



Alternative cost methodologies for setting track access charges: how do they compare?

Track Access Charges Summit

Professor Andrew Smith, Institute for Transport Studies,
University of Leeds

October 14th, 2020



- Explain the three main methods used
- Advantages / disadvantages
- Comparison of results from methods – gives a big disparity
- Research to understand differences

Approaches to estimating marginal cost



UNIVERSITY OF LEEDS

- Three methods have been used in the literature to date to measure rail infrastructure marginal cost

Engineering
approach

Cost allocation
/ accounting
approach

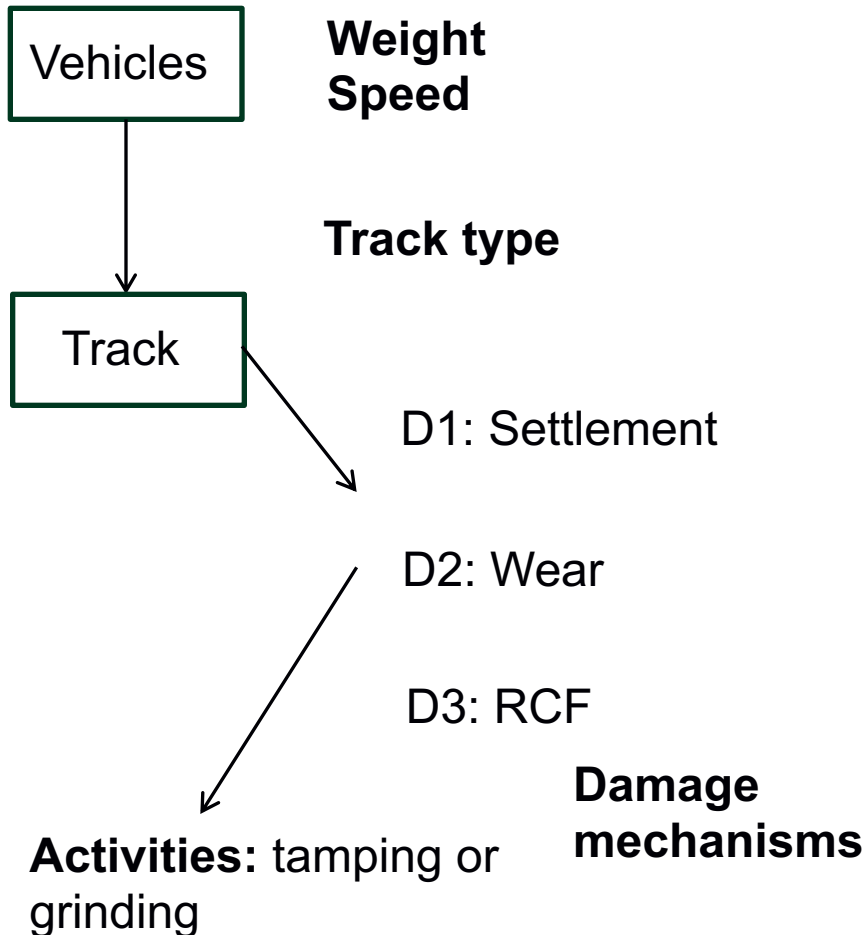
Econometric
approach

Engineering approach: illustration

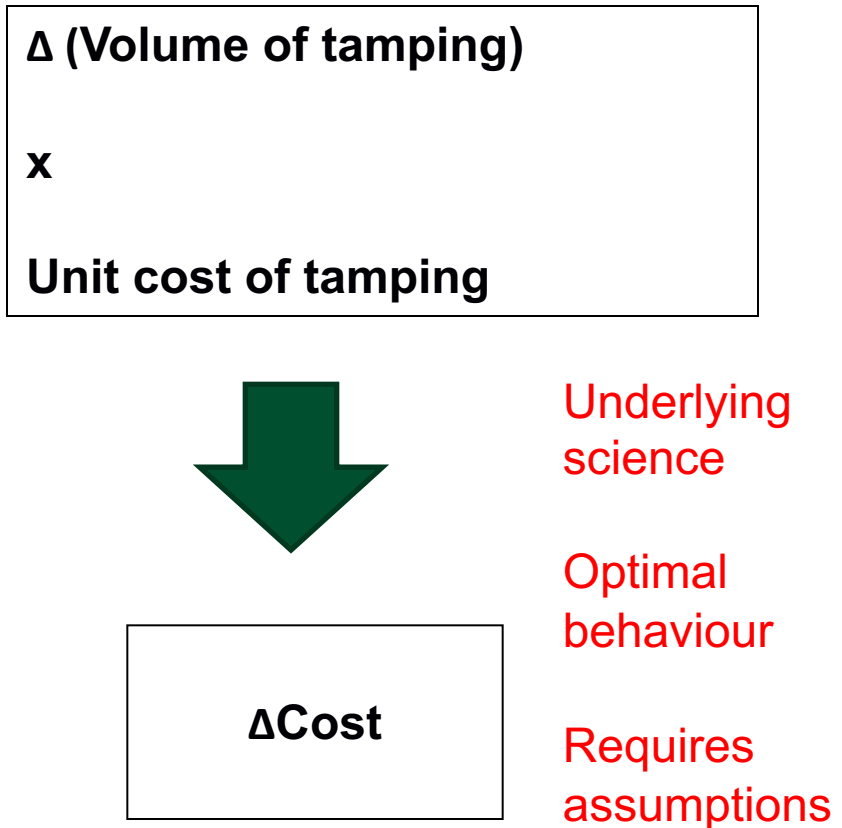


UNIVERSITY OF LEEDS

Stage 1: Simulation (track section level)



Stage 2: Unit cost analysis



Cost Allocation Approach / Accounting / Engineering (judgement) /



UNIVERSITY OF LEEDS

Activity / asset class	Variability Proportion: 2000 Regulatory Review	Variability Proportion: 2008 Regulatory Review
Track - maintenance	30%	29%
Track – renewals (plain line)	36%	23%
Track – renewals (switches and crossings)	25%	17%
Signalling - maintenance	5%	5%
Civils – metallic underbridges	10%	8%
Civils – embankments	10%	5%

Source: ORR (2008)

Proportions informed by judgement, possibly supported by evidence



Updated over time with new evidence

Econometric approach – relate costs to traffic in statistical regression

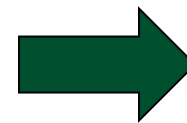


UNIVERSITY OF LEEDS

$$C_{it} = f(Y_{it}, P_{it}, N_{it}, \tau_t; \beta) + v_{it}$$

- C_{it} is the cost measure – say, maintenance and renewal costs
- i is the unit of observation (e.g. track section; maintenance unit; region; country); t is time period (year)
- Y_{it} - output measures (e.g. passenger tonne-km; freight tonne-km)
- β - parameters estimated – **gives % of cost variable with traffic**

$$MC = \beta \cdot AC$$



Track access charges

Notes: P_{it} - input prices (e.g. wage rate; price of materials); N_{it} - exogenous network characteristic variables (e.g. network length; linespeed capability; rail age; proportion of track in a curve; S&Cs); τ_{it} represent time variables capturing technical change over time

Comparing estimates (for maintenance and renewal costs)



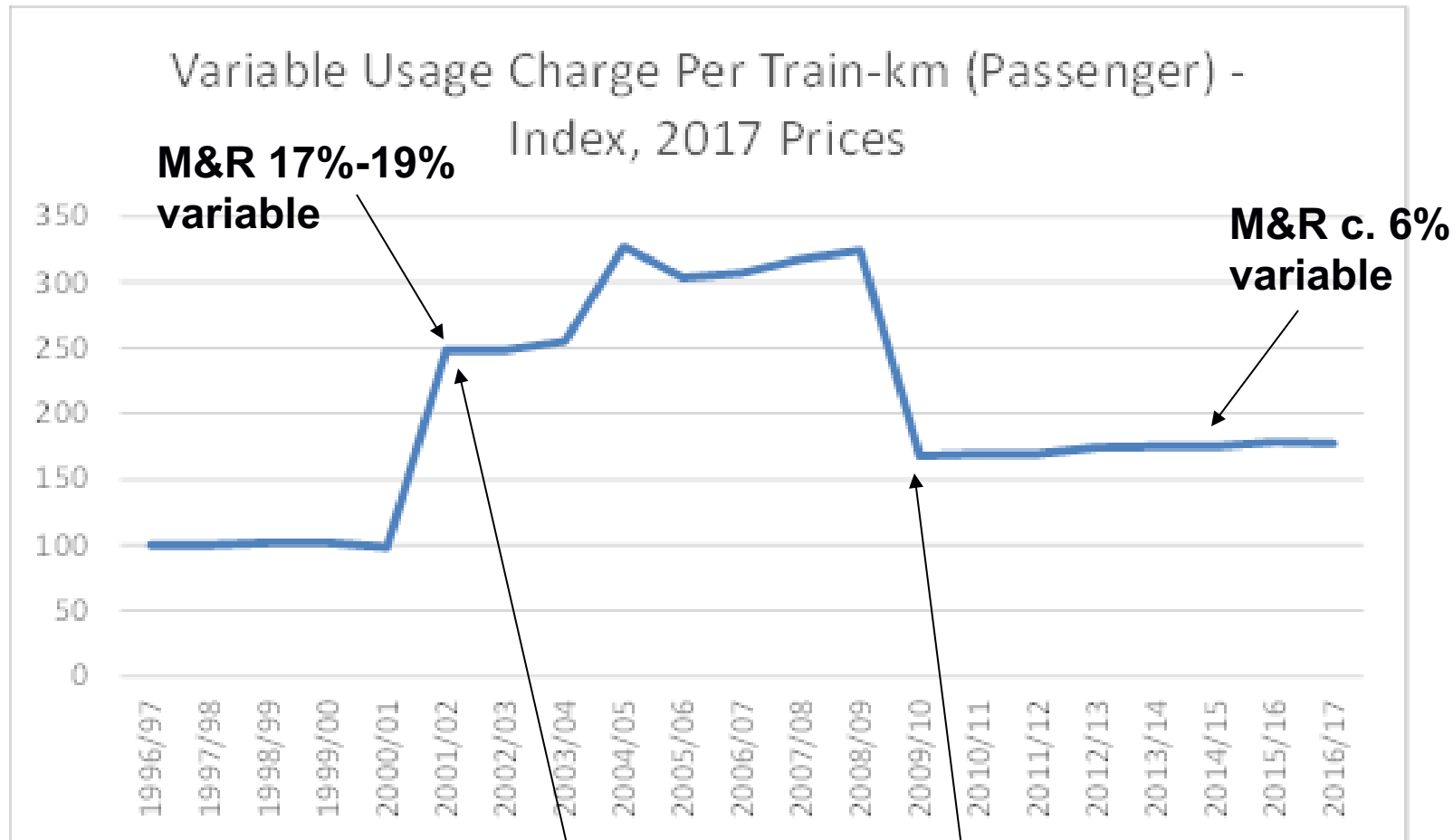
UNIVERSITY OF LEEDS

- The **econometric evidence** from European case studies suggests that rail infrastructure maintenance and renewal costs vary substantially with traffic):
 - **Variability = high (low end 20-25%; could be as high as 35-45%)**
 - **Engineering evidence (models)** underpinning track access charges in Britain suggests costs are largely fixed:
 - **Variability = low (c. 6%)**
 - **Earlier cost allocation / engineering (judgement)** in Great Britain (2000; 2005) put variability somewhere in between:
 - **Variability = medium (17-19%)**
- See Smith and Nash (2018)**

Engineering evidence and evolution of charges in GB



UNIVERSITY OF LEEDS



M&R 17%-19% variable

M&R c. 6% variable

PR2000: Cost allocation approach

PR2008: Engineering Modelling Approach

Towards explaining the differences?



UNIVERSITY OF LEEDS

- Actual data (econometric) versus optimal behaviour and assumptions about activity and cost (engineering)
- Variation in unit costs for activities – e.g. scale economies – need for calibration to reconcile to budgeted costs
- Impact of traffic on preventative maintenance regimes?
- Desire to avoid delays – even if no wear and tear (e.g. signalling)
- Use of actual sections (econometric) versus “representative” track sections (engineering)



- Thank-you for your kind attention

Professor Andrew Smith

Professor of Transport Performance and Economics

Institute for Transport Studies (ITS) and Leeds University
Business School, University of Leeds, Leeds, LS2 9JT

E-mail: a.s.j.smith@its.leeds.ac.uk

<http://www.its.leeds.ac.uk/people/a.smith>

Tel (direct): + 44 (0) 113 34 36654;

Tel (enquires): + 44 (0)113 34 35325



- Smith, A.S.J. and Nash, C.A. (2018), Track access charges: reconciling competing objectives: Case Study – Britain. CERRE.
- ORR (2008), Periodic Review 2008 Determination of Network Rail's outputs and funding for 2009-14. ORR, London.