REGULATION AND MARKET INCENTIVES IN AVIATION

Eurocontrol - ART Workshop 'Aviation Economics and Business Models'
16-17/4/2019 - Toulouse

TRANSPORT & MOBILITY LEUVEN

Structure

- Role of regulation and market incentives in aviation

- Market incentives:

  Flightpath project: Evaluation of policy options for promoting the uptake of sustainable aviation fuels

- Regulation:

  COMPAIR project: Competition for Air Traffic Management

FLIGHTPATH PROJECT:
EVALUATION OF POLICY OPTIONS FOR PROMOTING THE UPTAKE OF SUSTAINABLE AVIATION FUELS

Evaluation of policy options for promoting the uptake of sustainable aviation fuels

- Scenarios
  - SET1: EU RED II scenario variants
    - RED: Renewable Energy Directive
  - SET2: EU RED II Aviation scenario variants
    - EU RED II for road/rail and specific target for aviation
  - SET 3: CORSIA scenario variants
    - Based on the CORSIA (Carbon Offsetting and Reduction Scheme for International Aviation) of ICAO

Scenario Set 1: EU RED II variants

- Renewable energy share of 14 % in 2030 for transport
- Blending mandate
- The target applies to road and rail transport, but air and maritime transport may contribute to them
- Multipliers

Multiplier	Mode	Feedstock
1	Road, rail	Food & feed based
1.2	Road, rail	Part A Annex IX (requiring advanced technologies) Part B Annex IX (mature technologies)
2.4	Aviation	Part A and Part B Annex IX
4	Road	Renewable electricity
1.5	Rail	Renewable electricity

Scenario Set 1: EU RED II variants

- Only small take-up of sustainable aviation fuels (SAFs)
  - Central case
    - 0.6 Mtoe in 2030 (1 % of EU aviation fuel demand)
    - Almost no impact on user price of fuel for aviation
  - Even smaller take-up if less restrictions on fuels that can be used in road & rail
  - With higher multiplier for SAFs (4 instead of 2.4)
    - 1.6 Mtoe in 2030 (2.8 % of EU aviation fuel demand)
    - Less renewable fuels in total (road + rail + aviation) than in central case

Scenario Set 2: EU RED II Aviation variants

No.	Scenario	Policy instrument aviation	Food & feed based fuels in aviation	Target share SAFs by 2030	Policy instrument road/rail	Food & feed based fuels road/rail
2A	EU RED II Aviation – blending mandate	Blending mandate	Not allowed	3.5%	Blending mandate	Phase out by 2030
2B	EU RED II Aviation – Subsidy	Subsidy sustainable fuels (~ auctioning)	Not allowed	3.5%		Phase out by 2030
2C	EU RED II Aviation – Tax	Tax fossil fuel	Not allowed	3.5%		Phase out by 2030
2D	EU RED II Aviation +	Blending mandate	Not allowed	5.3%		Phase out by 2030

Scenario Set 2: EU RED II Aviation variants

	Units	Set 2: EU RED II Aviation (2030)			
		(2A) Blending mandate	(2D) Aviation +	(2B) Subsidy	(2C) Tax
SAFs used in EU aviation	Mtoe	2.0	2.9	2.0	1.0
	% of EU air fuel demand	3.50%	5.25%	3.50%	3.50%
EU aviation fuel demand	Mtoe	56.3	54.7	57.6 (= BAU)	27.5
Change in user price aviation					
Intra-EU	Change wrt BAU (%)	4.26%	10%	-0.2%	100%
Extra-EU	Change wrt BAU (%)	5.45%	12.36%	-0.2%	131%
User price road	Change wrt BAU (%)	1.18%	1.14%	1.17%	1.30%
Renewable energy EU road + rail + aviation	Mtoe	21.9	22.9	22.0	20.8
CO2eq (EU road + aviation)	Change wrt BAU (%)				
TTW		-1.6%	-2.4%	-1.2%	-10.7%
WTW		-2.8%	-3.5%	-2.4%	-12.2%
WTW with ILUC		-4.7%	-5.4%	-4.3%	-13.9%
Welfare cost (based on worldwide emission reduction of road and aviation)	Euro/ton CO2eq				
WTW		314	318	369	177
WTW with ILUC		177	195	194	149

Scenario Set 3: CORSIA scenarios

- offsets for CO_{2eq} emissions above those in 2020
  - Offsets required depend on WTW emissions of fuels
  - ICAO: CORSIA applies to international aviation only
  - In model simulations: both domestic and international aviation
  - Cost of carbon offsets not yet known → 2 values
  - Intra-EU aviation: with and without EU ETS

No.	Scenario	Policy instrument aviation	Offset cost (euro/tonne CO_{2eq})	Policy instrument road/rail	Food & feed based fuels road/rail
3A	CORSIA – offset cost 10 euro	CORSIA charge	10	Blending mandate	Phase out by 2030
3B	CORSIA – offset cost 50 euro	CORSIA charge	50		Phase out by 2030
3C	ETS and CORSIA– offset cost 50 euro	CORSIA charge and ETS charge for intra-EU aviation	50		Phase out by 2030

Scenario Set 3: CORSIA scenarios

	Units	Set 3: CORSIA (2030)		
		(3A) offset cost 10 euro	(3B) offset cost 50 euro	(3C) offset cost 50 euro and intra-EU ETS
SAFs used in world aviation	Mtoe	0	0	0
Aviation fuel demand				
EU	Change wrt BAU (%)	0.3%	-7.0%	-9.2%
nonEU	Change wrt BAU (%)	-1.9%	-9.2%	-9.1%
Change in user price aviation				
Intra-EU	Change wrt BAU (%)	-9.4%	5.8%	19.0%
Extra-EU and nonEU	Change wrt BAU (%)	4.5%	22.1%	21.9%
CO2eq (world aviation)	Change wrt BAU (%)	-1.6%	-8.9%	-9.1%
Welfare cost (based on emission reductions of world aviation and offsets)	Euro/ton CO2eq			
WTW		7	38	39

Conclusions

- Reducing CO_2 emissions in the aviation sector by imposing an uptake of SAFs is costly

- If one wants to promote the uptake of SAFs → a specific target should be set for aviation
  - If tax cannot be imposed on fossil fuel
  - target can be achieved at the lowest social cost by using a blending mandate
    - analysis considered shares of up to 3.5 % to 5.3 % in 2030, corresponding with 2 to 2.9 Mtoe of sustainable aviation fuels
    - With blending mandate of 3.5 % moderate increase in the fuel cost for aviation; this increases more than proportionally as the target share increases
    - Blending mandate implies a high social abatement cost for GHG emissions

- Among the 3 sets of policy scenarios, the lowest social abatement costs are associated with the CORSIA scenarios
  - however no uptake of SAFs

COMPAIR PROJECT:
COMPETITION FOR AIR TRAFFIC MANAGEMENT

COMPAIR project: Competition for Air Traffic Management

- Background
  - Air transport is facing many challenges (growing demand, larger airports, increased network congestion, disruptions,…)
  - Air Traffic Management (ATM) is an important player
  - The Single European Sky has set ambitious targets for ATM (capacity x3; costs /2)
  - However, progress towards targets is perceived as slow

- COMPAIR project:
  - would competition be the solution?
  - And if so – how do we introduce competition?
  - Research question: how to introduce competitive incentives in ATM?

Analysis of 4 options

- Regulatory approach/governance
  - Idea of increased involvement of ATM customers → higher customer focus
- Unbundling of support services (tower control, MET,…)
  - Competition IN the market
- Tendering of En-Route ATM (temporary licenses)
  - Competition FOR the market
- Origin-Destination based operations
  - Competition between Air Navigation Service Providers (ANSPs) (for O-D routes/networks of airlines)

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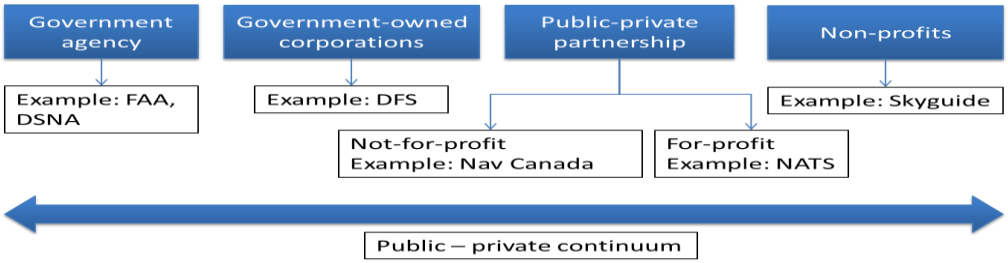
Effect of ownership?

- We see variation in ownership ANSPs



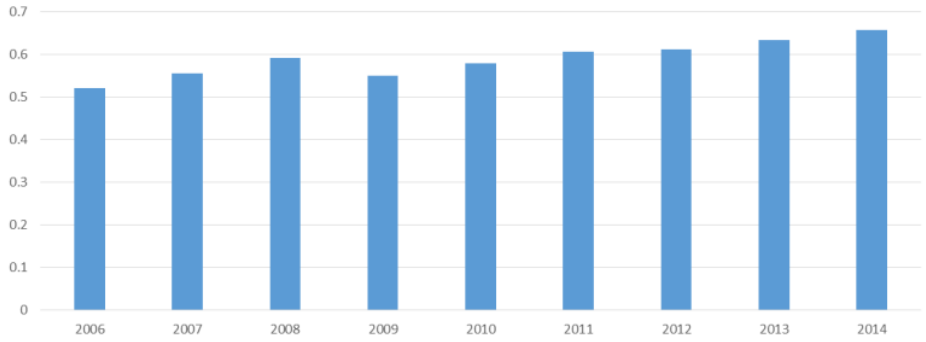
- Economic model suggests that effort will be higher if
  - Public company with board of stakeholders which are airspace users
  - Private firm in which shareholders are also the stakeholders

- Stochastic Frontier analysis estimated cost and production function for en-route and for terminal
  - Efficiency of public-private ownership > government owned corporation > state agency

- → Conclusion: Ownership matters

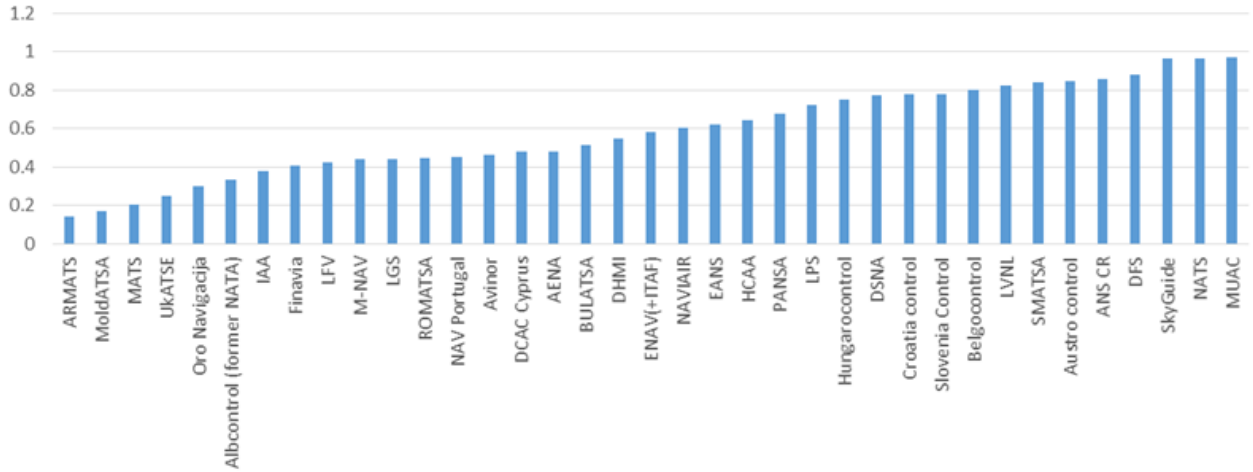
Cost efficiency ANSPs en-route

Average cost efficiency estimates for en route (2006-2014)



Results for
- Cost function/Production function
- En route/Terminal

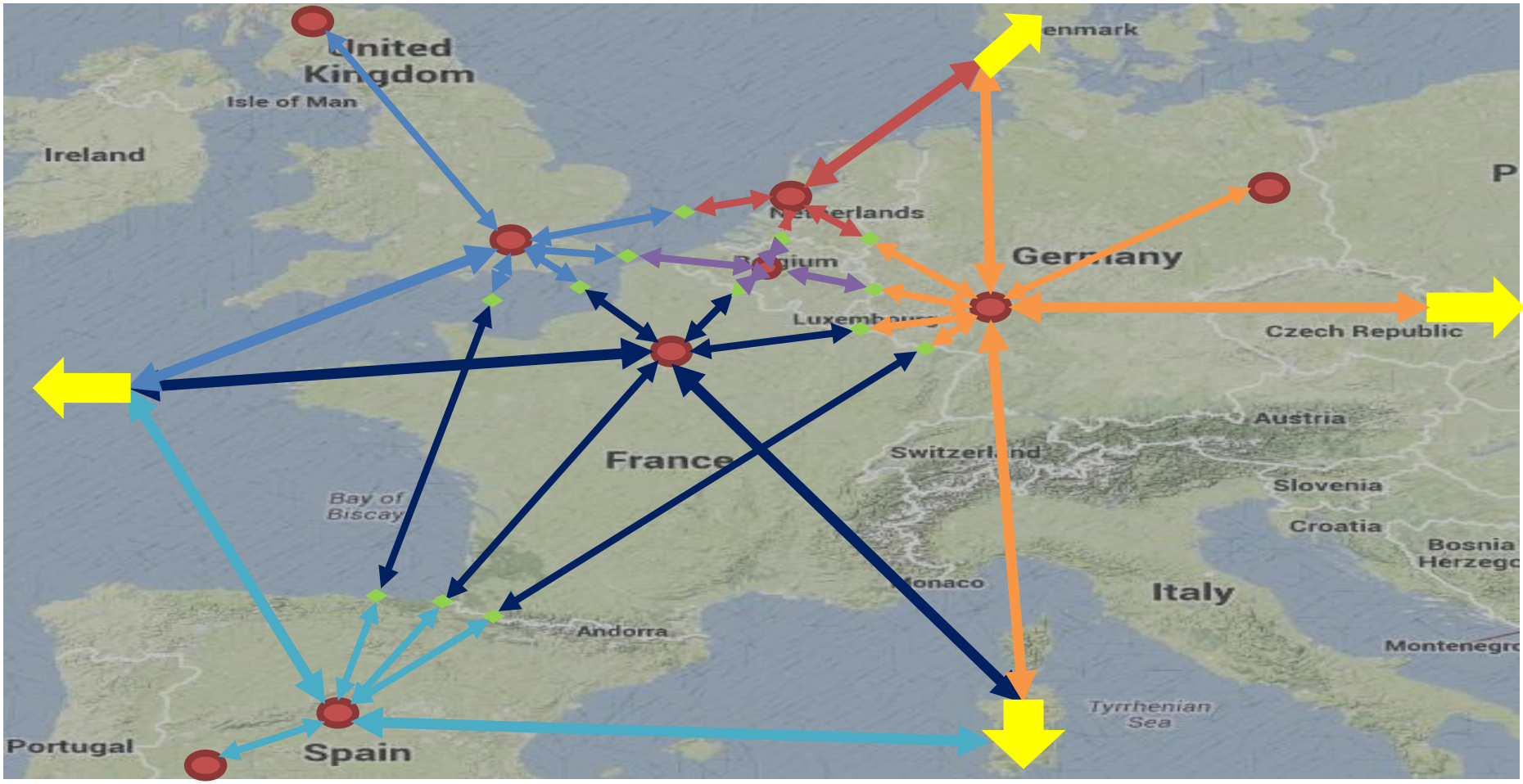
Average cost efficiency estimates per en-route ANSP (2014)



Auctioning the airspace

- Competition FOR the market -> two-stage network congestion game
  - multiple ANSPs bid to serve Member State airspace.
  - Airlines subsequently choose their optimal flight paths such that they minimize their operating costs.
  - The individual Member States set up an auction in which they specify minimum service levels and the rules of the auction, such as the right to increase charges as a function of air service levels.
  - The winners of the auctions are the service providers that bid the lowest charge.
- Different scenarios: for profit, not for profit, 2014-2030-2050
- Case study: 6 ANSPs, 6 major airports, 3 regional airports, 3 airline types (3 alliances, low-cost carrier, unaligned carrier)

Case study of Western Europe



Auctioning the airspace

- introducing competition for the market via outsourcing service provision → reduce charges by up to half the current levels
- auctioning is likely to lead to defragmentation of the European system
  - as companies win more than one auction.
- for-profit companies are highly likely to invest in SESAR technologies
  - thus encouraging technology adoption faster than appears to be occurring today
- important to ensure a sufficient number of competitors for the auction process to be successful over time.
- Without an auction process, non-profit companies would be strictly preferable to both the current state agency and to a government corporation.

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