



The impact of the European Union Emissions Trading Scheme on US aviation

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We estimate the economic impacts on US airlines that may arise from the inclusion of aviation in the European Union Emissions Trading Scheme from 2012 to 2020. We find that the Scheme would only have a small impact on US airlines and emissions, and that aviation operations would continue to grow. If carriers pass on all additional costs, including the opportunity costs associated with free allowances, to consumers, profits for US carriers will increase. Windfall gains from free allowances may be substantial because, under current allocation rules, airlines would only have to purchase about a third of the required allowances. However, an increase in the proportion of allowances auctioned would reduce windfall gains and profits for US airlines may decline.

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1. Introduction

In 2005, the European Union (EU) implemented an emissions trading scheme (ETS) for certain industries and installations to partially fulfill its obligations under the Kyoto framework to reduce greenhouse gas emissions (European Union, 2003). The EU-ETS is in its second phase (2008–2012) and a third phase will operate from 2013 to 2020. The EU will develop post-2020 climate policies according to future international policy developments and progress in the understanding of the science of global climate change.

The EU-ETS sets progressively lower caps on annual greenhouse gas emissions and 2020 limits are set at 79% of 2005 emissions covering all EU states plus Iceland, Liechtenstein and Norway. It covers carbon dioxide (CO₂) emissions and nitrous oxide emissions from installations in the energy sector such as power stations, combustion plants and oil refineries, and emissions from most other industrial installations.

In 2008, the European Commission adopted directive 2008/101/EC, to include aviation in the EU-ETS from the beginning of 2012. All flights to or from airports in ETS countries, irrespective of carrier nationality, will have to acquire allowances to cover CO₂ emissions. While the International Civil Aviation Organization (ICAO) and International Air Transport Association (IATA) generally support market-based policies to abate aviation emissions, the inclusion of aviation in the EU-ETS has been challenged. Some foreign

governments and airlines argue that the EU-ETS in its current form is both unjustly harmful to airlines and contravenes international treaties, such as the Chicago Convention. In this connection, the US government has requested an exemption from the EU-ETS for US carriers. Additionally, some US airlines and their trade body, Airlines for America (A4A), have filed a case in the European Court of Justice. Other countries, such as China, are also calling for exemptions (Flottau et al., 2011). Under current EU legislation, an exemption may be granted for airlines from countries that implement measures “equivalent” to those in the EU to reduce GHG emissions.

In extending the EU-ETS to aviation, the European Commission will allocate aviation allowances for 97% of average annual emissions from 2004 to 2006 in 2012, and 95% of the same historical average from 2013 to 2020. However, aviation emissions may exceed the quantity of aviation emissions allowances if aviation buys allowances from other sectors covered by the EU-ETS and/or purchases emissions credits from certain clean energy projects. Under current regulations, 85% of aviation emissions allowances will be granted for free (grandfathered) each year based on each carrier’s market share in 2010, and 15% of allowances will be auctioned. However, EU legislation allows policy makers to revise the number of allowances grandfathered from 2015 onwards.

2. Modeling framework

Following Winchester et al. (2011), we assess the impact of the EU-ETS on aviation by linking an economy-wide computable general equilibrium (CGE) model with a partial equilibrium model

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that focuses on the aviation industry. We use a CGE model to determine the impact of the EU-ETS on fuel prices and GDP, and simulate the impact of changes in these variables in a partial equilibrium model of the aviation industry.

Our chosen CGE model is the Emissions Prediction and Policy Analysis (EPPA) model. The EPPA model is a recursive dynamic model of the global economy that links GHG emissions to economic activity (Paltsev et al., 2005).

We model the aviation industry using the Aviation Portfolio Management Tool for Economics (APMT-E). APMT-E is one of a series of models that is being developed by the FAA and the Partnership for Air Transportation Noise and Emissions Reduction Center of Excellence. The APMT tool suite is designed to assess the effects of aviation on the environment, and APMT-E focuses on airline responses to policy changes. The model has been used in support of International Civil Aviation Organization/Group on International Aviation and Climate Change (2009) and International Civil Aviation Organization/Committee on Aviation Environmental Protection (2010) and is outlined by MVA Consultancy (2009). In the model, airlines can respond to CO₂ costs by raising prices (and flying less) and, when purchasing new aircraft, selecting more fuel efficient alternatives. The model is calibrated using 2006 data.

APMT-E identifies 23 route groups (e.g., North Atlantic, Domestic US, North America–South America and Europe–Africa). As we wish to determine the impact of the policy on US airlines, our analysis focuses on the North Atlantic. Based on Kincaid and Tretheway (2007), in the model, the price elasticity of demand on the North Atlantic for passenger travel is assumed to be -0.72 and -0.99 for freight.

Existing functionality in APMT-E does not allow us to consider at least two second-order effects of the EU-ETS on US airlines. First, we do not consider the impact of the policy on US carriers on routes outside the North Atlantic, such as decreased US domestic flights due to reduced connecting passengers from North Atlantic flights. Second, we do not consider asymmetric effects of the EU-ETS on competitiveness. For example, cost increases for US airlines transporting passengers to non-EU destinations via the EU relative to airlines that bypass the EU. This argument has been widely voiced by the EU aviation industry, but Albers et al. (2009) conclude that competitive distortions due to the EU-ETS will be small.

To evaluate the impact of the EU-ETS on US airlines, we focus on the North Atlantic route by carrier nationality. APMT-E identifies airline nationality for passenger travel, but not for freight. We extend the model using market share data from the International Air Transport Association (2010) and the US Department of Transportation (2011a) to estimate freight transported by US carriers on the North Atlantic. We do not consider belly-hold freight.

Grandfathered permits will be allocated according to 2010 revenue tonne kilometers (RTKs) shares of EU-ETS traffic. In modeling we augment this to adjust for freight by nationality; the 2010 market share of US carriers is 9% a figure validated by the Marketing Information Data Transfer (MIDT) database. The market share of US airlines in European traffic in this database is 10.2%, but the MIDT calculation is based on cargo data for US operations on all Atlantic operations. They thus include US cargo to several non-European regions, including Africa, the Middle East and India and also traffic to, within and from all European countries. To be consistent with APMT-E baseline assumptions, our allocation of free allowances to US airlines is based on a 9% market share, although 11% is also considered in a sensitivity analysis. We limit our analysis to the third phase of the EU-ETS ending in 2020 and do not consider climate policies in other regions.

To investigate the impact of the EU-ETS on US aviation, we compare three scenarios with a reference case (“business as usual”, BaU). Our reference scenario is based on International Civil Aviation Organization/Group on International Aviation and Climate Change (US-ICAO/GIACC) (2009). As we are examining the incremental impact of including aviation in the EU-ETS, the impact of the EU-ETS on other sectors is modeled in our reference scenario. Specifically, using predictions from an EPPA simulation of the EU-ETS that excludes aviation, we update US-ICAO/GIACC fuel prices and demand forecasts. Following Lee et al. (2001), we assume an annual increase in the fuel efficiency for new aircraft of 1.4%, rather than 1% in the US-ICAO/GIACC forecast.

In our scenarios, we calculate an effective fuel price, which is equal to the reference fuel price plus the cost of CO₂ emissions from fuel combustion. The price of CO₂ emissions allowances hovered around €15 per tonne of CO₂ (tCO₂) for most of 2010 (European Energy Exchange, 2011). There is also evidence that firms are banking allowances for use in later years (Grubb et al., 2009). Consequently, we assume a carbon price of €15/tCO₂ in 2010 and increase this by 4% each year; approximately equal to the current yield on 10-year German bonds, a low-risk investment, plus a 1% risk premium. EU legislation prevents airlines from selling allowances to other sectors, but there are no restrictions on airlines purchasing allowances from other sectors. Under these regulations, the price of aviation allowances could differ from that for other sectors. However, empirical evidence (Winchester et al., 2011) and our simulations indicate that CO₂ abatement costs are higher for aviation than other sectors, so it is likely that aviation will purchase allowances from elsewhere. Therefore, we assume that there is a single price of CO₂ allowances for all EU-ETS covered sectors.¹

Airlines’ cost pass-through behavior is an important determinant of the impact of the EU-ETS on aviation. Consistent with profit maximizing behavior in competitive markets, most studies assume that airlines will pass on the full cost of CO₂ allowances, including opportunity costs associated with ‘free’ allowances. However, airfares may rise by less than the cost of CO₂ allowances for at least three reasons. First, there may be opportunity benefits from using free allowances. Opportunity benefits arise when current traffic is used to determine future allowance allocations. The presence of opportunity benefits creates an incentive for airlines to reduce fares (and expand demand) relative to a case without opportunity benefits. If there are opportunity benefits, airfares will increase by less than the cost of allowances or may decrease.

The allocation of free allowances for aviation in the EU-ETS is currently based on a one-off benchmark using market share data for 2010, measured in RTKs. This benchmark will likely be used until 2020. If the EU follows current regulation, future allocations will be based on market shares in the year ending 24 months before the start of the next trading period (2020). As operations from 2012 to 2017 and 2019 to 2020 would not influence the share of free allowances allocated after 2020, opportunity benefits are unlikely to be present in these years. Opportunity benefits may exist in non-benchmark years, if current market shares depend on past operations, but incentives to inflate market shares in non-benchmark years are likely to be second order. Overall, we expect opportunity costs to be passed on to consumers during all years except 2018.

In 2018, opportunity benefits may exist, but would depend on the proportion of allowances grandfathered for future years. Although there are no historical observations for aviation, the

¹ Values in APMT-E are expressed in US dollars using a purchasing power parity (PPP) exchange rate of \$1.24 per € (Organization for Economic Cooperation and Development, 2011).

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