



# Trade-offs between environmental regulation and market competition: Airlines, emission trading systems and entry deterrence



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## ABSTRACT

The emission trading system (ETS) is being applied worldwide in different economic sectors as an environmental regulatory tool to induce reductions of CO<sub>2</sub> emissions. In Europe the system has been applied since 2005 to energy intensive installations and, since January the 1st 2012, to airlines with flights arriving and departing from Community airports. Regulators should consider not only the efficiency of the ETS in reaching an environmental goal, but also its implications for market competition. In this work, we develop a theoretical model that analyses the European ETS's main features as devised for airlines, focusing on its effects on potential competition and entry deterrence. Contrary to other economic activities under an ETS, potential competition is usual in most airline markets. Our results indicate that the share of capped allowances allocated initially for free to air operators may be a key element in deterring or allowing entry into the market. This result may be against the European principle of promoting competition and may represent a step backwards in the construction of a single European air transport market.

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## 1. Introduction

In Europe the climate change impact of aviation is a key element in the political agenda. In spite of improvements in aircraft technology, the rapid growth in air transport will undermine environmental sustainability in other sectors of the economy (European Commission, 2005; Peeters et al., 2005). If current growth rates continue in the future, air transport will become a major contributor to global warming and climate change.

Aviation has certain peculiarities. Since, by definition, it is an international activity, it requires an international environmental policy. In this context, and given the inability to reach an agreement at Kyoto, countries were required to pursue limitations or reductions of emissions of greenhouse gases through the ICAO (International Civil Aviation Organization). However, ICAO's initial recommendation was to implement an emission trading system on other Contracting States'

aircraft operators only if there is mutual agreement between those States. Taking this into account, the European Union decided to include the aviation industry into the European Emission Trading Scheme (EU ETS). During 2013 there have been some new developments within ICAO, whose Assembly agreed to develop by 2016 a global market-based mechanism to be implemented by 2020.

The ETS has been previously introduced in Europe in other industries. In particular, Directive 2003/87 established the EU ETS affecting energy intensive installations. According to this Directive the activities subject to the EU ETS are the following: energy activities, production and processing of ferrous metals, mineral industry and industrial plants for the production of pulp from timber, paper, and board.

This legislation was later amended by Directive 2008/101 to include aviation within the scheme on the 1st of January 2012, and for all flights arriving and departing from Community airports. This was highly controversial and resulted in a ruling of the European Court of Justice on December 2011 in a legal case brought by US airlines. Further, in November 2012, the Commission put forward a proposal to exempt from enforcement flights into and out of Europe. The intention was to leave room to reach an agreement at the international level through negotiations at ICAO. The proposal was approved in April 2013 (Decision 377/2013). At that time the EU ETS continued to apply to all flights

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<sup>1</sup> In Memoriam. While we were working in this paper our dear friend and co-author Cristina Barbot sadly passed away. This paper is dedicated to her memory.

within and between 30 European countries. Finally, and after the last ICAO agreement, the EU legislation has been amended again. At the time of writing the situation is as follows (European Commission, 2014):

- Emissions from flights between airports in the European Economic Area (EEA) continue to be covered.
- Emissions from flights to and from countries outside the EEA would be fully exempted for 2013.
- From 1 January 2014, for flights to and from countries outside the EEA only the emissions from the proportion of a flight taking place within EEA airspace would be covered.
- Flights between the EEA and some least developed countries will have a special treatment.

According to Directive 2008/101, the EU ETS consists in a rigorous cap on the number of allowances to be allocated. An allowance or permit is defined as the right to emit 1 t of CO<sub>2</sub> during the specified period. For the first year of operation, this cap will be equivalent to 97 percent of the historical aviation emissions (the average mean for years 2004–2006). This figure is lowered to 95 percent for each subsequent period. The majority of capped allowances will be allocated to air carriers for free, excepting a 15 percent that will be auctioned<sup>2</sup> and another 3 percent that will be reserved for new entrants and air carriers experiencing a high rate of growth (higher than 18 percent per year).

The amount of allowances or permits to be allocated initially for free will be determined in accordance to airlines' output levels in 2010. According to Directive 2008/101, the European Commission will calculate a benchmark to allocate permits free of charge. This benchmark will be given by the ratio of the number of free permits for incumbents and the number of total tonne-kilometres produced by all airlines under the scheme during the reference period. For the trading period 2012 it is equivalent to 0.0006797 allowances per tonne-kilometres (European Commission, 2011).

By the end of April 2012 air carriers should have available enough allowances to cover the emissions produced during year 2011, allowing them to buy or sell allowances on the market, or even bank them to cover future emissions. Air carriers that are unable to surrender enough allowances will be subject to a penalty of 100 euros per tonne of CO<sub>2</sub> and will have to surrender the corresponding allowances to cover the incurred emission excess by the next calendar year. In case of non-compliance, the air carrier could be banned from operations.

The literature that examines the impacts on air transport markets as derived of such emission trading scheme is relatively recent, and starts with CE Delft (2005). In this study, increases in airline ticket prices are estimated to be in the range 0.2–9 euros for a round trip, depending on the prices of allowances and route distances. CE Delft (2005) was actually the feasibility study carried out on behalf of the European Commission. It was the reference for the impact assessment that accompanied the development of legislation (European Commission, 2006). The views of the industry regarding impact assessment were reported in Ernst & Young and York Aviation (2008).

Forsyth (2008) also reviews the inclusion of aviation activities within the ETS as planned by the EU, Australia, and New Zealand, analysing their impact in terms of competition, prices, and airlines' profitability. The possible impact in terms of the percentage change in fares is estimated to be within the range 1.6–6 percent, depending on the type of route and on whether direct and indirect emissions are included. Nevertheless, he notes that the impact on

competition and prices will depend on the market structure of specific routes, whether the short or long run impact is being considered, and whether operations are subject to some constraints (e.g. airports capacity constraints).

Scheelhaase and Grime (2007) examine, under different assumptions, the impact of the inclusion in the EU ETS on some selected European airlines. They conclude that the implementation of the scheme in its current form may produce relatively moderate financial impacts on airlines, though the impact is likely to be more significant for low cost carriers and regional airlines than for network carriers. They also point out possible competition effects. In this regard, Scheelhaase et al. (2010) study the effects on competition between European and non-European network carriers, showing that those based outside the EU, and with a moderate growth of emissions between 2006 and 2012, may gain a significant competitive advantage as compared to their European counterparts. On the other hand, Anger (2010) and Anger and Köhler (2010) find the impact of incorporating aviation into the EU ETS negligible. Using a dynamic simulation model, they show that the reduction in growth rates of the airline industry and its emissions by 2020 is negligible. However, none of these works analyse how the EU ETS can affect new entrants' decisions and entry deterrence though, as opposed to other economic activities, potential competition and entry deterrence is very important in air transport markets.

Environmental regulations may be advantageous for large firms and, thus, raise concentration (Heyes, 2009). In particular, environmental policies may allow incumbents to discourage entry strategically (Schoonbeek and de Vries, 2009). In our work, we will develop a formal model that takes into account the EU ETS's main features as devised for airlines markets, focusing on their effects on potential competition and entry deterrence.

Entry deterrence consists of altering the initial conditions of the post-entry game to the advantage of the established firm (Dixit, 1980). As the EU ETS has been designed, airlines must decide their production levels in 2010 taking into account that the EU ETS starts in 2012 and that their output decisions in 2010 will affect the amount of free allowances that they will obtain. Moreover, the EU ETS introduces a special reserve of free allowances for new entrants and for incumbent airlines with a high level of growth. Hence, the special reserve may be shared among both groups: new entrants and incumbent airlines. We show that such setting may result in entry deterrence affecting competition and social welfare. This result collides with the general European aim of promoting competition and may represent a step backwards in the construction of a single European air transport market.

The rest of the paper is organized as follows. Section 2 is dedicated to present the main features of the model. Section 3 shows, given the ETS regulation, the modelling results and the market equilibria, that is, the monopoly or duopoly solution. Section 4 analyses how the environmental regulator may induce each type of equilibrium when establishing the ETS. Finally, the conclusions and policy implications derived from the modelling results are presented in Section 5.

## 2. The model

Economic models are simplified descriptions of reality and, thus, require simplifying assumptions. In this section we describe the basic assumptions of the model. In particular, we consider a simple case of one non-stop route operated by a monopolist that is subject to potential entry.<sup>3</sup> In particular, we consider a market

<sup>2</sup> On the economic advantages of auctioning trading allowances rather than allocating them for free to existing polluters (grandfathering) see, for example, Cramton and Kerr (2002), Hepburn et al. (2006), or OECD (2008).

<sup>3</sup> At a route level there is some evidence of a considerable number of routes being operated by a monopolist. For example in the Spanish case there is evidence

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