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Overall approach of the EU in the question of emissions: EU Emissions Trading System and CO2 taxation

Veronika Solilová[a], Danuše Nerudová[a,*]

[a]*Mendel University in Brno, Faculty of Business and Economics, Department of Accounting and Taxes, Zemědělská 1, 61300 Brno, Czech Republic*

Abstract

The EU Emissions Trading System was established in 2005 as the cost-effective tools for cutting greenhouse gas emissions. Initially allowances were allocated free, but from 2013 auctioning is the main method of allocating allowances. Further, the European Commission proposed CO2-related taxation in a way that complements the EU ETS in order to establish a comprehensive and consistent CO2 price signal outside the EU ETS. The aim of the paper is to discuss the EU ETS system, its development in 2013, and its impacts on the proposed CO2-related taxation. Further there is mentioned position of the Czech Republic in this question.

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Keywords: Emissions Trading System; CO2 taxation; Czech Republic; EU; auctioning

1. Introduction

Nowadays many European countries are running high fiscal deficits and have high debit liabilities; therefore they are looking at the options for raising taxes. Carbon-energy taxes currently play too small a role in the tax systems on many European countries, although they have high potential to generate higher tax revenues. At a time when a cost

* Corresponding author. Tel.: +420-545-132-343; fax: +420-545-132-353.
E-mail address: veronika.solilova@mendelu.cz, danuse.nerudova@mendelu.cz

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of restoring fiscal balance is high, it is especially important to act efficiently in taxation and reconsider the view on the carbon-energy taxes in fiscal policy.

According to the classical optimal tax theory by Ramsey (1927), the best system of commodity sales taxation is to tax relatively inelastically demanded goods heavily, and elastically demanded goods lightly. This supports the taxation of energy, as demand for energy is inelastic; see Kilian (2007), Bernstein and Griffin (2006). In contrast with the modern optimal tax theory that cautions against the variation of commodity tax rates by elasticity, due to the inverse-elasticity tax rule. Base on this rule, the possible effect of the increasing tax on inelastically demanded goods (differential commodity taxation), may reduce total tax revenue and/or lead to more distortion, as mentioned Crawford, Keen, and Smith (2010). Furthermore, authors states that it induces people to shift away from labor and consumption, towards leisure. Therefore as state Atkinson and Stiglitz (1976), the optimal system of commodity taxation could be a uniform tax rate. Differential goods taxation should not be used in order to raise revenue. However, it does not mean that the rule cannot be used in order to address externalities, but only that energy taxation cannot be justified to raise revenue.

The rationale for energy and carbon taxation is based on the externalities, which are not covered in the valuation of products. Therefore the market does not allocate resources optimally and welfare languishes below its potential. The solution can be achieved with a tax or trading scheme to reflect the externalities; see Pigou (1920). Their valuation can be made through the valuation of the damage from the externality, e.g. climate change which is caused by a carbon dioxide. Moreover carbon dioxide causes increasing in global average temperatures; see Hegerl et al. (2007), sea level rise; see Pethica et al. (2010), and a higher frequency of extreme weather events; see Smith et al. (2009).

The European Commission found out that the greatest impact for most common energy consumption is the emission of greenhouse gases, particularly CO2 from combustion; see Bickel, Friedrich, Droste-franke, and Preiss (2005). Therefore the optimal level of tax is at least the value of the damage caused by CO2. The value of damage from emission of a ton of CO2 is known as the social cost of carbon, which was estimated by Yohe et al (2007) in range from between US$-10 to US$ 350 per ton of carbon. However as previous authors mentioned, the value of the social cost of carbon is difficult to estimate, the result wide range due to a lot of factors, e.g. by uncertainties in the underlying climate science, by different choices of key variables and others. Further as mentioned Dietz and Fankhauser (2010), there is uncertainty how to structure of the problem due to multiple sources of parameter and how to model it.

As regard this fact that the estimates of the social cost of carbon is inconsistent with policy targets, there were found alternative approaches, a marginal abatement cost curve (MAC curve) or an emission trading scheme (ETS) to deduce the carbon price; see Watkiss (2005).

The EU Emissions Trading System (EU ETS) was established in 2005 as the cost-effective tools for cutting greenhouse gas emissions, which works on the cap-trade principle. It covers 50% of EU CO2 emissions and produces an EU-wide carbon price signal that should influence daily operational and strategic investment decisions. Due to the fact that the vast majority of emission allowances (hereinafter EUAs) was given away for free by governments (during I. and II. phases), it has not created a desirable results, despite of a reduction of emissions by 18%[1]. The current major cause of these strong emission reductions and rapid approach to the Kyoto target was the downturn in economic activity during the crisis, which radically altered the picture and the carbon market in EU. Moreover, regarding the emissions target it is clear that its setting was underestimated, present carbon market is significantly different, without overriding heavy industry and with more efficiency technologies used in industry than before.

The EU ETS after economic crisis has since experienced a surplus of allowances (406Mt) and international credits (549Mt) in the total amount of 955Mt (2011) compared to emissions, and further significant decline in the carbon price.[2] It influences businesses that have to buy an increasing proportion of their allowances at auctions, which start in 2013 as the main method of allocating allowances during the 3rd trading period of the EU ETS. Now

[1] For more details see COM(2014) 15. Figure at 2012.
[2] For more details see COM(2012) 652 final.

they pay for their allowances significantly lower amount and EU ETS does not establish a consistent CO2 price signal for strategic investment decisions. In the light of the evidence and the experience of current policies, the European Commission proposes a new reduction target for European greenhouse gases emission of 40 %[3] in 2030 compared to 1990 levels. This target must be shared between the EU ETS and non-ETS sector.

Furthermore, the European Commission proposed revision of the Directive 2003/96/EC on taxation of energy products and electricity, which introduces CO2-related taxation. This kind of taxation, as an alternative approach for setting up an energy efficiency that have the effect of reducing end-use energy consumption, was also supported by the Energy Efficiency Directive 2012/27/EU. The Energy Efficiency Directive entered into force on 4 December 2012 and most of its provisions will have to be implemented by the Member States by 5 June 2014.

Energy or CO2 taxation could complement the EU ETS in order to establish a comprehensive and consistent CO2 price signal outside the EU ETS. This overall approach should cover the vast majority of EU's greenhouse gas emissions and reduce them at least 20 % by 2020 (40 % by 2030), respectively at 80–95 % by 2050.

The aim of the paper is firstly to discuss the EU ETS system and its development, particularly in 2013, when cost-free allocation of allowances will shift towards auctioning, and its impacts on the proposed CO2-related taxation. In addition there is mentioned position of the Czech Republic in this question.

2. Methodology

Within the paper, mainly the methods of analysis and description will be used, as they are the basic methods, which enable the precise identification and description of researched phenomenon. This should help to classify the gained information in order to reach the higher level of structure and transparency of individual information basis. Furthermore, the others methods, namely quantification, induction and deduction should be followed by the method of synthesis, which will be applied in the process of the creation of the partial outcomes about the development of the EU ETS in 2013 and its impact on the CO2 taxation.

The basic sources of the research were the European Commission's Auctioning Regulation, European Commission reports about EU ETS, Carbon market, Energy Efficiency Directive and Energy Taxation Directive, ICE Future Europe emissions auctions, European Energy Exchange, Czech Energy Regulatory Office, Czech Ministry of Finance and others.

3. Results

3.1. EU ETS

Despite of the fact that EU ETS has been worked since 2005, the major reforms took effect from 1. January 2013. During 3rd phase is introduced an EU-wide cap on emissions which is reduced by 1.74 % every year up to 2020. However, based on the new reduction target for domestic greenhouse gas emissions of 40 % in 2030, the cap will have to increase to 2.2 % after 2020. Further, there is a shift towards auctioning of EUAs in place of cost-free allocation. As can be seen in figure 1 below, in phase 3 is increasing role of auctioning compared to the phase 2. During last quarter of 2013, the EUAs are allocated more by auctions than by cost-free allocation. Moreover, the average stock of EUAs in circulation in phase 3 is lower than in phase 2, particularly around 800 million EUAs.

[3] For more details see COM(2014) 15 final.

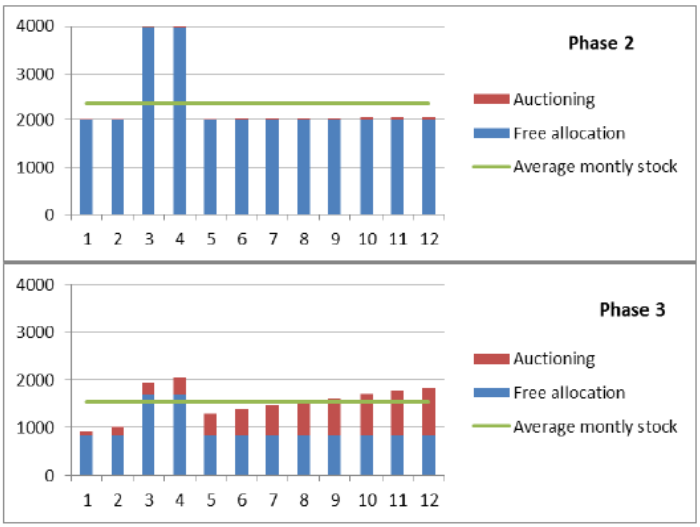

Fig. 1. Comparison of monthly stocks of allowances in phase 2 and phase 3.
Source: Impact Assessment of EU ETS, SWD (2014) 17 final.

As regard total auction volume and total revenue, during 2013 as a researched period, the European Energy Exchange market (hereinafter EEX) and ICE Future Europe market (hereinafter ICE) auctioned a total of 817 800 500 EUAs for the 3rd trading period on behalf of EU Member States, specifically 730 970 500 EUAs during 211 auctions at the EEX and 86 830 000 EUAs during 26 auctions at the ICE. The total amount raised from those auctions was EUR 3 204 173 735 at the EEX and EUR 370 228 920 at ICE. Further, the highest revenue through auctioning was reached on September (EUR 417 084 850), the lowest on August (EUR 148 203 765), as well as auction volume (33 653 500 EUAs). Regarding the auction revenue per Member State, the highest revenue reached United Kingdom, Germany, Italy and Spain. For more details see figures 2 and 3 below.

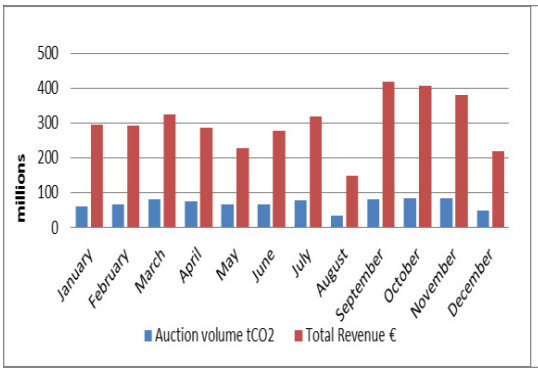

Fig. 2. Total auction revenue and auction volume per month in 2013.Source: EEX, ICE, own processing.

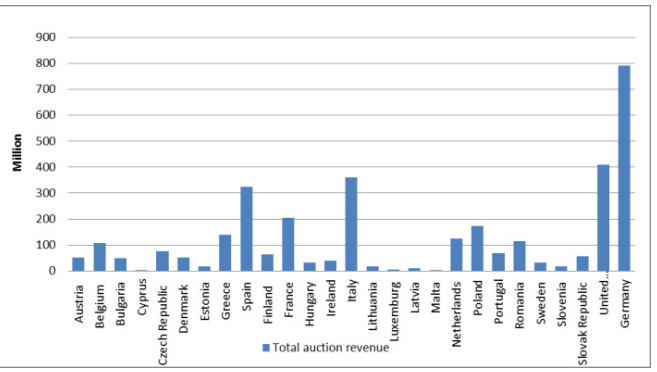

Fig. 3. Total action revenue per Member State in 2013.
Source: EEX, ICE own processing.

In respect of CO2 price development can be seen continuing decreasing from the first half of 2008 when the CO2 price was higher than EUR 20 per EUAs. During 2013 the CO2 price was moving within EUR 6.62 to EUR 2.65 per EUAs (for details see figure 4 below). From long-term perspective this strong drop in price has a significant effect on investment decisions and EU ETS can be considered as ineffective in the price signal (for more details about price signal see 3.2.1).

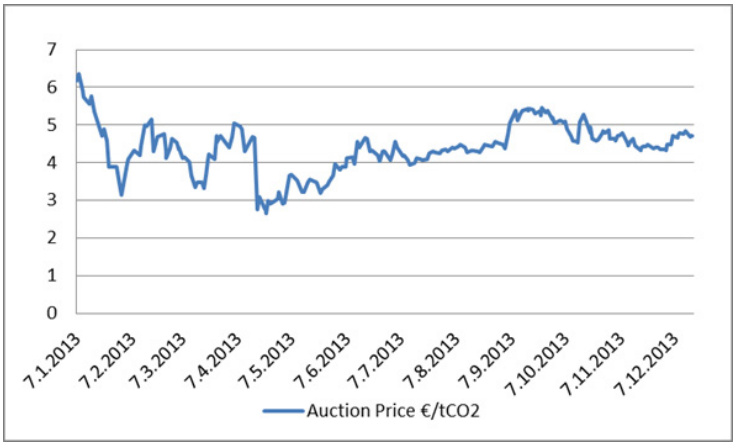

Fig. 4. Development of auction price in 2013.
Source: EEX, own processing.

Due to significant impact of the economic crisis on industrial production and electricity consumption, reported emission in EU ETS experienced a very large drop in 2009 (more than 11 % compared to 2008) and in 2011 (around 2 %). In contrast, on the supply side, the annual use of international credits and issued EUAs in the EU ETS experienced a significant increased. The effect of those two elements caused the large imbalance (for more details see tab. 1 below). The 2nd phase of trading period of the EU ETS can be characterized by oversupply; in the beginning of 2012 a surplus of 955 million EUAs was accumulated. Furthermore, at the start of 3rd phase, the EU ETS was characterized by a surplus of around 2 billion[4] of EUAs.

Table 1. Build-up of a surplus of unused allowances 2008–2011, EU

(in Mt)	2008	2009	2010	2011	Total
Supply: Issued EUAs and used international credits	2076	2105	2204	2336	8720
Demand: Reported emissions	2100	1860	1919	1886	7765
Annual change of surplus EUAs	−24	244	285	450	955
Change to year *x*−1		−11.4 %	3.2 %	−1.8 %	
Real GDP for EU27	0.3 %	−4.3 %	2.0 %	1.5 %	

Source: European Commission, SWD(2012) 234 final, Community Independent Transaction Log (CITL), compliance data 2011 as published on 2 May 2012.

Since a daily supply and demand determines a carbon price, and a large surplus results in a downward pressure on the carbon price signal (as can be seen in fig. 4 above), there is a risk of the locking the EU into high carbon capital and investment. Therefore, the European Parliament and Council agreed a proposal to empower the Commission to postpone auctioning of 900 million EUAs until 2019/2020 in December 2013 (the so-called "block-loading"), which amends the EU ETS Directive and EU Auctioning Regulation. Hence, between 2014-2016 900 million EUAs less will be auctioned than originally foreseen. This measure should improve the EU ETS functioning and CO2 price signal.

[4] Impact Assessment SWD(2014) 17 final.

Given all these facts, EU ETS is not driving investments in low-carbon technologies sufficiently well, and it is questioned whether block-loading will have desirable impact on achieving the long-term decarbonization target in a cost-effective manner.

3.2. CO2 taxation

Current Directive 2003/96/EC on taxation of energy products and electricity (hereinafter ETD) covers all energy products and electricity used to produce heat or to move engines, which are taxed by a fixed amount base on the quantity of energy products released for final consumption. Energy taxes are an important source of revenue for EU Member States. The EU energy taxation revenue as a percentage of GDP reached in average 1.9 % in 2011 based on Eurostat statistic.

However, this approach does not reflect the energy content or the CO2 emissions of the taxed energy products. Thus it leads to inefficient energy use and distortions in the internal market, for example it imposes lower tax rate on the use of coal, which produces the highest CO2 emission. Another problem is that there is lack of coordination between the current ETD and the EU ETS Directive. The EU ETS Directive applies to CO2 emissions from major energy and industrial installations, further some of operators are covered by both systems (e.g. paper mills), thus there are overlaps, whilst others are outside of the both systems (small installations). This situation leads to cost-efficiency losses and can distort the internal market.

Both above identified problems can be solved by revision of the ETD, which should enable the EU Member States to use energy taxation more effectively in areas where the EU ETS does not apply and avoid overlaps between both systems. Further, given that energy taxes are levied as a fixed amount on the quantity of energy products consumed, they are suitable for addressing the externality or costs to society caused by CO2 emissions.

Due to this fact, the European Commission proposed revision of the ETD (COM(2011) 169/3, hereinafter ETD proposal) on 13 April 2011, which introduces CO2-related taxation. Specifically, the ETD proposal suggests to splitting existing minima of energy tax rates into two parts – energy content and CO2 emissions, reflecting the different objectives of energy taxes – energy savings and reduction of CO2 emissions. According to the Impact Assessment of the ETD proposal (SEC(2011) 409), suggested CO2-related taxation should improve the functioning of the internal market as it removes distortions between the tax treatment of energy sources. Moreover it should remove distortions between ETS and non-ETS participants as all installations would be taxed. According to the Impact Assessment of the ETD proposal is estimated that around 14.5 % of emissions from the energy and industrial sectors combined are presently not covered by the ETS and could therefore become subject to CO2 taxation.

In respect of the level of CO2, the optimal value of a carbon tax is difficult to determine in practice. According to the Impact Assessment of the ETD proposal, CO2 price had originally been estimated to be 30 €/t CO2 (in 2005 prices), but then updated to a price of 16.5 €/t CO2 (in 2008 prices). However, the price needed to achieve the non-ETS emission reduction targets was found to differ from the suggested prices of 20 €/t or 30 €/t CO2. The average price was estimated to be 4–5 €/t CO2, which are corresponding with the current ETS price (in 2013 price). Regarding the EU's longer-term energy and climate strategy, it was clear that a carbon tax rate in the amount of 4–5 €/t CO2 would not be so incentivizing the significant changes in the energy systems and could be considered as an ineffective price signal in the non-ETS sectors. Further, there was identified a risk of locking into carbon-intensive technologies because the 2020 targets themselves require less of an effort given the lower level or economic activity. Due to this fact, the ETD proposal suggests minimal level in the amount of 20 €/t CO2 for all energy products excepting electricity as the expected CO2 price for the end of the trading period 2013–2020 on the EU ETS and in respect of EU's climate change policy for 2020 and the effort sharing decision.

From a macro-economic perspective applying the same CO2 prices (CO2 tax rate) across the whole economy is the most cost-effective solution. Under E3ME modelling used in the Impact Assessment of the ETD, the CO2 price of 20 €/t CO2 would reduce CO2 emissions by −0.42 % in 2020 and by −0.87 % in 2030. The impact on GDP and employment is small, but positive, specifically increasing by 0.05 % of GDP and 0.08 % of employment in 2020. However those results are dependent on the assumption that additional revenue from energy taxation would be used to reduce the employer's social security contributions. As regard as administrative burden, there are expected very low or zero additional administrative costs, if the existing excise/energy system will be used for the purpose of CO2 taxation.

From the general point of view, the CO2-related taxation should provide better and more consistent CO2 price signals as CO2-related taxation was established for the area where the EU ETS does not apply, and should ensure more effective use of energy taxation both for environmental and fiscal purpose. As regard to the Europe 2020 strategy, the ETD proposal enables to optimize the potential of the tax system to promote sustainable economic growth, encourage jobs and investment, and meet environmental goals.

Several EU Member States welcome the revision of the current ETD because it integrates EU ETS and energy taxation in the form of CO2-related taxation, and creates more cost-effective environmental policies. Some of the EU Member States have already introduced taxation based on CO2, e.g. Sweden, Denmark, Finland, Slovenia and Ireland. Other EU Member States, namely France, Netherlands, are preparing to implement CO2-related taxation. France would like to increase domestic consumption duty based on CO2 content of different energy products. The duty on each product will be set on the basis of its impact on the greenhouse effect by integrating the value of its CO2 content, using a value of EUR7 per ton of carbon in 2014, EUR 14.50 in 2015 and EUR 22 in 2016. Starting in 2014, the duty on the three energy products, namely natural gas, heavy fuel oil and coal, will increase in relation on their CO2 content. This measure is expected to bring in EUR 340 million in 2014; EUR 2.5 billion in 2015 and EUR 4 billion in 2016, which will help ensure compliance with the fiscal strategy of stabilizing tax rates. Netherlands would like to create a system in which the charge is levied on the basis of the extent to which a company contributes to the collective overreaching of the CO2 ceiling.

3.2. CO2 price signal

The suggestion of EU minima for CO2 taxation corresponds to differentiated targets of Member States based on the Kyoto protocol. Some Member States might need to impose higher CO2 taxes to reach their national target than other Member States that might need lower CO2 taxes to cover all the businesses concerned. Further, if the CO2 taxation is determined as close as possible to the EU ETS price, it helps to create an EU-wide CO2 price signal. However, nowadays the EU ETS price is around 4–5 €/t CO2. As was already mentioned above, the CO2 tax rate in this amount would not be incentivizing the significant changes in the energy systems, and there would be identified non-sufficient CO2 price signal for investment decisions. For details see example below.

Example:

***Company A** from ETS sector is making a decision: whether make an investment in the amount of EUR 1,000,000 (depreciation per year EUR 100,000) which reduces company's emissions in the amount of 10,000 ton per year, or buy 10,000 EUAs, which allows to emitting 10,000 ton of CO2. Realization of the investment depends on the CO2 price. Marginal costs for the elimination of 1 ton are EUR 10.*

If the price of EUAs is higher e.g. EUR 11 → investment is made in the amount of EUR 1,000,000, emissions are reduced by 10,000 ton per year. Profit EUR 10,000.

If the price of EUAs is lower e.g. 8EUR → investment is not made, EUAs are bought in the value of EUR 80,000. Profit EUR 20,000. In this case the purchase of EUAs is cheaper than making a low-carbon investment, therefore there is not sufficient CO2 price signal for investment decisions and consequently for reducing CO2 emissions in ETS sector.

***Company B** from non-ETS sector is liable to pay carbon tax for 10,000 ton of CO2. The CO2 tax rate is set on the amount of 8 €/t CO2, which corresponds with the price at the EU ETS. The tax burden of company B is same as well as company A, if buy EUAs at EU ETS, specifically EUR 80,000.*

However, if the CO2 tax rate is set on the amount of 11 €/t CO2, which is higher than EUAs at EU ETS, then the tax burden of company B is higher than company A, specifically EUR 110,000. Moreover, company B is not eligible to enter at EU ETS so it cannot avoid to tax by purchasing of EUAs at lower price. Company B can only eliminate the total amount of CO2 taxation, as long makes low-carbon investment for reducing its emissions. In this case, when CO2 tax rate is set higher than EUAs, then the tax burden in non-ETS sector is higher than in ETS sector. Further, non-ETS sector can be considered more incentivizing for low-carbon investment than ETS sector.

Based on the example can be considered that EU ETS is not functioning well, with sufficient CO2 price signal. Due to this fact, the European Parliament and Council agreed block-loading of 900 million EUAs, which should increases CO2 price.

3.2.1 Position of the Czech Republic in the question of CO2 taxation

The Czech Republic, accordingly the Kyoto Protocol is committed to reduce greenhouse emissions at least 20 % by 2020, compared to 1990 level. Based on the ETD the Czech Republic levies the energy taxes, specifically taxes on natural gas, solid fuels and electricity as well as other EU Member States. However, the carbon tax is not imposed there.

With regard to the purpose of energy taxes and potential CO2 taxation, it is question whether their main purpose is to discourage their consumption with aim to reduce CO2 emissions or fiscal purpose with aim to increase tax revenues. Due to the fact, that energy taxes are presented in Act on stabilization of public budgets No. 261/2007 Coll., as amended, it can be considered that their main purpose is receiving additional tax revenues without environmental purposes.

According to the Eurostat statistics is the Czech Republic 4th highest energy intensive country in the EU, its energy tax revenues reached the value of 2.2 % of GDP and ranked 6th in the EU in 2011. Thus energy or CO2-related taxation can be considered as a suitable source for increasing tax revenues in the time of a fiscal deficit, if the CO2-related taxation will be introduced.

In the Czech Republic are involved around 400 entities, 250 of them from energy sector, in the EU ETS, which covers around 60 % of CO2 emissions in the Czech Republic. During 3rd phase of trading period of the EU ETS, which starts in 2013, an allocation of EUAs is made through auctions. It is expected that the shift from cost-free allocation towards auctioning will more stimulate polluters to the reduction of their CO2 emissions. Cost-free allocation of EUAs is now possible only in other ETS sector excluding energy sector, but their amount is gradually reduced by up 30 % in 2020. However electricity producers, who shall buy all EUAs (100 %) through auctioning in 2013, can also receive some free EUAs as long as they used saved money for investment in way reducing the environmental burden.

With regard to the rest of 40 % of CO2 emissions from non-ETS sector, it has not been yet affected, despite the fact that its CO2 emissions are equally socially "harmful" as from ETS sector. Therefore, imposing CO2-related taxation on non-ETS sector, which should remove distortions between ETS and non-ETS sector, and further which should spread of motivational incentives to reduce CO2 emissions between all of polluters, is by the Czech policymakers desirable. Moreover OECD also recommends to the Czech Republic to introduce the carbon taxation or CO2-related taxation in its report Economic Surveys: Czech Republic 2011.

Given all these facts and proposed revision of ETD by European Commission, which introduces new CO2-related taxation, the second stage of the environmental tax reform (hereinafter Environmental Draft) was being prepared by the Ministry of Finance in cooperation with the Ministries of Industry and Environment in the Czech Republic during 2012. The CO2-related taxation, as a supplement of the EU ETS, was a main part of the prepared reform.

Since the level of CO2 component should be achieved through EU-ETS, the CO2 tax rate/price was set out in the amount of 15 €/t CO2 per year for the period 2014-2020. This value corresponds to the EUAs price on June 2011. However, the current EUAs price reaches the amount of around 4–5 €/t CO2, its significant drop was caused by oversupply of EUAs. Due to the selected CO2 price of 15 €/t CO2 (shadow price), which is more than 3time higher than current EUAs price, there would arise a cost disproportion between entities in ETS and in non-ETS sector. Further, the incentive to reduce CO2 emission would not be spread by fair way between all polluters. In addition, there would also arise disproportionate taxation of the entities in non-ETS sector, which are not considered for the main polluters, as compared with entities in ETS sector. For details see table below:

Table 2. Disproportionate taxation

	2012	2013
EUAs used for ETS sector	184.46 CZK/t CO2	118.64 CZK/t CO2
Shadow price for 2014-2020 intended for non-ETS sector	15€/t CO2	
CO2 component based on shadow price	69.30 CZK/MWh	
CO2 component based on EUAs	34 CZK/MWh	21.88 CZK/MWh
CO2 components difference	−35.3 CZK/MWh	−47.42 CZK/MWh

Source: Statement to the draft of the environmental tax reform (2013), own calculation.

Given that it is recommended to determine CO2 component or CO2 tax rate based on the developments in the EU ETS, specifically on the EUAs. The current Environmental Draft does not reflect it and therefore CO2 component is set significantly higher than EUAs in the EU ETS, which the current disproportion makes stronger.

Despite of the fact, that the overall statement of the Czech policymakers to the CO2-related taxation was positive and could bring to the state budget almost CZK 6.8 billion[5], its negotiation was postponed due to political changes. Now it is questioned whether new government will open again question of CO2-retated taxation or not.

4. Conclusions

The EU ETS covers 50 % of EU CO2 emission, initially the allowances were allocated free, but from 2013 auctioning is the main method of allocating allowances. Generally, EU ETS should produce a sufficient EU-wide carbon price signal for low-carbon investment. Moreover, the European Commission proposed the CO2 taxation as a complement to the EU ETS for entities not eligible for EU ETS. However, due to the fact that 2nd phase and 2013 were characterized by oversupply in the amount of 2 billion of EUAs, there arises question whether EU ETS works efficiently. Based on the research, it can be concluded that the EU ETS is not driving sufficient investments in low-carbon technologies. The CO2 price has experienced very large drop since 2008, the current CO2 price is around 4–5 €/t CO2, which effects CO2 taxation of non-ETS sector, e.g. in case of low carbon price compared with high CO2 tax rate the shift of tax burden from EU ETS sector towards non-ETS sector would be existed. Further, there would arise a cost disproportion and the incentive to reduce CO2 emissions would not be spread fairly between all polluters. However, if the CO2 tax rate would correspond with carbon price, then CO2 taxation altogether with EU ETS would create a comprehensive and consistent CO2 price signal. As regards to Czech Republic, the CO2-related taxation was postponed and it is a question whether new government will open again this issue.

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References

Atkinson, A.B., J.E. Stiglitz, 1976. “The Design of Tax Structure: Direct versus Indirect Taxation.” Journal of Public Economics 6: 55–75.
Bernstein, M. A., J. Griffin, 2006. Regional Differences in the Price-Elasticity of Demand for Energy. Santa Monica, February.
Bickel, P., Rainer F., B. Droste-Franke, P. Preiss, 2005. Externalities of Energy: Extension of Accounting Framework and Policy Applications.
Crawford, I., M. Keen, S. Smith, 2010. Value Added Tax and Excises. *In Dimensions of Tax Design: the Mirrlees Review*, ed. J. Mirrlees, S. Adam, T. Besley, R. Blundell, S. Bond, R. Chote, M. Gammie, P. Johnson, G. Myles, J. Poterba. http://www.ifs.org.uk/mirrleesReview/dimensions.

[5] Explanatory Memorandum prepared to the Environmental Draft by Ministry of Finance.

Czech Government, 2013. Statement to the draft of the environmental tax reform. http://www.spcr.cz/stanoviska-sp-cr/stanovisko-k-navrhu-zakona-kterym-se-meni-uprava-dane-z-pevnych-paliv-a-plynu.

Dietz, S., S. Fankhauser, 2010. "Environmental prices, uncertainty, and learning." Oxford Review of Economic Policy 26 (2) (June 23): 270–284. doi:10.1093/oxrep/grq005. http://oxrep.oxfordjournals.org/cgi/doi/10.1093/oxrep/ grq005.

European Energy Exchange, 2013. Auctions by the transitional common auction platform. Individuals reports 1 to 10. http://ec.europa.eu/clima/policies/ets/cap/auctioning/documentation_en.htm.

European Commission, 2014. Commission staff working document impact assessment accompanying the document Proposal for a Decision of the European Parliament and of the Council concerning the establishment and operation of a market stability reserve for the Union greenhouse gas emission trading scheme and amending Directive 2003/87/EC. SWD(2014) 17 final.

European Commission, 2014. Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the regions. A policy framework for climate and energy in the period from 2020 to 2030. Com(2014) 15 final.

European Commission, 2012. Report from the Commission to the European Parliament and the Council. The state of the European carbon market in 2012. COM(2012) 652 final.

European Commission, 2012. Commission staff working document. Information provided on the functioning of the EU Emissions Trading System, the volumes of greenhouse gas emission allowances auctioned and freely allocated and the impact on the surplus of allowances in the period up to 2020. SWD(2012) 234 final.

European Commission, 2011. Proposal for a Council directive amending Directive 2003/96/EC restructuring the Community framework for the taxation of energy products and electricity. COM(2011) 169/3.

European Commission, 2011. Commission staff working paper impact assessment. Accompanying document to the Proposal for a council directive amending Directive 2003/96/EC restructuring the Community framework for the taxation of energy products and electricity. SEC(2011) 409.

European Commission, Climate Action, 2014. EU Climate Change Committee agrees back-loading. http://ec.europa.eu/clima/news/articles/news_2014010801_en.htm

Eurostat, 2013. Taxation trends in the European Union 2013 edition. Collection: Statistical books. http://ec.europa.eu/taxation_customs/resources/documents/taxation/gen_info/economic_analysis/tax_structures/2013/report.pdf.

Hegerl, G.C., F.W. Zwiers, P. Braconnot, N.P. Gillet, Y. Luo, J.A. M. Orsini, N. Nicholls, J. E. Penner, P.A. Stott, 2007.Understanding and Attributing Climate Change. *In Climate Change 2007: Impacts, Adaptation and Vulnerability, Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*, ed. S. Solomon, D. Qin, M. Manning, Z. Chen, M. Marquis, K. B. Averyt, M. Tignor, H. L. Miller. http://www.ipcc.ch/pdf/assessment-report/ar4/wg1/ar4-wg1-chapter9.pdf.

ICE Future Europe emissions auctions, 2013. Report center. https://www.theice.com/marketdata/reports/ReportCenter.shtml#report/148

Kilian, Lutz, 2007. The Economic Effects of Energy Price Shocks. November. www.cepr.org/pubs/dps/DP6559.asp.

Ministry of Finance, 2012. Explanatory Memorandum prepared to the Environmental Draft by Ministry of Finance. www.komora.cz/download.aspx?dontparse=true&FileID=9870.

OECD, 2011. Economic Surveys: Czech Republic 2011. http://www.oecd-ilibrary.org/economics/oecd-economic-surveys-czech-republic 2011/improving-energy-system-efficiency_eco_surveys-cze-2011-5-en.

Pigou, Arthur Cecil, 1920. The Economics of Welfare. London: Macmillan.

Pethica, J., F. Fox, B. Hoskins, M. Kelly, J. Mitchell, S. Owens, T. Palmer, et al., 2010. Climate change: a summary of the science. September. http://royalsociety.org/policy/publications/2010/climate-change-summary-science/.

Ramsey, F. P., 1927. "A Contribution to the Theory of Taxation." The Economic Journal 37 (145) (March): 47–61.

Smith, S. H. Schneider, M. Oppenheimer, G. W. Yohe, W. Hare, M. D. Mastrandrea, A. Patwardhan, et al.,2009. "Assessing dangerous climate change through an update of the Intergovernmental Panel on Climate Change (IPCC) 'reasons for concern'." Proceedings of the National Academy of Sciences of the United States of America 106 (11) (March 17): 4133-7. doi:10.1073/pnas.0812355106. http://www.pubmedcentral.nih. gov/articlerender.fcgi?artid=2648893&tool=pmcentrez&rendertype=abstract.

Watkiss, P., 2005. The Social Cost of Carbon Review: Methodological Approaches for Using SCC Estimates in Policy Assessment. London.

Yohe, R.D. Lasco, Q.K. Ahmad, N.W. Arnell, S.J. Cohen, C. Hope, A.C. Janetos, R.T. Perez, 2007. Perspectives on climate change and sustainability. *In Climate Change 2007: Impacts, Adaptation and Vulnerability, Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*, ed. M.L. Parry, O.F. Canziani, J.P Palutikof, P.J. van der Linden, and C.E. Hanson, 811-841. http://www.ipcc.ch/pdf/assessment-report/ar4/wg2/ar4-wg2-chapter20.pdf.