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Much Ado about Nothing? – An analysis of economic impacts and ecologic effects of the EU-emission trading scheme in the aviation industry

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ABSTRACT

From 2012 on, all CO_2 emissions from flights departing from or arriving at airports within the European Union have to be offset. We analyze the economic and ecological impacts that are caused by an inclusion of the aviation industry into the proposed emissions trading scheme (ETS). Building on the now fixed system design we employ a simulation model to estimate the impacts of the scheme. Our results indicate that financial impacts are highly dependant on external settings, such as allowance prices and demand growth. We show that the financial burden on the aviation industry will be rather modest in the first years after the introduction of the system and therefore induce only low competition distortions. Likewise, emission reductions within air transportation will be comparably low. While aviation will induce a decline of emissions in other sectors, significant absolute reductions within air transportation can only be reached by a more restrictive system design.

1. Introduction

Aviation is one of the fastest growing industries of the global economy. Over the past 20 years, the industry grew by an average annual rate of around 5%. Aviation is an important contributor to the world's gross domestic product, generating substantial employment across all nations. Despite the current recession and the crises in air transportation, the industries' growth is estimated to remain a global phenomenon with an average projected annual growth rate of about 4.2–5.1% (IATA, 2009; Boeing, 2009; ACI, 2008; Airbus, 2007).

While this development has a positive economic influence, the growth rates of international aviation do not seem to be ecologically sustainable.[2] Most studies agree that the negative environmental impacts of aviation are largely uncompensated (Goetz and Graham, 2004; Chapman, 2007). This inadequate reflection of the 'real' costs of air transportation by current prices would represent a market failure and lead to sub-optimal activity levels and low investments in more efficient operational procedures and technologies (Wit et al., 2005). Negative external effects of aviation thereby exist both at the local and global level. At the local level, particularly in the airport proximity and under flight paths, noise pollution is an environmental problem (Schipper, 2004). At the regional and global level, aircraft emissions from the burning of kerosene are important (Janic, 1999). Overall, air transportation is believed to be responsible for about 2–3.5% of all anthropogenic greenhouse gas emissions (Oxford Economics, 2008).

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[2] For an introduction to the concept of sustainability and its application to the transportation/aviation sector see Gudmundsson and Höjer (1996), Banister (2008), Amekudzi et al. (2009) and Hoyos (2009).

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Even though aviation has been able to achieve substantial efficiency improvements, these gains have regularly been offset by even higher numbers of traffic growth. If this development continues, air transportation will further increase its share of emitted greenhouse gases and thereby its contribution to climate change. Some studies estimate that emissions from aviation may increase more than threefold until the year 2050 (Olsthoorn, 2001), and may even threaten international aims for the reduction of anthropogenic emissions as agreed on in the Kyoto Protocol (Macintosh and Wallace, 2008). To address these problems, the European Union (EU) has elaborated plans to subject air traffic within its member states to an emissions trading scheme (ETS). The system would cover one third of all CO_2 emissions caused by international aviation and impact the industry from January 2012 on. From that time, all emissions of flights departing from or arriving at airports within the EU need to be offset. These additional costs will incur both ecological effects as well as economical burdens on the air transport industry.

First studies have analyzed – at an aggregated level – the effects of such a scheme under fixed parameter constellations or for individual airlines. Carlsson and Hammar (2002) explore the possibilities of using incentive-based environmental regulations of CO_2 emissions from international civil aviation. Wit et al. (2005) develop concepts for amending the existing EU emissions trading scheme to address the climate change impact of aviation. The study by Morrell (2007) focuses on the method of allocation of emissions permits in the EU context. Scheelhaase and Grimme (2007) analyze the potential cost impact of an ETS system. Their research covers four selected carriers on the European market. Scheelhaase et al. (2009) present a case study on two selected carriers from the US and Europe, analyzing potential impacts of the EU emissions trading scheme on competition structures between European and non-European network airlines.

While all of these studies provide important insights into the ETS system and potential impacts of such a scheme, they rely on assumptions and parameters that have recently been overtaken by the increasing concretion of the system design. Also, rather restrictive scenario considerations on the impacts of the ETS system lead to a lack of validity and explanatory power. Many important cause-and-effect chains and feedback loops, such as higher overall costs of flying resulting into less demand for air transportation, remain unconsidered. Furthermore, many questions on the ETS impact on the overall competitive environment of the industry remain open. From an ecological perspective, there is – to our knowledge – no analysis on the environmental effects of the ETS system. It is not yet clear to which extend an inclusion of air transportation into the EU–ETS system will induce emission reductions.

This research aims at quantifying both economical and ecological impacts of an inclusion of the air transportation industry into an ETS system. We therefore sub-divide our general research question into two sets of questions. The first set addresses economical impacts. By quantifying these costs, we draw conclusions concerning potential distortions of traffic flows and competition structures. The second set of questions looks into the ecological effects of the ETS system on air transportation. As there is no detailed analysis of these effects, our objective is to quantify overall emission reductions, closing a gap in the literature.

The paper is set out as follows. We begin our analysis by introducing the EU–ETS, its political background, system design and main parameters (Section 2). Section 3 introduces the simulation model. We present the model parameters and interdependencies and lay out the method to compute the financial and ecological impacts of the ETS system. We thereafter analyze and interpret the results of the simulation model and discuss potential model limitations (Section 4). Section 5 provides a conclusion.

2. The EU–ETS system: background and system design

2.1. Political background of emissions trading schemes

The EU–ETS has been developed to facilitate the implementation of the Kyoto Protocol. The Kyoto Protocol is a legally binding international agreement under the United Nations Framework Convention on Climate Change (UNFCCC), aimed at combating global warming through the stabilization of greenhouse gas emissions. The protocol was adopted in 1997 and entered into force in 2005. It requires the 37 so called 'Annex-I countries' (industrialized countries) to a reduction of emissions – including the greenhouse gas carbon dioxide. As the Annex-I countries commit themselves to reduce their emissions below a certain baseline (a reduction of 5.2% from the 1990 level by the year 2012), the protocol can be considered a cap system with national-level commitments. The Kyoto Protocol authorizes three cooperative implementation mechanisms that involve tradable permits – the Clean Development Mechanism (CDM), Joint Implementation (JI), and Emission Trading Schemes.

While the Clean Development Mechanism allows the creation of carbon credits (so called Certified Emission Reductions – CER) by developing emission reduction projects in non-Annex-I countries, Joint Implementation projects allow project-specific credits (Emission Reduction Units – ERU) to be transferred within Annex-I countries.

Emissions trading schemes represent a third policy approach aimed at reaching the goals of the Kyoto Protocol with market-based mechanisms. Market-based instruments in particular have the potential to encourage efficiency improvements at emitters and provide economic incentives for technological innovation. The basic line of argument is that behavioral sources of pollution problems could be traced to an ill-defined set of property rights (Tietenberg, 1980). However, by making property rights (here: the right to emit) explicit and transferable, the market would gravitate towards an ultimate cost-effective allocation of the permits (Montgomery, 1972). This can be ascribed to the fact that as long as marginal abatement costs