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OECD ENVIRONMENT DIRECTORATE
AND
INTERNATIONAL ENERGY AGENCY

**MARKET POWER AND MARKET ACCESS
IN INTERNATIONAL GHG EMISSIONS TRADING**

INFORMATION PAPER



FOREWORD

This document was prepared by the IEA Secretariat in October 1999 at the request of the Annex I Expert Group on the United Nations Framework Convention on Climate Change. The Annex I Expert Group oversees development of analytical papers for the purpose of providing useful and timely input to the climate change negotiations. These papers may also be useful to national policy makers and other decision-makers. In a collaborative effort, authors work with the Annex I Expert Group to develop these papers. However, the papers do not necessarily represent the views of the OECD or the IEA, nor are they intended to prejudice the views of countries participating in the Annex I Expert Group. Rather, they are Secretariat information papers intended to inform Member countries, as well as the UNFCCC audience.

The Annex I Parties or countries referred to in this document refer to those listed in Annex I to the UNFCCC (as amended at the 3rd Conference of the Parties in December 1997): Australia, Austria, Belarus, Belgium, Bulgaria, Canada, Croatia, Czech Republic, Denmark, the European Community, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Japan, Latvia, Liechtenstein, Lithuania, Luxembourg, Monaco, Netherlands, New Zealand, Norway, Poland, Portugal, Romania, Russian Federation, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey, Ukraine, United Kingdom of Great Britain and Northern Ireland, and United States of America. Where this document refers to “countries” or “governments” it is also intended to include “regional economic organisations”, if appropriate.

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Introduction - aim of the paper

The Kyoto Protocol, once entered into force, would create a “market” where Annex I Parties with commitments listed in Annex B of the Protocol could acquire and transfer greenhouse gas emission reductions, so-called assigned amount units (AAUs), in order to reduce the cost of meeting their emission objectives. It is legitimate to ask whether, and how, this new market could function efficiently and deliver the expected economic gains. In particular, any participant, given an opportunity to do so, may exert market power to lower its own economic cost at the expense of overall economic efficiency.

This paper aims to present the principal issues related to market power for international greenhouse gas emission trading, drawing primarily on emission trading literature. Since other examples could be drawn from other markets, it should not be seen as a complete survey of this issue.

Section 1 defines market power in the context of international greenhouse gas emission trading (IET). Section 2 provides some estimates of the economic implications of market power and discusses these results. Section 3 touches on the question of market access. Section 4 offers issues for further research.

1. Definitions of market power

Two types of market power are usually identified in relation to emissions trading (Burniaux, 1999):

- capacity to influence the transaction price of traded permits (“cost minimising” or “profit maximising manipulation”),
- “exclusionary manipulation”, by which the producer of a commodity hoards tradeable permits to prevent the entrance of competitors on the market of that commodity.

1.1 The size of market participants

An essential component of market power in IET is the quantity of AAUs that any single participant may acquire or transfer. As we explain below, a market with few sizeable participants would be more prone to market manipulation. This would be the case if governments were to be the primary actors in IET (Party-to-Party trading).

Some Annex I Parties have already indicated their intent to devolve assigned amounts to their legal entities, which could limit this problem. Whether these Parties would rely on an upstream or downstream approach for allocating AAUs would eventually determine the size of individual participants. In an upstream system, a few fossil fuel producers or importers may be allocated the majority of a Party’s assigned amount, and be major players on the international market. A downstream system, where assigned amounts would be allocated to individual emission sources, would generate a larger number of smaller participants.

In any case, not all Parties may wish, or be able to, devolve parts of their assigned amount to their legal entities. A probable scenario is one in which some Annex I Party governments will trade on the market, with some participation by legal entities from other Parties. The nature (governments or entities) and therefore the size of individual participants remain uncertain.

1.2 Exclusionary manipulation

Under “exclusionary manipulation”, a firm that holds a significant share of total tradeable permits decides to hoard them in order to exclude other firms from its product market. The result is a distortion in competition for that product market.

This may not be a significant problem with international GHG emissions trading, at least in the following instances. If private sector entities participate in IET, the market actors will cover a broad range of different economic activities. A new entrant in a given sector, which must cover its emissions by CO₂ equivalent units, would then have access to tradeable permits from entities outside its own sector. These entities would have limited interest in hoarding their tradeable permits, as they do not compete on the same market as the new entrant. Exclusionary manipulation seems therefore difficult if many sectors and firms are allowed to trade nationally and internationally.¹

1.3 Cost-minimising (profit maximising) manipulation

However, cost-minimising manipulation *is* a source of concern for some potential participants to IET. Either dominant buyers (monopsony/oligopsony) or sellers (monopoly/oligopoly) in a market could exert market power.

Market power in international emission trading

How is market power characterised? A pure monopoly occurs when the market comprises a single seller that can price its output at a higher level than its marginal cost of production. Market prices under monopolistic conditions are therefore higher than under perfect competition. In the context of IET, traded parts of assigned amounts (AAUs) would be overpriced. This would lead to buyers taking more actions to reduce emissions domestically, at higher cost. It would also lead to a lower volume of trading, with a consequent loss in economic efficiency. Symmetrically, a monopsony (a single buyer) could lower the market price for AAUs and reduce its emissions more than under a fully competitive system. Cases of *pure* monopoly or monopsony are rare. However, relatively large buyers or sellers could exert so-called monopoly or monopsony power, influencing the market along the lines just described. They could also form cartels to arrive at the same result. International emissions trading may not deliver its full economic efficiency potential if market power is exerted. Permit price manipulation would entail additional economic costs to achieve the same level of greenhouse gas emission reductions as under the competitive market.

¹ Westkog (1996) explains that in the case where governments, not firms, would be the primary traders, potentially conflicting interests by different firms within each country would make it difficult for governments to arrive at any effective exclusionary market manipulation.

2. Market power issues for international greenhouse gas emissions trading

Under the emission commitments of the Kyoto Protocol, national GHG projections show that some Parties (e.g. the Russian Federation and Ukraine) may already have a big share of projected supply of AAUs by 2008-2012. The IEA World Energy Outlook projects that under business as usual projections, emissions from countries with economies in transition² would already be some 150 million tons of carbon below their 1990 levels for the year 2010. OECD emissions would be more than 1,000 million tons higher than the Kyoto objective.

2.1 A quantitative analysis

Burniaux (1999) addresses the specific question of market power under the Kyoto Protocol, based on CO₂ mitigation cost information provided by the OECD GREEN model. He seeks to provide an estimate of the potential economic losses that would result from monopoly power that could be exerted by the Russian Federation and Ukraine. More precisely, the estimates that follow should be taken as maximum orders of magnitude for this potential problem.

Note that in GREEN, the Russian Federation and Ukraine are grouped under the banner of a single region (Commonwealth of Independent States). Burniaux first notes that in order for monopoly power to be possible, one must assume that trading by the CIS would be done in a fully centralised fashion (e.g. through some form of cartel), and not through a large number of domestic entities that would act as independent agents.³ Two other critical assumptions underlie Burniaux's estimates: trade in other Annex I Parties is done by individual firms, and not through centralised institutions (e.g. governments), and the CIS does not take into account the effect of its market power in emissions trading on energy prices and terms of trade.

With these caveats in mind, the results of Burniaux's can be summarised as follows:

- By 2010, the price of AAUs would be about 20 per cent higher than under the competitive scenario (US\$ 91 per tonne of carbon versus US\$ 75). The CIS would be able to apply a price wedge of 178 per cent on top of its marginal cost of reduction;
- The CIS would reduce its emissions by less than it would have under the competitive scenario, and other Annex I Parties would achieve more reductions domestically, at a higher cost;
- Market power would reduce the *gains from emissions trading* by about 20 per cent in 2010, for OECD countries, compared with a non-monopolistic, perfectly competitive market situation.

² Note that these numbers cover all countries from the former Soviet Union, so this is a rather high estimate of business-as-usual reductions for the Russian Federation and Ukraine.

³ Again, with multiple entities trading, no single seller could orient the market alone (Bohm, 1998), unless these entities manage to form a cartel.

2.2 Discussion

The risk of monopolistic power

While Burniaux's scenario of market power holds well under the chosen assumptions, it may be questionable if we look beyond Annex I emissions trading. Indeed, the above results assume that the supply of AAUs would come exclusively from Annex I Parties (in fact from the CIS and to a much lesser extent, Eastern European countries). Supply of "certified emission reductions" could also come from developing countries through the Clean Development Mechanism (CDM) for compliance with Article 3 emission commitments. Exactly how much the CDM may deliver is uncertain, but in all cases, it would enlarge the market from what is assumed by Burniaux, and therefore reduce the market share of the Russian Federation and Ukraine. The potential market power of the CIS could therefore be lowered. However, preliminary modelling work shows that if the CDM is assumed to enable developing countries to fully participate in international emissions trading, the risk of monopoly power could be shifted to other regions, e.g. to China.⁴

Secondly, the modelling that underlies the analysis assumes that the CIS would be able to generate a large quantity of AAUs beyond 'business-as-usual' reductions. Out of all the AAUs sold in the year 2010, two thirds would come from reductions beyond "laissez-faire" trends.⁵ But computable general equilibrium models like GREEN assume that agents operate under perfect competition, and that emission trading would function through an economy-wide price signal on fossil fuels. If the region were not able to reduce its emissions as much as projected by GREEN, *and if* other regions could supply larger amounts, the risk of market power would be reduced. In addition, Ukraine and the Russian Federation are two separate countries. They may act in collusion, or as a cartel⁶, but could also compete against one another to supply parts of assigned amounts, hence reducing their monopoly power as a single entity.

Thirdly, there is growing interest, at least from the Russian Federation, in transferring AAUs on the basis of well-identified projects that would generate reductions before 2008. If such an approach were to be the main vehicle for trades, the price of AAUs may be more closely related to the actual cost of reduction in specific projects, which would also limit the potential for price manipulation and market power.

Fourth, excessive pricing may drive buyers out of the market: some Parties may decide not to comply, and withdraw from the overall demand in the emission trading market, an option that is not envisioned in Burniaux's paper. This would result in lower potential revenues for sellers with market power, and reduce the incentive for them to raise prices above the competitive level. This may be a powerful incentive for Parties not to exert market power.

Last, large buyers of AAUs could also have monopsony power, i.e., if their demand represents a significant share of total demand. Monopsony power would lower the price of AAUs from its level in the competitive scenario. As monopoly power tends to push prices up, the behaviour of large buyers and sellers could counter-act each other. This could bring price levels closer to the competitive level, and reduce the efficiency losses caused by market power. However, the current emission outlook suggests that market power is more likely to come from sellers than from buyers. The ability of a single buyer to manipulate the price may therefore have only a limited effect on prices.

⁴ Burniaux, personal communication.

⁵ In the competitive scenario, the CIS would sell a total of 410 million tons of carbon in 2010, out of which 285 million tons would be generated by mitigation measures, the remainder coming from business-as-usual emissions below 1990 levels.

⁶ As assumed by Burniaux (cf. *Supra*)

The risk of dominant buyers (monopsony)

Bohm⁷ looks specifically at the role of a dominant buyer: in his example, the US acting as a single buyer. He assumes that:

- AAUs are traded through a double auction system: whether to buy or sell, participants must post their offers. Trades are then concluded on a first-come first-served basis, at the announced price. This system is similar to trading on a stock exchange;
- All Parties/traders would share some common knowledge about others' mitigation costs.

He argues that the more the US would try to lower the market price at its interest, the more other Parties (sellers) could turn into buyers if low prices make this option attractive. This would effectively neutralise the market power of the dominant buyer.

Effects on environmental effectiveness

In the above discussion, it is assumed that Annex I Parties would comply with their emission objectives, but at higher economic cost (except for monopolists). We have mentioned the possibility that some Parties may decide not to comply because of the high price in a non-competitive market.

Even in the case where Parties do comply, by artificially raising the price of AAUs, market power would increase the perceived cost of compliance. This would possibly induce Parties to negotiate less ambitious emission objectives in the next budget period than they would otherwise do.

In both these instances, beyond altering the economic efficiency of the trading system, market power would also undermine the environmental effectiveness of the Kyoto Protocol.

2.3 How can the risk of market power be minimised?

What could a solution to market power be if indeed one country, or region, were in a position to dominate the market of AAUs? Burniaux (1999) and Bader (1996), following Hahn (1984), find that industry-level trading would greatly minimise the risk of market power under IET, provided that selling Parties adopt this approach (see also Bohm, 1998). It is the allocation of AAUs at the country level, versus sector or entity level, and the possibility of governments trading large amounts in a centralised manner which create the risk of market power.⁸ In the end, it is up to the Parties themselves to decide whether they want to set up a domestic trading regime, which could help remove the risk of market power. Some Parties may not want to use this approach, or lack the institutional infrastructure to organise and maintain such a system.⁹ There is nevertheless the possibility that some trading will be based on projects, which may reduce the risk of market power in a way that is similar to what legal entity trading would imply.

As for the problem of a dominant buyer, it has been argued that the solution could be in trading AAUs through a system similar to a stock exchange. The role of exchanges is also mentioned to resolve the issue of market transparency, addressed in the next section.

⁷ See Carlén (1999) for more detailed explanation.

⁸ Mocilnikar (1998), in his theoretical review of tradeable permit systems and market issues, demonstrates that the introduction of forward trades would also lower the opportunity for market manipulation.

⁹ Even with legal entity trading, the upstream allocation mentioned in section 1.1 may also be conducive to some, albeit less important, market power.

3. Market access and transparency

3.1 Party-to-Party, and the issue of political trades

Article 3.5 of the United Nations Framework Convention on Climate Change states that “The Parties should cooperate to promote a supportive and open international economic system [...]. Measures taken to combat climate change, including unilateral ones, should not constitute a means of arbitrary or unjustifiable discrimination or a disguised restriction on international trade”. In that regard, another concern is open access to the IET market. This issue can be expressed as follows: because governments, and not only economic actors, may participate in IET, transactions could be the result of bilateral bargaining, where AAUs would not be the only element of the transaction.¹⁰ This is in fact, another aspect of the exclusionary manipulation mentioned in Section 1: other participants could be excluded from such transactions, as they may not be able to deliver the same “product” to the seller.

Supposedly, the visible price of the transaction would be lower than the real cost of mitigation, which could distort the market signal. If such Party-to-Party transactions were common, they could further reduce the efficiency of trading by sending the wrong price signal to participants and misguide their GHG mitigation and trading decisions.

Some have proposed that prior notification by Parties (i.e. an advance indication when Parties intend to buy or sell large amounts of AAUs), could alleviate this problem. The Party would post its intent in advance, possibly on a registry or exchange¹¹, or through other means.¹² By allowing all interested Parties and entities to compete for this transaction, such arrangement would improve market access, and help deliver an efficient economic outcome. Whenever AAUs are traded by Parties, they would be expected to go to the buyer with the highest bid price; this would help generate the right signal regarding the marginal cost of GHG mitigation.¹³

More specifically, it has been argued that transactions initiated by Parties may take place on an exchange, to promote competitive behaviour on the market. It is important to note that none of the commodities traded on exchanges throughout the world are traded exclusively on these exchanges. In fact, bilateral transactions are the rule, and exchange trading is more the exception. If Parties were to agree that a special treatment is necessary for Party-to-Party transactions,¹⁴ the question remains whether prior notification would be enough to avoid transactions that are not driven by economic considerations, or if a more structured mechanism (exchange, auction) would be required.

¹⁰ Economic actors (companies) are maximising profits (minimising costs); their participation in IET should therefore contribute to improved economic efficiency. Government actions can be motivated by other factors than strict economic ones.

¹¹ According to Bohm (1998), this would be the natural choice for GHG emissions trading.

¹² See paragraphs 158 and 160 in UNFCCC (1999).

¹³ If an exchange were to be used for such transactions, the common practice of anonymous transactions would prevent pre-arranged transactions.

¹⁴ E.g. Article XVII of the GATT.

3.2 On market design and market efficiency

The existing literature does not offer any analysis of the issue of transactions that are not based on economic considerations. However, some experiments have been conducted to test the relative efficiency of different types of trading regimes (Hizen and Saijo, 1999). By design, as we explain below, these experiments may apply more to legal entity trading than to Party trades.

These authors tested the generally accepted hypotheses that:

- Bilateral trading would be inefficient, and
- The disclosure of contract information after trades have been concluded would improve efficiency.

They suggest that neither economic theory, empirical evidence, nor experimental analysis support these views. Their first experiment investigates whether the disclosure of information on (1) marginal cost curves of different Parties, and (2) market prices of AAUs improves the efficiency of trading when only bilateral transactions are possible. To some extent, complete information on marginal cost curves may never be fully available to Parties themselves¹⁵ and therefore the question of whether that information would change the outcome is not so relevant for our discussion. On the other hand, the disclosure of market prices may matter in the formation of a clear market signal which fully reflects marginal reduction costs. This could be a crucial component of the efficiency of an IET regime.

While the following results are based on experiments where “virtual” Parties traded, they may apply better to trading among entities: participants were motivated by economic considerations, so no exclusionary manipulation or political trades of the kind mentioned above was tested.

In the case of bilateral trading, as opposed to trading on an exchange, the experiments conducted by Hizen and Saijo show that there is no significant difference in overall efficiency when contract prices are not revealed.¹⁶ Knowing the price of other participants’ transactions does not significantly help, nor does it hamper, the efficiency of the trading system in their experiment.¹⁷ On the other hand, the design of their experiment rules out any kind of transaction cost: all traders are gathered at the same time and place, and negotiation is strictly limited to price and quantity.

In another set of experiments, the same authors tested the efficiency of a trading regime working under the so-called double auction system (see above). The experiments showed that the efficiency under the double-auction rule is as high as that observed under bilateral trading, which suggests that the disclosure of price and quantity information to all does not improve market efficiency.

¹⁵ For instance, private entities are unlikely to reveal their true cost information to governments if they believe that it can be used to define more stringent reductions. An example can be found in the US SO₂ allowances program, where estimates of marginal abatement cost presented at the preparation stage of the Clean Air Act Amendment of 1990 have turned out to be much higher than current market prices.

¹⁶ However, we have seen above that trading on an exchange can resolve the potential problem of a dominant buyer.

¹⁷ Efficiency in both cases was close to its theoretical optimum. In a new set of experiments, Niizawa, Hizen and Saijo (personal communication) introduced penalties and rigidities in emission strategies, to better reflect the inertia of GHG emissions trends. Although their preliminary findings indicate that efficiency would be much lower in such a case, the disclosure of contract information (prices and quantities) did not affect efficiency in any significant fashion.

The authors note that the number of offers to buy or sell is significantly lower under the double auction than under bilateral trading, and add that if there were to be a transaction cost for such offers, the double-auction regime would be more efficient than bilateral trading.

In brief, experiments conducted by Saijo and Hizen do not argue strongly either in favour or against the disclosure of contract (price and quantity) information. Similarly, trading through an exchange (double-auction) does not seem to improve significantly the efficiency of the trading regime in their experiment. Again, this result may apply more to trading by legal entities than to Party-to-Party trading, where market access may be an issue.

4. Issues for further research

While this paper provides a preliminary assessment of some issues related to market power and market access, the following elements would need further research for a more complete treatment:

- Cartels and market power, based on the oil and other commodities market experience. How are they formed? Would cartels be sustainable under the Kyoto Protocol?
- The risk of market power on the demand side. How large should a player be in order to exert monopsony power?
- The influence of emission commitments for the second or later periods, and their negotiation, on the emergence of market power in the first commitment period;
- Supplimentarity and market power. How would quantitative ceilings on the use of IET and other mechanisms affect market power?
- Market power in joint implementation and the clean development mechanism;
- Market access in Party-to-Party trading;
- What are the safeguards offered by exchanges against possible market manipulation?
- The participation of multinational companies under a trading regime. Can multinationals use emission trading among their entities for other purposes than the minimisation of GHG abatement cost?

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