Secondly, search and bargaining costs can be kept low if the small number of traders already know each other and communicate regularly, which was for instance the case in the US lead phasedown program (Kerr and Maré, 1997).

Instead of a large international market of interlinked domestic permit trading schemes implemented in each Annex B Party, a fragmented carbon market is emerging that consists of only a few domestic permit trading schemes which are not yet interlinked, each with different designs and trading rules. If the domestic schemes that emerge are finally connected, but continue to evolve in this fragmented way, as Rosenzweig et al. (2002: 36) expect for the short term, it will result in higher transaction costs than assumed in the ideal model due to the associated differences and complexities. Rosenzweig et al. (2002: 35) also present some kind of lock-in argument. They contend that changing the domestic schemes that now emerge to make them compatible is likely to be difficult, because it could affect the interests and competitive positions of those firms that have a stake in the existing, sub-optimal design (where only a few firms or even no firms at all are regulated by means of tradeable permits under obligatory emission ceilings).

Each domestic market itself contains a limited number of participants. For instance, in the domestic, mandatory permit trading scheme for CO₂ emissions in Denmark, only electricity producers participate, whereas in the domestic, voluntary
permit and credit trading scheme for GHG emissions in the UK also other companies which already have (relative) emission or energy targets are allowed to participate if they want. To facilitate administrative oversight, as discussed in the previous chapter, permit receivers can be restricted to fossil fuel producers (upstream system), who will pass on their permit costs in a mark-up on the fuel price for both small emitters (such as households and cardrivers) and large emitters (such as utilities and industrial sources). Another option is to allocate permits to fossil fuel producers and large emitters (hybrid system). To facilitate incremental change and learning, permits can also be exclusively distributed to large emitters (such as the electricity sector as proposed by the EU (COM, 2000a)), while small emitters are regulated via taxes or standards (mixed system).

According to Michaelowa (1998b), an upstream system, for example, is likely to suffer from high transaction costs, because the number of traders will be small (compared to a downstream system). However, to judge the effect on transaction costs of upstream and other systems with a limited amount of potential traders, a distinction has to be made between search and bargaining costs, incurred by those who trade, on the one hand, and monitoring and enforcement costs, incurred by the government, on the other hand.

On the one hand, if there are less potential traders, it may be more difficult (than in a downstream system) to find a suitable trading partner, which raises search costs. Nevertheless, information facilities that are both easily accessible and reliable (such as a clearing-house) reduce this potential problem (e.g. Tietenberg, 1999). However, transaction costs also depend, to some extent, on the ‘thickness’ of the market concerning the amount of trades that occur in the market (cf. Liski, 1999). In a thick market, many traders are active and trades occur regularly, whereas in a thin market, only a few trades occur. If there are less potential traders, transactions are likely to occur less frequently (than in a downstream system), which makes the market ‘thinner’. This could increase price uncertainty on the market as information which is relevant for the traders and their transactions does not dissipate speedily through the market, which complicates the bargaining process between buyers and sellers and adds to their information and negotiating costs. This could be partly offset by auctioning (a part of) the permits to give a price signal to the market, but the same problem returns if these
prices show a large variety. This, in turn, which is not the topic of this chapter, depends on the design of the auction (e.g. Lyon, 1982).  

On the other hand, checking compliance for only a limited number of traders saves administrative monitoring and enforcement costs for the government. This is a transaction cost advantage of upstream as well as hybrid and mixed schemes over a downstream system if the latter directly includes and monitors small end-users, such as individual motorists (Bohm, 1999). Nevertheless, in the previous chapter it was demonstrated that monitoring can also be organized upstream in a downstream trading scheme, so that administrative costs can also be reduced if many sources are directly included in the tradeable permit system.

If politicians start with an upstream, hybrid or mixed system and experiences are satisfactory, they may extend the trading system to other sectors. By imposing the flexible instrument on more entities, the government in principle also creates positive network externalities that result in lower market transaction costs for the users, such as lower search costs and lower costs of exchanging information. The more entities are subject to a particular flexible instrument, the easier it is for them to communicate and trade with each other when they use similar emission reduction entitlements. This would also increase the scope for efficiency gains.

Government trading is another story. In principle, it depends on information mechanisms whether government-to-government emissions trading will have higher transaction costs than international private emissions trading. Nevertheless, the transaction costs of government-to-government emissions trading are expected to be higher than those in the case of international firm-to-firm trading, because firms would have more and better information (e.g. on their marginal abatement costs) than governments to achieve cost-effective emission trades (e.g. Tietenberg, 1992). However, albeit to a lesser extent, also private sources do not have perfect information about the costs of abatement options (e.g. Savornin Lohman, 1994). Moreover, the

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6 Moreover, the fossil fuel producers and importers in an upstream or hybrid trading system should not get any of their permits via grandfathering in the first place according to the end-user compensation principle of equity, discussed in the previous chapter, because this would mean that consumers pay a mark-up on the fuel price, whereas the producers and importers have received their permits for free without having to make the costs of reducing emissions.
transaction costs per unit of emissions traded decrease as the quantity of trade in the intergovernmental deal becomes larger (Boom and Nentjes, 2000).

Next to the problem of market power in a government trading market (e.g. Gusbin et al., 1999), it is feared that political considerations or issue linkages may distort the presupposed economically rational market behaviour of governments. For instance, a government could refuse to enact an efficient trade with a country whose non-economic policy or ideological views are perceived to be objectionable, or it could be inclined to enact a relatively expensive trade (compared to cheaper possible deals in other countries) in order to intensify general trading relations with certain politically favoured countries, such as a particular subset of (the most industrialized) Central and Eastern European countries with a view to their future accession to the EU.

Although the legal text of Protocol Article 17 specifies no other emission trade than that between the governments of industrialized countries, international trading between private or so-called ‘legal’ entities under the responsibility of the Parties is now explicitly acknowledged as a policy option in the Marrakesh Accords of 2001: ‘A Party that authorizes legal entities to transfer and/or acquire under Article 17 shall remain responsible (...) [and] shall maintain an up-to-date list of such entities and make it available to the secretariat (...)’ (CP, 2001b Add. 2: 53-54). To make international permit trading possible, it is necessary to develop domestic permit trading schemes first, which could eventually be connected (under conditions sketched in the first and previous chapter) to create an international market (Zhang and Nentjes, 1999).

The fact that permit transfers can be checked at the end of the year (and do not have to be checked for each transaction) depresses market transaction costs, but these costs could become higher in a ‘thin’ market when politicians decide to start with a small number of traders to facilitate incremental change and administrative learning. The political transaction costs of permit trading are relatively high, because they largely replace existing environmental policy by explicitly (re)allocating property (or user) rights, whereas credit-based approaches have lower set-up costs as they build upon existing environmental policy. The implication, as demonstrated in the next chapters, is also that legal problems and cultural frictions are larger in the case of permit trading than in the case of credit-based flexibility options. These factors are institutional barriers that make the transaction costs of emissions trading higher than various
economists have claimed, but it should also be kept in mind that there are design opportunities to lower these costs, for instance by creating adequate information facilities.

5.4.2 Empirical evidence of transaction costs in permit trading markets

Just like in other markets (e.g. Masten, 1996), transaction costs appear to be ‘common’ in permit trading markets (Stavins, 1995: 144). In the market for lead permits during the lead phasedown from 1982 to 1987 in the US, Kerr and Maré (1997) estimate that transaction costs resulted in an efficiency loss in the order of 10%. Fisher et al. (1996) state that a source of indirect evidence of the prevalence of transaction costs in these early permit markets comes from a bias toward internal trading within firms as opposed to external trading among firms. However, these early markets contained specific trade restrictions and regulatory uncertainties, increasing transaction costs, that are absent in the more recent US SO\(_2\) allowance trading market where trading is unrestricted and user rights are clearly defined and protected (e.g. Tietenberg, 1999).

According to Klaassen and Nentjes (1997: 395), brokerage fees in the US SO\(_2\) allowance trading market, which give some indication of the magnitude of transaction costs that result from searching and negotiating, are about 5% of the transaction value. Because brokerage fees fell from about $1.75 per allowance in 1994 to about $1.00 per allowance in 1996, it can be calculated on the basis of data gathered by Ellerman et al. (1997: 32-33) that transaction costs in this market have dropped to about 3% (1.5% for each side of the transaction). Based on figures provided by Joskow et al. (1998), it appears that the average commission figure per allowance per trade in 1996 was less than 2% of the prevailing spot price for SO\(_2\) allowances. Probably because the transaction volume increased further, Hargrave et al. (1999b: 11) and Brockmann et al. (1999: 90) note that transaction costs have decreased to approximately 1% of each trade according to brokers active in the SO\(_2\) market. Conrad and Kohn (1996) conclude that transaction costs have not significantly affected the trading and price of SO\(_2\) allowances.

However, when drawing a parallel between the transaction costs in the US SO\(_2\) emissions trading market and those in a possible future GHG emissions trading system, one has to realize that the former is a national scheme with many participants, while the
latter - if agreed upon - could be an international scheme which requires additional trading rules to ensure environmental integrity and state compliance. Theoretically, transaction costs will decline as the number of potential traders and the number of transactions per source increase *et vice versa* (Stavins, 1995). However, the amount of participants depend on market design: for instance, transaction costs could rise relative to the international firm-to-firm trading blueprint in the case of government trading under IET Article 17 or in the case of small, for instance upstream, domestic trading schemes (e.g. Michaelowa, 1998b). With respect to the evolutionary economic process, Jepma and Munasinghe (1998: 306) also underline that the supposition of low transactions costs with many potential traders and transactions only applies to the final stage of a full-grown market rather than to the time-consuming process leading up to it.

### 5.5 Methodological Problems of Comparing Transaction Costs

One might argue that it is not strange to obtain ambiguous (empirical) results from comparing the transaction costs in more or less different markets, because each market has its own typical transaction costs (e.g. some particular markets may have high search costs, whereas others may rather have high approval costs). Unfortunately, different studies do not seldomly focus (implicitly) on different types of transaction costs (e.g. search costs versus approval costs) or they do not (sufficiently) define the type of transaction costs they analyze, which thus make them difficult to compare in a systematic fashion. Although it is instructive to consider empirical data on transaction costs of both permit transactions and emission reduction projects, one must be aware of the methodological problem of comparability with regard to the cost components involved.

#### 5.5.1 Comparing AlJ transaction costs with permit trading transaction costs

In the case of permit trading, each firm or industry pays for the measurement and registration of its own emissions, but firms’ transaction costs usually do not include the transaction costs of monitoring and enforcement which are borne by the responsible
government. Although including the latter cost components would clearly raise the total costs of permit trading transfers (Fisher et al., 1996), transaction costs in permit trading markets are generally expressed as a percentage of the transaction value with respect to the costs that private entities incur (such as search costs, negotiation costs and insurance costs).

In order to facilitate a comparison between permit trading and existing or emerging project-based credit markets such as the AIJ pilot phase, some argue that emission reduction projects’ transaction costs have to be expressed as a percentage of the total investment, yielding relatively high AIJ transaction cost figures. However, in several cases (notably in the so-called simulation projects as discussed in the previous chapter), the amount invested to generate a reduction of GHG emissions in an AIJ project is only a percentage, say 10%, of the capital supplied by the investor. Consequently, it would be doubtful to relate the transaction costs of the total investment to the 10% GHG emission reduction component of the investment. Therefore, it is also possible, and probably more relevant, to express the transaction costs for AIJ projects not in terms of the investment-related component (such as the transaction costs associated with obtaining a construction licence), but rather in terms of the AIJ/JI/CDM-related component (such as the transaction costs associated with paying the consultant responsible for monitoring and verification). Obviously, the transaction costs related to the value of the GHG emission reductions of the project are lower than those related to the total investment.

Indeed, some studies presented above have considered such AIJ specific transaction costs, which would presumably facilitate a more adequate comparison with transaction cost figures in permit markets. In that case, based on the scarce empirical data available, transaction cost percentages for both permit and credit trades seem to lie somewhere within a range of about 1 to 10% of the transaction value. Nevertheless, the early credit-based emissions trading systems in the US as well as the experimental and international market for AIJ projects (where credits can not be used for compliance purposes) experienced higher transaction costs than the well-established and domestic SO\textsubscript{2} allowance trading market in the US.

However, the fact that the transaction costs in the US were higher in the early credit trading programs than in the current American permit trading program for SO\textsubscript{2}
emissions and the fact that international AIJ projects have higher transaction costs than domestic SO\textsubscript{2} allowance trades in the US does not imply that (project-based) credit trading programs have higher transaction costs than permit trading programs \textit{in general}. The transaction costs in those two types of programs crucially depend on their specific design characteristics. Firstly, comparing those programs with their respective predecessors is methodologically wrong, because the trading program under the Kyoto Protocol will be different, both in geographical scope, sector coverage, emission type, institutional arrangements and trading rules. Secondly, the trade restrictions and regulatory uncertainties that increased transaction costs both in the early US credit trading programs of the past and in the present AIJ program do not have to be copied to the design of permit and credit markets under the Kyoto Mechanisms (cf. Ingham, 1992) and will, in fact, not be copied: one example is the ‘fast’ track project cycle created for JI projects in host countries with reliable emission registration systems (CP, 2001b: 13). Thirdly, there are empirical data from some reports which have confirmed that transaction costs could be low, not only for permit trading (e.g. Hargrave et al., 1999b), but also for, mainly large-scale, climate change mitigation projects (e.g. Michaelowa and Stronzik, 2002; Fichtner et al., 1999).

Therefore, Haites (1997) is right in drawing the following general conclusion with respect to transaction costs in project-based versus allowance-based emissions trading programs: ‘Which type of trading program has the highest total transaction costs is not clear’ (Haites, 1997: 31). In reality, institutions are a ‘mixed bag’ of factors that lower and factors that raise transaction costs (North, 1990: 63). From a positive perspective, as long as the Kyoto Mechanisms have not been worked out completely and as long as they are not (all) up and running, it may be premature for anyone to claim that either one of them has lower transaction costs. In particular, from a normative and more pro-active perspective, one might also argue that the discussion should not only focus on which type of flexible instrument has inherently lower transaction costs, but also on how we can reduce the transaction costs for each of the Kyoto Mechanisms by choosing a proper design. Indeed, finding effective ways to reduce the transaction costs of the Kyoto Mechanisms will significantly contribute to the extent to which these flexible instruments will be successful in enhancing the efficiency of international climate policy.
Instead of arguing that ‘(...) project-based mechanisms, CDM and JI, will always have higher transaction costs than emissions trading by their very nature’ (Vrolijk and Grubb, 2000: 9), we have demonstrated above that transaction costs for JI and CDM projects will not necessarily be higher than those for transfers under IET. This will depend on how decision-makers of the FCCC will shape the Kyoto Mechanisms and succeed in keeping the transaction costs low in the emerging carbon trading market, not only for transactions under IET Article 17, but also for transactions under JI Article 6 and CDM Article 12. Design matters, not only for emissions trading, but also for the other Kyoto Mechanisms.

5.5.2 Comparing market transaction costs with political transaction costs

In this chapter, we have criticized the idea that market transaction costs for permit trading are always lower than those for credit-based approaches. Moreover, we have introduced an institutional economics perspective by incorporating political transaction costs (or set-up costs) when comparing the Kyoto Mechanisms, which further nuances the traditional neo-classical viewpoint. The methodological problem of comparing market transaction costs with political transaction costs is that both have their roots in different economic research traditions.

The neo-classical tradition focuses on the efficiency of equilibrium outcomes in which the fittest will survive (or the fitter under incomplete information), assuming rational and cost-minimizing actors with given preferences, operating in an institutional vacuum or operating within given institutions. The new institutional tradition (behind the concept of market transaction costs) builds upon neo-classical analysis by assuming cost-minimization, but it also focuses on the efficiency of processes in the context of institutions and recognizes that costs may occur when property rights are transferred. The neo-institutional tradition (behind the concept of political transaction costs) also recognizes that costs may occur when property rights are established by analyzing the emergence and disappearance of institutions, not only in terms of efficiency, but also in terms of (changing) cultures and perceptions, as outcomes of a historical and continuing path-dependent process where boundedly rational actors form preferences and show routine (as well as learning) behaviour (e.g. Allen, 2000; Nooteboom, 2000).
However, to nuance the traditional economic hierarchy of the Kyoto Mechanisms, these flexible instruments must be compared with each other by adding a new dimension or perspective. For this purpose, market transaction costs should not so much be compared with political transaction costs for each instrument, but the Kyoto Mechanisms should rather be compared with each other in terms of both market and political transaction costs. This comparison of the Kyoto Mechanisms is roughly summarized in Table 5.1. Although it would have been possible to construct a more detailed table based on the nuances outlined in this chapter (for instance by making a distinction between ‘fast’ track and ‘slow’ track JI projects), it is not desirable – albeit important in the verbatim analysis above – to incorporate them in a visualization as it would result in a cluttered and unsurveyable collection of qualifications. Therefore, the table has been deliberately kept simple by only making a distinction between permit trading, credit trading/JI and the CDM and by only using the classifications ‘high’, ‘medium’ and ‘low’ to force the author to make clear choices. The advantage of such an approach is that the table stays transparent, the disadvantage is that the table is no more than a rough reflection of the much richer and differentiated analyses performed in earlier sections.

Table 5.1 Market and political transaction costs of the Kyoto Mechanisms

<table>
<thead>
<tr>
<th>Type of transaction costs</th>
<th>Theoretical framework</th>
<th>Permit trading</th>
<th>Credit trading + JI</th>
<th>CDM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Market transaction costs</td>
<td>Neo-classical economics (traditional view)</td>
<td>Low</td>
<td>High</td>
<td>High</td>
</tr>
<tr>
<td></td>
<td>Institutional economics (this chapter)</td>
<td>Medium</td>
<td>Medium</td>
<td>High</td>
</tr>
<tr>
<td>Political transaction costs</td>
<td>Institutional economics (this chapter)</td>
<td>High</td>
<td>Low</td>
<td>Medium</td>
</tr>
</tbody>
</table>

The first row of Table 5.1 reflects the traditional (neo-classical) view in environmental economics that the market transaction costs in credit-based arrangements, in particular
for the CDM, will be higher than in permit trading systems (e.g. Hahn and Stavins, 1999; Tietenberg et al., 1999; Haites, 2000; Sijm et al., 2000). We argued before that this view asymmetrically assumes a ‘model versus muddle’ situation in which environmental policy is well-developed in the case of permit trading, but underdeveloped in the case of credit-based approaches. The second row of this table reflects our refinement of this view, which is taken as a starting point, by introducing some ‘muddle’ elements in the permit trading model and some ‘model’ elements in the credit-based approaches. The market transaction costs for permit trading are relatively low if transactions can occur freely with annual checks, but they could become higher either when politicians decide in an incremental fashion to start with a ‘thin’ market of limited scope or when information is incomplete, whereas these costs can be lowered for credit-based approaches through the institutional opportunities offered for instance by baseline standardization, capacity-building and multilateral funds. Moreover, the market transaction costs for JI projects can be kept at reasonable levels in the ‘fast’ track project cycle which is allowed when the JI host Party has a reliable emission registration system. In addition, both credit trading and permit trading do not necessarily require a pre-approval of each transaction and compliance can be checked at the end of the year, which results in moderate transaction costs. Despite the opportunities to lower market (and political) transaction costs for CDM projects in developing countries, they will be relatively high because environmental policy and institutional capacity are in fact less developed and because the sustainability requirements of Article 12 are stronger than for JI Article 6 projects within Annex B countries.

In addition, the third row of Table 5.1 reflects our assertion that the political transaction costs of permit trading are relatively high, because they largely replace existing environmental policy by explicitly (re)allocating property (or user) rights, whereas credit-based approaches have lower set-up costs as they can build upon existing environmental policy. In general, North (1990: 51) suggests that political transaction costs are higher (and more difficult to measure) than market transaction costs when he writes that ‘(...) markets [that approximate] the Coase zero transaction cost conditions (...) are scarce enough in the economic world and even scarcer in the political world’. If this is also true for the Kyoto Mechanisms, the third row will
dominate political developments (rather than the first or the second), which helps to explain that credit-based approaches are more easy to implement than permit trading schemes. Where neo-classical economists expect governments of Annex B countries to opt for permit trading because of its low market transaction costs when the market is established, our neo-institutional approach rather expects these politicians to opt for credit trading/JI because of its low political transaction costs of establishing this market – assuming that their decision-making behaviour is guided more by political transaction costs (which they perceive to be higher for themselves) than market transaction costs.

Contrary to the path dependence approach, transaction cost economics can not explain the survival of sub-optimal institutions (e.g. Nooteboom, 2000); rather, transaction cost economics assumes ‘(...) that the organization of hierarchies is the result of a minimization of transaction costs’ (Estache and Martimort, 1999: i). In terms of market transaction costs, the traditional view is that permit trading is optimal, whereas credit trading, JI and the CDM are sub-optimal. Yet the latter do persist in political reality. Transaction cost economics is only able to explain their ‘survival’, to use the evolutionary term, if the neo-institutional concept of political transaction costs is introduced, which appeared to be relatively high in the case of permit trading. However, the problem is that political transaction costs in the form of perceived set-up costs, that include legal and cultural barriers, are difficult or even impossible to quantify. The implication is that political transaction costs (which may also change over time) can be better dealt with in a path dependence analysis than in a (static) neo-classical or new institutional economic framework (cf. Magnusson and Ottosson, 1997: 3).

As part of (or next to) the perception of such (political) transaction costs to set up the Kyoto Mechanisms, detailed research is required of the role of laws and culture in relation to networks and learning (e.g. Magnusson and Ottosson, 1996: 354; North, 1997: 151), which will be done in the next chapters. The introduction of institutional factors in this chapter has made clear that there are barriers and opportunities which were not considered or appreciated in the traditional analyses of flexible instruments for environmental policy. Our institutional economics approach makes the idea that permit trading is superior in terms of transaction costs less straightforward than several economists have suggested in the past.
5.6 Conclusion

Although the Kyoto Mechanisms lower the costs of climate change mitigation, transaction costs (e.g. to find a trading partner) may reduce their cost-effectiveness. One element of the theoretical superiority of permit trading is that it is considered to have lower transaction costs than the other flexible instruments (e.g. Tietenberg et al., 1999). This traditional view in environmental economics is usually defended by arguing that credit-based approaches like JI and the CDM require advance approval because of the baseline problem (as discussed in the third chapter), whereas permit transfers can be automatically registered and checked annually. To some extent, this economic hierarchy of the Kyoto Mechanisms is a ‘model versus muddle’ comparison which asymmetrically assumes that environmental policy is well-developed in the case of permit trading, but underdeveloped in the case of credit-based approaches. We relax these assumptions by introducing some ‘muddle’ elements to the neo-classical analysis of permit markets as well as some ‘model’ elements to its understanding of credit markets. We also model the differences in the political ‘muddle’ between the Kyoto Mechanisms necessary to establish them. The traditional economic hierarchy of the Kyoto Mechanisms is criticized by analyzing not only the institutional barriers that increase the transaction costs of permit trading, but also the institutional opportunities that lower the transaction costs of credit trading, JI and the CDM.

To raise the level of precision and completeness of the discussion, a distinction is made between market transaction costs (neo-classical definition) and political transaction costs (neo-institutional definition). Market transaction costs are the costs of transferring property (or user) rights between parties in a market (e.g. Williamson, 1975). These costs include search costs, negotiation costs, approval costs, monitoring costs, enforcement costs and insurance costs (Dudek and Wiener, 1996). Political transaction costs are the costs of creating and defining property (or user) rights through political, administrative or judicial decisions (e.g. North, 1990). These costs arise from setting up a market. In the second chapter we have referred to these costs as set-up costs. Examples are the costs of gathering and processing information, the costs of developing the required legal framework, the costs of (re)allocating property (or user) rights, and the costs of dealing with lobbying efforts and cultural resistance.
Part II  Institutional Barriers and Opportunities

Firstly, next to learning effects, the market transaction costs of JI and CDM projects can be lowered (although they tend to raise set-up costs) by standardizing (baseline) procedures, strengthening institutional capacity-building and developing multilateral funds. Baseline standardization implies the development of ‘business-as-usual’ scenarios for various project categories. This reduces transaction costs, because it will not be necessary anymore to construct a baseline for each individual project. Furthermore, next to capacity-building in host countries which strengthens communication and monitoring possibilities, transaction costs can be lowered by clustering several projects in multilateral funds (such as the Prototype Carbon Fund of the World Bank). In addition, a ‘fast’ track for JI projects has been created at CoP7 in 2001 to lower transaction costs. If a host Party has a reliable emission registration system (according to Protocol Articles 5 and 7), a host Party may verify reductions as being additional. Otherwise, verification must occur along a ‘slow’ track via the Article 6 Supervisory Committee more or less similar to the CDM project cycle. This makes CDM transaction costs relatively high, despite the cost-saving opportunities mentioned above, also due to the sustainability requirements under Article 12 and the infrastructural impediments in (particular) developing countries.

Secondly, for reasons other than efficiency (e.g. environmental integrity or administrative transparancy), trading rules and market designs could be established that raise market transaction costs for international permit trading under IET Article 17. An example is buyer liability in which the permit buyer is liable for seller non-compliance. This not only strengthens effectiveness (if buyers have a stronger willingness to comply than sellers and if the enforcement system is weak), as discussed in the third chapter, but it also raises transaction costs because the buyer must check whether the seller is in compliance or not. Another example (to be discussed in the last few chapters) is the proposal of the EU, now abandoned, to place a quantitative ceiling on the use of the Kyoto Mechanisms for instance to restrict ‘hot air’ trading, which would have required a pre-approval of each trade to make sure that a transaction does not fall behind that ceiling. This underlines once more that trade-offs between the economy and the environment must be made when implementing the Kyoto Mechanisms.

To facilitate incremental change and learning, politicians could also decide to start with a small market, for instance by allocating permits only to fossil fuel producers
(upstream system), or large emitters (mixed system) as proposed by the EU (COM, 2000a). In principle, transaction costs increase as the number of traders decreases (e.g. Pearce, 1995; Stavins, 1995), although the transaction costs per tonne of carbon traded are lowered again if this also means that the size of the transactions becomes larger. If there are less potential traders (than in the theoretical ideal of the downstream system), transactions are likely to occur less frequently, which makes the market ‘thinner’. This could increase price uncertainty on the market, which complicates the bargaining process between buyers and sellers and adds to their information and bargaining costs. It may then also be more difficult to find a suitable trading partner, although information facilities (such as a clearing-house) could reduce this potential problem. However, checking compliance for only a limited number of traders (as in an upstream or mixed system) saves monitoring and enforcement costs for the government. In the previous chapter it was demonstrated that this transaction cost advantage can also accrue to a downstream system if monitoring is organized upstream.

Thirdly, the theoretical analysis is complemented with an empirical analysis by discussing studies that calculate or estimate transaction costs of existing non-GHG emissions trading markets as well as of GHG emission reduction projects under the AIJ pilot phase. The several studies reviewed have reported relatively high as well as relatively low transaction costs (roughly around 1 to 10% of the transaction value) for various types of emissions trading markets and emission reduction projects (e.g. Michaelowa and Stronzik, 2002; Hargrave et al., 1999b; Fichtner et al., 1999; Kerr and Maré, 1997; Klaassen and Nentjes, 1997; JIQ, 1997). Although the empirical evidence turns out to be both limited and mixed, it is also clear that the early credit-based emissions trading systems in the US as well as the experimental and international market for AIJ projects experienced higher transaction costs (sometimes even more than 20%) than the well-established and domestic SO₂ allowance trading market in the US (about 1%). Nevertheless, all of these data are difficult to compare systematically, for instance because each market has its own typical transaction costs and because different studies do not seldomly focus (implicitly) on different types of transaction costs (e.g. search costs versus approval costs). Moreover, the transaction costs of pilot phase projects are likely to be an upper bound for the transaction costs of JI and CDM
projects, because of the experimental character of AIJ and because of the
aforementioned opportunities to lower such costs.

Fourthly, the institutional nuances made to the traditional (neo-classical) analysis of market transaction costs are also complemented with a neo-institutional economics perspective by considering the political transaction costs of setting up the Kyoto Mechanisms. These costs are relatively high for permit trading, because they largely replace existing environmental policy by explicitly (re)allocating property (or user) rights, whereas credit-based approaches have lower set-up costs because they can use existing environmental policy as the baseline from which to calculate the (tradeable) emission reductions. In general, political transaction costs are likely to increase if the regulatory instrument deviates more from the status quo (e.g. Rolph, 1983; Welch, 1983; Krutilla, 1999), for instance because this could intensify legal incompatibilities, cultural resistance and lobbying activities. In addition, North (1990: 51) suggests that political transaction costs are higher (and more difficult to measure) than market transaction costs. If this is also true for the Kyoto Mechanisms, then political transaction costs (instead of market transaction cost considerations) will dominate governmental decision-making and political developments, which helps to explain that credit-based approaches are more easy to implement than permit trading schemes.

In a similar fashion as Liebowitz and Margolis (2000) have argued that the QWERTY keyboard persists because it is not as technically inferior to the Dvorak keyboard as some contend, we have demonstrated that credit trading, JI and the CDM are taken seriously in politics because their transaction costs are not necessarily higher than permit trading as traditional (neo-classical) economic analysis suggests. Although the empirical evidence turns out to be limited and mixed, it is clear that design matters. On the basis of a (neo-)institutional economics approach we have emphasized that there are institutional opportunities to lower market transaction costs for credit-based approaches, like baseline standardization for the CDM and a ‘fast’ track project cycle for JI. There are also institutional barriers that could raise market transaction costs in permit trading schemes, for instance if politicians decide to facilitate learning by starting with a limited number of participants which could imply less transactions and increased price uncertainty adding to their information and bargaining costs. Moreover, it is stressed that the political transaction costs of setting up a permit trading market are
higher than those of credit-based approaches, because the former largely replaces existing environmental policy by explicitly (re)allocating property (or user) rights.

The legal problems and cultural resistance which contribute to the political transaction costs will be analyzed in the next chapters. These chapters take a step beyond transaction cost economics towards (neo-institutional) law and economics and political science. This is necessary because politics and historical evolution are more than transaction cost minimization (e.g. Magnusson and Ottosson, 1996). Laws and culture may act as set-up costs, but the values and equity considerations that partly characterize them can not be analyzed in terms of costs alone. Therefore, the analysis will be continued in a framework that is able to deal not only with the effectiveness and efficiency, but also with the equity impacts of the Kyoto Mechanisms. By doing so we will shift from nuancing the economic hierarchy to explaining the political hierarchy of the Kyoto Mechanisms.
transaction costs in AIJ pilot phase projects. Section 5.4 discusses the institutional barriers which could raise the transaction costs of permit trading and gives an overview of empirical transaction cost figures in existing permit trading markets. Section 5.5 analyzes the methodological problems of comparing the transaction costs between different types of flexible instruments as well as of comparing different types of transaction costs. Finally, section 5.6 presents the conclusion.

5.2 Definition of Transaction Costs

Although emissions trading lowers the costs of climate change mitigation, transaction costs may reduce its cost-effectiveness. In this chapter we distinguish between two types of transaction costs:

- market (or: ex post) transaction costs;
- political (or: ex ante) transaction costs.

Firstly, in a neo-classical framework, Stavins (1995) defines transaction costs as the difference between the buying and selling price of a commodity in a given market. According to him, transaction costs are generally ubiquitous in market economies, since parties to transfers (for instance in property (or user) rights such as tradeable permits) must find one another, communicate and exchange information. Furubotn and Richter (1997) prefer to refer to this type of costs as market transaction costs, whereas we use the term ex post transaction costs introduced by Vollebergh (1994) to reflect the idea that these are the costs of transferring property (or user) rights between parties in a market after (ex post) this market has been set up by politicians.¹

Following Coase (1960), the authors Dudek and Wiener (1996) explain that market transaction costs typically consist of search costs, negotiation costs, approval costs, monitoring costs, enforcement costs and insurance costs. The transaction costs of monitoring emissions and enforcing the environmental policy are usually borne by the government. Mullins and Baron (1997) subdivide transaction costs into direct costs (e.g.

¹ However, Vollebergh (1994) used the term ex post transaction costs in a stricter sense to refer to the administrative costs of monitoring and enforcement.