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UNIVERSITY OF LEEDS

Railway Finance in Europe

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Outline

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1. Introduction
2. Case for subsidies
3. Ways of giving subsidies
4. Ensuring subsidies are used efficiently
5. Government finance of railways in practice
6. Conclusions

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Case for subsidies

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- Normalisation of accounts
- Public service obligations
- Economies of scale
- Relief of externalities on other modes
- Wider economic benefits
- Option values

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Normalisation of accounts

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- Designed to relieve rail companies of inherited obligations not born by other modes (pensions, social obligations, housing etc)
- Often include write-off of debt
- 1192/69 on Normalisation of Accounts

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Public service obligations

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- Motivation often political
- E.g. Cannot face level of cuts in service or fares increases needed to restore profitability
- But may be good reason – maintaining mobility, relieving congestion and environment
- Is rail the most cost effective way of fulfilling these needs?

- 1191/69 on Public Service Obligations

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Economies of scale

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- Major economies of scale in infrastructure
- Moving from single to double track much more than doubles capacity by eliminating conflicts between trains in different directions
- Improving signalling increases capacity without adding to infrastructure
- Moving from double to quadruple track more than doubles capacity by reducing conflicts between trains at different speeds

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Mixing fast and slow trains.

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- Suppose fast and slow trains follow each other for 10km.
- Fast trains take 6 min; slow 20min.
- Minimum headway is 3 mins.
- Capacity if all trains identical – 20 trains per hour
- If Fast/slow/fast etc only 6 trains per hour

  (at 0, 3, 20, 23, 40, 43)

  If quadruple track, 20 trains per hour on all lines

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Economies of scale in train services

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- Longer trains
- Better utilisation of staff and rolling stock/economies in reserve fleet
- Economies of scale in stations and depots

Taking infrastructure and rolling stock together, cost elasticity with respect to traffic density around 0.5

(Mizutani et al, 2015)

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Relief of Externalities on other modes

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Depends on

- Extent that new traffic is diverted from other modes
- Gap between marginal social cost and price on that mode

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Diversion Factors (change in passenger km as a percentage of change in rail km)

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Walk	-0.47
Cycle	-0.46
Car Driver	-26
Car Passenger	-20
Bus	-7.4
Total km travelled	46

Source: WEBTAG

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Marginal cost and revenue analysis by type of vehicle and time of day

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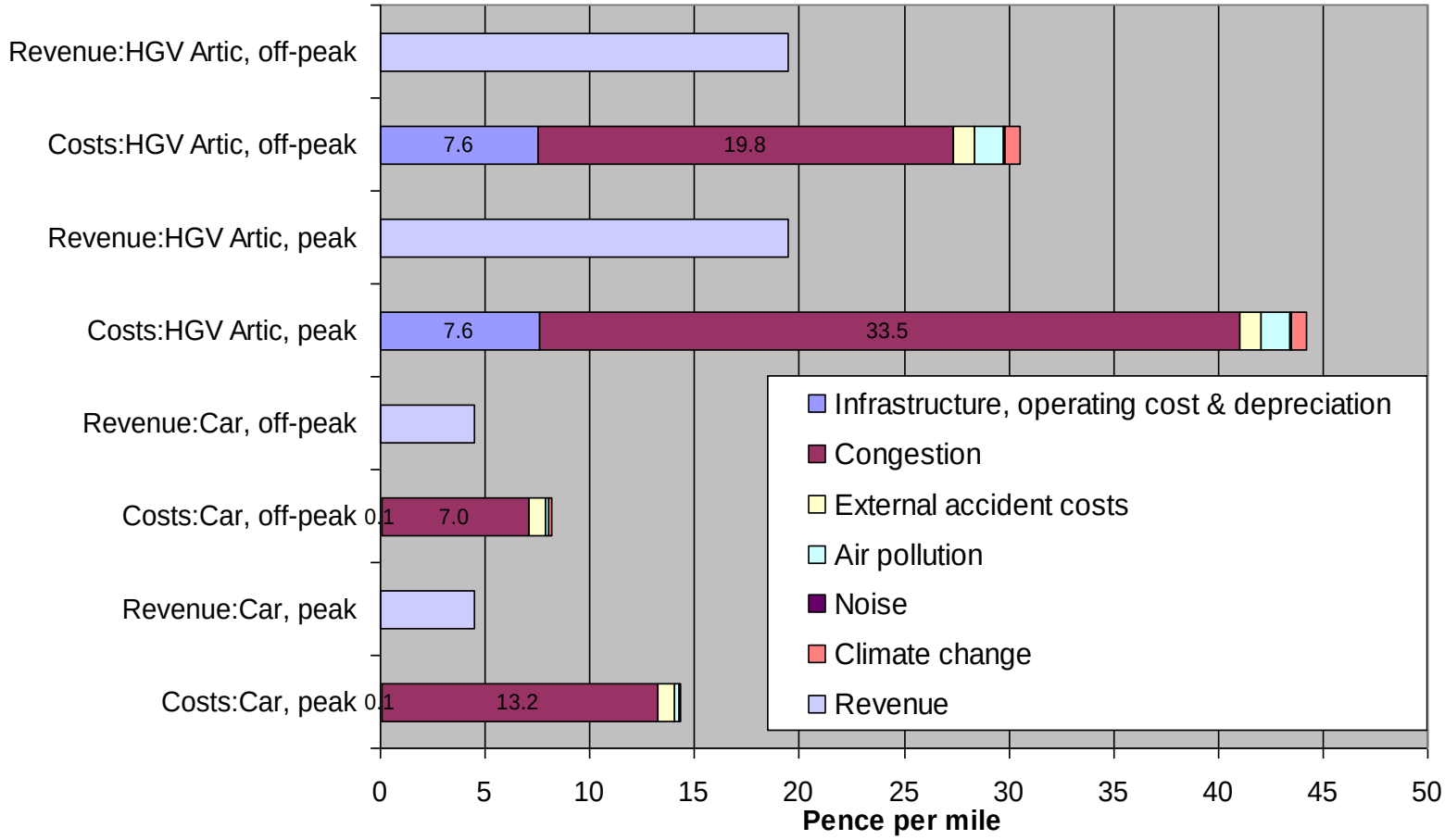

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Wider economic benefits

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Current British appraisal method considers these only for major conurbations on the assumption of unchanged land-use

- Agglomeration benefits
- Labour market benefits
- Imperfect competition

Graham examined whether there were further agglomeration benefits from improving inter city rail business travel? Concluded very small due to low share of all journeys in the course of work.

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Wider economic benefits ctd

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Additional mechanisms which may apply to inter city transport (Venables, Laird and Overman, 2014).

- Increases in density and city size leading to further agglomeration effects
- Specialisation and economies of scale
- Attraction of additional private investment

But shortage of clear empirical evidence

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What is an option value?

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- WTP to preserve the option of using transport service for trips not yet anticipated or currently undertaken by other modes.

- A *car owner* may value the ability to use a public transport service when for whatever reason they cannot drive or car is not available.

- A *public transport user* may value the options offered for travel other than those already taken into account in their individual plans and expectations

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Evidence on option values

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Mode / Package	Value per household per annum		
	Option value	Sensitivity tests	
		Excluding non-use value	Value of mixed mode package
Train	£170	£102	---
Bus	£90	£54	---
Train and bus	£170	£102	£260

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Ways of giving subsidies

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1. Contributions to infrastructure operating costs

(depend on level of track access charges)

2. Investment grants for infrastructure

3. Subsidies for services

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Rail Infrastructure Cost Elasticities

(source: CATRIN)

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Maintenance		
<3m gtKm		-0.2
3-10m gtkm		0.3
>10m gtkm		0.45
Renewals		0.35
Operations		0.15

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British track access charges

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- Fixed charges - paid by passenger franchisees only
- Variable usage charge
- Electrification asset usage charge
- Capacity charge (based on impact of additional trains on reliability)
- Coal spillage charge
- Freight specific charge (mark up)
- Charges for lease of stations and depots

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Rail infrastructure cost coverage in Britain (2014/5) Source: ORR (2016)

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Costs (£b)		Revenue from charges (£m)	
Maintenance	1.2	Variable access charge	167
Operations	1.2	Capacity charge	407
Amortisations	2.4	Fixed charges to franchisees	428
Financing	1.4	Stations	282
Total	6.2	Use of electrification assets	15
		Other charges	84
		Total	1383

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Congestion charges

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- Apply where an additional train can be accommodated but will reduce punctuality
- Delays directly caused by that train charged for by the performance regime
- But there is still a further externality in that an additional train may add to reactionary delay even when not the direct cause of delays itself

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Reactionary delay

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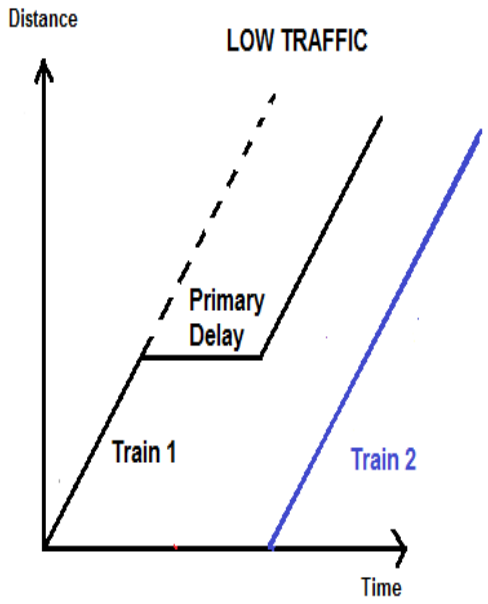

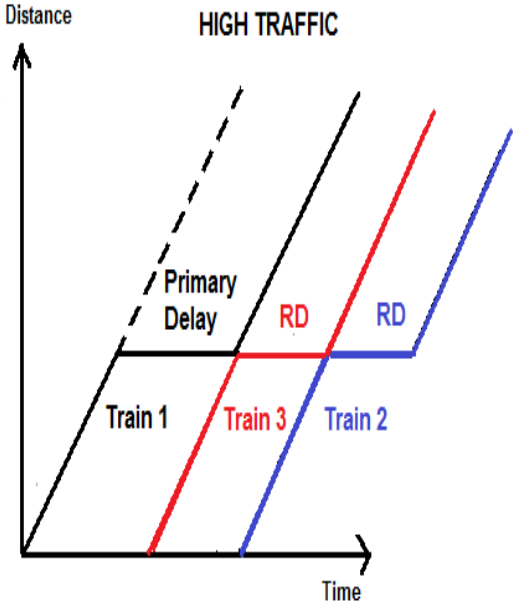

Adapted from diagram in ：Network Rail (2012) Periodic Review 2013 – Consultation on the Capacity Charge

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Calculation of the Charge in Britain

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- Capacity usage was calculated (CUI).
- Regression Analysis was carried out with the measure of capacity usage (CUI) as the explanatory variable and observed reactionary delay per train mile as the dependent variable.
- The exponential form was chosen as providing the 'best' relationship between capacity usage and reactionary delay.
- The calculated impact on reactionary delay of additional capacity use provided the basis for calculating the Capacity Charge.
- The charge varies by time band and location.

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Criticisms of the current capacity charge

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- Too complex: operators do not know what they will have to pay
- But still not sufficiently differentiated to be accurate
- Does not take account of actual pattern of service (e.g. regular interval timetables)
- Does not take account of true scarcity (i.e. where demand for paths simply cannot be met)

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Mark ups

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- Direct cost unlikely to be more than 30-40% of total maintenance and renewal costs (unless a high scarcity or congestion charge)
- Non discriminatory mark ups may be applied when needed for financial reasons
- But must not exclude market segments willing to pay direct cost

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Ramsey pricing principle:

There is a social loss when people willing to pay marginal cost are priced out of the market by mark ups.

This loss is minimised if

% mark up in a market segment is inversely proportional to price elasticity of demand

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Application in principle

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Suppose price elasticity of demand for inter city passenger transport is -0.8 and for suburban passenger -0.4.

Suppose in each case track access charges are 50% of total costs so that a 100% rise in track access charges leads to a 50% rise in price.

This suggests that the mark up on intercity should be half that for suburban passenger

BUT

- Will the mark up affect frequency rather than just price?
- What is the price elasticity of demand for a public service contract?

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Market segments identified by the first railway package recast

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- (a) passenger versus freight services;
- (b) trains carrying dangerous goods versus other freight trains;
- (c) domestic versus international services;
- (d) combined transport versus direct trains;
- (e) urban or regional versus interurban passenger services;
- (f) block trains versus single wagon load trains;
- (g) regular versus occasional train services.

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Further possibilities for differentiating mark ups

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For passenger, ideally want to distinguish type of traveller and journey purpose.

Cannot do so precisely but may be related to:

1. Type of service (inter city, commuter, regional, high speed)

2. Peak versus off peak

For freight, commodity

Possible for trainload freight, but not for wagonload or container

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Freight specific charge in Britain

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Impact of doubling variable track access charges by commodity (% change in tonne km)

Nuclear	0
Iron Ore	0
Power station coal	-0.4
Inter modal	-12.9
All freight	-8.9

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Problems with applying mark ups to passenger services

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- Not just an issue of elasticities of demand in the final market

- Also frequency of service is an important quality attribute

- Profitability of individual trains varies greatly

  (e.g. London – Leeds versus London – Hull

  time of day/day of week)

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Investment grants

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- Justified to cover (part of) the investment costs of projects where benefits exceed costs but the investment is unprofitable
- E.g. Crossrail in London
- A new CrossLondon tunnel linking suburban services East an West of the City

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Crossrail CBA (£mPV2002)

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Time savings	12832
Crowding	2889
Other transport benefits	372
Wider economic benefits	7161
Total benefits	23254
Total costs	13902
Less revenues	-6149
Plus tax loss	1207
Cost to government	8960

BCR 2.6 (1.8 excl Wider economic benefits)

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Subsidies to services

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- Under EU Law must take the form of a public service contract
- May be given by means of direct award to incumbent or via competitive tender
- 5th package sought to make competitive tendering compulsory, but will still be provision for direct awards if justified
- Freight subsidies may take the form of a reduction of track access charges, as in Britain

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How to ensure subsidies are used efficiently

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- Regulation
- Competitive tendering
- On track competition

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- In Britain, the Regulator undertakes a periodic review of the Infrastructure Manager (Network Rail) every 5 years, and determines financial requirements for the next 5 years
- Government determines outputs required and funding available
- Regulator determines how costs should be covered

  -track access grants

  -government grants

  -borrowing
- If government grants inadequate must negotiate a reduction in outputs required. A key issue is efficiency of Network Rail

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Rail infrastructure cost trends in Britain

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£m 2012 prices	1998	2013	Growth
Maintenance	1,055	968	-8%
Operating Costs	1,004	1,390	39%
Renewals	1,605	2,672	66%
Enhancements	281	2,318	723%
	3,946	**7,349**	86%

- Total unit costs up by 45% per train-km
- OM&R unit costs up 7% per train-km
- Though, don't forget, substantial economies of density

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Efficiency estimates for Network Rail (PR08)

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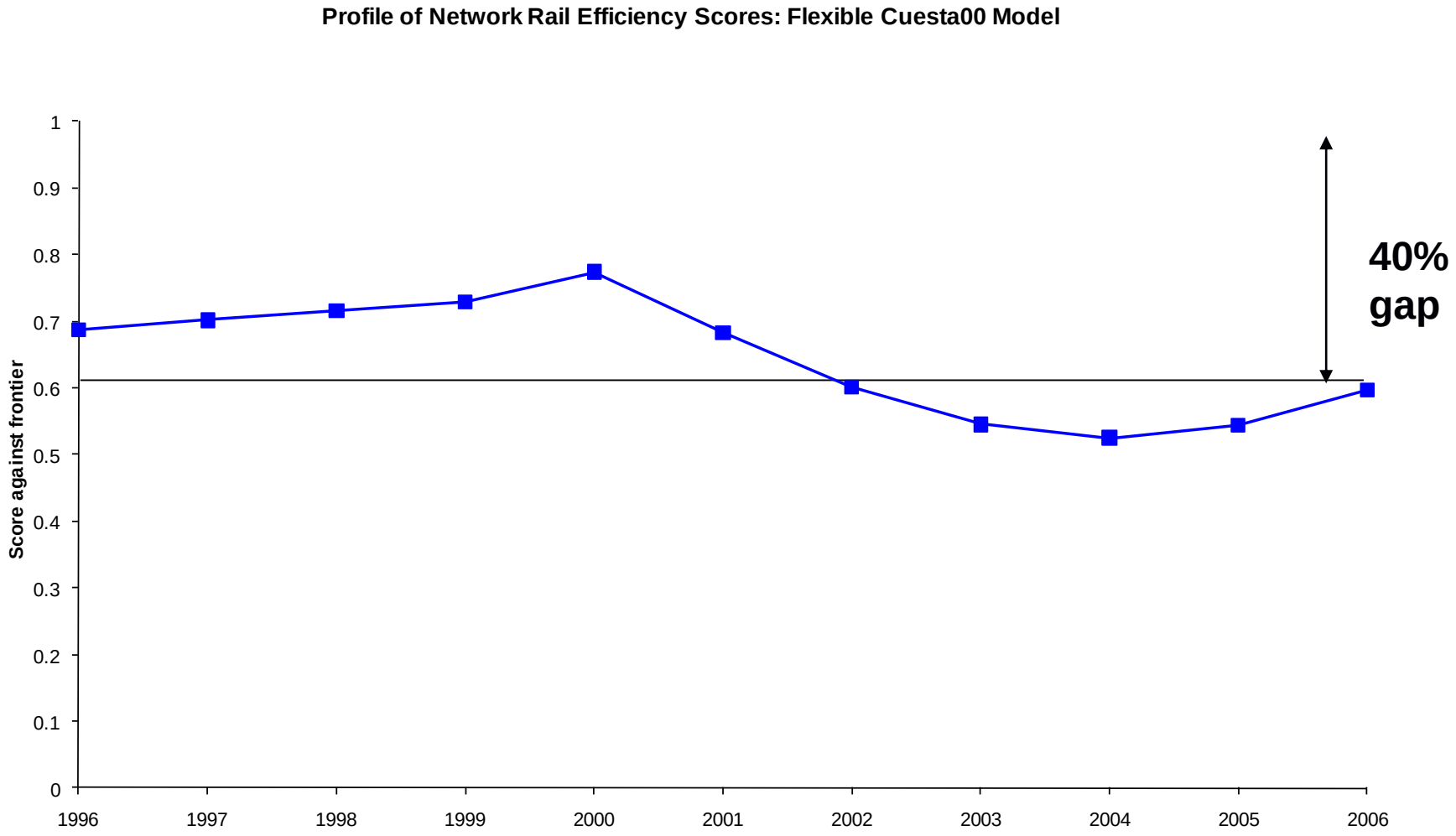

Implies a gap against the frontier of 40% in 2006

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Multi annual contracts

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- In most European countries, the Regulator does not assess the efficiency of the Infrastructure Manager or determine its financial requirements
- Instead there is a direct negotiation between the infrastructure manager and the ministry leading to a multi annual contract
- This will specify required outputs and finance available
- How are incentives for efficiency determined?

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Ways of opening passenger market

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1. Competition for the market

Competitive tendering for franchises

The only approach for subsidised services

2. Competition in the market

Open access for new commercial operators

Normal approach for freight

4th package proposes a combination of both for passenger

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Competition for the market – franchising by competitive tender

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Most used in:

- Sweden for all subsidised services
- Britain for virtually all passenger services
- Germany for an increasing proportion of regional services

Also used to a more limited extent elsewhere including:

Denmark

Netherlands

Portugal

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Franchising - lessons from experience

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- Franchising generally a success (20-30% reduction in subsidies), but British cost increase (9% per vehicle km) a problem.

Reasons:

- Scale of franchising
- New operator obliged to take on existing staff and conditions
- Vertical separation

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Open access competition in the market

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Only possible where services profitable (low track access charges?)

Germany and Britain - limited low frequency new entry

Sweden - MTR operating frequent services Stockholm – Gotenburg

Austria -frequent competing services Vienna-Salzburg

Italy - frequent services by a new entrant throughout the high speed network

Czech Republic – 3 competitors on one route

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Impacts of open access competition

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- Lower fares
- Improved services
- Reduced costs?

But

Less well integrated timetables

Poorer use of scarce capacity

Reduced profitability

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Extent of competition in Freight

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- Typically around 30% of the market held by new entrants
- Often subsidiaries of foreign railways (DB, SNCF, Trenitalia)
- Sometimes also the incumbent freight operator has been separated off and sold (Britain, Netherlands, Denmark, Hungary).
- In all cases this has been bought by a neighbouring incumbent – DB, OBB.
- Evidence of a big impact on costs – greater efficiency of new operator or result of rationalisation

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EVESrail project conclusions

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- Passenger and freight market opening had no significant impact
- Horizontal separation of freight has reduced costs
- At higher traffic densities, vertical separation increases costs
  - At mean traffic densities, vertical separation does not significantly change costs
  - Whereas a holding company model reduces them, compared with complete vertical integration (weakly significant)
- A higher share of freight in total revenues increases the costs of vertical separation
  - Freight traffic may cause more coordination problems in a separated environment than passenger traffic

(Mizutani et al, 2015)

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Government finance of railways in practice (Nash, Nilsson and Link, 2013)

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	Britain	Sweden	Germany
Support to Services	Yes	Yes	Yes
Support to Infrastructure			
- running costs	Yes	Yes	No
- Investment	No	Yes	Yes

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Form of finance in practice

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Schafer and Gotz (2016) confirm dichotomy

France and Germany – no revenue support for infrastructure but high support for services

Britain – now no net support for services but high revenue support for infrastructure

However, most countries are on a hybrid model with a mix of the two forms of support

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Comparisons of Support to the Railway Industry (2005 Prices) Nash, Nilsson and Link

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	Support €m		
	1997	2007	Per pass km (2007/1997)
Britain	2,622	5,134	1.25
Sweden	1,261	1,898	1.0
Germany	8,641	9,888	1.0

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Average support 2001-15 (euros)Schafer and Gotz

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	Support per inhabitant	Support per traffic unit
Lowest	Britain (80)	Sweden (0.03)
Average	139	0.08
Highest	Swiss (308)	Norway (0.14)

Support rising fast in France, Norway and Sweden; Britain to 2007; stable in Germany and Switzerland

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Concluding remarks

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- There are good reasons for subsidising railways but a need to ensure subsidies are used efficiently
- In vertically separated railways, it is difficult to cover infrastructure costs from track access charges without leading to inefficiencies in service provision
- Regulation including benchmarking is an important way of incentivising efficiency in infrastructure costs
- Competition for or in the market is an important way of promoting efficiency in train operations but the evidence on the impact of reforms is mixed – they seem to have worked in some circumstances but not in others
- Such measures should reduce or eliminate the relationship between subsidies and inefficiency

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