

The Personal Airplane Carbon Exchange, Design and CO2 emissions reduction: the French example

Discussion by Frederic Cherbonnier*

ISA - Sustainable Aviation Webinar

*Sciences-Po Toulouse & Toulouse School of Economics

march 18th 2025

The paper in a nutshell

Motivation : aviation = 2-3% of GHG.. 5.5% in France.. more with contrails..
+ inequality and political acceptability

The paper in a nutshell

Motivation : aviation = 2-3% of GHG.. 5.5% in France.. more with contrails..
+ inequality and political acceptability

Policy proposal : Personal Airplane Carbon Exchange (PACE)

- ▶ For residents in France using commercial aviation from or to France
- ▶ Emission rights of 0.4 tons per CO₂ for individuals (none for business)
- ▶ Price guaranteed by public authorities (100€ per ton of CO₂ at the beginning)

The paper in a nutshell

Motivation : aviation = 2-3% of GHG.. 5.5% in France.. more with contrails..
+ inequality and political acceptability

Policy proposal : Personal Airplane Carbon Exchange (PACE)

- ▶ For residents in France using commercial aviation from or to France
- ▶ Emission rights of 0.4 tons per CO₂ for individuals (none for business)
- ▶ Price guaranteed by public authorities (100€ per ton of CO₂ at the beginning)

Quantitative assessment :

- ▶ Detailed data on air traffic from french airports in 2023 + regression to estimate prices of the corresponding flights
 - ▶ Four distinct elasticities (business / leisure, short-medium / long haul) + full pass-through assumption
- ⇒ **-7.6% reduction in CO₂ emissions from commercial air transport (-4.3MtCO₂)**

Motivation and general approach

Motivation

- ▶ Political acceptability ? no strong negative reaction linked to ETS
- ▶ The main justification seems rather to target flights connecting to countries outside Europe (70% GHG emission)
- ▶ CORSIA not good enough

Motivation and general approach

Motivation

- ▶ Political acceptability ? no strong negative reaction linked to ETS
- ▶ The main justification seems rather to target flights connecting to countries outside Europe (70% GHG emission)
- ▶ CORSIA not good enough

Articulation / comparison with ETS

- ▶ More reduction than ETS between 2013 and 2016: ok but 7.5€ in 2013...
 - ▶ PACE = a complement (taking into account contrails only) or a substitute (needing quota adjustment if not adopted by all EU)
- ⇒ Which mechanism is the most efficient ? cf. next slide.

Motivation and general approach

Motivation

- ▶ Political acceptability ? no strong negative reaction linked to ETS
- ▶ The main justification seems rather to target flights connecting to countries outside Europe (70% GHG emission)
- ▶ CORSIA not good enough

Articulation / comparison with ETS

- ▶ More reduction than ETS between 2013 and 2016: ok but 7.5€ in 2013...
 - ▶ PACE = a complement (taking into account contrails only) or a substitute (needing quota adjustment if not adopted by all EU)
- ⇒ Which mechanism is the most efficient ? cf. next slide.

Innovation

- ▶ Reducing emissions in the aviation sector depends largely on innovation
- ▶ Included in ETS (tax on Kerosene ⇒ more fuel efficiency, may be SAF)
- ▶ **Not included in PACE ?** (taking only into account “companies’ virtuous actions based on an ISO standard”)

Mechanism

Rationing by price rather than quantity

- ▶ Price fixed by governments : €100/tCO₂ vs. €82 ETS today, vs. about €200 for the past US administration (EPA 2023) and for the french administration (Quinet reports)
- ▶ the "quantity" will evolve depending on reaction of demand to price : level of emissions allocated = level allocated the previous year net of oversupply (meaning that the 0.4 initial endowment **may** slowly decrease)
- ▶ What does the theory say about price vs. quantity in theory ? rather in favor of such an approach, when taking into account uncertainty (Weitzman's argument if marginal cost more sloppy) and competition (optimal tax lower than Pigovian tax, cf. Bruecker Zhang 2010), ..

Mechanism

Rationing by price rather than quantity

- ▶ Price fixed by governments : €100/tCO₂ vs. €82 ETS today, vs. about €200 for the past US administration (EPA 2023) and for the french administration (Quinet reports)
- ▶ the "quantity" will evolve depending on reaction of demand to price : level of emissions allocated = level allocated the previous year net of oversupply (meaning that the 0.4 initial endowment **may** slowly decrease)
- ▶ What does the theory say about price vs. quantity in theory ? rather in favor of such an approach, when taking into account uncertainty (Weitzman's argument if marginal cost more sloppy) and competition (optimal tax lower than Pigovian tax, cf. Bruecker Zhang 2010), ..

Transfer / carbon allowance

- ▶ 0.4 tons CO₂ = total 2019 emission / french citizen and residents in France over the age of 2
- ▶ Optimal rational behavior : sell at once (if possible), buy later if necessary
- ▶ Not the best tool to cope with inequality. Avoid injustice? but about 30% of french people do not travel by plane, about 50% do not travel abroad..
- ▶ Alternative use : subsidy innovation, reduce fiscal distortion, inequality..

Quantitative assessment

What elasticities ? What about flight frequency and strategic reactions ?

- ▶ Elasticities used consistent with the literature (1.5 for leisure short-haul vs. 0.7 for business short-haul) **but competition not taken into account**
- ▶ Fageda & Teixeira (2022) : EU ETS reduced emissions by 4.7% but 10.7% for routes with other means of transport and 11% for low cost.
- ▶ in Fageda & Teixeira (2022), not significant for network airlines, a priori because of the Hub-and-Spoke route structure (i.e., load factor and flight frequency maintained attracting more connected passengers)

⇒ can we have the same thing here? Yes if only France is concerned , no if the whole of Europe is. Except potentially if some airlines reroute flights through non-EU hubs (Istanbul, Dubai, ..)

Quantitative assessment

What elasticities ? What about flight frequency and strategic reactions ?

- ▶ Elasticities used consistent with the literature (1.5 for leisure short-haul vs. 0.7 for business short-haul) **but competition not taken into account**
- ▶ Fageda & Teixeira (2022) : EU ETS reduced emissions by 4.7% but 10.7% for routes with other means of transport and 11% for low cost.
- ▶ in Fageda & Teixeira (2022), not significant for network airlines, a priori because of the Hub-and-Spoke route structure (i.e., load factor and flight frequency maintained attracting more connected passengers)
⇒ can we have the same thing here? Yes if only France is concerned , no if the whole of Europe is. Except potentially if some airlines reroute flights through non-EU hubs (Istanbul, Dubai, ..)

Result : 7.6% reduction in CO2 emissions from commercial air transport (France-only measure)

- ▶ **very small in comparison with Fageda & Teixeira's result** : importance of short-haul low-cost flights (with higher elasticity) ? or marginal effect ?
⇒ need for a more precise estimation taking into account reaction on both fares and frequency
- ▶ would be interesting to provide the result for a) flights connecting outside Europe and b) same with contrails (€170 instead of €100)

Conclusion

- ▶ A very interesting proposal for breaking the environmental policy deadlock on international flights
- ▶ Not necessarily necessary to provide carbon allowances, or seek to replace the ETS system \Rightarrow focus on international flight ?
- ▶ What about innovation ?
- ▶ The quantitative assessment must be set against the ex-post studies (ibid.), focusing on international flights

(need to reconcile ex-post and ex-ante academic work on the impact of ETS... ideally taking into account load factors, hub-and-spoke structure and the operator's frequency and fare strategy)

Conclusion

- ▶ A very interesting proposal for breaking the environmental policy deadlock on international flights
- ▶ Not necessarily necessary to provide carbon allowances, or seek to replace the ETS system \Rightarrow focus on international flight ?
- ▶ What about innovation ?
- ▶ The quantitative assessment must be set against the ex-post studies (ibid.), focusing on international flights

(need to reconcile ex-post and ex-ante academic work on the impact of ETS... ideally taking into account load factors, hub-and-spoke structure and the operator's frequency and fare strategy)