Competitive Distortions in the Air Transport Markets as a Result of the Upcoming Worldwide Emissions Trading Systems?

Within the next 5 to 10 years, different national and supranational emissions trading schemes will be introduced globally to reduce aviation's CO2 emissions: The European Union's emissions trading scheme will directly limit the CO2 emissions of virtually all flights starting from or landing at any European airport from 2012 onwards. The upcoming US cap-and-trade-system for greenhouse gases as well as the New Zealand system will very likely choose the fuel suppliers as accountable entities of their systems (upstream approach): Aviation will be covered indirectly by the price impact on the fuel purchased. Detailed plans for mandatory national emissions trading systems have also been worked out by Australia, Canada, Norway, Iceland, Liechtenstein and Switzerland. This foreseeable heterogeneous global framework will have impacts on competition within the aviation sector. This paper analyses the economic and competitive impacts of the introduction of differently designed emissions trading systems on the international aviation sector.

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Background

According to recent expert estimates, international aviation contributes about 4.9 per cent to anthropogenic radiative forcing (Lee et al., 2009). Within the next decade, a number of emissions trading schemes tackling climate change both on a national as well as on a supranational level is expected to be introduced. However, these schemes are designed rather differently from one another. At the moment, the plans on a European level are the most advanced. According to EU Directive 2008/101/EC, which came into force in 2009, international aviation will be included into the EU emissions trading scheme for the limitation of CO2 emissions by 2012. Detailed plans for mandatory or voluntary national emissions trading systems affecting aviation have also been worked out by the US, New Zealand, Australia, Canada, Norway, Iceland, Liechtenstein and Switzerland. This anticipated heterogeneous global framework will have effects on competition within the aviation sector.

Against this backdrop, several high-level groups of the International Civil Aviation Organization (ICAO) are working to develop a framework for market-based measures. However, at this point, it is not quite clear what this exactly entails. Possible options include a global trading scheme for aviation or guidance on how to link different trading schemes in which aviation is included.

Upcoming National and Supranational Emissions Trading Systems

In the European Union, and in the Non-EU-States Norway, Iceland and Liechtenstein, the emissions trading scheme will cover virtually all flights departing from or arriving at European airports. This way, both European and non-European airlines will participate in the EU emissions trading scheme (ETS). Aircraft operators will be obliged to hold and surrender allowances for CO2 emissions. EU Allowances (EUAs) as well as permits from the Kyoto-based "Clean Development Mechanism" (CERs) and "Joint Implementation" (ERUs) will be accepted for compliance.

The Clean Development Mechanism allows emission-reduction projects in developing countries to earn certified emission reduction (CER) credits, CERs can be traded and sold, and used by industrialized countries to meet a part of their targets under the Protocol. Joint Implementation as defined in Article 6 of the Kyoto Protocol, allows a country with an emission reduction or limitation commitment under the Kyoto Protocol (Annex B Party) to earn emission reduction units (ERUs) from an emission-reduction or emission removal project in another Annex B Party. Both CDM and JI are understood politically as being additional to emission reduction measures within the European Union.

In Europe, in the year 2012, the total quantity of allowances allocated to aircraft operators will be equivalent to 97% of the historical aviation emissions of the years 2004-2006 (so-called overall "cap"). This "cap" will be lowered by another 2% in 2013. Allowances allocated to aircraft operators will be valid within the aviation sector only. However, it will be possible to purchase additional permits from other sectors or from the project based Kyoto instruments "Joint Implementation" and "Clean Development Mechanism". In 2012, aircraft operators may use emission permits from "Joint Implementation" and "Clean Development Mechanism" for up to 15% of the number of allowances they are required to surrender for this year. In the period of 2013 until 2020, the use of these Kyoto instruments will be reduced to 1.5%. This figure was a political compromise agreed upon after long and controversial negotiations. Flights from third countries, which have introduced equivalent CO2 reducing measures can be excluded from the EU-ETS. It will be on the EU Commission to decide whether the third-country measures are equivalent. The potential for conflicts could be significant on this issue in the future when other trading schemes addressing international aviation will be in force, too.

Currently, Switzerland is negotiating with the EU Commission on what terms Switzerland as a non-member of the European Union may join the EU emissions trading scheme.

In the United States of America, several cap-and trade bills for the limitation of greenhouse gases are currently under consideration. Most prominent discussed are: The American Clean Energy and Security Act of 2009 (ACESA) and the Clean Energy Jobs and American Power Act (CEJAPA). Common elements are: A mandatory cap on five Kyoto greenhouse gases plus NF3. The overall reduction target is a 3% reduction in 2012, a 17% respectively 20 % reduction in 2020 and a 42% reduction in 2030, compared to 2005 levels. Accountable entities include refineries, electrical generators, distributors of natural gas and industrial facilities. Unlike the EU scheme, in which aircraft operators are directly affected by a cap on international aviation's emissions and must surrender allowances to cover them, under both the ACESA and the CEJAPA, it will be the refineries that will be the accountable entities. Here, the refineries are expected to pass on the costs of compliance to the aircraft operators in the form of increased kerosene prices (so-called upstream approach). An upstream approach has the advantage of being much easier to handle because the number of accountable entities is significantly smaller compared to a downstream approach. However, a trading scheme applying an upstream approach is not as predictable in terms of economics because it is unclear whether the fuel suppliers will fully pass on the cost of permits, and straight to the accountable entities or according to the (individual) price elasticities of demand (see also below). At this point in time, it remains to be seen whether fuel for domestic flights and for international flights will be treated differently within the US cap-and-trade scheme. This is because both ACESA and CEJAPA do not explicitly make this distinction.

New Zealand has introduced an emissions trading system for the limitation of greenhouse gas emissions in 2008. Until 2015, several sectors will be gradually phased in the trading scheme. The forestry sector started in 2008. The liquid fossil fuels sector as well as the stationary energy and industrial processes sectors have become mandatory participants by mid-2010. Other sectors will follow at a later point in time. Transport including domestic aviation is covered indirectly by the upstream approach explained above. Fuel used for international aviation (and marine transport) are exempt from the scheme at the moment, consistent with the Kyoto Protocol.

For the transition period (mid-2010 until December 2012), participants of the New Zealand Scheme will only be required to surrender one emission permit for every two tons of emissions, and can purchase additional permits at a fixed price of $25 per unit from the Government if needed. This regulation will function as a price cap. In the scheme, both New Zealand emission units and Kyoto units are accepted for compliance. Currently, New Zealand is considering a bilateral link with the upcoming Australian emissions trading scheme.

In Australia, plans for the introduction of a mandatory national Carbon Pollution Reduction Scheme (CPRS) are at an advanced stage. According to the draft legislation, this cap-and-trade scheme will cover about 75% of Australia's total greenhouse gas emissions. An upstream approach will be chosen here, too. Domestic aviation will be included in the CPRS. For compliance, Australian emissions units, CERs, ERUs and RMUs (Removable Units)[1] will be accepted. The bill was voted against in the Australian Parliament in December 2009 because of several reasons: On the one hand, it was feared that the CPRS would cost jobs, reduce Australian living standards, substantially raise the price of electricity and harm the Australian economy. On the other hand, some were afraid that the CPRS' environmental gain would be too small due to its design characteristics. A revised bill is planned to be brought to the floor for mid-2011.

Until the CPRS will be in force, reductions of aviation's greenhouse gas emissions can be achieved with voluntary offsetting.

Like many airlines worldwide, Australia's major airlines have offered voluntary carbon offsetting to their passengers for both domestic and international flights for some years now. Since mid-2010, airline passengers are able to offset their carbon emissions against Australian Government accredited "National Carbon Offset Standard", which applies to a voluntary Australian carbon market.

The Canadian Government intends to introduce a domestic emissions trading scheme for greenhouse gases. This scheme will be harmonized with that of the US. The first steps to achieve this goal have already been taken. The Canadian Government has indicated its wish for a continental approach and, ultimately, for a global emissions trading system.

On the level of the International Civil Aviation Organization (ICAO), the ICAO GIACC (Group on International Aviation and Climate Change) adopted a 'Programme of Action' with the following main goals, in May 2009: An annual improvement of the fuel efficiency of 2% over the medium term until 2020. For the long term, the GIACC recommends an aspirational global fuel efficiency improvement rate of 2% per annum from 2021 to 2050. In addition, the ICAO Council should establish a process to develop a framework for market-based measures in international aviation. These goals were agreed upon in the 37th ICAO Assembly in October 2010.

How can Emissions Trading Systems be Linked?

By linking emissions trading schemes with one another, competitive distortions within the aviation sector could be avoided in a relatively easy way. In principle, such links can be of direct or indirect nature.

A direct link would enable the accountable entities of system A to directly purchase and use allowances from emissions trading system B for compliance in emissions trading system A. In this case, the tradable permits of the two trading systems are fully equivalent for compliance. Possible sub-options are unilateral, full bilateral or multilateral linking. A direct link requires a formal or informal agreement between the countries and/or trading schemes involved.

Indirect links between emissions trading schemes do not require any formal or informal agreement between the systems involved. An indirect link will occur when emissions trading schemes A and B are directly linked to each other and trading between scheme A with another system C takes place. In this case, an indirect link between schemes B and C will be established. Indeed, a great number of the upcoming emissions trading schemes will be linked indirectly to each other since most of them allow for the use of Kyoto-project-based CERs for compliance (Schuele and Sterck, 2008).

When considering linking arrangements between trading schemes, it will be important to assess the level of legal commitment of the schemes (mandatory versus voluntary schemes), the overall reduction targets, the covered greenhouse gases, the type of emissions permits accepted for compliance and their perceived quality, the method of initial allocation of permits, the penalties for non-compliance, and the possibilities to harmonize special provisions such as a price cap, among other issues.

The potential benefits of linking two or more emissions trading schemes include:

- Overall lower costs of compliance due to a greater diversity of emission sources and the inclusion of more abatement options. This leads to a higher economic efficiency of both (or more) linked trading schemes.
- Higher liquidity of the emissions trading markets because of increased demand and supply. The risks of 'thin markets' will be significantly lower in linked systems.
- Competitive disadvantages for sectors that operate internationally to a considerable degree, such as aviation, can be avoided as much as possible.

However, there are potential risks and obstacles related to linking trading systems as well:

- Higher total emissions or unintended double-charging of emissions if the provisions for regulating emissions are not clearly defined. Also, leakages could occur. Leakage is the indirect effect of emission reduction policies or activities in the trading scheme(s) under consideration, which leads to a rise in emissions elsewhere. These risks are directly related to the question of how to ensure uniformity in terms of reduction targets, geographical coverage, covered gases, monitoring requirements, penalties for non-compliance, etc. between the linked schemes. If uniformity cannot be achieved, it may result in the effective application of the least or, in some cases, the most stringent regulations. Ultimately, the ecological effectiveness of both (or more) systems under consideration could be endangered.
- Different policy initiatives in the countries with linked emission trading schemes may also bear risks. This is especially true

for schemes applying an upstream approach: Assuming a policy initiative is implemented in a country to promote natural gas in the heating market. This will lead to a drop in demand for heating oil, among other reactions. The fuel suppliers could react to this different demand situation by decreasing the price of heating oil and increase the price for another product, say kerosene, for instance. This strategy is likely if the elasticities of demand are appropriate. In this situation, the accountable entities of the country under consideration will encounter higher kerosene prices than in other countries. Kerosene price hedging can ease this risk, but economic uncertainties will remain for the airlines.

- Changing currency exchange rates may also negatively affect the uniformity of the linked trading schemes.
- Uneven price caps in the linked schemes or price interference in one of the trading schemes will lead to emission markets distortions in both linked systems. In general, the introduction of price caps or price interferences by the government/trading authority have to be considered very thoroughly, because these measures could induce a malfunctioning of the emissions trading markets as such.
- Increased administrative burdens for trading schemes' participants. The necessity to harmonize regulations could lead to very complex rules for trading, monitoring and verification.

A great number of these risks and obstacles can be avoided by a very thorough harmonization of the provisions of the trading schemes under consideration, at least if the possibility of linking is considered at an early stage of the design of the trading schemes.

Economic and Competitive Impacts on International Aviation

If the different emissions trading schemes can be successfully linked, and if many regions important for international aviation will be covered by the linked schemes, relatively equalized costs of compliance within the aviation sector will be induced. A given emissions reduction target can then be realized with overall low abatement costs. This will result in relatively similar competitive conditions in the markets under consideration. Under these conditions, economic and competitive distortions can be avoided.

But linking cap-and-trade-schemes with fundamentally different approaches can be technically complex:

- Firstly, linking upstream trading systems as favored by the US, Canada, Australia and New Zealand with the European Emissions Trading Scheme applying a downstream approach can be difficult: While the CO2 reduction target imposed on the participating airlines in the EU, Norway, Iceland and Liechtenstein (and perhaps Switzerland) will be relatively easy to calculate, this could be much more complex in trading systems covering aviation indirectly by the price impact on the fuel purchased.

- Secondly, the participants of both systems are incentivized in a different way with the European approach providing a direct incentive for the airlines either to reduce CO2 emissions or to purchase allowances. Instead, the US/Canada/New Zealand/Australian approach will be providing a direct incentive to the refineries, and the airlines will be incentivized indirectly by higher fuel prices. As mentioned above, here it is unclear whether the refineries will be passing through the costs of compliance fully and straight to the airlines or according to the price elasticities of demand.

- Thirdly, the same is true for the proposed distribution of reduction targets within the considered timeframe. While the reduction activities within the European system will predominantly take place in the short and medium term, and therefore will require significant and costly abatement measures relatively soon, the possible North American trading system – as it is foreseeable from today's point of view - seems to emphasize its reduction activities in the years 2020 – 2030 due to general energy economic goals.

- Finally, linking mandatory trading schemes like the EU ETS and the proposed North American Schemes with a voluntary system as applied in Australia for some time now could harm the environmental integrity of the mandatory trading systems. Moreover, competitive distortions could arise due to the different treatment of aviation's emissions in the systems under consideration.

In essence, linking the EU ETS with the upcoming trading schemes in the US, Canada, New Zealand and Australia, in the way they are taking shape now, seems to be difficult in terms of achieving uniformity. If successfully linking turns out to be impossible, competitive disadvantages for airlines originating from the country/the group of countries with the more stringent scheme are likely to occur. This will be especially true for network carriers competing on markets for long-haul air services. In this case, considerable competitive disadvantages may result as Scheelhaase et al. (2010) and Schaefer et al. (2010) have shown.

Modeling the economic and competitive impacts of the different upcoming trading schemes would require reliable and detailed information on the design of the trading schemes in North-America and Australia. This kind of information does not exist to date. Just for illustrative purposes, the following table shows estimations of the economic impact of the EU ETS for selected EU- and non-EU network carriers. The table reveals that, even though both kind of carriers are included in the EU ETS, significant differences arise due to the fact that EU network carriers fully operate under the EU ETS (with some exceptions) while only the non-EU network carriers' long haul services to and from Europe are subject to the EU ETS.

Unsuccessful linking of different trading schemes may even induce greater economic effects. This is because network carriers

Table 1: *Comparison of initial allocation, forecasted emissions and acquisition costs for different airline groups in 2012. Source: Schaefer et al. (2010).*

	10 largest EU network carriers	10 largest non-EU network carriers
Free allocation of EU-allowances in Mt	60.8	24.0
Forecasted CO2-emissions in Mt	93.0	31.8
Percentage of free allocation	65.4	75.6
EU allowances to be acquired in Mt	32.2	7.8
Acquisition cost for additional allowances (25 € per allowance) in million €	805.3	193.9
Acquisition cost for additional allowances (40 € per allowance) in million €	1288.5	310.2

originating from the more stringent trading scheme are likely to encounter two systematic competitive disadvantages compared to airlines under the less stringent scheme: Firstly, given the same origin/destination city pair, network carriers originating from the more stringent scheme will in most cases fly a longer distance under this scheme than their third-country counterparts. Secondly, at least a part of the total distance will be covered with environmentally relatively inefficient short-distance feeder flights subject to the more stringent scheme. Network carriers originating from the less stringent scheme, however, operate their short-distance feeder flights with relatively high specific emissions outside the scope of the more stringent trading scheme.

Conclusions

In this paper, we have indicated the necessity as well as the rather great difficulties associated with linking the upcoming trading schemes for the reduction of greenhouse gases. At least from today's point of view, unsuccessful linking is a likely option. This will have negative economic implications for the aviation sector because many airlines operate on a largely global scale and, on many routes, compete worldwide. Under these conditions, competitive disadvantages for airlines originating from the country/the group of countries with the more stringent cap-and-trade scheme are a viable option. Network carriers competing on markets for long-haul air services in particular will encounter these disadvantages.

Overall, international aviation may face a heterogeneous and rather difficult political environment in the foreseeable future. An unfavorable 'patchwork' of different cap-and-trade schemes seems to be a likely outcome. Strategic options for ICAO Contracting States, airlines and other stakeholders are in this respect:

- To actively promote and support ICAO's goal to develop a framework for market-based measures, especially rules or guidance how to design or link emissions trading schemes for the limitation of greenhouse gases from international aviation. Given the urgent need to address climate change, a much more ambitious approach, including a robust cap on international aviation's emissions seems to be necessary from an ecological point of view.
- To develop and implement a basket of climate-friendly measures for international aviation on a voluntary basis, which lead to ambitious greenhouse gas reductions as a complementary strategy. The International Air Transport Association (IATA) has already conducted first steps in this respect by committing to carbon neutral growth in the year 2020. Currently, tests are being conducted on the commercial use of biofuels for aviation.

It will be on the Contracting States, the airlines and other important stakeholders to make noticeable progress towards a homogenous political environment for aviation.

Notes

[1] RMUs are tradable units issued by the UNFCCC to an Annex B Party for specified sequestration activities during the Kyoto Protocol commitment period (2008-2012).

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Photo: *Airplane condensation trails (contrails) across the English Channel. Courtesy by NASA*