

Economic Impact Modelling

Workshop on European Aviation Modelling Capabilities
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Knowledge for Tomorrow

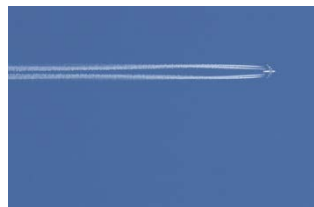


Issues and Objective

Integrated (European) aviation modelling capabilities:

Focus on **negative** externalities

- Noise
- GHG
- LAQ

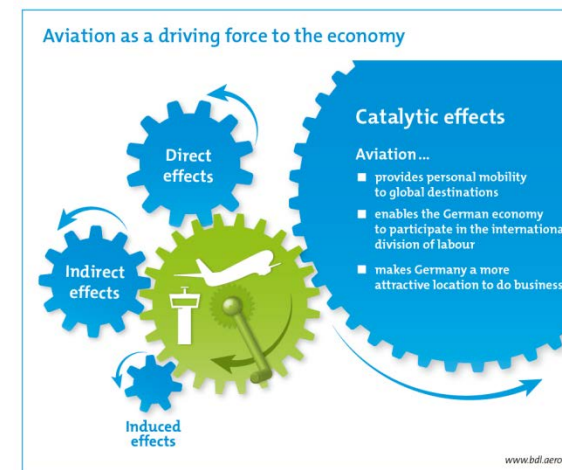


Sources: DLR, public domain (wikipedia)

Positive impacts (trade-offs) of measures, trends and technologies in the air transport sector neither fully nor systematically modelled and monitored

- **Employment** and **gross value added** within the sector's value chain
- Provision of **connectivity, accessibility** and **travel time savings**
- (Regional) **economic growth** and resulting employment and gross value added

Where do we stand?



Source: BDL



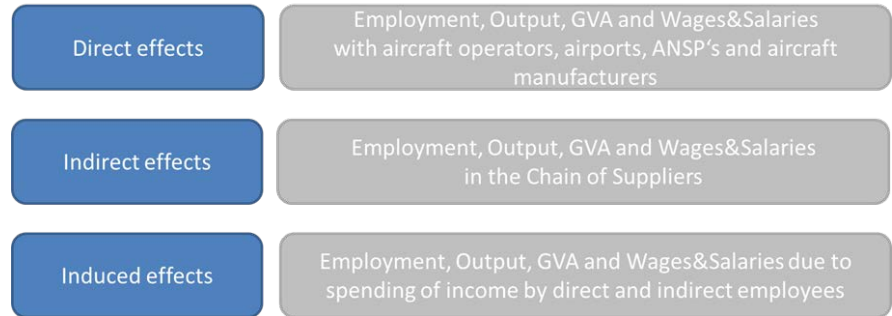
Agenda

- Issues and Objective
- **Economic assessment of measures, trends and technologies in the air transport sector: Existing modelling approaches and gaps**
 - **Input-Output analyses (IO)**
 - Computable general equilibrium modelling (CGE)
 - Cost-benefit-analyses (CBA)
- Summary



Economic assessment: Input-Output-Analyses

- Estimation of sector-specific **direct, indirect and induced demand effects**: Employment, Gross value added, Wages...
- I-O-model represents the current **interdependencies between different branches** of a national economy or different regional economies
- Input: National account data (**input-output tables**), available for many countries



Year 2003		France										
		Mio. Euro										
		Current prices										
		France										
		PRODUCTS (CPA)										
		Air transport services	Supporting and auxiliary transport	Post and telecommunication	Financial intermediation services, except insurance	Insurance and pension funding	Services auxiliary to financial	Real estate services	Renting services of machinery	Computer and related services	Research and development	Other business services
No	Code	62	63	64	65	66	67	70	71	72	73	74
8	14											
9	15	25	9	18	6	3	1	20	6	21	58	132
10	16			1								1
11	17	2	2		2			1				5
12	18	4	6	6	9		1		1			29
13	19		3		2	1	1					17
14	20	1	12	14	1			13		2	4	16
15	21	32	15	59	16	23	49	19	41	31	588	
16	22	2	15	50	84	30	33	28	33	58	70	422
17	23	158	126	57	28	8	4	30	19	49	128	203
18	24	9	17	40	6	9	3	39	6	32	359	312
19	25	22	30	126	3	6	5	10	13	27	31	152
20	26	1	35	8				14	4	7	40	104
21	27	1	35	4					6	4	98	31
22	28	8	49	30	2			27	9	18	34	126
23	29	8	329	96	39	1		26	54	21	116	374
24	30		1	277	49	7	4	51	5	349	229	538
25	31	4	123	409	9	5	3	22	8	136	141	352
26	32	2	69	609	43	7	3	16	12	424	223	352
27	33	1	3	57	7	1		17	4	60	197	157
28	34	28	232	46	3			18	15	17	30	180
29	35	752	8	4		1	1	17	5	1	578	41
30	36	2	9	16	55	6	3	19	25	21	61	163
31	37											
32	40		2	8	3	1	1	10		1	2	11
33	41											
34	45											
35	50											
36	51	26	59	37	13	4	5	114	7	40	52	290
37	52											
38	55											



Economic assessment: Input-Output-Analyses

- Analyses of **direct interdependencies between sectors**: „How many jobs are generated in air transport and with its suppliers?“
- Assessment of „**static correlations**“ („1,000 jobs per 1 Mio. pax“-rule) and of the effects of e.g. policy measures („Will movement caps result in job losses?“)
- Application in **toolsuites** like AIM-OS, TEAM_Play and by many researchers and **consultants**
- I-O-modelling **does not depict the full spectrum of dependency relations** in a market economy

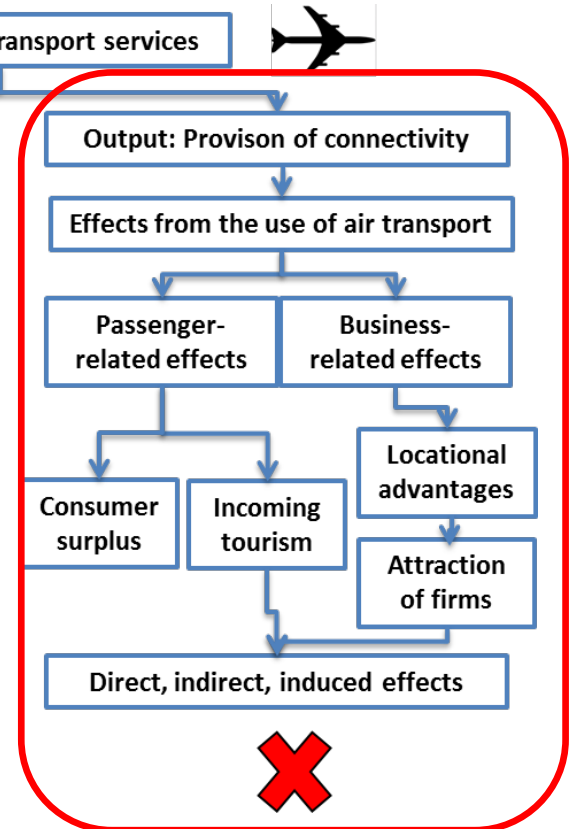
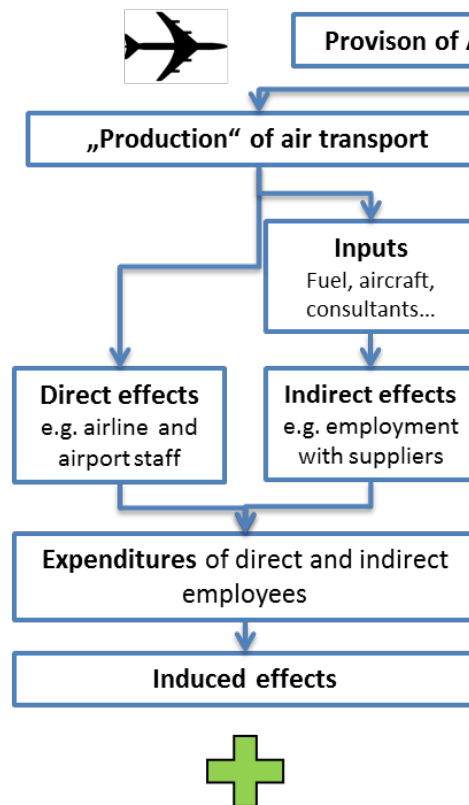
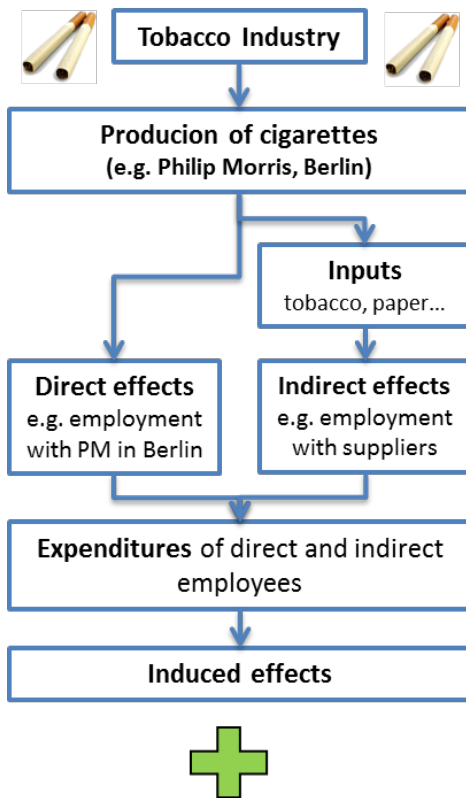


Sources: http://centreforaviation.com/images/stories/2015/Feb/02/3Direct_Jobs_by_Employment_Type.png



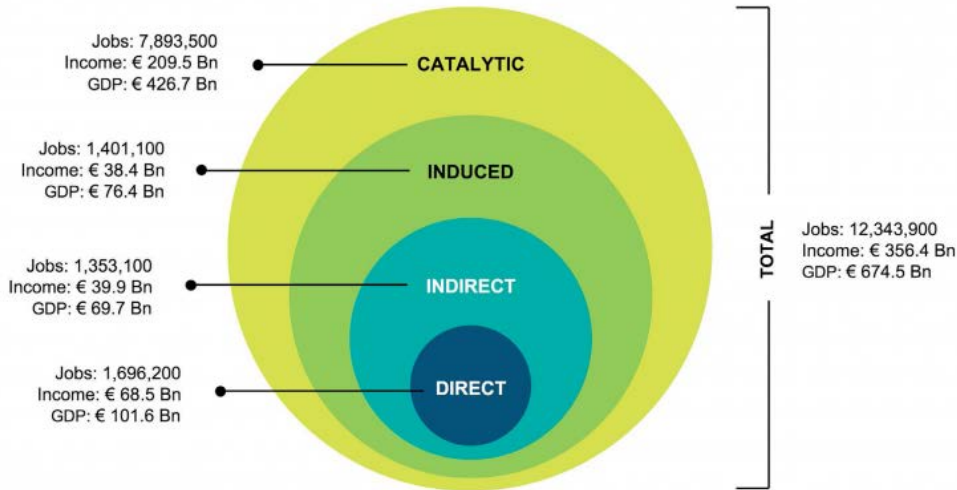
Economic assessment: Input-Output-Analyses

- No consideration of specific economic effects stemming from (air) transport, e.g. „catalytic effects“

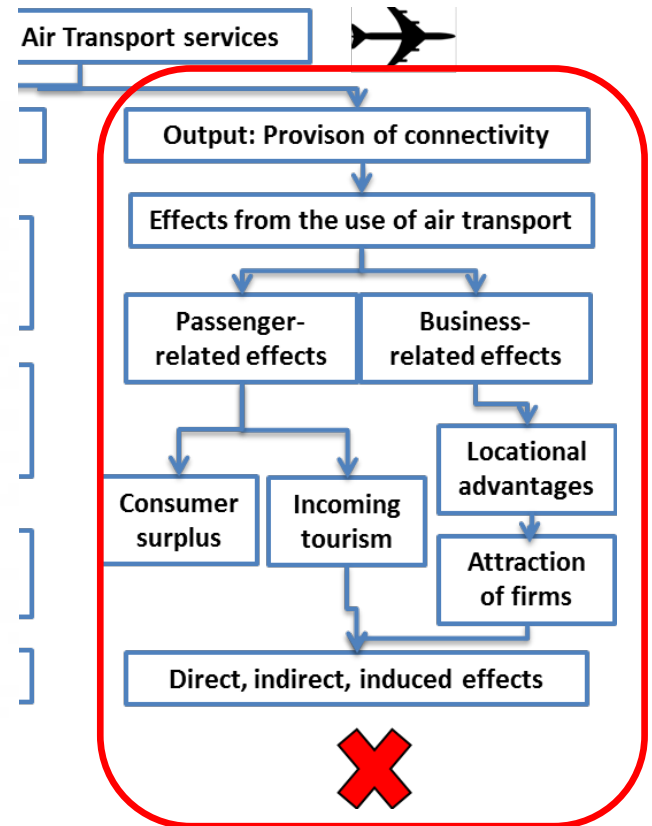


Economic assessment: Input-Output-Analyses

- „**Catalytic effects**“ only tackled on a case-by-case basis, mainly in specific studies by consultants



Source: Economic Impact of European airports report



Agenda

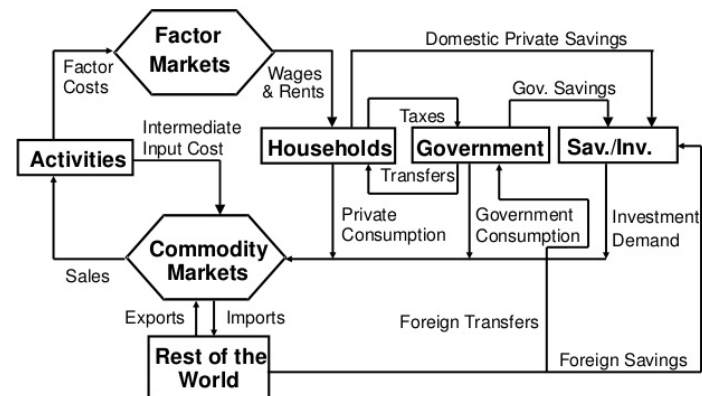
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Economic assessment: CGE modelling

- **Computable general equilibrium models (CGE)**
- Estimations of how an economy **reacts to changes** in policy, technology or other external factors
- Give a more **important role to prices** compared to I-O-models where e.g. a fixed amount of labor is assumed to produce a ton of iron
- In contrast, a CGE model would normally allow e.g. wage levels to (negatively) affect labor demands.
- Input: **Equations describing model variables** and **detailed databases** with tables of transaction values and elasticities

Stylized CGE Model Structure



21

Model inputs difficult to estimate

No systematic application for air transport

No/limited consideration of catalytic/regional effects



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Economic assessment: Cost-Benefit-Analyses (CBA)

- **Monetization of costs and benefits** associated with e.g. a **policy measure** or an **investment**
- Allows for **comparisons between different options**
- Decision criterion: **Net present value**
- Application e.g. in road and rail infrastructure investments



Monetization of non-monetary effects: wide range

Wide range of possible effects: Where to stop? Causality?

Difficult to apply beyond project evaluation

Assessments at e.g. the regional level possible



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Summary

- (Air) transport does not only cause jobs/GVA within its value chain, but also in other sectors (like e.g. investments in education)
- Wide range of economic effects, difficult to measure
- Different modelling approaches tackling different aspects, with different advantages and drawbacks; only I-O-modelling included in aviation toolsuites
- Sometimes mis-application of modelling approaches, e.g. use of I-O-analysis for welfare analyses
- Regional perspectives and catalytic/cluster effects are usually neglected

Criterion	Macroeconomic modelling approaches		
	I-O	CBA	CGE
Capability (Gaps) / Quality	Quantifying the connections between economic sectors No consideration of catalytic effects No welfare analysis, no substitution effects considered Dynamic I-O-models available but not yet part of aviation toolsuites	Standard approach for project evaluation in transport Quality dependent on inclusion of effects and their monetization No ready-to-use system available Some effects could be generalised in a toolchain, e.g. emissions modelling and subsequent monetization Welfare analysis possible but depending on assumptions (e.g. the „value“ of one job for the society)	More realistic mapping of the economy “IO-Model with prices considered” Substitution elasticities difficult to estimate – largely based on assumptions
Durability / updates	Regular data updates	Monetization values need to be updated regularly to reflect state-of-the-art in valuation Monetization very complex	very complex in implementation
Access	I-O-data open source Working connections to toolsuites Public access possible (e.g. AIM-OS)	Cost data and model concepts widely available from literature Lack of toolsuites	Several models available as open source, but not designed to aviation needs



Summary

Criterion	Macroeconomic modelling approaches		
	I-O	CBA	CGE
Capability (Gaps) / Quality	<p>Quantifying the connections between economic sectors</p> <p>No consideration of catalytic effects</p> <p>No welfare analysis, no substitution effects considered</p> <p>Dynamic I-O-models available but not yet part of aviation tool suites</p>	<p>Standard approach for project evaluation in transport</p> <p>Quality dependent on inclusion of effects and their monetization</p> <p>No ready-to-use system available</p> <p>Some effects could be generalised in a toolchain, e.g. emissions modelling and subsequent monetization</p> <p>Welfare analysis possible but depending on assumptions (e.g. the „value“ of one job for the society)</p>	<p>More realistic mapping of the economy</p> <p>“IO-Model with prices considered”</p> <p>Substitution elasticities difficult to estimate – largely based on assumptions</p>
Durability / updates	<p>Regular data updates</p>	<p>Monetization values need to be updated regularly to reflect state-of-the-art in valuation</p> <p>Monetization very complex</p>	<p>very complex in implementation</p>
Access	<p>I-O-data open source</p> <p>Working connections to tool suites</p> <p>Public access possible (e.g. AIM-OS)</p>	<p>Cost data and model concepts widely available from literature</p> <p>Lack of tool suites</p>	<p>Several models available as open source, but not designed to aviation needs</p>



Thank you!

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