HOW SHOULD THE EUROPEAN UNION EMISSIONS TRADING SCHEME BE REFORMED?

KHALED AL KHAJA LLB Law and Economics (Hons.) (in progress)

UNIVERSITY OF EDINBURGH

s0902240@ed.ac.uk

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1 INTRODUCTION

Rising sea levels, melting glaciers, merciless droughts and devastating floods; the effects of climate change are distressing and real. The release of carbon dioxide (CO_2) into the atmosphere from burning fossil fuels is "the biggest culprit" [1] of all, trapping heat that would otherwise radiate into space, causing global warming. Increasing population levels mean increasing levels of demand for goods, the production of which often involves the harmful release of emissions of CO_2 and other greenhouse gases into the atmosphere. In Europe, nature has, in a sense, become an industry; permits allowing the release of greenhouse gases into the atmosphere are traded between firms under an EU-wide scheme, which entered its ninth year of operation in 2013.

Covering an estimated 11,000 power stations, factories and industrial plants across thirty-one nations, the European Union Emissions Trading Scheme (EU ETS) is the largest market of its kind anywhere in the World.[2] Traded volumes within the EU ETS reached 10.3 billion tonnes of carbon dioxide equivalent (CO_2e) in 2011, worth around €126 billion. [3] According to the European Commission, the average annual greenhouse gas emission level per installation within the scheme has fallen by 8.3% on average since 2005.[4] It was reported that between 2005 and 2008, carbon emission by firms in countries covered by the scheme fell by 120-300 million tonnes, and they fell again by 340 million tonnes in the following two years.[5] However, despite this success, the EU ETS has entered its third phase this year facing challenges, both existing and new, which limit its effectiveness as a tool for preventing climate change.

This dissertation aims to identify the main problems facing the EU ETS and make a recommendation as to how the scheme should be reformed. There are a number of ways in which the question of reform of the EU ETS could be tackled. For example, a broader

[1] Bell, M. (2009) *An Invitation to Environmental Sociology,* 3rd edition, Pine Forge Press, p. 7.
[2] European Commission (2012) *EU ETS Factsheet*, available at http://ec.europa.eu/clima/publications/docs/factsheet_ets_2013_en.pdf [accessed 23 January 2013].
[3] World Bank (2012) *State and Trends of the Carbon Market*, Carbon Finance, p. 9, available at http://siteresources.worldbank.org/INTCARBONFINANCE/Resources/State_and_Trends_2012_Web_Optimized_19035_Cvr&Txt_LR.pdf [accessed 18 February 2013].
[4] European Commission (2011) *Factsheet: The EU ETS is delivering emission cuts*, available at http://ec.europa.eu/clima/publications/docs/factsheet_ets_emissions_en.pdf [accessed 18 February 18 2013].
[5] Brown, L., Hanafi, A. & Petsonk, A. (2012) *The EU Emissions Trading System*, Environmental Defense Fund, p. vi.

evaluation of the effectiveness of the use of a market-based cap-and-trade system in promoting a reduction in greenhouse gas emissions could be undertaken. There could be both theoretical and practical arguments against the use of a market-based system for the trade of emission allowances. However, the angle from which this dissertation will approach the question of reform is more internal; within the current market-based structure of the emissions trading scheme, how can reform help achieve the system's objectives? It will therefore be assumed that the use of a cap-and-trade market system is appropriate, and reform will centre on improving this system.

This dissertation is one containing elements of both law and economics; it applies economic theory and analysis to determine how the EU ETS, a major scheme in international environment law, should be reformed. Section Two of this dissertation will provide a background of the EU ETS, including the primary aim of the scheme and the changes in its structure since its inception. In Section Three, the main problems with the EU ETS will be discussed, identifying the possible causes of these problems. In Section Four, methods of reform will be considered, beginning with a comparison of two different options. The feasibility of introducing a price floor in the market for emission allowances will be considered (Section 4.1), explaining the rationale behind introducing a price floor and assessing its economic effects. An intervention process known as 'back-loading' will be outlined, analysed and evaluated (Section 4.2). Section 4.3 will illustrate how the implementation of a combination of both the aforementioned reform options could be undertaken within the EU ETS. In Section Five, a comparative analysis of the reform methods will be conducted, focusing on the effectiveness of each type of reform in solving the three main problems identified in Section Three. Section Six will argue that implementing the joint policy is the most effective way of reforming the EU ETS for it to achieve its aim. Finally, Section Seven will provide a reflection of the dissertation and discuss the challenges that were faced in its writing. It will also discuss how the dissertation contributes to knowledge and suggest areas for further research.

2 THE EVOLUTION OF THE EU ETS

The EU ETS was launched as a method of reducing greenhouse gas emissions, which cause climate change.[6] It stemmed from a green paper[7] from 2000 that launched the initial discussion about the prospect of introducing greenhouse gas emissions trading in addressing climate change. Three years later, under Article 1 of a 2003 European Council Directive[8], a greenhouse gas emissions trading system was to be established within the European Community "in order to promote reductions of greenhouse gas emissions in a cost-effective and economically efficient manner".

The scheme was implemented in phases, the first of which commenced in 2005.[9] In Phase I, emissions allowances called European Union Allowance Units (EUAs) were allocated for free in a process known as 'grandfathering'[10] to EU Member States, with quantities of EUAs distributed to individual states proportional to their respective emission levels in 1990.[11] Under the 2003 Directive, one EUA allows a holder to emit one tonne of CO_2e into the atmosphere.[12] EUAs were then redistributed within each country to firms and could then be freely traded in an open market. This is known as a 'cap-and-trade' system in that there is a total cap on emission allowances and the allowances can be used or traded in a market.[13]

Phase II of EU ETS operation ran between January 2008 and December 2012, expanding the scheme to include emissions from a number of products including glass, petrochemicals and mineral wood.[14] In addition, non-EU members Iceland, Norway and Liechtenstein joined the existing twenty-seven members of the scheme.[15]

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[6] Bell, *op. cit.,* p. 7.
[7] European Commission (2000) *Green Paper on greenhouse gas emissions trading within the European Union*, COM(2000) 87.
[8] Council Directive 2003/87/EC, *Establishing a scheme for greenhouse gas emission allowance trading within the Community and amending Council Directive 96/61/EC*, OJ L 275/32.
[9] Mulvey, S. (2005) EU leads Kyoto 'carbon revolution', *BBC*, 16 February 2005, available at http://news.bbc.co.uk/1/hi/world/europe/4269021.stm [accessed 20 March 2013].
[10] Gilbertson, T. & Reyes, O. (2009) *Carbon Trading: How it Works and How it Fails*, Dag Hammarskjöld Foundation, p. 10.
[11] European Commission, COM(2011) 624 final, *Progress towards achieving the Kyoto Objectives*, p. 4.
[12] Council Directive 2003/87/EC, *op. cit.,* Article 3(a).
[13] Gilbertson & Reyes, *op. cit.,* p. 9.
[14] Wartmann, S., Harnisch, J., Phylipsen, D. & Gilbert, A. (2006) *Inclusion of additional activities and gases into the EU-Emissions Trading Scheme*, Ecofys, available at http://ec.europa.eu/clima/policies/ets/docs/ecofys_review_en.pdf [accessed 20 March 2013].
[15] Gilbertson & Reyes, *op. cit.,* p. 31.

The third and current phase of the EU ETS began in January 2013 and will run until December 2020, prompting some changes to the modus operandi of the scheme. A harmonised EU-wide cap has replaced national emission caps set for each country,[16] and auctioning has replaced grandfathering as the default method of EUA allocation, although it was estimated by the European Commission that only 50% of EUAs would be auctioned in 2013, followed by increases in subsequent years.[17] Croatia also joined the scheme, increasing the number of members to thirty-one.[18]

[16] Commission Decision 2011/278/EU OJ L130/1.
[17] International Emissions Trading Association (2012) *The EU's Emissions Trading System*, available at ieta.org/index.php?option=com_content&view=article&id=324:the-eu-emissions-trading-system&catid=54:3-minute-briefing&Itemid=135 [accessed 19 February 2013].
[18] Point Carbon (2012) Croatia's biggest emitters to join EU ETS in Jan 2013, *Point Carbon*, 25 January 2012, available at http://www.pointcarbon.com/news/1.1728507 [accessed 19 February 2013].

3 THE PROBLEMS WITH THE EU ETS

There are a number of problems with the EU ETS that prevent it from achieving its aim under Article 1 of the 2003 Directive[19] of promoting a reduction in greenhouse gas emissions in a cost effective and economically efficient manner. Some of these problems may be inherent flaws of the scheme that have existed since its inception in 2005, whereas other problems may have manifested over time. Within the scheme itself and therefore within the scope of this dissertation, three major problems have been identified with the EU ETS. The following is a discussion of each of these problems.

3.1 A Lack of Incentive To Reduce Greenhouse Gas Emissions

Firstly, it has been argued that there is a lack of incentive for firms to reduce their emission levels.[20] One possible reason for this is the over-allocation of EUAs.[21] With the existence of surplus credits, firms will continue to emit high levels of CO_2 and other harmful greenhouse gases into the atmosphere as there is no monetary cost involved in obtaining the right to emit these gases. In Phase I, the numbers of EUAs allocated to participating countries were based on their respective emission levels in 1990.[22] The scheme has been criticised for failing to create incentive to reduce emissions because those who emitted the most were given more EUAs than they needed to cover their existing emission levels.[23] Likewise, it has been said that the EUA allocation levels in Phase 1 were "overly generous" [24]. In Phase II, EUA allocation levels were "made on the assumption that European economies would keep growing"[25]. However, the 2008 recession reduced output across Europe leaving firms with more excess credits.[26] This, along with the ability to bank credits from Phase II to Phase III of the scheme, means that surpluses from Phase II allocations still exist in Phase III.[27]

[19] Council Directive 2003/87/EC, *op. cit*.
[20] Gilbertson & Reyes, *op. cit.,* p. 10.
[21] Birnie, P., Boyle, A. & Redgwell, C. (2009) *International Law & the Environment*, 3rd edition, Oxford University Press, p. 368.
[22] European Commission, COM(2011) 624 final, *Progress towards achieving the Kyoto Objectives*, p. 4.
[23] Gilbertson & Reyes, *op. cit.,* p. 10.
[24] Birnie, Boyle & Redgwell, *op. cit.*, p. 368.
[25] Gilbertson & Reyes, *op. cit.,* p. 41.
[26] *Ibid.*
[27] *Ibid.*

Another possible reason for the lack of incentive to reduce emissions is the low price of EUAs.[28] In January 2013, prices hit a record low of €2.81 per tonne of CO_2e emissions.[29] Low EUA prices mean that, from a firm's point of view, it is cheaper to purchase permits to emit greenhouse gases than it is to reduce emissions either by using alternative production methods or by reducing output levels.

3.2 Price Volatility in the EUA Market

Secondly, a current problem with the EU ETS is the price volatility of EUAs.[30] A commodity that is volatile is defined as one "that may be expected to fluctuate greatly and frequently in value"[31]. The following will establish that price volatility does currently exist in the EUA market and discuss why this is problematic.

Figure 1: Price of EUAs from March 2010 to October 2012

Developed using the European Energy Exchange (EEC) Website (http://www.eex.com/en/)

A price crash occurred early in Phase I, when the EUA market lost over 70 percent of its value in a matter of days.[32] Another price crash occurred in 2009 when EUA prices fell from €31 to €8 per tonne of CO_2e between mid-2008 and early 2009.[33] A third similar price crash occurred between June and December 2011, with prices falling dramatically from around €17 to €7 per tonne of CO_2. Figure 1 above illustrates EUA price fluctuations from March 2010 to

[28] Sartor, O. (2012) *The EU ETS carbon price: To intervene, or not to intervene*, Caisse des Dépôts, p. 1, available at http://www.cdcclimat.com/IMG/pdf/12-02_climate_brief_12_-_the_eu_ets_carbon_price_-_to_intervene_or_not_to_intervene.pdf [accessed 28 February 2013].
[29] Clark, P., Chaffin, J. & Blas, J. (2013) EU Carbon Prices Crash to Record Low, *Financial Times*, January 24 2013, available at http://www.ft.com/cms/s/0/77764dda-6645-11e2-b967-00144feab49a.html#axzz2KgPRHzQH [accessed 12 February 2013].
[30] Sarton, *op. cit.*, p. 6.
[31] *Oxford Dictionary of Finance and Banking* (2008) 4th edition, Oxford University Press, p. 460.
[32] Birnie, Boyle, & Redgwell, *op. cit.,* p. 368.
[33] Gilbertson & Reyes, *op. cit.,* p. 41.

October 2012, which include this third price crash. It should be noted, however, that although EUA prices are volatile, they are somewhat less volatile than a number of other commodities. Between July 2008 and March 2012, the price of EUAs was reported to be far less volatile than those of perishable commodities such as cocoa, coffee and rice.[34] During the same time period, coal prices fluctuated 3 percent more than EUA prices, and natural gas and West Texas oil prices were 24 percent and 11 percent more volatile respectively.[35] Still, the history of EUA price crashes is enough to show that price volatility exists in the market.

Using economic theory, price volatility is problematic because it makes it more difficult to fulfill the primary aim of the EU ETS under Article 1 of the 2003 Directive. This is because higher production cost uncertainty creates a greater risk for firms committing to long-term decisions. According to Stein and Stone,[36] uncertainty depresses capital investment, which includes spending on new machinery and the building of new factories that would increase productive capacities. It is widely accepted in basic economic theory that as a firm's production capacity increases, it benefits from economies of scale that lower the average cost of production.[37] If firms are discouraged from capital investment it means that, in the long-term, productive inefficiency will occur. This is a type of economic inefficiency which occurs when there is a feasible allocation of the same available resources that generates a greater level of output.[38]

On the other hand, it has been argued that price volatility is not necessarily a major problem.[39] It may be beneficial in that it may prevent firms from expanding and emitting more greenhouse gases into the atmosphere.[40] It should be noted, however, that Article 1 of the 2003 directive explicitly states that reductions in emissions should happen in a "cost-effective and economically efficient manner"[41]. Therefore, even if emissions don't increase, the aim of the EU ETS is not entirely being fulfilled.

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[34] Brown, Hanafi & Petsonk, *op. cit.,* p. 16.
[35] International Monetary Fund (2012) *IMF Primary Commodity Prices*, available at *www.imf.org/external/np/res/commod/index.aspx* [accessed 18 February 2013].
[36] Stein, L. & Stone, E. (2012) *The Effect of Uncertainty on Investment, Hiring, and R&D: Causal Evidence from Equity Options*, Stanford University, p. 2.
[37] Pindyck, R. & Rubinfeld, D. (2008) *Microeconomics*, 7th edition, Pearson, p. 246.
[38] Mas-Colell, A., Whinston, M. & Green, J. (1995) *Microeconomic Theory*, Oxford University Press, p. 150.
[39] Brown, Hanafi & Petsonk, *op. cit.,* p. 15.
[40] *Ibid.*
[41] Council Directive 2003/87/EC, *op. cit.*.

It has also been argued that price volatility can lead to increases in spending on research and development to find alternative production methods that do not involve the volatile commodity.[42] Theoretically, this could lead to emissions reductions in the long term. However, because firms have large surpluses of EUAs and can purchase more at a low cost, there would be no financial incentive in researching and developing alternative production methods. Therefore, it can reasonably be concluded that price volatility is a problem within the EU ETS.

3.3 The Existence of Windfall Profits

The third and final major problem identified within the EU ETS is that producers earn large windfall profits by selling EUAs that have been grandfathered to them.[43] According to an independent report,[44] the estimated sum of windfall profits earned by firms in the UK, Germany, Spain, Italy and Poland during Phase II of the scheme is between 23 and 63 billion euros. The Office of Gas and Electricity Markets (OFGEM) reported that UK firms alone earned windfall profits of around £9 billion during the same period due to the free distribution of EUAs.[45] The existence of windfall profits in the EU ETS is a problem because they reinforce the lack of incentive to reduce emissions by rewarding greenhouse gas emitting firms.[46] For example, if we assume a firm in the United Kingdom emits *X* tonnes of CO_2e in Year 1 and is given permission to emit *(X + Y)* tonnes in Year 2 in the form of grandfathered EUAs, the firm can earn windfall profits without reducing emissions. It could maintain the same volume of greenhouse gas emissions, using *X* EUAs, and sell the remaining *Y* tonnes worth of emission allowances in the EUA market, earning a profit of *Y*(EUA Price)*. In this scenario, the firm does not need to reduce its emission levels to earn profits and has effectively been rewarded by the EU ETS in exchange for nothing.

[42] Stein & Stone, *op. cit.*, p. 2.
[43] Gilbertson & Reyes, *op. cit.,* p. 36.
[44] Point Carbon Advisory Series (2008) *EU ETS Phase II – The potential and scale of windfall profits in the power sector*, WWF, p. 2.
[45] Ofgem, *Market is sound – Ofgem assures Chancellor* (2008) Press Release, 16 January 2008, available at http://www.ofgem.gov.uk/Media/PressRel/Documents1/Ofgem%202.pdf [accessed 18 February 2013].
[46] Gilbertson & Reyes, *op. cit.,* p. 36.

4 REFORMING THE EU ETS

Three main problems with the EU ETS have been identified; the lack of incentive for firms to reduce emissions, EUA prices that are too volatile and have a tendency to crash, and firms earning billions of euros in windfall profits. It must be noted that there are undoubtedly issues, problems and criticisms involving the use of a market-based cap-and-trade system as a means of reducing greenhouse gas emissions. It is a possibility that an altogether different type of scheme would be more appropriate. However, given the aim to undertake an internal analysis of the current scheme, the discussion of these issues is beyond the scope of this dissertation. The following (Sections 4.1, 4.2 and 4.3) will consider and compare three different types of reform within the current structure and function of the EU ETS. The discussion will focus on the ability of each to address the three main problems and to achieve the aim set out in the 2003 Directive[47] of promoting a reduction in greenhouse gas emissions in a cost-effective and economically efficient manner.

4.1 Introducing a Price Floor

One possible type of reform that could be implemented and indeed has been suggested is the introduction of a price floor in the EUA market.[48] A price floor provides price support in the form of a minimum price imposed on a good or service.[49] Figure 2 illustrates the theoretical effects of the introduction of a price floor on the EUA market.

[47] Council Directive 2003/87/EC OJ L 275/32 Article 1(a).
[48] Bloomberg (2012) *EU May Weigh Carbon Price Support, Offset Limit, Draft Shows*, 23 October 2012, available at http://www.bloomberg.com/news/2012-10-23/eu-may-weigh-carbon-price-mechanisms-offset-limits-draft-shows.html [accessed 19 February 2013].
[49] Besanko, D. & Braeutigam, R. (2002) *Microeconomics: An Integrated Approach*, John Wiley & Sons, p. 435.

Figure 2: Effect of Price Floor on EUA Market

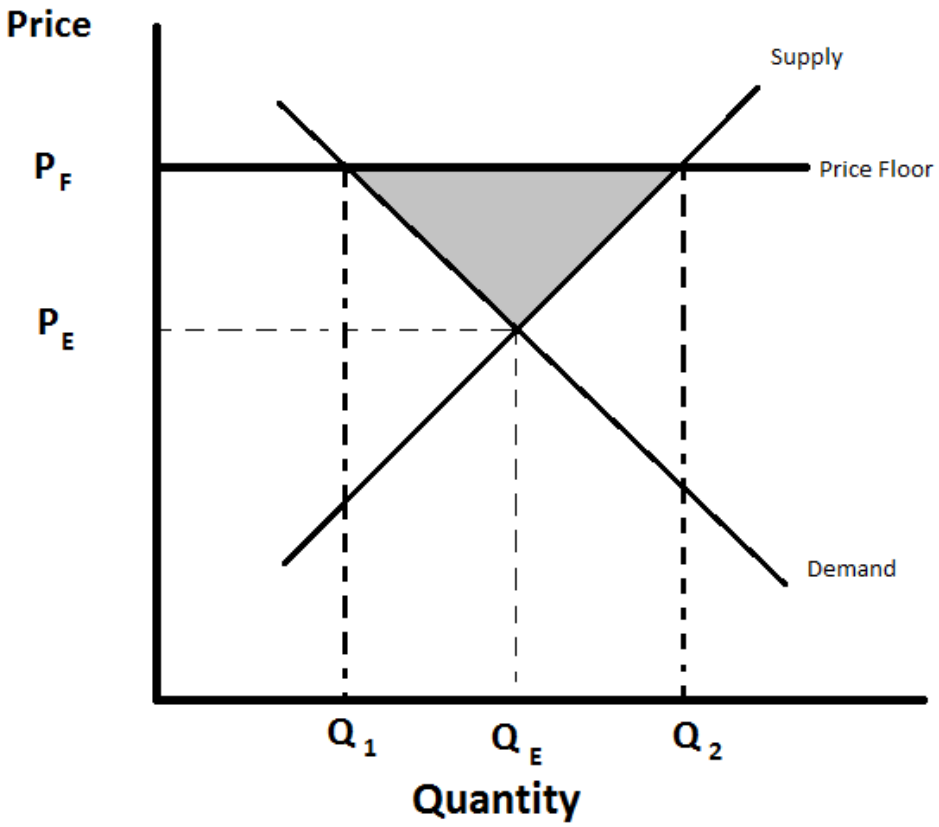


Figure 2 above is a supply and demand diagram for EUAs in the EU ETS.[50] In general, a supply curve shows how the quantity of a good or service offered for sale by a firm changes as the price of EUAs changes.[51] In this example, it illustrates how the number of EUAs being offered by firms in the market increases as the price of EUAs increases. The more expensive EUAs are, the greater the incentive to sell them, so the supply curve has a positive slope. A demand curve, on the other hand, shows what quantity of a good consumers are willing to purchase at different prices.[52] Here, the 'consumers' are firms in countries covered by the EU ETS and the 'good' is an EUA. Like any good or service, demand for EUAs decreases as their price increases, and this is illustrated by its negative slope. The point at which the supply and demand curves intersect is known as the equilibrium, and it shows the market-clearing price and quantity.[53] In the example above, the market-clearing quantity of EUAs is Q_E, at market-clearing price P_E. However, Figure 2 illustrates the consequences of setting a

[50] Model adapted from Besanko, D. & Braeutigam, R. (2008) *Microeconomics*, John Wiley & Sons, p. 382.
[51] Pindyck & Rubinfeld, *op. cit.*, p. 22.
[52] *Ibid,* p. 23.
[53] *Ibid*, p. 25.

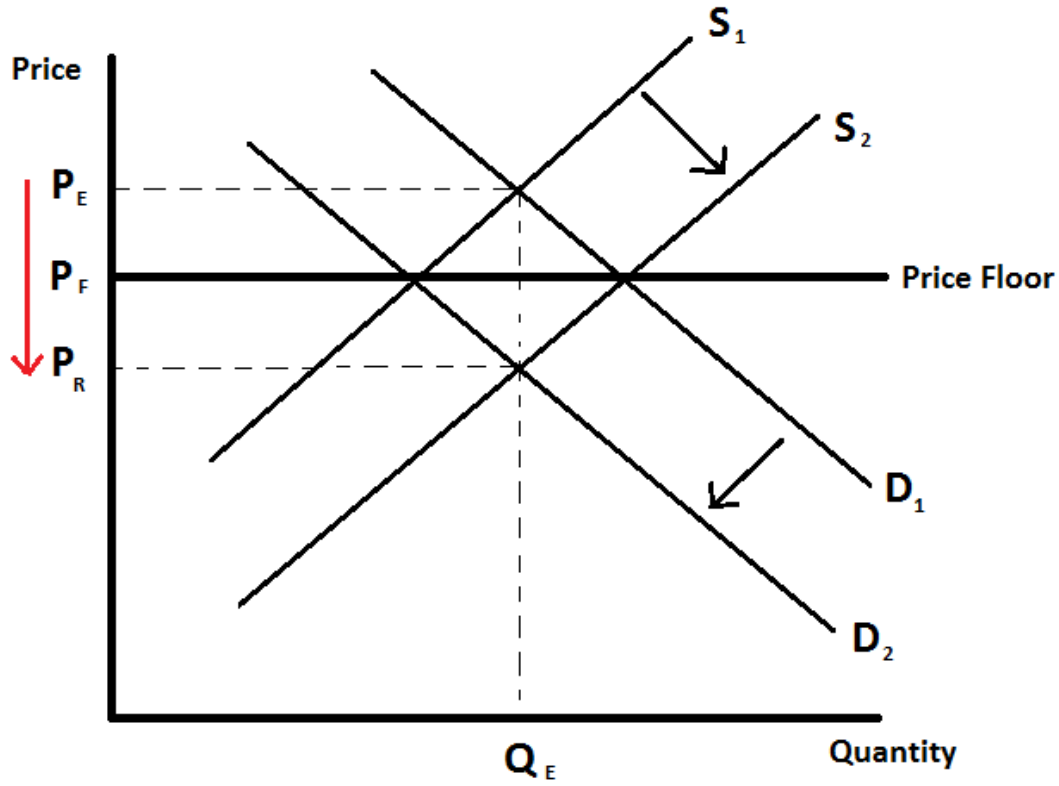
price floor of P_F in the EUA market. In theory, when a price floor mechanism is triggered it increases the equilibrium price to the set price floor level and creates excess supply of the good or service.[54] Since the market-clearing price without intervention is below the price floor, the price of EUAs will increase from P_E to P_F. Also, a surplus of EUAs will be created in the amount of $Q_2 - Q_1$, shaded in Figure 2. In contrast, if the price floor is set below the market-clearing equilibrium, it will have no effect on the price or quantity of EUAs in the market because it will not be triggered.

There are two main reasons why introducing a price floor in the market for EUAs could be a suitable type of reform of the EU ETS. Firstly, it has been established above[55] that there is a lack of incentive for firms to reduce emissions, and that one cause of this problem is the low price of EUAs. If a price floor mechanism were to be introduced in the EUA market, it could eliminate the problem of prices being too low. A higher production cost of goods that involve greenhouse gas emission and require the purchase of EUAs would reduce the profits firms expect to earn from producing these goods.

Secondly, a price floor would theoretically reduce the price volatility of EUAs. Figure 1 and the historical price data above[56] indicate that the EUA market is prone to strong price variations and has a tendency to crash. If a price floor is introduced in the EUA market, prices would never fall below it regardless of the levels of supply and demand. The manner in which a price floor would protect the EUA market from potential price crashes is indicated below in Figure 3.

[54] Besanko & Braeutigam, *op. cit.*, p. 382.
[55] See Section 3.1.
[56] See Section 3.2.

Figure 3: Price Floor Protection in a Recession



Without a price floor in place, the equilibrium quantity in the EUA market is Q_E, at price P_E. However, if a recession were to hit members of the EU ETS, it would theoretically have an effect on both the supply of and the demand for EUAs. In a recession, unemployment rates typically rise while demand for goods and services in the economy falls.[57] Since demand for goods would fall, production levels would decrease to match the reduction in demand. Consequently, firms would require fewer EUAs and would not need to purchase as many. The demand curve for EUAs would therefore shift to the left from D_1 to D_2. Since firms would theoretically be using fewer EUAs and would be struggling to earn profits in a recession, they would have excesses of emission allowances. As a result, the supply curve of EUAs would shift to the right from S_1 to S_2. This kind of attempt to sell large quantities of excess credits occurred in 2009, during a recession.[58] Due to the shifts in supply and demand, the equilibrium price would fall from P_E to P_R. The price fall, if significant, could be interpreted as a price crash which is problematic for the reasons outlined above.[59] With the price floor in operation at price P_F, the EUA market is protected from the price crash as the

[57] Barro, R. (2007) *Macroeconomics: A Modern Approach*, Thomson, p. 5.
[58] Gilbertson & Reyes, *op. cit.*, p. 41.
[59] See Sections 3.1-3.2.

price of EUAs can only fall as low as the price floor level P_F. Since EUA prices would never fall below P_F, it would be reasonable to deduce that there would be less price uncertainty. It was indicated above[60] that price uncertainty lowers capital investment, leading to long-term productive inefficiency. Therefore, the introduction of a price floor would help prevent this.

Despite these potential benefits of introducing a price floor, there are a number of theoretical drawbacks and problems that could arise with the use of this type of reform. Perhaps the biggest problem with the use of a price floor is that it creates excess supply, represented by the shaded area in Figure 2. It was indicated above[61] that a major cause of the lack of incentive for firms to reduce emissions is the excess number of EUAs. Implementing a price floor would lead to an even larger number of excess emission credits being present in the EUA market, which could potentially reduce the incentive to lower emissions levels.

Another potential problem with the use of a price floor is the concern that intervention causes uncertainty.[62] Although a price floor would reduce price uncertainty due to the impossibility of a price crash occurring, the stability and predictability of the operation of the EU ETS could become more uncertain if the scheme implements major changes.[63] From the point of view of a firm in a country within the EU ETS, the observation of too much intervention in the scheme may increase the risk involved with making long-term investment decisions, since it may be anticipated that further intervention could occur at any point; intervention "sets a precedent for more intervention"[64]. In fact, the European Commission rejected a proposal to introduce a price floor in 2009 for this reason.[65] According to Barbara Helfferich, a spokeswoman for the European Commission, "a price floor may unduly interfere with the market"[66]. Furthermore, it was pointed out that low prices had not resulted in the market collapsing, so a price floor was deemed unnecessary at the time.[67] However, it is important to recognise that the situation in 2013 is quite different to the situation in 2009. In 2009, the

[60] See Section 3.2.
[61] See Section 3.1.
[62] Sartor, *op. cit.*, p. 5.
[63] Confederation of European Paper Industries (2013) *Position of the Alliance of Energy Intensive Industries on the Commission proposal to back-load (set-aside) EU ETS allowances*, Position Paper, available at http://www.cepi.org/taxonomy/term/17 [accessed 1 March 2013].
[64] Sartor, op. cit., p. 5.
[65] Wood, P. & Jotzo, F. (2009) *Price Floors for Emissions Trading*, Crawford School of Economics and Government, p. 5, available at http://ageconsearch.umn.edu/bitstream/94885/2/EERH_RR36.pdf [accessed 1 March 2013].
[66] Gardner, S. (2009) Little support for carbon floor price, *Ethical Corporation*, 3 May 2009, available at http://www.climatechangecorp.com/content.asp?ContentID=6130 [accessed 1 March 2013].
[67] *Ibid.*

record low price of an EUA had been €8 per tonne of CO_2e,[68] whereas the recent record low price was €2.81 per tonne of CO_2e.[69] Such large price falls are empirical examples of price volatility, which is problematic for the reasons given above.[70] Furthermore, lower prices of EUAs lower the incentive to reduce greenhouse gas emissions, a point also illustrated above.[71]

The fall in EUA prices over the past few years did not lead to a market collapse, but it is important to consider whether the aim of the EU ETS under the 2003 Directive[72] is being achieved as effectively as possible when deciding how best to reform the system. Had a price floor been introduced in 2009, the price of EUAs would not have crashed to the recent record low levels and it would have been a less financially attractive option to exhaust EUAs through greenhouse gas emission. This is because the opportunity cost, which is the value of the next best alternative forgone,[73] would have been higher. In this case, the opportunity cost of using an EUA is the earnings from selling it; the higher the price of an EUA, the higher the opportunity cost of using it on emitting greenhouse gases.

It is also noteworthy that applying a price floor may not necessarily be very straightforward. The economic analysis below shows that determining the right price floor level to set would be a challenge in itself. The following will discuss the situations where price floors have been introduced in the EUA market but have been set at levels that are too low or too high.

[68] Gilbertson & Reyes, *op. cit.,* p. 41.
[69] Clark, Chaffin & Blas, *op. cit.*
[70] See Section 3.2.
[71] See Section 3.1.
[72] Council Directive 2003/87/EC, *op. cit*.
[73] Besanko & Braeutigam (2008), *op. cit.*, p. 227.

Figure 4: Price Floor Set Too Low

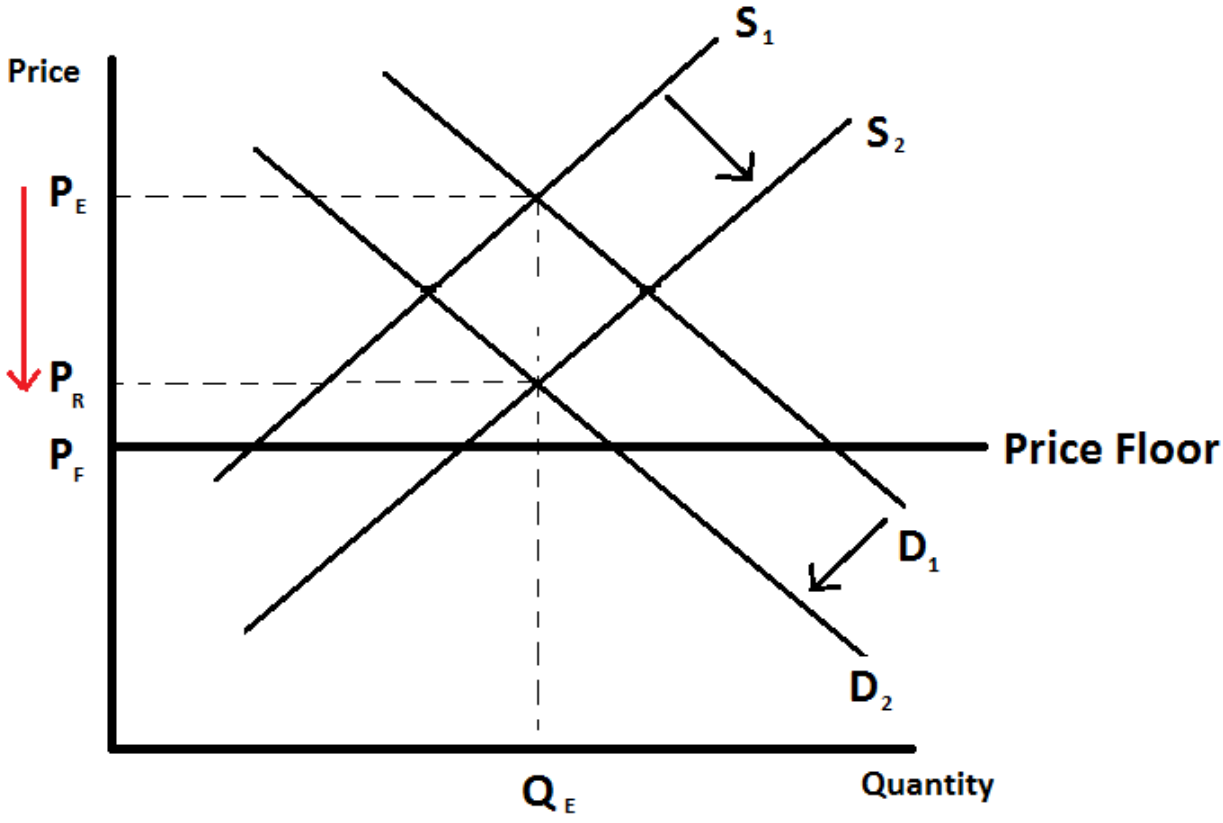
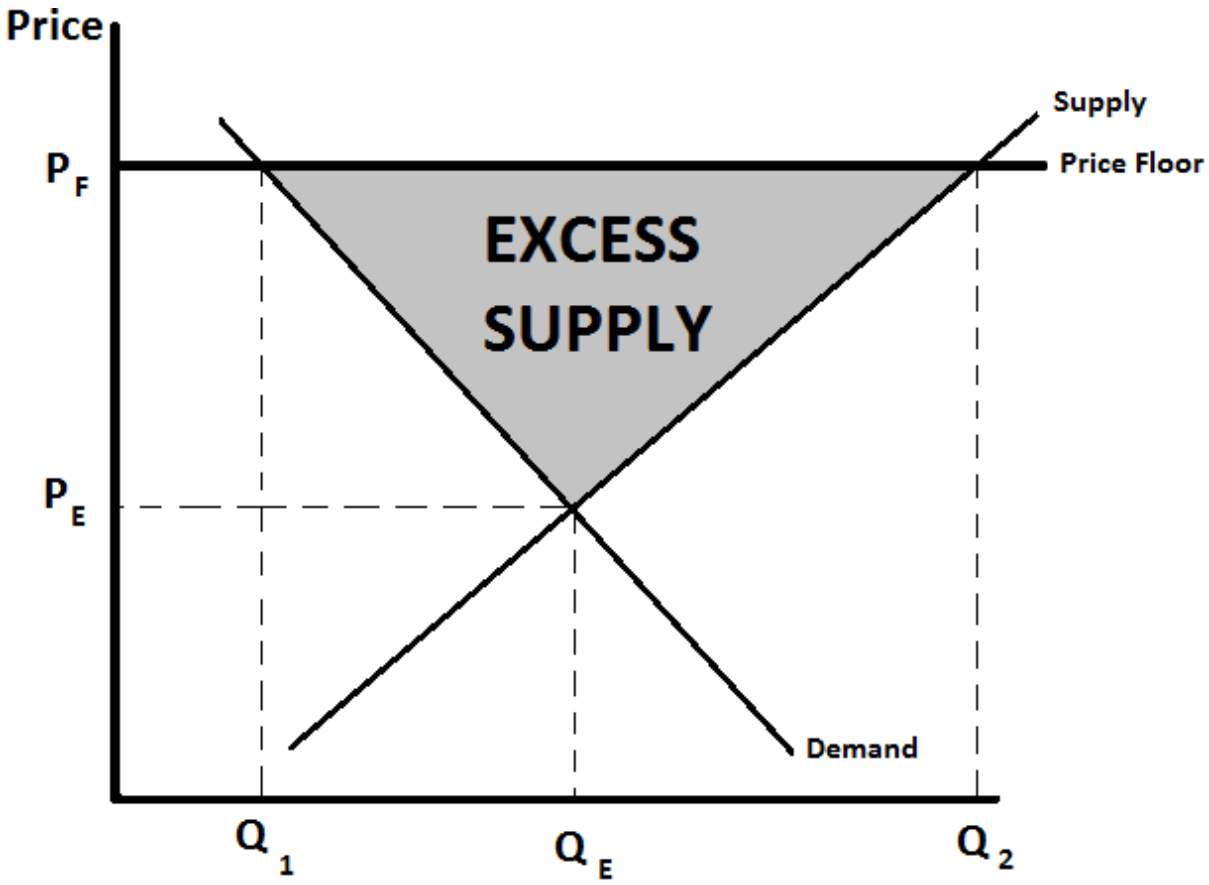


Figure 4 illustrates that a price floor may have no effect whatsoever if it is set too low. In this scenario, a recession has hit EU ETS members, similar to Figure 2 above. The difference is that in Figure 4 the price floor is set much lower than in Figure 2 and has no effect; the equilibrium price after the changes in supply and demand, P_R, is still higher than the price floor level, P_F. In this situation, the price floor has no effect and businesses will "take it on the chin and do little to invest in low-carbon technology"[74]. Figure 5 below shows the effect of a price floor that is set too high.

[74] Slade, T. (2012) Energy Bill: carbon price floor, *Utility Week*, 23 November 2012, available at http://www.utilityweek.co.uk/news/news_story.asp?id=197838&title=Energy+Bill%3A+carbon+price+floor [accessed 3 March 2013].

Figure 5: Price Floor Set Too High



Setting a price floor too high can also be problematic. Figure 5 above shows the market for EUAs where a price floor has been introduced at a very high level, P_F. Although this price is higher than the equilibrium price without any intervention, P_E, a large number of excess allowances has been created, shaded in grey in the diagram. The excess supply of credits is problematic for the reasons given earlier.[75] Since there are already too many excess EUAs in the market,[76] the potential creation of more would only be more problematic. Furthermore, there may be adverse effects of excessively high EUA prices. If the price of EUAs increases, then it can be deduced that the production cost of a good that involves purchasing EUAs will also increase, causing producers to charge higher prices in order to earn a profit.[77] If producers of goods in countries in the EU ETS charge higher prices, the rise in price levels is defined as inflation,[78] and the cost is passed off to consumers. Since all EU member states are

[75] See Section 3.1.
[76] Birnie, Boyle & Redgwell, *op. cit.*, p. 368.
[77] Besanko & Braeutigam (2008), *op. cit.*, p. 32.
[78] Mankiw, G. (2006) *Macroeconomics*, 6th edition, Worth, p. 558.

covered by the EU ETS, this inflation has the effect of making EU products less price competitive in the world economy; the levels of EU exports would theoretically decrease and EU imports would increase, leading to a deficit in the EU's balance of trade, and therefore a balance of payments deficit.[79] This is widely accepted as being highly undesirable in macroeconomic theory.[80] This supports the European Commission's view in 2009 that a price floor may unduly interfere with the market.

Therefore, if a price floor is to be introduced in the EUA market, it is very important to ensure that it is neither too high nor too low. A successful price floor would protect the market from price crashes without creating an excess supply of EUAs and without causing high inflation levels that would reduce the international competitiveness of goods produced in EU ETS member countries. It appears, however, that the creation of EUA surpluses is an inherent part of a price floor, so the implementation of a price floor is potentially dangerous.

Finally, it should be noted that a price floor mechanism would not have a clear effect on windfall profits, which was identified above[81] as being a major problem in the EU ETS. This is because the price floor mechanism does not prevent firms from selling EUAs that have been grandfathered to them. Although the price floor would lead to lower levels of demand for EUAs, which could lower windfall profit earnings, this is counteracted by the higher revenue firms would earn from selling EUAs at higher prices. Therefore, the effect of a price floor on windfall profit amounts is uncertain.

4.2 Back-loading of EUAs

A second method of reforming the EU ETS is 'back-loading' permits, which is setting aside EUAs with the intention of allocating them in the market sometime in the future.[82] Instead of introducing and allocating a number, X, of EUAs at a particular time, $(X - Y)$ EUAs are allocated. The remaining allowances, Y, are set-aside for the time being with the intention of

[79] *Ibid*, p. 119.
[80] *Ibid.*
[81] See Section 3.3.
[82] Point Carbon (2012) Commission proposes back-loading of 900 million allowances from EU ETS, *Point Carbon*, 13 November 2012, available at http://www.pointcarbon.com/aboutus/pressroom/pressreleases/1.2057566 [accessed 5 March 2013].

being allocated in the long-term. This type of reform is currently being considered by the European Commission, and a vote on its implementation is expected to be held sometime in the future.[83] An unpublished draft of an EC Regulation indicates that if the proposal is accepted, around 900 million allowances would be set-aside in the next few years and allocated over 2019 and 2020.[84]

One advantage of back-loading is that it would reduce the number of excess EUAs that currently exist in the market.[85] Reducing the over-supply of EUAs would help lessen the problems caused by the existence of excess credits. It was established above[86] that excess supply in the EUA market is problematic as it allows firms to continue emitting greenhouse gases into the atmosphere without having to purchase permits. If back-loading is implemented, firms will have fewer EUAs and will have to pay in order to acquire the right to emit these harmful greenhouse gases, creating incentive to reduce emissions. This would help the EU ETS achieve its aim of promoting a reduction in greenhouse gas emissions.

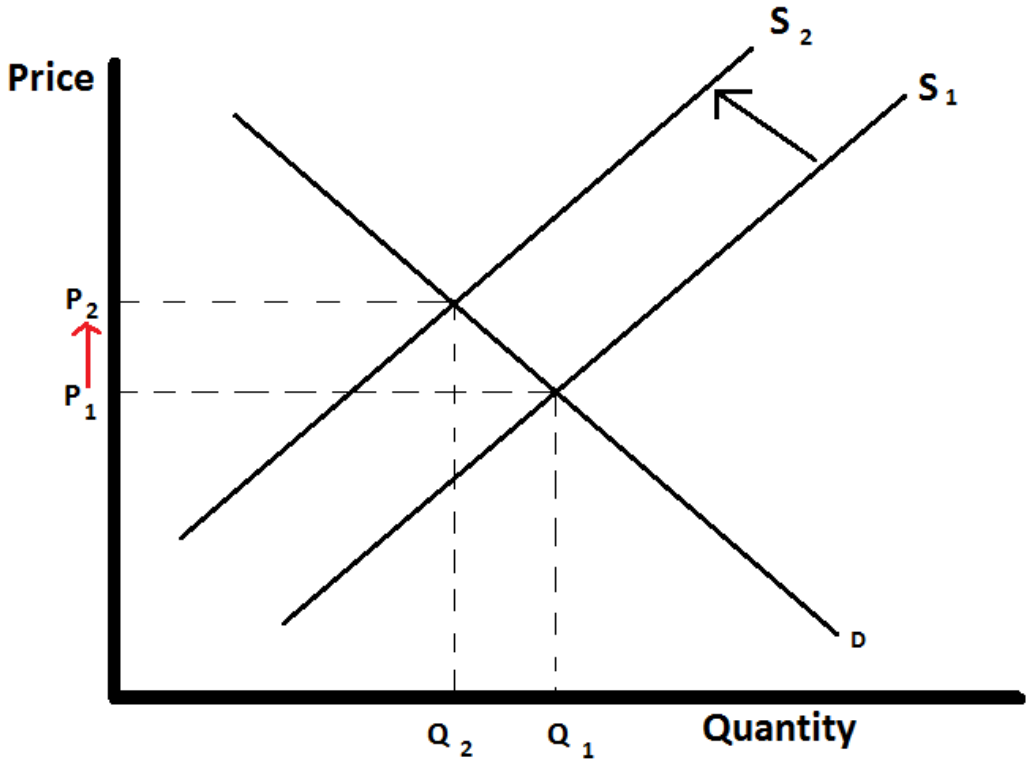
Secondly, it has been said that reducing the number of EUAs allocated to firms would reduce the ability of firms to sell permits that have been grandfathered to them, leading to a reduction in windfall profits in the short term.[87] Windfall profits lead to a lack of incentive to reduce emissions, so reducing the ability of firms to earn these profits would help encourage firms to find ways of reducing greenhouse gas emissions either by reducing output or using alternative production methods.[88]

Thirdly, back-loading would theoretically lead to an increase in EUA prices, which is desirable because the low EUA price was identified above as a cause of the lack of incentive

[83] Lewis, B. (2012) Update 2 – EU vote on plan to withhold carbon permits delayed, *Reuters*, 29 November 2012, available at http://uk.reuters.com/article/2012/11/29/eu-ets-idUKL5E8MTGL620121129 [accessed 4 March 2013].
[84] European Commission (2012) Article 1, Draft Commission Regulation amending Regulation (EU) No 1031/2010 in particular to determine the volumes of greenhouse gas emission allowances to be auctioned in 2013-2020, available at http://ec.europa.eu/clima/policies/ets/cap/auctioning/docs/20121112_com_en.pdf [accessed 5 March 2013].
[85] Grubb, M. (2012) *Strengthening the EU ETS*, Climate Strategies, p. 6, available at http://www.astrid-online.it/Clima--ene/Documenti/cs-strengtheningtheeuets-fullreport.pdf [accessed 4 March 2013].
[86] See Section 3.1.
[87] Brown, Hanafi & Petsonk, *op. cit.*, p. viii.
[88] *Ibid.*

firms have to reduce emissions.[89] Economic analysis below will show how back-loading would lead to an increase in EUA prices.

Figure 6: Effect of Back-Loading on EUA Market



If a number of EUAs are set-aside instead of being allocated to firms through grandfathering or auctioning, firms would have fewer EUAs they would be willing and able to sell, which will have cause a shift of the supply curve in the EUA market leftwards from S_1 to S_2.[90] The effect of the leftwards supply shift is an increase in the equilibrium price of EUAs from P_1 to P_2. One of the problems with the EU ETS identified above[91] was the low price of EUAs which makes it cheaper for firms to purchase EUAs than to find alternative production methods that reduce greenhouse gas emissions. Since back-loading would theoretically increase EUA prices, it would encourage firms to reduce their emissions.

However, there are a number of potential problems with implementing the proposal to back-load allowances. It has been said that removing allowances from the EUA market would be

[89] See Section 3.1.
[90] Besanko & Braeutigam (2008), *op. cit.*, p. 32.
[91] See Section 3.1.

dangerous as it would increase uncertainty and unpredictability in the EU ETS.[92] As with price floors, there is an argument against intervention that it "sets a precedent for more intervention"[93] making it difficult for firms to make long-term decisions.

Additionally, it is difficult to predict the extent to which EUA prices would rise if back-loading were to be implemented.[94] Figure 6 indicated that prices would rise from P_1 to P_2, but one should keep in mind that this is merely a simplified economic model that makes a number of assumptions. For example, the value of $(P_2 - P_{1)}$ depends on the price elasticities of supply and demand, which are defined as the responsiveness of supply and demand to changes in price and are represented by the slopes of the supply and demand curves respectively.[95] In reality, there is no practical way of ascertaining the slopes of the supply and demand curves for EUAs, and quantifying these values would require the undertaking of extensive empirical research. This causes further uncertainty, making it riskier for firms to invest in capital in the long-term which is problematic.[96] Furthermore, setting aside too many EUAs could cause the price of EUAs to rise to a level deemed to be too high. The problems outlined above[97] with respect to a price floor that has been set too high will also exist here if EUA prices become too high. Therefore, in terms of certainty and predictability, implementing a price floor would be a better option than back-loading. Regardless of the slopes of the supply and demand curves, the effect of a price floor that has been triggered will always be for prices to equal the set price floor level.

It has also been said that the policy of back-loading EUAs on its own "would not adequately resolve [The EU ETS'] problems"[98]. EUAs would merely be set-aside in the short-term but would have to be allocated in the future, meaning that back-loading is perhaps only a short-term solution.[99] When those EUAs that were set-aside are eventually allocated into the market, a surplus of credits could manifest which would cause a plunge in EUA prices or the reemergence of windfall profits in the long-term, particularly if they are grandfathered.[100] It

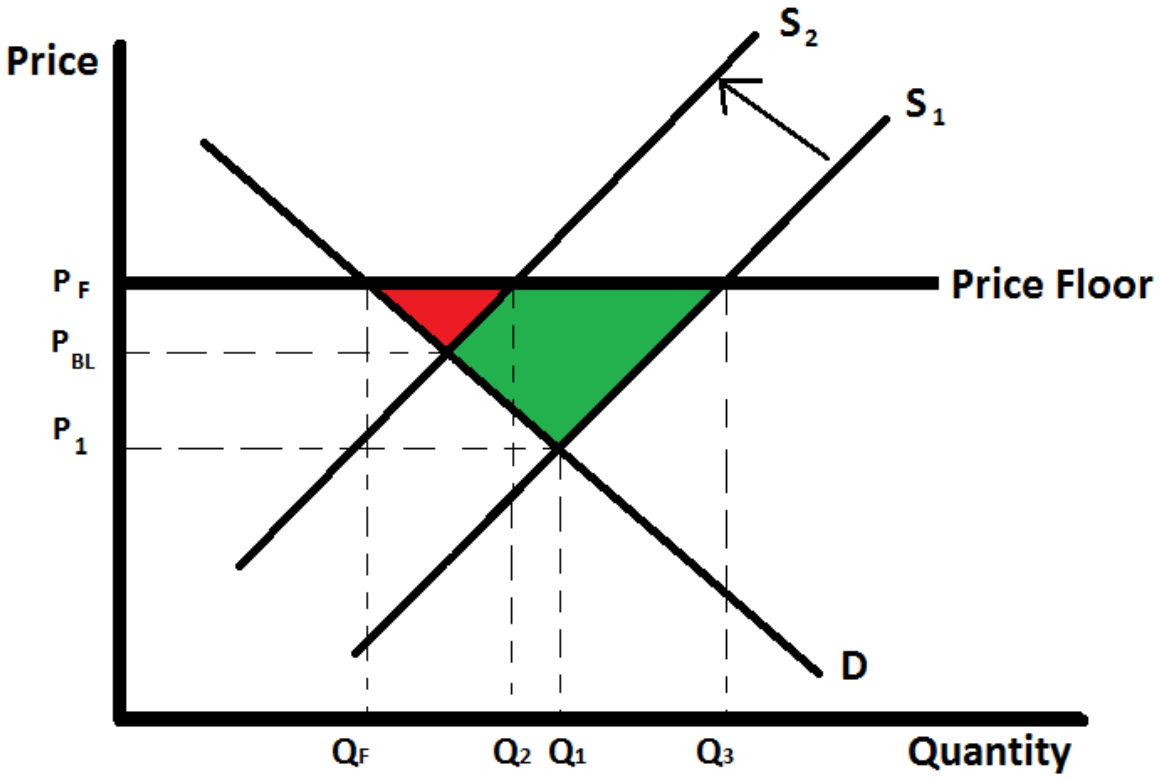
[92] Brown, Hanafi & Petsonk, *op. cit.,* pp. 13-14.
[93] Sartor, *op. cit.*, p. 5.
[94] Grubb, *op. cit.*, p. 6.
[95] Besanko & Braeutigam (2008), *op. cit.*, p. 38.
[96] Stein & Stone, *op. cit.*., p. 2.
[97] See Section 4.1.
[98] Grubb, *op. cit.*, p. 6.
[99] Maroo, J. (2013) EU ETS faces back-loading test, *Energy Risk*, 26 February 2013, available at http://www.risk.net/energy-risk/feature/2242753/eu-ets-faces-back-loading-test [accessed 5 March 2013].
[100] See Section 3.3.

is, however, reassuring that structural changes in Phase III of the EU ETS mean that more EUAs set-aside would be auctioned at a cost to firms rather than grandfathered, so windfall profits will probably not reemerge to the same degree.[101]

4.3 Implementing a Combination of Price Floor and Back-loading

A third possible way of reforming the EU ETS is the implementation of a policy that combines both the price floor and back-loading mechanisms. The use of these two forms of intervention is being debated,[102] but the discussion relates to the potential application of each mechanism separately. There is little discussion about the feasibility of implementing both policies simultaneously, although economic analysis will show that this method of intervention could be effective. Figure 7 shows the theoretical effects of implementing both reform methods simultaneously.

Figure 7: Effect of Simultaneous Use of Price Floor and Back-Loading on EUA Market



[101] International Emissions Trading Association, *op. cit.*
[102] See Sections 4.1-4.2.

Figure 7 illustrates that back-loading EUAs would lead to a leftwards shift in supply from S_1 to S_2. This shift occurs because firms would have fewer EUAs they would be willing and able to sell.[103] This leftwards shift in supply would cause an increase in the price of EUAs from P_1 to P_{BL}. However, with the additional introduction of a price floor, set at price P_F, the market price of EUAs would increase to P_F. With a price floor as the only form of intervention, the excess supply of EUAs created would have been equal to $(Q_3 - Q_F)$, the value of which is represented by the sum of both the green and red shaded areas. When combined with back-loading, the excess supply of EUAs created is reduced to $(Q_2 - Q_F)$, represented by the smaller red shaded area.

There are a number of reasons why this kind of reform could be effective in achieving the EU ETS aim of promoting a reduction in greenhouse gas emissions in a cost-effective and economically efficient manner.[104] Firstly, reforming the scheme in this way could create incentive to reduce emissions by tackling two root causes of this problem. It was established above[105] that low EUA prices contribute to the lack of incentive for firms to reduce their emissions. If introducing a price floor and backloading are implemented simultaneously, the price floor mechanism aspect of the reform would prevent prices from falling below P_F, eliminating the lack of incentive to reduce emissions that would have been caused by low prices. Also, implementing both reforms simultaneously could limit the number of excess EUAs created by the price floor mechanism. This would be beneficial because it has been argued that another reason for the existing lack of incentive to reduce emissions is the large number of excess credits in the EUA market.[106] Figure 7 indicates that implementing this type of reform would reduce the excess number of credits from $(Q_3 - Q_F)$ to $(Q_2 - Q_F)$. In practice, this could ease the problem of the "overly generous"[107] allocation of EUAs.

Secondly, this type of intervention would theoretically reduce price volatility. It was shown above[108] that price volatility is a problem in the EUA market as the increased risk for firms to invest in long-term capital would lead to long-term economic inefficiency. If EUAs were less price volatile, then production costs incurred by firms covered by the EU ETS would be less

[103] Besanko & Braeutigam (2008), *op. cit.*, p. 32.
[104] Article 1, Council Directive 2003/87/EC, *op. cit*.
[105] See Section 3.1.
[106] Birnie, Boyle & Redgwell, *op. cit.*, p. 368.
[107] *Ibid.*
[108] See Section 3.2.

unstable, so investment in capital would theoretically increase.[109] It was also illustrated above[110] that the use of a price floor would reduce price volatility in the EUA market by preventing the price from ever falling below the set price level in spite of any supply and demand shocks that may occur in a recession. A price floor mechanism is one part of this type of reform; Figure 7 shows that prices would never fall below P_F, which would limit the ability of EUA prices to fluctuate. Price volatility is therefore reduced in this scenario.

Thirdly, implementing this type of reform would reduce windfall profits in the short-term. It was shown above[111] that windfall profits being earned by firms in EU ETS member countries are very high, which is problematic as it rewards firms without the need for them to reduce their greenhouse gas emissions. It was also indicated[112] that back-loading EUAs could reduce windfall profits by reducing the number of EUAs firms could sell that had been grandfathered to them at no cost. Since back-loading is one of the two parts of this type of reform, windfall profits would be reduced in the short-term after the reform.

There are, however, some potential problems with the implementation of this joint policy reform. Some problems arise due to the price-floor aspect of the reform. One such problem is the potential difficulty of determining the optimal price level. It was shown above[113] how and why in the case of price floors, care needs to be given to ensure the price floor is not set too high or too low; a price floor that is too low could have no effect whereas a price floor that is too high creates excess supply in the EUA market, reducing the incentive to cut emission levels, which is problematic.[114] Furthermore, if the price floor is set too high, the high production costs that firms will incur will be passed to consumers in the form of higher prices.[115] This is potentially disastrous as it could lead to a balance of payments deficit in the EU.[116] Additionally, The European Commission's view in 2009 that "a price floor would unduly interfere in the market"[117] discussed above[118] may apply to this type of reform, since a price floor mechanism is one aspect of this method of intervention.

[109] Stein, L & Stone, E, *op. cit.,* p. 2.
[110] See Section 4.1.
[111] See Section 3.3.
[112] See Section 4.2.
[113] See Sections 4.1-4.2.
[114] See Section 3.1.
[115] Besanko & Braeutigam (2008), *op. cit.*, p. 32.
[116] Mankiw, G. (2006) *Macroeconomics*, 6th edition, Worth, p. 558.
[117] Gardner, S., *op. cit.*
[118] See Section 4.1.

Also, the benefits of the back-loading aspect of this reform may not be sustainable in the long-term. The long-term feasibility of back-loading is debatable since EUAs that have been set aside will have to be allocated sometime in the future.[119] Earlier discussion of this issue[120] indicated that short-term windfall profits would fall with the use of back-loading but would reemerge when the set-aside EUAs are allocated in the future, particularly if they are grandfathered.

[119] Maroo, *op. cit.*
[120] See Section 4.2.

5 COMPARATIVE EVALUATION

It has been established in Section Three that the EU ETS needs reform because there are three main problems it currently faces that hinder its effectiveness as a tool for preventing climate change. The first is a lack of incentive for firms to reduce their greenhouse gas emission levels. The second is the existence of price volatility in the EUA market. The third is the high level of windfall profits earned by firms in EU ETS member countries. Three possible methods of reform have been discussed above[121], and economic analysis showed the potential advantages and disadvantages of each. These reform options are: the introduction of a price floor mechanism; the set-aside of EUAs in a process called back-loading; and the implementation of both aforementioned reform options simultaneously. A direct comparison of the effectiveness of the three options in addressing each of the three problems will show that the application of both a price floor and back-loading would be the best way of reforming the EU ETS.

5.1 Creating Incentive to Reduce Emissions

The price floor analysis above[122] indicates that this type of mechanism would theoretically have mixed results in terms of creating incentive to reduce emissions. On one hand, a price floor would lead to higher prices, which would theoretically increase the incentive to reduce emissions. On the other hand, a price floor would create a large surplus of credits, which would theoretically reduce the incentive to reduce emissions. Similarly, it is indicated[123] that back-loading EUAs could have mixed results in terms of creating incentive to reduce emissions. Whilst setting aside excess EUAs would theoretically create incentive to reduce emissions, the high level of uncertainty involved with this method of reform could negate the positive effects.

However, implementing both reform options simultaneously would be the most effective way of creating incentive to reduce emissions. The price floor aspect would increase EUA prices, while back-loading would reduce excess credits in the EUA market, both of which would

[121] See Section 4.
[122] See Section 4.1.
[123] See Section 4.2.

encourage firms to reduce emission levels. Furthermore, applying both reform options together could eliminate the problems each separate type of reform would create. The creation of excess credits by a price floor mechanism, which makes it easy for firms to keep emitting greenhouse gases, would at least partially be offset by the set-aside of these EUAs, and the uncertainty created by back-loading could be reduced greatly by the introduction of a price floor. Therefore, this dissertation suggests that introducing a price floor and back-loading EUAs simultaneously is the most effective way of creating incentive for firms to reduce their greenhouse gas emissions.

5.2 Making EUA Prices Less Volatile

The price floor analysis above[124] illustrates how the introduction of this kind of mechanism would reduce price volatility in the EUA market by preventing the price from ever falling below the set price floor. Back-loading EUAs, however, would not solve this problem due to the uncertain and unpredictable effect setting aside EUAs would have on prices. Although economic analysis above shows[125] that prices would increase, the extent to which this increase would occur is uncertain due to the difficulty of quantifying the price elasticities of supply and demand in the EUA market.

If both reform options are implemented simultaneously, the price floor aspect would make EUA prices less volatile by preventing them from ever falling below the set price level. Although the back-loading aspect would have an uncertain effect on price volatility, this uncertainty is negligible for two reasons. Firstly, with a price floor in place, EUA prices would never fall below the set price level regardless of the effect of back-loading.[126] Secondly, the excess supply of credits created by the introduction of a price floor in a market would protect EUA prices from sky-rocketing by the set-aside of too many EUAs. This is because, without a price floor, the uncertain price elasticities of supply and demand in the EUA market mean that prices could increase to levels that are deemed to be too high if too many EUAs are set-aside.[127] The excess credits that are created by a price floor, illustrated in

[124] See Section 4.1.
[125] See Section 4.2.
[126] Besanko & Braeutigam (2002), *op. cit.,* p. 435.
[127] See Section 4.2.

Figure 7 by the red shaded area, could be the credits that are set-aside, which would prevent prices from rising too high above the price floor level.

Therefore, introducing a price floor mechanism on its own or in combination with back-loading would have the same effect on price volatility; both would be equally effective ways of reducing price volatility in the EUA market.

5.3 Reducing Windfall Profits

The price floor analysis above[128] indicates that the effect of a price floor mechanism in the EUA market on windfall profits earned by firms in EU ETS member countries is uncertain. On one hand, lower demand for EUAs would reduce the number of EUAs sold. On the other hand, the selling price of those EUAs would be higher, so the two effects may essentially cancel each other out. However, it is indicated above[129] that back-loading would reduce windfall profits in the short-run by setting aside EUAs instead of allocating them to firms in the EU ETS. In the long term, these EUAs would be allocated in the EUA market, so windfall profits could reemerge, especially if these EUAs are grandfathered instead of auctioned. Since auctioning is now the default method of allocating EUAs and fewer EUAs are being grandfathered every year, windfall profits would not reemerge completely in the future.

If both a price floor and back-loading are implemented simultaneously, the back-loading aspect of the reform would reduce windfall profit levels in the short-run. Although the long-term effects of this kind of reform on windfall profits are uncertain, the higher percentage of EUAs being auctioned instead of grandfathered means windfall profits in the long-term would not reemerge to the same degree that they exist today.[130] Therefore, in terms of reducing windfall profits, joint reform would be equally effective to back-loading alone.

[128] See Section 4.1.
[129] See Section 4.2.
[130] International Emissions Trading Association, *op. cit*.

6 RECOMMENDATION

It has been shown that reforming the EU ETS by both introducing a price floor and back-loading permits in the EUA market would be an effective way of improving the Scheme.[131] The price floor mechanism would lower price volatility in the EUA market and create incentive for firms to reduce greenhouse gas emissions, while back-loading would do the latter and also reduce windfall profits in the short-run. Furthermore, it has been shown[132] that reforming the EU ETS in this way would allow the Scheme to experience the benefits of each individual policy whilst avoiding some of the potential problems that may arise with the separate use of either policy. The price floor mechanism would prevent some of the problems that could be caused by back-loading, and vice versa. The analysis of the effectiveness of each policy in addressing the three main identified problems shows that the joint reform method is more effective than the status quo and at least as effective as each individual policy in fixing each problem. Therefore, this dissertation recommends both introducing a price floor in the EUA market and back-loading EUAs.

[131] See Section 4.3.
[132] See Section 5.

7 CONCLUSION

This dissertation aimed to identify the main problems facing the EU ETS and recommend ways to reform the scheme. It identified three main problems in Section Three, which are: the lack of incentive for firms to reduce emissions; the existence of price volatility in the EUA market; and the billions of euros in windfall profits firms are earning in exchange for no reductions in greenhouse gas emission. In Sections 4.1 and 4.2, the economic rationale and feasibility of introducing a price floor and back-loading in the EUA market were analysed respectively. Section 4.3 analysed the theoretical effects of applying these two reform options simultaneously, and the comparative analysis in Section Five indicated that a combined reform approach would be most effective in eliminating the problems facing the EU ETS. Finally Section Six recommended the simultaneous introduction of a price floor mechanism in the EUA market and back-loading of EUAs.

However, implementing this kind of reform has its challenges. The tasks of setting a price level that is neither too high nor too low and deciding how many EUAs to set-aside may not be straightforward. It would also not completely eliminate the windfall profits that firms in EU ETS member countries may receive in the long-term, although it could in the short-term. Furthermore, any kind of intervention in the EUA market would end its status as a completely free market and introduce elements of a command economy, but the theoretical and philosophical implications of this are beyond the scope of this dissertation. This dissertation argues that given the scheme's current structure, introducing a price floor mechanism and back-loading permits simultaneously in the EUA market would be the most effective way of helping the EU ETS fulfill its aim of promoting a reduction in greenhouse gas emissions in a cost effective and economically efficient manner.

This dissertation makes two contributions to the area of international environment law. Firstly, it applies economic models and analysis to explain the rationale behind different possible solutions to the problems facing the EU ETS. Secondly, it makes an original recommendation, supported by economic analysis, that combines two potential methods of reform. In order to implement these recommendations, further research should be undertaken to determine the optimal price level and back-loading quantities that would be most effective in achieving the EU ETS' aim of promoting a reduction in greenhouse gas emissions in a

cost-effective and economically efficient manner. Further research is also recommended to investigate possible solutions outside the current scheme.

In reflection, there were challenges that were faced in the writing of this dissertation. Due to the relative newness and constantly developing nature of the EU ETS, there was a scarcity of academic literature on reforming the scheme and, in particular, the effectiveness of Phase III thus far. Furthermore, on a number of occasions, conflicting news reports were published on the scheme's development just days apart. However, this merely highlights the level of uncertainty of the EU ETS in the future, and indicates that the issues facing the scheme are very interesting and topical and urgently need to be addressed in order to prevent the harmful effects of climate change from materialising.

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