Chapter 18

EU Emission Trading System, Competitiveness and Taxes on the Energy Sector

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SUMMARY: I. INTRODUCTION. II. IMPACT ON COMPETITIVENESS RELATED TO ELECTRICITY PRICES. III. IMPACT ON COMPETITIVENESS OF ENERGY-INTENSIVE INDUSTRIAL SECTORS. IV. «ENERGY EFFICIENCY» AND «ENVIRONMENTAL INNOVATION»: A BALANCE FOR COMPETITIVENESS AND ENVIRONMENTAL PROTECTION. V. COORDINATION WITH OTHER ENVIRONMENTAL INSTRUMENTS: EU ETS AS AN ELEMENT OF AN ENVIRONMENTAL TAX SYSTEM. VI. REGULATORY ASYMMETRIES INTRA-EU AND EXTRA-EU: «CARBON LEAKAGE». VII. CONCLUDING REMARKS AND RECOMMENDATIONS.

I. INTRODUCTION

The impact of the European Union Emission Trading System (EU ETS) on competitiveness is a worrying issue for the energy sector and related industries in Europe. When it was established in 2005, it was said that the price for carbon emissions created by the EU ETS could affect cost structure, and therefore competitiveness with foreign imports. The main concern was that it could produce emissions leakage and delocalization of industries, with the corresponding impact on jobs and domestic production.

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In order to corroborate these initial threats, it is necessary to first determine the real impact of the EU ETS. Altogether the EU ETS covers around 45% of total greenhouse gas emissions from the 28 EU countries. The focus of the EU ETS is on emissions which can be measured, reported and verified with a high level of accuracy. The system covers emissions of carbon dioxide (CO_2) from power plants, a wide range of energy-intensive industry sectors (including oil refineries, steel works and production of iron, aluminium, metals, cement, lime, glass, ceramics, pulp, paper, cardboard, acids and bulk organic chemicals) and commercial airlines (only for intra-EU flights). Road Transport (25% of emissions) is not included in the EU ETS[2].

Consequently, we can identify two main impacts on the competitiveness of the EU economy. On the one hand, a general impact on electricity prices which, depending on the configuration of the electricity mix and the pass-through effect, could be distributed among all the economic actors. On the other hand, a more concentrated impact could be observed on certain energy-intensive industries included in the EU ETS.

There are however two other important aspects to be taken into account for measuring the impact on competitiveness: the allocation of permits and the pass-through effect. Regarding the allocation of permits, the initial allocation under the EU ETS reduced its impact. In phases I and II, countries were called upon to draw up National Allocation Plans that both fixed the national cap and determined the sectoral allocation. Free allowances were granted to new entrants whereas the allowances of existing facilities were revoked and cancelled. Nevertheless, for trading phase III, beginning in 2013, Directive 2009/29/EC introduced a «Community-wide quantity of allowances», which means that the allocation of free emission allowances is no longer made by national governments but in Brussels. Moreover, for phase III, the allocation scheme is harmonized in order to reduce

2. According to the European Commission, road transport sector is responsible of 25% of CO_2 emissions. They are not covered by ETS but there are mandatory emission performance standards for new passenger cars and new light commercial vehicles introduced by Regulations 443/2009 and 510/2011. See Regulation (EC) No 443/2009 of the European Parliament and of the Council of 23 April 2009 setting emission performance standards for new passenger cars as part of the Community's integrated approach to reduce CO_2 emissions from light-duty vehicles. OJ L 140, 5.6.2009, p. 1-15; Regulation (EU) No 510/2011 of the European Parliament and of the Council of 11 May 2011 setting emission performance standards for new light commercial vehicles as part of the Union's integrated approach to reduce CO_2 emissions from light-duty vehicles. OJ L 145, 31.5.2011, p. 1-18. There are, however, initiatives in order to include road transport sector in the EU ETS. See M Achtnicht, K Von Graevenitz, S Koesler, A Löschel, B Schoeman, T Reaños, and M Angel «Including Road Transport in the EU-ETS-An alternative for the future» (2015) Report of the Centre for European Economic Research (ZEW) 29.

competitive distortions (benchmarking system)[3]. This will increase the negative effect on EU competitiveness or, at least, it will reduce the possibilities of mitigating the impact at national level.

Finally, pass-through effect means that carbon prices on production could be borne by consumers, having a general impact on the competitiveness of the whole economy[4]. Pass-through could be essential not only to measure the impact on competitiveness but also to analyse the wish of companies to move forward greener technologies, which is one of the goals of the EU ETS system.

II. IMPACT ON COMPETITIVENESS RELATED TO ELECTRICITY PRICES

The impact of the EU ETS on the European economy might differ depending on the possibility to pass on carbon prices to consumers. While the manufacturing sector is typically relatively open to international trade and thus exposed to international competition, the power market is highly concentrated and less exposed to international competition since it is selling mostly to local markets[5]. In Spain the average pass-through in electricity market is above 80% (100% on high-demand hours)[6]. Due to the lack of real EU electricity market, the effect is similar in other EU countries[7].

However, dynamic effects of carbon prices may cause firms to discover and implement cost-effective energy efficiency measures[8]. If the EU

3. Commission Decision 2011/87/EU of 27 April 2011 determining transitional Union-wide rules for harmonised free allocation of emission allowances pursuant to Article 10a of Directive 2003/87/EC of the Parliament and of the Council. OJ L 130/1 (Benchmarking Decision). This decision stipulates that free allocation be based on product benchmarks to the extent possible. A product benchmark is defined as the average greenhouse gas emission performance of the 10% best performing installations in the EU producing that product, measured in tons of CO_2 equivalent per unit of output.
4. P Ekins and S Speck «Impact on competitiveness: what do we know from modelling?», in J E Milne and M S Andersen (eds.) *Handbook of Research on Environmental Taxation*, (Edward Elgar Publishing Limited 2012).
5. S Veith, J R Werner and J Zimmermann «Capital market response to emission rights returns: Evidence from the European power sector» (2009) 31 Energy Economics 605.
6. N Fabra and M Reguant 'Pass-through of emissions costs in electricity markets', NBER Working Paper 19613, (National Bureau of Economic Research 2013).
7. F Mokinski and N Woelfing «The effect of regulatory scrutiny: Asymmetric cost pass-through in power wholesale and its end», (2014) 45 Journal of Regulatory Economics 175. D Kirat and I Ahamada «The impact of the European Union emission trading scheme on the electricity-generation sector», (2011) 22 Energy Economics 995.
8. R Cowart «Prices and policies: carbon caps and efficiency programmes for Europe's low-carbon future» (2011) Study Conference Proceedings, Energy efficiency first: The foundation of a low-carbon society, 6-11 June 2011, Stockholm.

ETS fixed cap is reduced, the prices for allowances increase. Energy providers pass on the additional costs from the EU ETS and raise their prices according to their emission intensity. With higher energy prices, investments in efficiency become more attractive for end users[9]. Since innovation could take some time, it is necessary to distinguish between long and short term impact.

It is obvious that electricity intensive consumers are more affected than those using less electricity, however when the impact rises and it becomes harmful for the competitiveness of the company, they normally change the source of energy that they consume, switching from electricity to gas[10]. Some studies have tried to determine an average competitiveness impact of the increase of energy prices, which could be fixed between 0.1 to 0.2% of import increase for each 1% of energy prices growth[11].

Another issue is the interaction of energy efficiency policies with the EU ETS and its impact on the electricity market. According to Thema J. *et al*[12]. the decrease in electricity demand produced by energy efficiency policies could reduce electricity prices, the demand of EU ETS allowances and, at the same time, the pass-through effect of EU ETS costs for power plants. Consequently, it is necessary to coordinate both policies (EU ETS and energy efficiency policies), so as to reduce EU ETS free allowances to power plants when energy efficiency policy leads to a reduction of the demand. Otherwise, energy efficiency policy could lead to carbon prices fall up to a level that EU ETS could become irrelevant.

III. IMPACT ON COMPETITIVENESS OF ENERGY-INTENSIVE INDUSTRIAL SECTORS

According to Johanna Arlinghaus[13], who has made a literature review in order to estimate a causal relation between carbon prices, emission reductions and competitiveness effects on energy-intensive industrial sectors after the introduction of the EU ETS, it is not possible to find a causal relation between carbon pricing and competitiveness.

9. J Thema, F Suerkemper, K Grave, and A Amelung «The impact of electricity demand reduction policies on the EU-ETS: Modelling electricity and carbon prices and the effect on industrial competitiveness» (2013) 60 Energy policy 656.
10. F Flues and B J Lutz «Competitiveness Impacts of the German Electricity Tax» (2015) 88 OECD Environment Working Papers.
11. M Sato and A Dechezleprêtre «Asymmetric industrial energy prices and international trade» (2015) 52 Energy Economics S130.
12. J Thema et al. (n 8).
13. J Arlinghaus «Impacts of Carbon Prices on Indicators of Competitiveness» (2015) 87 OECD Environment Working Papers.

One of the reasons for explaining this phenomenon is the exemptions, reductions and rebates that Member States have introduced in order to maintain competitiveness[14]. These have been very popular during the last decade, and they were promoted by ministries of industries at the national level. However, last studies[15] conclude that reduced rates and exemptions are not always necessary to maintain the competitiveness of firms affected by the policy.

Pass-through also takes place in manufactory sectors, but in a different scale than in the electricity sector. In those sectors with high market concentration (such as iron, steel and refineries), pass-through could achieve 100%[16]. It is however much lower for chemicals (50%), glass (25%) and ceramics (30%)[17].

The reduction of competitiveness in one particular sector does not imply necessary the reduction of competitiveness of the economy as a whole. The competitiveness of a whole economy depends on a range of structural factors including the macroeconomic environment, commercial framework, openness to trade and investment, labour skills, ability to innovate and labour market regulation[18]. The ability to innovate (Porter hypothesis) could play a key role in the compensation of costs of the EU ETS and the increase of competitiveness of European economy. Recent studies show that EU ETS sectors are more likely to innovate than non-ETS sectors[19]. Constantini and Mazzanti[20] have demonstrated, for example, that when the regulatory framework is followed by private innovation, environmental policies seem to foster rather than undermine export dynamics.

14. F B Chevallier and J Philippe Quirion «Carbon Leakage and Competitiveness of Cement and Steel Industries Under the EU ETS: Much Ado About Nothing» (2016) 37(3) The Energy Journal, DOI: *http://dx.doi.org/10.5547/01956574.37.3.fbra*.
15. R Martin, L De Preux and U. Wagner «The impacts of a carbon tax on manufacturing: Evidence from microdata» (2014) 117 Journal of Public Economics 1.
16. S D Bruyn, A Markowska, F De Jong, and M Bles «Does the energy intensive industry obtain windfall profits through the EU ETS? An econometric analysis for products from the refineries, iron and steel and chemical sectors» (2010) 7.005 CE Delft Report.
17. U Oberndorfer, V Alexeeva-Talebi and A Loeschel «Understanding the competitiveness implications of future phases of EU ETS on the industrial sectors» (2010) 10-044 ZEW Discussion Papers.
18. J Adams «Environmental Policy and Competitiveness in a Globalised Economy: Conceptual Issues and a Review of the Empirical Evidence» in OECD *Globalisation and Environment – Preliminary Perspectives*, (OECD Proceedings 1997), 53.
19. S Borghesi, G Cainelli, and M Mazzanti «Linking emission trading to environmental innovation: evidence from the Italian manufacturing industry» (2015) 44(3) Research Policy 669.
20. V Costantini, and M Mazzanti «On the green and innovative side of trade competitiveness? the impact of environmental policies and innovation on EU exports» (2012) 41(I) Research Policy 132.

IV. «ENERGY EFFICIENCY» AND «ENVIRONMENTAL INNOVATION»: A BALANCE FOR COMPETITIVENESS AND ENVIRONMENTAL PROTECTION

Environmental regulation is an important driving force together with technology push, market pull and firm-specific factors[21]. Analysing the Italian Community Innovation Survey, Borghesi *et al.* have concluded that there is a high correlation between the EU ETS and environmental innovation[22].

Innovation impact could differ depending on the sector. The high pass-through in the electricity sector has reduced the innovation effect of the EU ETS as it has been demonstrated by Hoffman, analysing the German power plant sector[23]. According to Roggeand Hoffmann, the EU ETS has only discouraged the new implementation of large-sized coal-based power generation plants[24].

However large sample and cross-sector studies say that firms subject to the EU ETS have been more innovative than unregulated firms[25]. Nevertheless, this impulse has not been enough to foster a technological change, according to environment related patents production[26].

Regarding energy efficiency, Martin *et al*[27] evaluating the UK Climate Change Levy have found little effects on competitiveness but high impact on energy efficiency. According to this study, the companies included have reduced electricity use by 22.6%, which can be translated in a decrease in carbon emissions by between 8.4% and 22.4%.

These figures, however, do not impact on intensive energy industries because, generally speaking, it is very expensive (and/or very risky) to implement innovation. Investments in cement, steel or oil plants that include changes to the core process in order to make them more efficient

21. K Rennings and S Rexhauser «Long-Term Impacts of Environmental Policy and Eco-Innovative Activities of Firms» (2011) 11 (3/4) International Journal of Technology, Policy and Management 274.
22. S Borghesi *et al.* (n 18).
23. V H Hoffmann «EU ETS and Investment Decisions: The Case of the German Electricity Industry» (2007) 25(6) European Management Journal 464.
24. K Rogge and V Hoffmann «The impact of the EU Emission trading system on the sectoral innovation system of power generation technologies: findings for Germany» (2010) 38 Energy Policy 7639.
25. R Calel and A Dechezlepretre «Environmental policy and directed technological change: evidence from the European carbon market» (2012) 22 Working Paper FEEM.
26. Borghesi, S. *et al.* (n 18).
27. R Martin, L. De Preux and U Wagner «The impacts of a carbon tax on manufacturing: Evidence from microdata» (2014) 117 Journal of Public Economics 1.

could involve more than 1 billion euros[28] and would double the price of cement or increase the price of construction by 20/30%[29]. Taking into account that investment cycles in these industries are very long (between 20 and 40 years), risks associated with investing in a new technology (for example, risks related to regulatory changes or just to the willingness to pay for decarbonized materials) are too high[30].

Since the industrial sector accounts for about 30% of global emissions and, inside it, 60/80% corresponds to energy-intensive production of basic materials[31], a consistent long term policy is essential in order to foster the application of innovative ideas in the raw materials industry. A possible solution would be to include technology-oriented agreements like the ones that are mentioned in art. 4.c of UNFCCC[32]. However, this has never been developed and it was not in the Paris agenda except for some discussions on technology transfer. Such short reference is of course not enough. The UNFCCC should take a greater role in the global technology development effort for sustainable energy[33].

V. COORDINATION WITH OTHER ENVIRONMENTAL INSTRUMENTS: EU ETS AS AN ELEMENT OF AN ENVIRONMENTAL TAX SYSTEM

The price signal of the EU ETS cannot be defined as a tax. Environmental taxes are compulsory and revenue-raising fiscal policy instruments[34]. On the contrary, the purchase of an emissions certificate is linked to a «right to pollute» which could be a cost or revenue depending on the behaviour of the company. Moreover, EU ETS rights have a volatile price, being

28. R J Lempert, S W Popper, S Resetar, and S Hart «Capital cycles and the timing of climate change policy» (Pew Centre on Global Climate Change 2002).
29. J Rootzén*Pathways to deep decarbonisation of carbon-intensive industry in the European Union-Techno-economic assessments of key technologies and measures* (Chalmers University of Technology 2015) Phd Dissertation.
30. M Åhman, L J Nilsson, and B Johansson «Global climate policy and deep decarbonization of energy-intensive industries» (2016) *Climate Policy* 1.
31. M Fischedick, J Roy, A Abdel-Aziz, A Acquaye, J M Allwood, and J Ceron, J. P. «Chapter 10: Industry» in Intergovernmental Panel on Climate Change (eds.), *Climate Change 2014: Mitigation of Climate Change. Contribution of Working Group III to the Fifth Assessment Report* (Cambridge University Press 2014).
32. United Nations Framework Convention on Climate Change.
33. B B Brook, K Edney, R Hillerbrand, R Karlsson, and J Symons, J. «Energy research within the UNFCCC: a proposal to guard against ongoing climate-deadlock» (2015) Climate Policy 1.
34. OECD «Glossary of statistical terms-Environmentally related taxes» (2004). Available at*https://stats.oecd.org/glossary/detail.asp?ID=6270* (last access 30 September 2016).

then more difficult to predict than a carbon tax. However, taking into account the practice and effects in the competitiveness of companies, both instruments could be seen as environmental costs and, consequently, they should be coordinated. In fact, some studies related to environmental tax reforms (ETR) and competitiveness[35] assimilate the EU ETS to a tax.

The positive effects of the EU ETS on carbon reduction are not discussed. On the one hand, missions reductions were estimated close to 3% (210 million tons of CO_2) higher for firms participating in the EU ETS than for firms which did not participate[36]. On the other hand, it is sometimes difficult to articulate the EU ETS with other tax instruments for avoiding overlapping and negative effects on competitiveness. In case that carbon and energy taxes are introduced as part of a comprehensive environmental tax package, the impact on competitiveness could be neutral. However, in that case, depending on which other taxes are reduced in order to compensate the increase of carbon taxes, the effects could differ among sectors. For example, if it is decided to reduce social security contributions, labour-intensive firms could be in a better position than energy-intensive ones.

VI. REGULATORY ASYMMETRIES INTRA-EU AND EXTRA-EU: «CARBON LEAKAGE»

Without trade, carbon pricing produces incentives for efficiency improvements and innovation towards lower carbon economy. However, in an open economy, carbon prices could lead to delocalization of carbon-intensive production to less-regulated countries[37]. Climate change policies may not reduce pollution but may only redistribute it («carbon leakage»).

Carbon leakage is an important issue in the literature[38], but it is difficult to formulate general conclusions about it since, depending on the risk factors at stake, trade openness could be positive or negative for the functioning of the EU ETS system. Carbon leakage risk factors are,

35. A Miltner and R Salmons «Trends in the competitiveness of selected industrial sectors in ETR countries» in M S Andersen and P Ekins, P. (eds.) *Carbonenergy Taxation: Lessons from Europe*, (Oxford University Press 2009).

36. R Martin, M Muûls and U Wagner «The Impact of the EU ETS on Regulated Firms: What is the Evidence after Nine Years?» (2014) SSRN. Available at *http://ssrn.com/abstract=2344376* (last access 30 September 2016).

37. M Condon and A Ignaciuk «Border Carbon Adjustment and International Trade: A Literature Review» (2013) 6 OECD Trade and Environment Working Papers.

38. For a good overview see A Marcu, C Egenhofer, S Roth and W Stoefs «Carbon Leakage: An overview» (2013) CEPS Special Report. Available at *www.ceps.be/book/carbon-leakage-overview* (last access 30 September 2016).

basically, carbon costs and the ability to pass on carbon costs to other sectors or consumers. These two groups of factors do not act independently and they could influence each other. Into the first group, we can include, among others factors, carbon costs relative to total costs of production, carbon price level, CO_2 intensity[39], costs already passed on from other sectors, sectoral margins, abatement potential and the cost of abatement and long-term reduction targets.

The ability to pass on carbon costs is, then, the most influential factor and, at the same time, the most difficult to quantify. It depends on the trade intensity of the product, price-setting mechanisms, risks for other parts of the value chain (including transport costs and positive externalities like recycling or R&D innovation), the product heterogeneity, the exchange-rate risks and the price elasticity of the demand.

Moreover, the structure of the market could play an important role in the interaction of these elements. In an oligopolistic market (like petrol or electricity) some international competition reduces the pass-through of carbon prices which could be compensated by other ways, for example efficiency or environmental innovation. It is true that, for mature manufacture sectors where competition is very high, regulatory asymmetries could represent a challenge for the industry. On the contrary, current studies have not demonstrated a direct relation between carbon pricing and delocalization[40], probably because current prices are not very high in comparison with other regulatory factors like labour/social security costs or general taxes.

Despite of this complexity, European Commission studies on carbon leakage[41] have only taken into account two elements (carbon costs and trade intensity/exposure) in order to measure risks. Regarding the first one, no more than two sectors (cement and lime) were sensitive to carbon costs because these costs could have a direct impact on their gross value added. This conclusion was taken using a stand-alone test (carbon costs). The same study also calculated the impact of carbon costs in conjunction with other quantitative criteria (trade intensity) and then aluminium, iron

39. On this regard, see N Pardo, J Moya and K Vatopoulos «Prospective Scenarios on Energy Efficiency and CO_2 Emissions in the EU Iron and Steel Industry» (2012) EUR 25543 Joint Research Centre.

40. R Martin *et al.* (n 26)

41. European Commission «Draft Commission Staff Working Document, Impact Assessment, Accompanying document to the Commission Decision determining a list of sectors and subsectors which are deemed to be exposed to a significant risk of carbon leakage pursuant to Article 10a (13) of Directive 2003/87/EC», Brussels, 24.12.2009, SEC(2009) 1710.

and steel, paper and crude oil and natural gas extraction were considered affected by the EU ETS. That covered 36% of the total emissions from industrial sectors. The same was made regarding trade-related risks (trade intensity or trade exposure) and in this case 133 sectors (covering 26% of the industrial emissions in the EU ETS) were considered sensitive[42]. However other factors were not taken into account, particularly the structure of the market which is, essential, for determining the possibilities of costs pass-through.

Following this study, and contrary to its initial plan, in 2009 the European Commission decided to extend free permit allocation for industries having a risk of carbon leakage (giving a 100% reduction) because they were carbon intensive or very trade exposed[43]. There is no empirical evidence that these exemption criteria are related to actual relocation or downsizing risk[44]. In fact, there is substantial variation in the reported vulnerability between sectors as well as individual firms which indicate that the EU's approach of exempting entire industries may not be efficient[45].

VII. CONCLUDING REMARKS AND RECOMMENDATIONS

The impact on competitiveness of the EU ETS is not clear. It is true that some activities (electricity production and energy intensive industries) could be affected. However, competitiveness is a multi-faceted phenomena in which carbon reduction policies indirectly play a role. Even in those activities where carbon pricing could have an important impact on costs, the business structure and/or the lack of effective competence in the sector permit the pass-through of carbon costs to other sectors and/or consumers. Consequently, negative effects on competitiveness have a water-down impact on the whole economy. Finally, the carbon leakage effect rarely takes place. Only energy intensive sectors involving products that are easy to trade and with no pass-through effects due to the structure of the market are subject to carbon leakage. Even in those cases

42. S De Bruyn, D Nelissen and M Koppman «Carbon leakage and the future of the EU ETS market. Impact of recent development in the EU ETS on the list of sectors deemed to be exposed to carbon leakage» (2013) 13.7917.18 Delft.
43. Commission Decision 2010/2/EU determining, pursuant to Directive 2003/87/EC of the European Parliament and of the Council, a list of sectors and subsectors which are deemed to be exposed to a significant risk of carbon leakage (2010) OJ L 1/10.
44. R Martin, M Muûls, L B De Preux, and U Wagner «Industry compensation under relocation risk: A firm-level analysis of the EU emissions trading scheme» (2014) 104(8) The American Economic Review 2482.
45. Ibidem.

the reduction of other costs (like labour costs, transport facilities and/or regulatory barriers) could compensate carbon pricing and eliminate leakage effects. At the end of the day, what the EU ETS looks for is to introduce some financial stress in business structure in order to incentivize efficiency and innovation in the path to a low carbon economy. Without some pressure, it is not possible to achieve climate change goals. For all these reasons, we conclude as follows:

- It is not clear that the EU ETS has had a negative effect on the European competitiveness. However, the current design includes too many exceptions, particularly in energy intensive sectors, which prevent negative effects on competitiveness but also reduce positive impact on energy efficiency and innovation.
- In order to resolve this problem, we recommend changing the current strategy of general sectorial exceptions to a case by case one (like State aid proceedings). In this individual analysis, it would be necessary to take into account not only the risk of delocalization and the loss of jobs, but also other factors such as the structure of the market and the openness of the sector to international competition.
- There should not be exceptions to sectors with little external and/or internal competition since they normally pass on implementation costs to consumers. Power plants sector is a clear example of this.
- It is also important to include the EU ETS into a general strategy on environmental taxation. According to the literature, there is some overlapping between the exceptions on EU ETS and other kind of environmental tax benefits. In fact, since some EU ETS exceptions are related to competitiveness (mainly for protecting economic activities and jobs), it should be advisable to analyse their opportunity, always based on an individual assessment, taking into account all tax and social benefits and any other State aid that the company received.