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**The economics of CO<sub>2</sub> emissions  
trading for aviation**

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## Environmental policy options for aviation

1. Limits on number of flights, rationing
2. Setting stricter standards for new aircraft and engines
3. Use of larger aircraft: frequency implications
4. Drop-in bio-fuels
5. Voluntary targets

*None of above offer incentives for emissions reduction or introduce polluter pays principle*

→ **Market based mechanisms:**  
*Cap and trade*  
*Environmental tax*

# Market-based options

## Cap & Trade or Emissions trading schemes

*Need to decide cap rather than price*

*Well designed scheme more efficient than tax*

## Environmental tax

*Long-term signal to airlines and manufacturers to invest in greater fuel efficiency*

*Could be lowered or increased as fuel prices rose or fell*

*but clause in Air Services Agreements forbids fuel related taxes*

*Needs to be co-ordinated internationally but implemented at a country level*

*What happens to tax revenues?*

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## Market-based initiatives

### Cap & Trade or Emissions trading schemes

*EU scheme applied to CO<sub>2</sub> since 2005 but limited to power and heat generators, and some energy intensive industries such as cement and paper (emitters included account for around 45% of total EU CO<sub>2</sub> emissions)*

*EU scheme to be enlarged to include all flights to/from and between EU airports from 2012*

*US Waxman-Markey bill would only apply to ground-based emitters, but alternative proposal from Senate would apply to aviation*

*Australian and New Zealand schemes would include domestic aviation*

*Voluntary schemes in UK and Japan already run but included only domestic emissions (including aviation)*

### Environmental tax

*Only applied to domestic aviation fuel*

## **EU Directive for Inclusion of Aviation in ETS (2009)**

- ❑ **Includes aviation in the existing scheme for greenhouse gas emission allowance trading**
- ❑ **First year 2012**
- ❑ **All flights to/from European Community airport**
- ❑ **Various exemptions including smaller aircraft, military, training and rescue flights**
- ❑ **Greenhouse gases cover only CO<sub>2</sub>**
- ❑ **Cap based on actual emissions averaged across calendar years 2004, 2005 and 2006**
- ❑ **Cap set at 97% of baseline in 2012, and 95% for 2013 to 2020**
- ❑ **Emissions allocation based on benchmark**
- ❑ **Initially 15% of allowance to be auctioned**
- ❑ **Provisions for free allowance to be given to start-up airlines (with no operations in 2010) and those whose Revenue Tonne-kilometres (RTKs) are growing by more than 18% pa**

## Allocation of allowances

- ❑ **Under EU Aviation ETS cap set initially at 97% of baseline emissions**
- ❑ **Initially 15% allowance auctioned and 85% distributed free**
- ❑ **Free allowance to be benchmarked rather than grandfathered**
- ❑ **Benchmark based on:**

*Traffic rather than capacity (tonne-kms carried rather than available)*

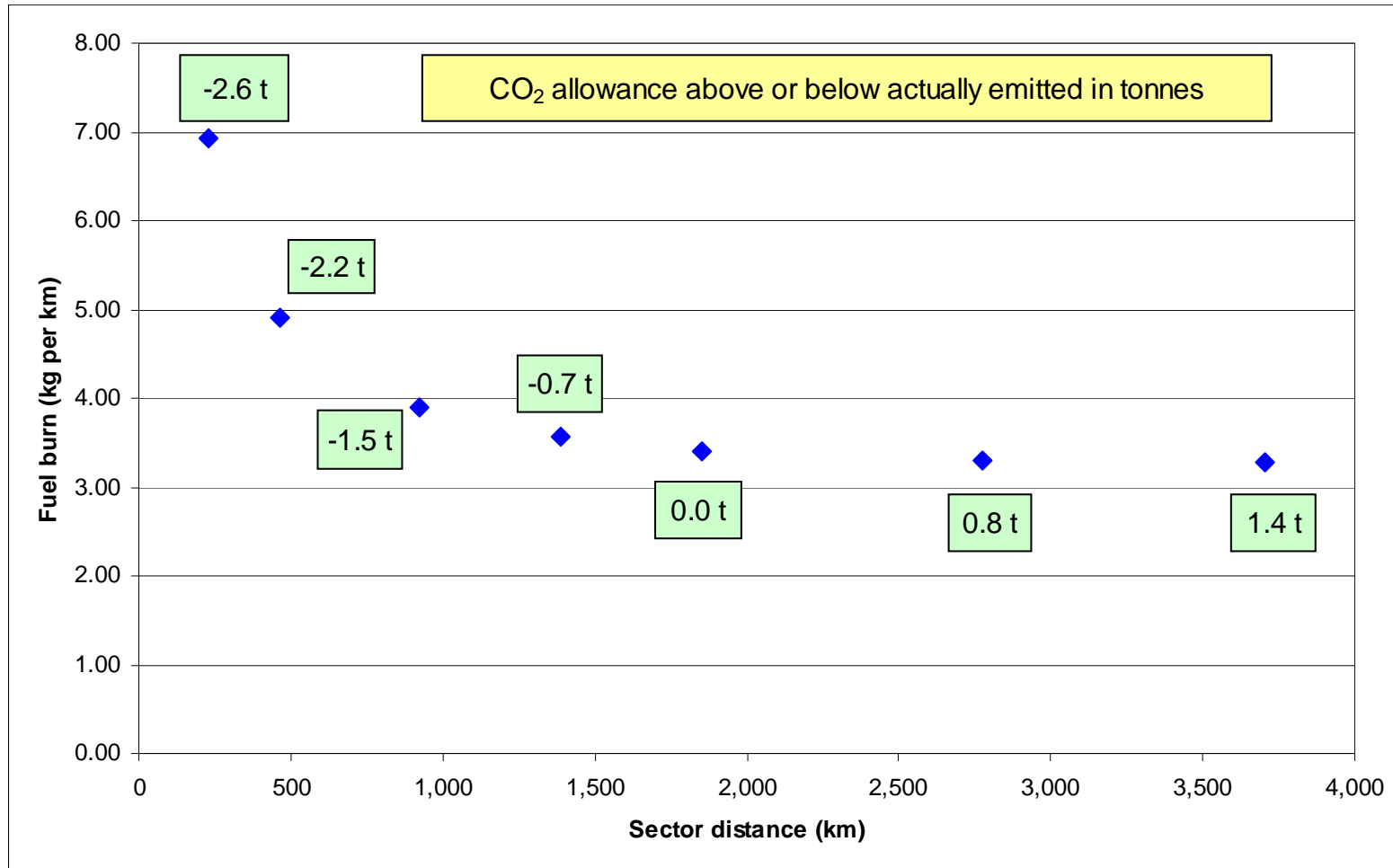
*Efficiency in terms of tonne-kms carried in 2010*

*Favours long-haul operators and those with tightly packed aircraft*

## ETS aviation implications

- ❑ **In first years, need to buy 25% of annual allowance at auction and more in the market for expansion**
- ❑ **Auction price close to market price:**  
*Range: €10-30 per tonne CO<sub>2</sub> in past but may increase*
- ❑ **Longer term likely to have to buy larger share of allowance:**  
*Larger share auctioned*  
*Lower cap and larger difference between cap and actual operations*

## Impact of benchmarking on B737-400 flight with hypothetical average at 1,850km sector length



## Distortions from scope of EU ETS



New York-Helsinki-Delhi  
(11,821km):

Total 294t CO<sub>2</sub> or  
€43/passenger @ €40/tonne

New York-Dubai-Delhi  
(13,229km):

Total 326t CO<sub>2</sub> but no ETS  
costs,

*but extra route length  
burns 32t more fuel, or  
€34/passenger at mid-  
2008 fuel price*

Helsinki route cost disadvantage offset by extra fuel and other costs for longer Dubai route

## Allowance cost impact

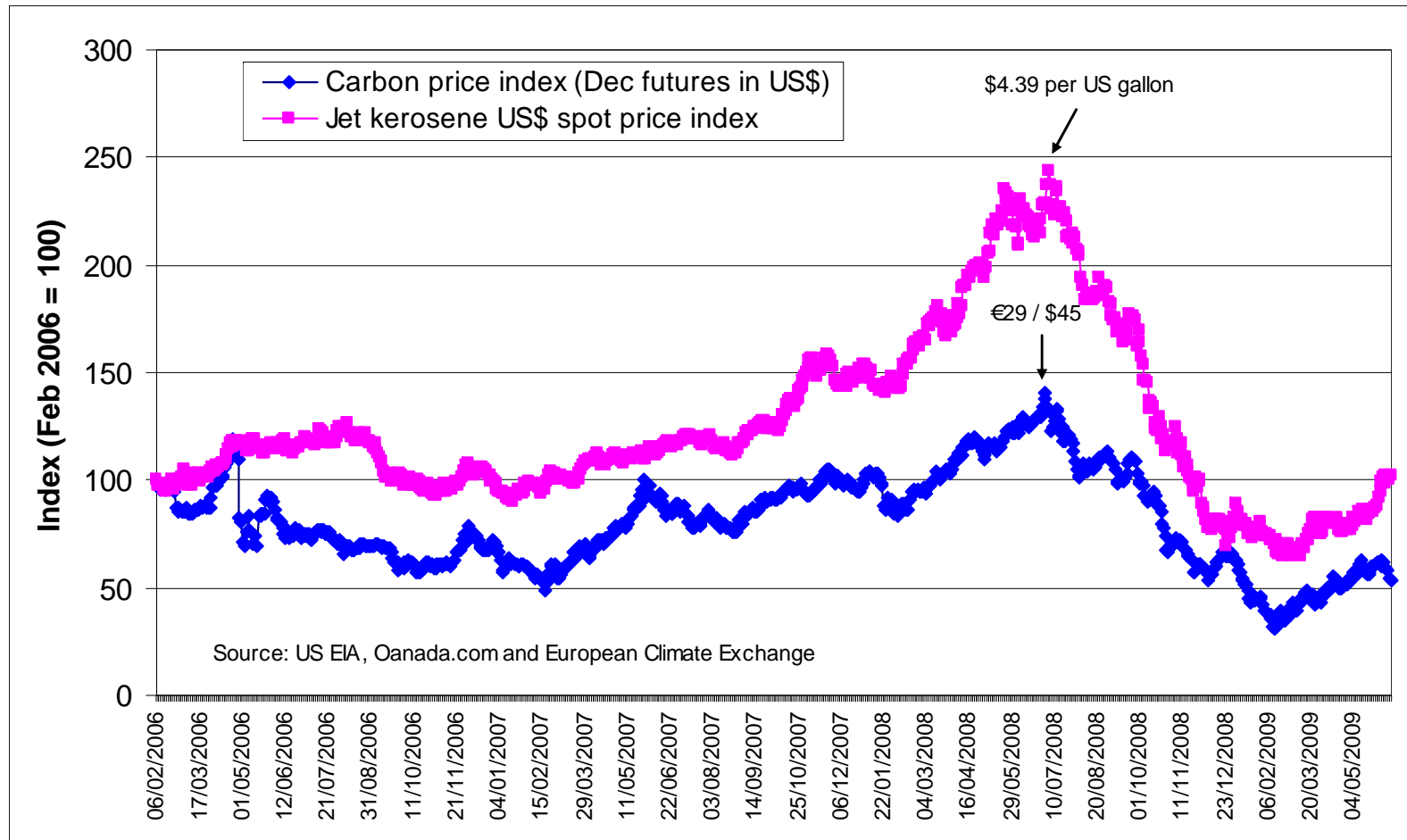
Impact on consumer of cost of acquiring allowance will depend on:

- ❑ Share to be auctioned
- ❑ Pass through policy of airline (eg competitive factors)
- ❑ Market price of carbon
- ❑ Auction price

Study impact (per return ticket)*	Short-haul	Medium-haul	Long-haul
European Commission (2006)	€4.60 (full service airline)	€9.00	€36.90
E&Y York Aviation (2007)	€0.80 (low-cost airline)		
Merrill Lynch (2008)	€1.54 (low-cost airline)		
	€3.53 (full service airline)		

\* Assumes costs to be passed through only to passengers and none to air cargo

# Jet kerosene spot and Carbon futures (EUA) Market prices



## Impact on airline pricing

- **European Commission's impact statement based on CE Delft study assumptions (2005):**

*All extra costs incurred in acquiring allowance passed on to markets subject to ETS*

*Cross-subsidisation from markets outside ETS impossible*

*No empirical evidence either way on whether opportunity costs would be passed on (evaluated both possibilities)*

- **Other pass through estimates:**

*IATA(2007): 75% of costs passed on*

*UK Defra (2007): 100% of costs passed on*

*Oxera (2003): 100% of costs passed on at uncongested airports, 0% at congested airports*

*Frontier Economics (2006): Differential impact on low-cost and network airline*

## Impact on passenger demand

- ❑ Large range of price elasticity of demand estimates
- ❑ Omitting income from estimation leads to over-estimation of price elasticity (Brons et al, 2002)
- ❑ Network carriers can apply differentiated pass through depending on price elasticity (eg premium and economy passengers, cargo)
- ❑ Low-cost carrier pricing system precludes above approach ( ... and no cargo)

***Anger et al (2008) concluded that 100% pass through of aviation allowance cost would result in 2020 traffic being 7.5% lower than it would have been without the ETS***

# Conclusions

- ❑ **Emissions Trading Scheme easier to introduce than environmental tax, at least on international flights**
- ❑ **EU Aviation ETS to start in 2010, with cap based initially on 97% of 2004-06 average emissions**
- ❑ **Scope to introduce lower cap and free allowance later**
- ❑ **Most studies estimate a modest increase in cost per passenger, although the high estimate of €30 per tonne of carbon may be far too low**
- ❑ **Distortions inherent in any scheme likely to be minimal even at higher carbon prices**
- ❑ **Degree to which costs passed on (and to whom) will depend on type of carrier, size of costs in relation to total revenues, price elasticities and economic climate**