



**PhD Program
in Management
and Business
Administration**

THESIS COLLECTION

Dóra Fazekas

Carbon Market Implications for new EU Member States

Empirical analysis for Hungary

Ph.D. Dissertation

Advisor:

Prof. Dr. Sándor Kerekes

Vice Rector for Academic Affairs

Budapest, 2009

Environmental Economics and Management

THESIS COLLECTION

Dóra Fazekas

Carbon Market Implications for the new EU Member States

An empirical analysis for Hungary

Ph.D. Dissertation

Advisor:

Prof. Dr. Sándor Kerekes

Vice Rector for Academic Affairs

© Dóra Fazekas

Table of Contents

EU Emissions Trading Scheme for Decreasing Carbon-Dioxide Emissions .	2
Structure of the Thesis: Theoretical Background and Empirical Analysis...	3
Research Methodology: Qualitative and Quantitative Analysis.....	6
Findings of the Thesis.....	8
Implications of the Pilot Phase EU ETS on Hungarian Installations.....	12
Experiences during the EU ETS Pilot Phase	18
Author's Publications related to the Thesis.....	20

EU Emissions Trading Scheme for Decreasing Carbon-Dioxide Emissions

The Earth is becoming warmer than ever before. The increasing temperature of the planet is closely related to the use of fossil fuels, and the emissions of anthropogenic greenhouse gases (GHG), especially carbon dioxide (CO₂).¹ The problem of climate change, as well as its causes and consequences, has recently gained international public and political attention.

The European Union Emissions Trading Scheme (EU ETS) is the first cap-and-trade initiative worldwide to mobilize market forces in an effort to decrease carbon emissions. From 2005, large combustion installations (producing heat and electricity), oil refiners, coking plants, metallurgy and steel production facilities, cement, lime, glass and construction material producers and paper industry plants may generate CO₂ emissions only subject to permits issued by the respective National Authority.

This dissertation aims to present the pilot phase of the EU ETS between 2005 and 2007, and to provide an analysis of the Hungarian experiences. The prevalent international opinion is that new EU Member States will slow down or even reverse EU environmental policy, due to their “Socialist past and related economic/administrative transition challenges”.² It is interesting to analyze, then, how this market-based environmental tool worked in Hungary during the pilot phase. Could it be implemented in a country that has lacked the necessary institutions, experience with markets and practices?

The doctoral dissertation:

- (1) has certified that emissions trading as a market-based environmental tool works well even in a country that has lacked necessary institutions, experience with markets and practices;
- (2) has analyzed the impacts of the EU CO₂ Emissions Trading Scheme on Hungarian companies during the pilot phase; and
- (3) has quantified Hungarian companies’ involvement in the EU CO₂ emissions allowance market.

¹ IPCC (2007): Climate Change 2007: Mitigation. Contribution of Working Group III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change [B. Metz, O. R. Davidson, P. R. Bosch, R. Dave, L. A. Meyer (eds)], Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.

² Skjærseth, J. B. – Wettestad, J. (2007): Is EU Enlargement Bad for Environmental Policy? Confronting Gloomy Expectations with Evidence. *Int. Environ. Agreements* 7 pp. 263–280 (p. 264.)

Structure of the Thesis: Theoretical Background and Empirical Analysis

The dissertation is comprised of two parts: first, the theoretical background of the topic is presented; second, the results of the empirical research are discussed. The *first chapter* of the **theoretical background** reviews the policy options for environmental regulation in the context of climate change. Tradable permit systems are one form of limiting access to a common property resource by issuing usage rights. These are of particular utility if a large number of emissions sources are covered and if the pollutant is spread more or less evenly in the environment. This is the case with the emissions of CO₂.

The *second chapter* presents an overview of the implementation and practical experiences with tradeable permit schemes. The Kyoto Protocol was adopted in 1997, with signatory countries undertaking to reduce greenhouse gas emissions by 5.2% by the year 2012. The three Flexibility Mechanisms of the Protocol allow a group of countries to fulfill their commitments jointly, in order to minimize the costs of emissions reduction. This chapter describes the currently existing and emerging emissions trading systems. The EU ETS, described, gives the framework for this study. The EU system, aimed at assisting Member States to achieving their Kyoto targets, covers nearly half of the CO₂ emissions of twenty-seven EU Member States. Apart from this, there are compliance and voluntary systems in place in Norway, in Australia, in Japan, in Canada and in the northern states of the United States of America. Linking these schemes could establish a global carbon market to regulate most emitters.

The *third chapter* presents previous empirical work assessing the pilot phase (2005-2007) of the EU ETS. The literature focuses mostly on the effects of the scheme on old EU Member States (members prior to 2004). Studies describe that companies were initially reluctant to become involved in the scheme.³ The implications of the system on competitiveness were considered to be rather marginal during the pilot phase. Scientists agree that due to loosely defined targets and low carbon prices, the EU ETS has not spurred innovation. The three years of the pilot phase were not enough for the system to have lasting impacts. Uncertainties and delays were present throughout the period; nevertheless, the market was established and carbon prices have adjusted to the new circumstances.

³ Brewer, T. L. (2005): Business Perspectives on the EU Emissions Trading Scheme, *Climate Policy* 5(1), pp. 137–144.

In the context of new EU Member States (joining the Union after 2004) few studies describe the operation of the scheme. Articles rather present concerns over the EU enlargement, with accession countries being portrayed as laggards slowing down environmental policy.⁴ Given that new Member States participate in the Kyoto Protocol Mechanisms either through hosting Joint Implementation (JI) projects or through International Emissions Trading, this chapter deals with both. Eastern Member States had to prepare for EU accession and the introduction of the EU ETS concurrently. Governments had to create their National Allocation Plans, set up their Registries and develop rules for JI projects at the same time. The EU ETS was often prioritized over JI⁵ – nevertheless, several projects were registered during the pilot phase. Eastern Member States, with the sole exception of Slovenia, received more allowances than needed to cover their emissions. These surpluses – so called *hot air* – may be sold to other Kyoto signatories in accordance with International Emissions Trading regulations, a move controversial politically because it does not reduce overall emissions. Green Investment Schemes are set up with the aim of easing the anxiety over trading with surpluses and securing their environmental efficiency. The selling country has to spend all revenues on the reduction of emissions. Hungary was among the first countries to link its Registry with the UN's International Transaction Log, which allowed the government to sell surplus allowances. At the same time, Hungary was also among the first Eastern Member States to set up a Green Investment Scheme.

The second part of the dissertation, presenting the **empirical research**, describes Hungarian experiences with carbon emissions trading. The *first chapter* discusses previous studies on the implementation of the EU ETS in Hungary and deals with Hungarian GHG emission. The *second chapter* focuses on the implementation of the EU ETS, both on a national and on a corporate level. Hungarian CO₂ emissions between 2005 and 2007 were less than during the reference period for Kyoto targets (the average of the years 1985-1987). Thus, Hungary did not have to take austerity measures, and the government of Hungary (GOH) was rather generous when allocating allowances to Hungarian installations. The GOH was among the first to allocate allowances for compensation and to sell surplus allowances to other countries.

The *third chapter* analyzes Hungarian participants covered by the scheme; it examines the effects of the new regulation on these companies and quantifies carbon allowance

⁴ Skjærseth, J. B. - Wettestad, J. (2007): Is EU Enlargement Bad for Environmental Policy? Confronting Gloomy Expectations with Evidence. *Int. Environ. Agreements* 7 pp. 263–280 (p. 264.)

⁵ Korppoo, A. - Gassan-zade, O. (2008): Joint Implementation: Looking Back and Forward. *Climate Strategies*, Cambridge, UK (p. 21.)

transactions. Hungarian allowances were involved in both national and international transactions, and the majority of the surplus was surrendered in foreign Registries. Available data is not sufficient to distinguish the exact sales by Hungarian companies to foreign installations and the intrafirm transfers of multinational companies. Sales data will only become publicly available five years after the date of the actual sales. Differentiating intrafirm transfers from actual transactions will be of interest once data is made public.

Research Methodology: Qualitative and Quantitative Analysis

The research methodology of this dissertation does not follow previous stochastic, simulation-centric or modeling approaches. For conducting representative statistical analysis, the number of Hungarian participants – around two hundred and fifty installations – is not sufficient. Thus the impacts of the new carbon regulation on Hungarian installations covered by the scheme were examined through a **qualitative analysis**. Personal interviews were conducted with the representatives of the key Hungarian sectors responsible for the majority of the first phase allocation: major emitters representing energy production, cement, iron, steel, and oil refinery sectors provided data for the preparation of this study. Sectors responsible for only six and a half percent of Hungarian carbon emissions (namely the production of metal ore, coke ovens, glass, ceramic products, pulp, paper and board production) were not analyzed. Installations with more than half of Hungarian carbon allowances received the questionnaire, which provided the basis for personal interviews. The list of questions covered a wide range of topics, including the following: allocation implications of the EU ETS, effects on sectoral competitiveness, impacts on investment decisions and operational costs. The qualitative part of the dissertation hence relies on case studies, aided by a *semi-structured questionnaire*, to analyze the recently emerged allowance market in Hungary.

A **quantitative approach** was used to examine Hungarian emissions transactions during the pilot phase. Several obstacles were encountered in the process, as transaction data are not public. Information on Hungarian emission allowance transactions is listed in two databases: the EU's Community Independent Transaction Log (CITL)⁶ and the Hungarian National Transaction Registry. Data contained in the CITL is classified for five years, while information in the Registry is not searchable. Currently, all the central database will provide is the destination of a specific emission allowance, i.e. what installation in which Member State received it, as well as information on what installation in which Member State surrendered it. Data was collated by the research group Association for Promoting Research on Carbon Economy.⁷ The flow of emission allowances between Member States may thus be reconstructed, as long as it is assumed that the allowances were not redistributed through other installations and other Member States.

⁶ <http://ec.europa.eu/environment/ets> (November 2007)

⁷ APREC (www.aprec.net)

For lack of other relevant market data, the international literature⁸ can only draw upon the surrendered allowances indicated in the CITL. This dissertation examines not only the CITL data, but also the aggregate transfer data of the Hungarian trading Registry, provided directly by the Registry for this project. This dissertation is among the first to interpret the differences between the two databases and to point out that surrendered amounts indicated in the CITL do not reflect real emission allowance transactions. It may be concluded that it is prudent to use the CITL records and the national Registry data together in parallel, as the two databases contain information to complement each other. Although CITL data do not precisely depict international transactions and their schedules, they may be useful for inferring which Member States' companies entered into transactions with the installations in a given Member State. The data of the national Registries may be used to determine the precise quantity, scheduling and value of national transfers.

⁸ Kerr, A. (2007): Is Emissions Trading Working for Europe? *Environmental Finance*. Nov. S30-S32 and Trotignon, R. - Ellerman, A. D. (2008): Compliance Behavior in the EU ETS: Cross Border Trading, Banking and Borrowing, APREC working paper

Findings of the Thesis

The findings of the dissertation are structured around the following three main themes.

- (1) *The majority of Hungarian companies have not realized the opportunity cost of emission allowances.*

During the 2005-2007 pilot phase Hungarian companies covered by the EU ETS received 97.5% of the allocation at no cost to them. In keeping with relevant economics theories, opportunity costs have to be considered even when discussing free allocation of allowances, as the profits resulting from their possible sale do not differ from cost-based allocation.⁹ In this scenario, the opportunity cost refers to the fact that for every tonne of carbon-dioxide emitted, the number of emission allowances – received in this case for free – available on the market decreases by one, so that companies' potential revenues will also decrease by the same amount. Interviews showed that – contrary to the theory – companies did not recognize the opportunity costs of these allowances during the pilot phase.

Hungarian companies tended instead to pursue a cost-minimizing strategy regarding the EU ETS, and were not striving to maximize their profits. If they had been interested in maximizing their profits, they would have reduced their emissions and increased their allowance surplus, increasing their own presence as sellers in the international carbon market. Instead, a substantial number of Hungarian companies focused on compliance and worked to reduce their own costs related to the introduction of the new system. They did not recognize that the grandfathered allowances also entail an opportunity cost as well as a profit-generating potential in the same way as they would had the company had to pay for them. Based on personal interviews, it may be concluded that the majority of Hungarian companies did not recognize that grandfathered allowances have an opportunity cost; in other words, that by reducing their emissions, further units would become available, the sale of which would generate additional profits.

An examination of Hungarian accounting practices confirms that the management executives did not clearly understand the impacts of emission allowances on the company's finances and balance sheets. They failed to understand that this new regulation would not only mean a burden for their company, but would also potentially entail profits. They did not recognize,

⁹ OECD (1999): *Implementing Domestic Tradeable Permits: Permits for Environmental Protection*. Organisation for Economic Co-operation and Development, Paris, France (p. 237.)

then, that they could generate revenues by reducing their emissions as long as doing so is less costly to them than the market price of the allowances.

It is worthwhile to differentiate between the sale of the surplus free emission allowances and the recognition of the opportunity costs. This thesis supposes that, as can also be concluded based on the interviews, Hungarian companies did not substantially reduce their emissions. This study quantifies the surplus, which was at the companies' disposal as a result of the generous allocation, as the difference between the verified emission amounts for the given year and the allowances originally allocated. Based on these calculations, Hungarian entities amassed a surplus of some 12 million tonnes. Trade data show a net amount of nine million tonnes that was transferred abroad from Hungarian trading accounts. It was not possible, however, to quantify, based on the data available, what percentage of this amount was related to internal transfers executed by international companies and what amount was actually sold.

(2) The large number of foreign allowances surrendered by Hungarian companies is not a result of purchases, but is due to internal transfers by multinational companies.

The data of the Hungarian transaction Registry show that a significant number of emission allowances, originally allocated abroad, were transferred to Hungarian installations. This is surprising, as virtually all Hungarian sectors and installations amassed surpluses during the pilot phase. During these three years more than one and a half million emission allowances were transferred to the accounts of Hungarian installations from foreign accounts. This import activity seems questionable – why would Hungarian companies, in possession of a surplus, purchase emission allowances from abroad to ensure their compliance? Import data seemed misleading; it therefore appeared useful to also identify the allowances surrendered in Hungary but originally allocated abroad, and to examine the industries involved. This part of the research was made possible by an examination of the CITL.

It was determined that Hungarian installations used foreign allowances to ensure their own compliance in twenty-seven instances, amounting to one-tenth of all Hungarian installations. This comes to some 670 thousand foreign allowances over a period of three years. It is interesting to note that this amount is still less than half of the 1.5 million registered foreign-originated allowances, which were transferred to Hungary during the pilot phase. It may be concluded that over half of the foreign emission allowances showing up on Hungarian accounts expired worthless at the end of the pilot phase without having been used and/or

surrendered by the Hungarian company. This interesting finding is not unique to Hungary, however.¹⁰ At the same time, a significant number (240 thousand) of emission allowances originating in Hungary were not surrendered in any EU Member State Registry.

According to the data examined, the majority (87.66%) of the foreign allowances surrendered in Hungary were surrendered by international corporations. Four multinational companies are responsible for over four-fifths of the total amount: Electrabel (32.89%), Dalkia (25.86%), the Wopfinger group (14.47%) and ATEL (13.64%).

Of the twenty-seven installations, which utilized foreign allowances, three were new entrants and attempted to meet their emission needs through the international market; this accounted for less than one percent of all foreign allowances. A further eleven Hungarian-owned installations utilized foreign-originated allowances to meet their emission needs during the pilot phase. Three of these installations clearly resorted to this move to offset their own short position. One installation was closed down during the pilot phase; this installation made up for substandard performance in 2006 by purchasing foreign allowances in 2007. Seven of these eleven installations imported allowances even though they were in long position. This behavior on their part warrants further examination. There may have been installations in this category, which had sold off their own surpluses earlier and were thus left with an insufficient amount in the final year to meet their own requirements, leaving them to turn to the market to obtain the necessary allowances. Companies following this course of action were able to profit greatly from a drop in market prices, having sold their own allowances at a high price but buying them back later at a lower cost.

The quantitative findings of the dissertation were confirmed by the personal interviews conducted. It was found that the headquarters of foreign-owned companies tended to pool their subsidiaries' units at the beginning of the compliance period, and would re-allocate at the end of the period the number of allowances each installation required to meet its obligations.

The difference between aggregate Hungarian transaction data and real trade data serves to justify the research methodology used, which combined information from the two databases. Results thus showed that the significant import activity apparently conducted by Hungarian installations was not necessarily an accurate assessment. Four-fifths of the foreign emission

¹⁰ Trotignon, R. - Ellerman, A. D. (2008): Compliance Behavior in the EU ETS: Cross Border Trading, Banking and Borrowing, APREC working paper (p. 24.)

allowances entering Hungary were accounted for by internal transfers between the headquarters and the Hungarian subsidiaries of multinational corporations.

(3) *The Government of Hungary made use of the revenue-generating potential of emissions trading.*

According to a general perception, Eastern European EU Member States lack the necessary experience to recognize and make use of the opportunities within the emissions trading system.¹¹ For Hungary, participation in the EU Emissions Trading Scheme was an obligatory component of the country's adherence to the European Union. The lenient goals aimed at the reduction of emissions led to environmental concerns being pushed to the background, and the Government of Hungary began to look upon the EU ETS more as a tool for economic development rather than as a system necessary for meeting environmental protection goals. This dissertation, however, confirms that the GOH met the inherent challenges. During the pilot phase, the establishment of the institutional framework for the implementation of the EU ETS, and compliance with relevant legal regulations, encountered some obstacles, which was exacerbated by the lack of experienced officials and the continuous fluctuation of any such individuals. The long process of institutional learning evolved from a sort of "blind leading the deaf"¹² scenario.

At the same time, Hungary was in many ways a pioneer among the Member States: the country was first to join the UN's International Transaction Log, which is a major step toward the establishment of a global carbon market. Hungary was also the first in the region to establish a Green Investment Scheme to ensure that surplus allowances do not harm the environmental effectiveness of targets aiming to reduce emissions. Hungary was also the first nation to sell Assigned Amount Units to another country at a high cost.¹³ Hungary was one of only a handful of states to have used provisions in the ETS Directive allowing governments to auction allowances, contributing 10 million EUR to the central budget of the country. The Hungarian experience serves as evidence that a new market economy has the institutional capacity and technical expertise to carry out auctioning. This dissertation wishes to call

¹¹ Skjærseth, J.B. - Wettestad, J. (2007): Is EU Enlargement Bad for Environmental Policy? Confronting Gloomy Expectations with Evidence. *Int. Environ. Agreements* 7 pp. 263–280 (p. 266. The authors cite some ten articles.)

¹² In the words of József Feiler, former head of Climate Change and Energy Unit at the Ministry for Environment and Water

¹³ The actual price is not public, estimates are between €13-15.

attention to the stressful situation due to the conflict of interests and lack of coordination between Ministries when conducting the auctions. Accordingly, the timing of Hungarian auctions did not help maximize profits, as market prices fell in the meantime.

Implications of the Pilot Phase EU ETS on Hungarian Installations

The dissertation examines the effects of the EU ETS pilot phase on Hungarian companies in part through interviews and in part through an analysis of allocation, verified emissions and allowance transaction data. During the personal interviews, company representatives mentioned *uncertainty* as the main feature of the scheme. Short deadlines and delays in regulation, however, are not unique to the eastern part of the continent.

Hungarian companies considered the pilot phase of the European Unions Emissions Trading Scheme to be an administrative burden. They viewed the grandfathered amount as their standard emissions limit, and worked to maximize their profits through the allocation process. In other words, they were interested in obtaining as many grandfathered allowances as possible, instead of focusing on abating emissions. The companies looked upon the free allowances received as a kind of maximum emissions amount to work with. Their relevant officials never considered that it might be worthwhile to realize further reductions. The companies did not perceive the price of carbon to be expenditure. Nonetheless, the three years of the pilot phase proved sufficient for Hungarian companies covered by the scheme to realize that the emission of carbon-dioxide has, indeed, become a new factor of production, which must be taken into consideration when making business decisions.

In the case of Hungarian companies, the EU ETS pilot phase did not bring about technological or operational changes, which would otherwise not have been instituted had the system not been put in place. *The effect of the pilot phase on driving innovation was marginal*, a result both of the abundant supply of grandfathered allowances in Hungary and the low carbon prices.

Regarding competitiveness implications of the scheme on Hungarian sectors, respondents cited carbon leakage above all. Leakage refers to the relocation of carbon emitting operations to new locations outside the borders of the EU ETS. This possibility is especially relevant in the case of cement production and oil refinery, but only in the post-2008 Kyoto-period.

The questionnaire used for the survey also showed that companies covered by the scheme, in general, did not wish to begin trading with allowances, but focused rather on ensuring the sufficient amount to cover their own CO₂ emissions. *The overall impact of the EU ETS on Hungarian companies during the pilot phase was not significant.* Its effect on company operations was mostly limited to fuel switching.

Only one of the companies approached for the survey introduced the costs of carbon-dioxide emissions into its operational and investment decision-making processes. This company applied the shadow price of CO₂ in its profit and management evaluation criteria. By setting an internal carbon price, higher than actual market prices, this company created exemplary strategic opportunities and the potential for profits.

Applying the EU emissions allowance trading necessitates a learning process within companies. Initially, participants viewed the system as a regulatory framework; it took time for that to change. The management then had to realize the new system of regulations, and had to appoint an official within the company to oversee the process and comprehensively introduce tradeable allowances in the company's operational and strategic functions. Only then could the emissions trading system become an integral component of the company's operations and processes, leading to an internalization of CO₂. Hungarian companies did not reach the final stage of this process during the pilot phase.

The EU ETS market is rather concentrated, both in terms of sectors and companies as well as installations. In Hungary, over 70% of the allocated allowances and the actual emissions are accounted for by barely 4% of all facilities, the majority of which are power plants.¹⁴ Representatives of the energy sector received nearly three-fourths of all allocation. Seven installations received 55% of allocated allowances; all seven were interviewed for the sake of this dissertation. When looking at allocation by company groups, multinational companies also come into play (e.g. Electrabel, EDF, E-ON, AES, ATEL).

By comparing verified emissions data with allocated allowances, we arrive at positions of sectors and installations. Installations facing a shortage are in a *short* position, whereas installations with a surplus are *long*. In general, *Hungarian sectors tended to receive more allowances than would have been necessary to cover their verified emissions during the pilot phase.* Fifty-two installations were short, while 191 installations were long.

¹⁴ Hungarian Meteorological Service (2008): National inventory report for 1986-2005, Hungary, Greenhouse Gas Inventory Division (<http://www.met.hu>)

The so-called *relative position*¹⁵ of the different sectors indicates allocations within the sector as compared to the verified emissions data; it shows the ratios between net and gross positions. Only net long positions could be observed in Hungary during the pilot phase; no sector was found to experience a shortage in this period. Hungary's relative position is a high positive number, which indicated a surplus and that few installations were experiencing shortages. Hungary's *allocation factor*¹⁶, greater than 1, confirms that Hungarian ETS sectors, taken as a whole, possessed a surplus. With the exception of the paper industry, however, every sector had at least one installation, which received more allowances than it eventually ended up using; there was also at least one installation, which received less allowances than it would have required. *Overall, Hungarian participants were able to rely on a surplus of 14%, which amounts to 12 Mt of CO₂ emission allowances.*

In order to examine the environmental efficiency of the EU ETS, it would be necessary to quantify the emissions reduction witnessed as a result of the introduction of the system. This, however, is difficult to do, for a number of reasons. For one, it would be necessary to obtain data spanning a longer period than the pilot phase of three years, to arrive at appropriate conclusions. Furthermore to determine differences between emission reductions or abatement, it would be necessary to isolate the effects of the EU ETS from business as usual scenarios. To do so, it would be necessary to determine the quantity, which would have been emitted had the EU ETS not been introduced. Clearly, this amount cannot be measured; it may only be estimated. And estimation is difficult: there is great uncertainty, and no verified emissions data is available for the base period – especially in new Member States –, which would be essential to determining the emissions of business as usual operations. Thus, the dissertation does not focus on quantifying the emissions abatement, but instead examines the issue, through survey results, from a qualitative perspective.

The interviews conducted revealed practices, which were contrary to theories of economics. Companies are – theoretically – profit-maximizers and should therefore reduce their emissions as long as the cost of abatement is less than the market price of emission allowances.¹⁷ This

¹⁵ Ellerman, A. D. - Buchner, B. K. (2008): Over-Allocation or Abatement? A Preliminary Analysis of the EU ETS Based on the 2005–06 Emissions Data. *Environmental and Resource Economics* 41(2) pp. 267-287

¹⁶ Anger, N. - Oberndorfer, U. (2007): Firm Performance and Employment in the EU Emissions Trading Scheme: An Empirical Assessment for Germany. *Energy Policy* 36 pp.12–22. (p. 3.)

¹⁷ Kerekes, S. (2007): *Basic Theories of Environmental Economics* ("A környezetgazdaságtan alapjai"), Aula Kiadó, Budapest and Lesi M. - Pál G. (2004): Regulation of the emissions of Greenhouse Gases and effects of regulation on electricity producers in Hungary ("Az üvegház hatású

should hold true also when they are in possession of a sufficient number of allowances. Nevertheless, *no significant emissions reduction could be confirmed in the case of Hungarian companies as a result of the EU ETS*. Certainly, there may be underlying strategic reasons for this behavior, such as a realization that it was better for companies to delay reducing their emissions until the period 2008-2012. Doing so would mean that reductions accomplished during the pilot period, which serves as the basis for the Kyoto period, would not lead to a shortage later. Also, any surplus amassed through reduction could be sold over five years. The interviews revealed a reliance on traditional abatement techniques in Hungary: instances of fuel switching and techniques for increasing efficiency were doubtless encountered, however, companies did not act to change their technology or product structure during the three-year period. Analysis revealed that the fairly insignificant reduction in emissions was due in part to the low carbon price and in part to the original allocation of allowances, which presented few constraints to companies. The results mesh with Hungarian companies' behavior aimed at compliance. They did not recognize the inherent business possibilities of the scheme, as they worked not to maximize profits but to minimize their own costs related to the implementation of the system. This confirms that trading companies did recognize the opportunity costs of reducing their emissions, and thus did not act to do so.

The interviews also pointed out that *accounting and book keeping of allowances presented a problem for the companies*. Even despite having access to both Hungarian as well as EU guidelines, companies failed to understand the effects of the allowances on company revenues. Emissions allowances may be recorded in company books either as intangible assets or as goods, depending on whether the company will retain ownership for more or less than one year. It would be vital to publish international standards adopted by Member State authorities and acknowledged by obligated companies. This would be a significant step toward reducing uncertainty in the system. It is also essential, at the same time, to prepare accountants and tax advisors for tasks related to the book keeping and accounting of allowances.

The research for the dissertation covered data from the three-year pilot phase. During this time, a common and liquid carbon market was established, without national borders. Traditional financial products also appeared: options, swaps, hedges and derivative deals;

gázok kibocsátásának szabályozása, és a szabályozás hatása a villamosenergia termelő vállalatokra Magyarországon”). PhD Dissertation, Budapest

futures trading also commenced, in addition to spot trading (and in fact preceded the latter due to the delays surrounding registries).

Two databases are available for the analysis of the Hungarian market activity with carbon allowances: surrendered allowances recorded in the Community Independent Transaction Log and the transfer data of the Hungarian National Registry. Generally, and for the three years of the pilot phase, the information contained in the two databases matches. Emissions allowances were transferred to foreign accounts from Hungary – approximately 10.5 million EUA¹⁸. At the same time, allowances were transferred to Hungarian companies from abroad. Broken down by year, the two databases contain different figures, however. According to the Hungarian registry, 1.5 million allowances originally allocated abroad showed up on Hungarian trade accounts, whereas CITL figures show 670 thousand foreign-originated allowances being surrendered from Hungarian accounts. This contradiction is due to the fact that units sold or purchased in a given year were not used in the same year.

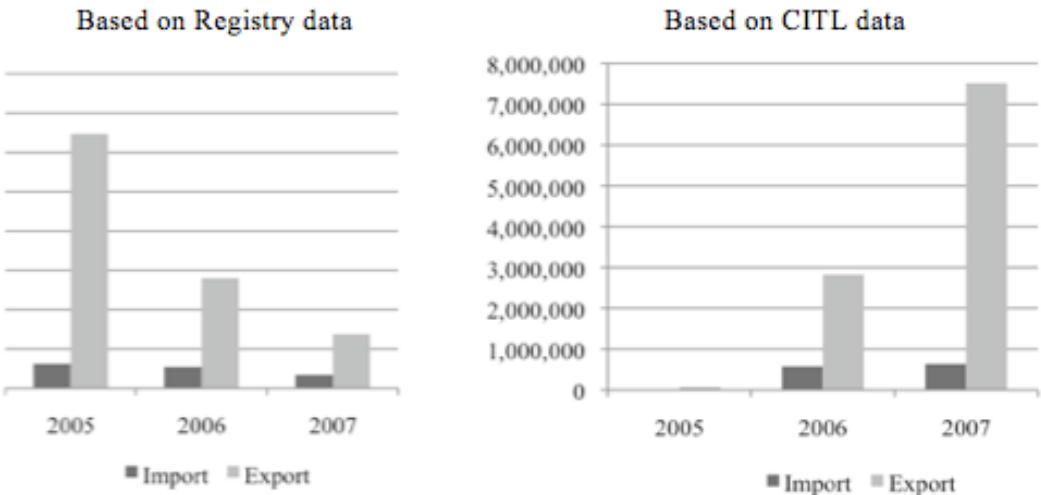


Fig. 1: Trading of emission allowances

These conclusions, as well as a comparison of data broken down by year, clearly show that there is a time lag between the allocation and utilization of emission allowances. Registry data reflect the actual scheduling of the transactions, while CITL data quantify the allowances surrendered in a given year. The comparison of the data confirms that companies – both in Hungary as well as abroad – made use of the flexibility in timing that the EU ETS allows for. *Companies both banked emission allowances, delaying their utilization until later years, and borrowed units from the allowances of the following year.*

¹⁸ EUA: European Union Allowance, the emission unit of the EU ETS which allows for the emission of one ton of CO₂.

The Hungarian transaction registry went online on April 11, 2006. Spot trading on the CO₂ exchange began on April 20, when the market price was 29.9 EUR per tonne. This price dropped to 13.3 EUR per tonne by the April 30 deadline for surrendering allowances, following the publication of 2005 verified emissions data. Thus, Hungarian companies, which sold their surplus during this period, were able to realize significant profits.

Hungarian companies became party to the pilot phase trading of carbon emission allowances. During these three years 17.1 million emission allowances were traded on Hungarian accounts – with a total value of 234 million EUR. To quantify the value of transactions the dissertation relies on the following method: the number of allowances traded was multiplied by the average carbon price during the particular year.

In the first year of the pilot phase, Hungarian companies had only one and a half week – between the launches of the Hungarian Registry and the CO₂ exchange – to conduct business in the international market prior to the deadline at the end of April 2006. Half of the trading during the pilot phase occurred during these ten days, accounting for over three-fourths of the value traded during the entire period. Between April 20 and 30, some 6.5 million allowances were transferred from Hungarian companies' accounts, ending up abroad.

The data do not reveal whether it was Hungarian operators who sold their surpluses in the nearly 200 transaction taking place within these ten days – netting 130,5 million EUR in revenues as a result – or the allowances were simply transferred to the central accounts of multinational companies from their Hungarian subsidiaries. The research framework thus limits the interpretation of the findings. *It will be possible to enhance and expand this research once the relevant data becomes public.*

Hungarian companies entered into transactions with companies in twenty-one other Member States during the pilot phase. Hungarian allowances were surrendered in twenty countries, and Hungarian companies utilized allowances from twelve other Member States in addition to their own allocations. Although Hungary was, in general, a net exporter during the period examined, it was nonetheless a net importer vis-à-vis five countries. The majority of emissions allowances allocated and surrendered in Hungary did not enter international trading. This conclusion matches the international findings of Trotignon and Ellerman (2008); in every participating MS, it was predominantly the allowances of that particular country, which were being traded.

This dissertation supposes that companies with a surplus would surrender the allowances necessary for meeting their own emissions requirements to the authorities at the end of each year, and would sell their surplus on the market. Essentially, the surplus would thus become the potential supply on the market.¹⁹ Comparing the surplus of nearly 12 million emissions allowances, amassed by Hungarian market entities, with the net 9 million emission allowances exported, we may conclude that *Hungarian companies did not enter the market with their full potential supply*. Yet compared with other Member States, the share – over four-fifths in Hungary – of surplus being transferred to foreign accounts is considered high.

In addition to the international transactions, nearly 5 million allowances traded hands domestically, worth some 58.5 million EUR. These amounts – both in terms of quantity and in terms of value – are far lower than the trade conducted with companies in other Member States. This is hardly surprising, as Hungarian companies and sectors on the whole were in long position.

Experiences during the EU ETS Pilot Phase

The EU's CO₂ emissions trading scheme represents an entirely new approach, both from the perspective of parties regulated and from the perspective of regulators. The system called for a new approach on the part of all stakeholders. The dissertation examined whether expectations of the pilot phase were fulfilled. During the three years of the pilot phase, a new resource was created – the carbon emissions allowance. Hungarian entities established the necessary institutional framework and oversight mechanisms. The Government of Hungary and installations obligated to participate in the scheme came to understand the workings of emissions trading. Producers are able to appropriately measure and track their emissions – this is a key result of the pilot phase: EU Member States now have reliable and verified emissions data available going back to 2005.

This new factor of production, however, failed to take root in individuals' mindset during the three years of the pilot phase. It did not become ingrained in corporate decision-making and company executives did not prepare for expenses related to the emission of carbon-dioxide.

Uncertainty surrounding new legal regulations made it difficult to adopt the system in Hungary. The EU ETS appeared to be unpredictable: regulations were still being put in place

¹⁹ Trotignon, R. - Ellerman, A. D. (2008): Compliance Behavior in the EU ETS: Cross Border Trading, Banking and Borrowing, APREC working paper (p. 7.)

during the pilot phase itself, and decision-making on the EU level was not coordinated. Member States did not observe deadlines. At the same time, a pilot phase, which was far shorter, to begin with, than the timeframe necessary for implementing new economic decisions, did not aid the pricing of carbon emissions in business decision-making. The ability to plan ahead for the long term is vital for the scheme to succeed. It is important for companies to know that the effects of current investments aimed at reducing emissions will bear fruit in the long term.

Hungarian companies – due to more plentiful allocations than may have been necessary – were able to realize significant profits in the short term. The long term, however, is a different situation; starting in 2012, the European Union plans to significantly reduce the amount of grandfathered allowances. It is important to note that if the percentage of CO₂ emitting industry increases in the medium term as a result of lower production costs, it is to be expected in the long term that the competitiveness of this industry will drop (as a result of necessary environmental protection investments). Alternatively, the industry may be shifted east, outside the coverage of the EU ETS. This strategy would simply mean delaying necessary expenditures, and would mean doing so through a less than practical economic approach as far as the future is concerned.

The operation of the EU's carbon-dioxide emissions trading scheme is a valuable experience on the road to the establishment of a global CO₂ market. On the whole, the EU Emissions Trading Scheme brought about the realization of a common European carbon market. Countries did not establish their own, isolated and compliance-focused, national trading systems. It was not countries but companies, which participated in the trading, and – regardless of nationality – they worked to either sell their surplus or obtain additional allowances through the common European market. The decentralized and liquid carbon market established an effective trading scheme, with minimal transaction costs. Hungarian companies were party to this in the same way as Western-European – and already highly experienced – corporations.

Author's Publications related to the Thesis

Hungarian-Language Publications

Book Chapter

Fazekas, D. (2008): Carbon-dioxide market ("Szén-dioxid piac") In: „...*Hogy művelje és őrizze meg*” Tanulmánygyűjtemény a környezettudatos gondolkodáshoz. pp. 67-71. Szent István Társulat Kiadó, Budapest

Article in Referred Journals

Andor, Á. – Fazekas, D. (2008): Accounting Aspects of Emission Trading ("A szennyezési jogok kezelése a gazdálkodó szemszögéből: számviteli kérdések") *Budapest Management Review* ("Vezetéstudomány") XXXIX (3.) pp. 44-59. Budapest

Fazekas, D. (2009): Auctions in the Pilot Phase of the EU ETS („Akción az Európai Unió szén-dioxid kereskedelmi rendszer próbaidőszakában”) *Budapest Management Review* ("Vezetéstudomány", forthcoming)

Article in Other Journals

Fazekas, D. (2007): Environmental tools against climate change - Emission trading ("Hogyan működik az emissziókereskedelem? – Gazdasági eszközökkel a klímaváltozás ellen”) *Facility Management*, 2007/1. pp. 30-32. Budapest

Fazekas, D. (2008): Series of articles on emission trading In: *Steps toward Sustainability* ("Lépések a fenntartható fejlődés felé”) *Joint journal of KÖVET and TTMK*, Budapest
Emission trading („Emissziókereskedelem”) Vol. 11. Issue 1. (27) pp. 6-7.

Emission trading - CO₂ carbon exchange launched („Emissziókereskedelem - Megindult a CO₂ tőzsde”) Vol. 11. Issue 2. (28) p. 4.

Emission trading („Emissziókereskedelem: CO₂ hitelesítés”) Vol. 11. Issue 3. (29) p. 6.

CO₂ accounting, book keeping of allowances („CO₂ számvitel, kvótakönyvelés”) Vol. 11. Issue 4. (30) p. 8.

Emission trading („Emissziókereskedelem”) Vol. 12. Issue 1. (31) p. 17.

National Climate Change Strategy is under construction („Készül a Nemzeti Éghajlatváltozási Stratégia”) Vol. 12. Issue 2. (32) pp. 17-18.

Joint Implementation („Együttes végrehajtás”) Vol. 12. Issue 3. (33) p. 21.

Clean Development Mechanism („Tiszta Fejlesztési Mechanizmus”) Vol.12. Issue 4. (34) p. 20.

English-Language Publications

Book Chapter

Fazekas, D. (2008): Auction Design for Selling CO₂ Emission Allowances. In: *Emissions Trading in Europe: Initial Experiences and Lessons for the Future*. ed. Michael Rodi, pp.125-140. Der Juristische Verlag, Berlin

Conference Paper

Fazekas, D. (2008): Carbon Market Implications for the New EU Member States. *Association for Promoting Research on Carbon Economy*, Paris

Working Paper

Fazekas, D. (2007): Assessment of the EU Emissions Trading Scheme. *Managing Carbon Constraints, ETH 2007*, Zürich

Other Publications

Book Chapter

Fazekas, D. – Vári, S. (2007): Fair trade coffee, tea and cacao (“Kávé, tea, kakaó tisztességes áron - előtérben a helyi közösségek”) In: *Társadalmi vállalkozók*, Alinea Kiadó, Budapest (forthcoming)

Other Paper

Krishnan, N. – Kaufman, S. – Fazekas, D. – Lackner, K. – Brennan, S. (2008): Carbon Footprinting: A Critical Review of Existing Activities. *Lenfest Center for Sustainable Energy*, Earth Institute at Columbia, New York