



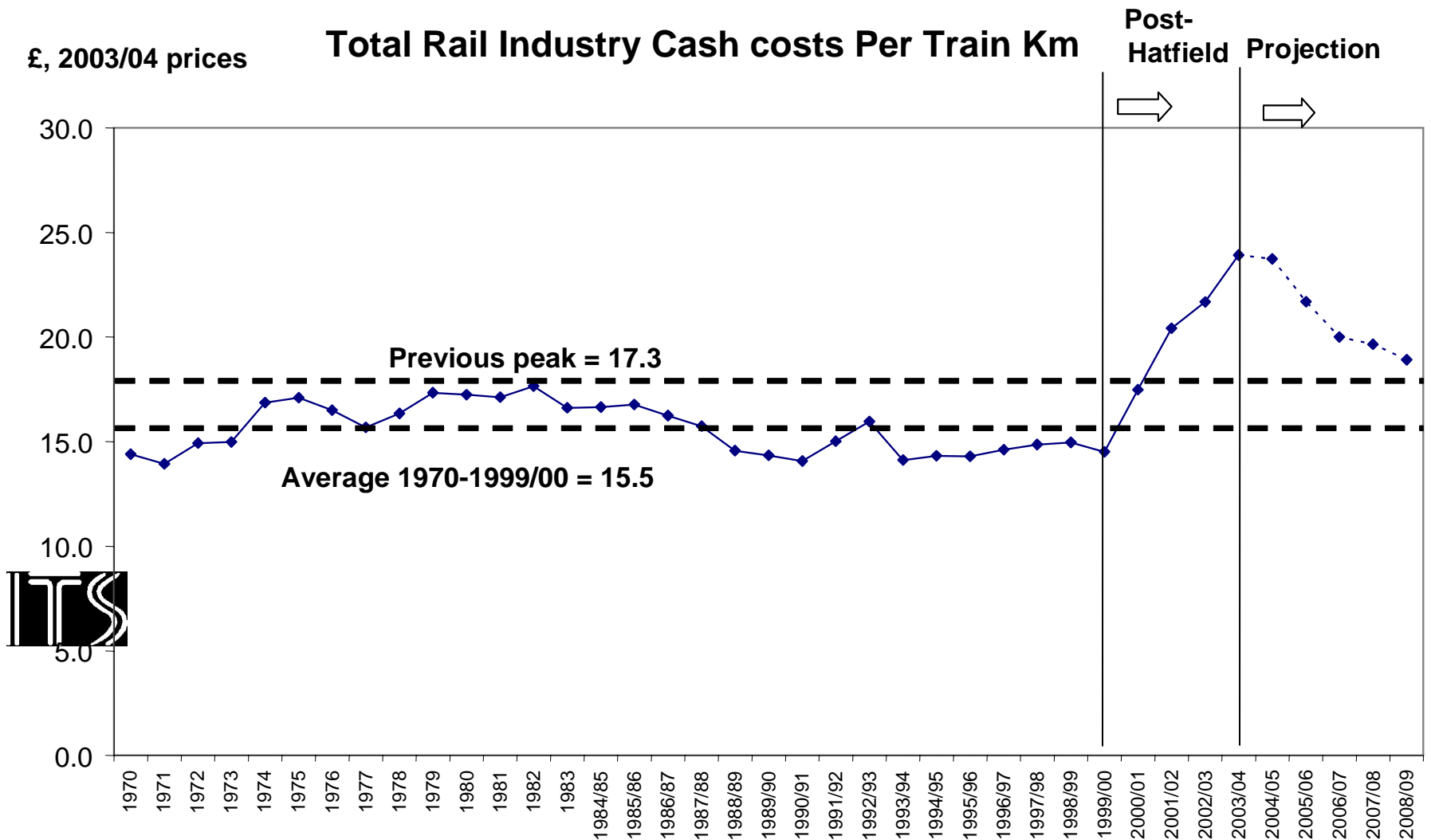
## Project B7: Rail Industry System Cost Model

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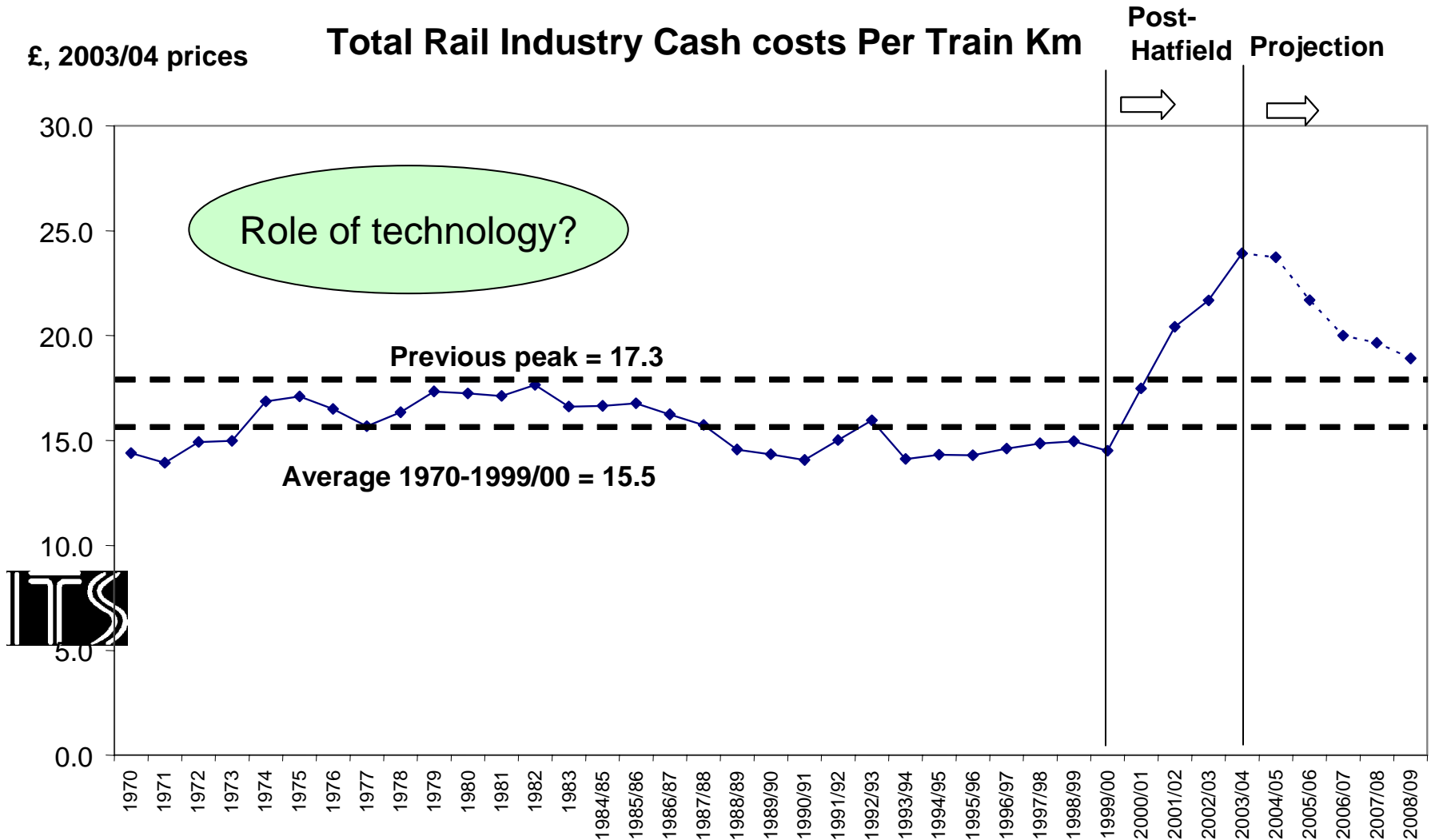
**13 December 2006**

# A renewed interest in cost modelling



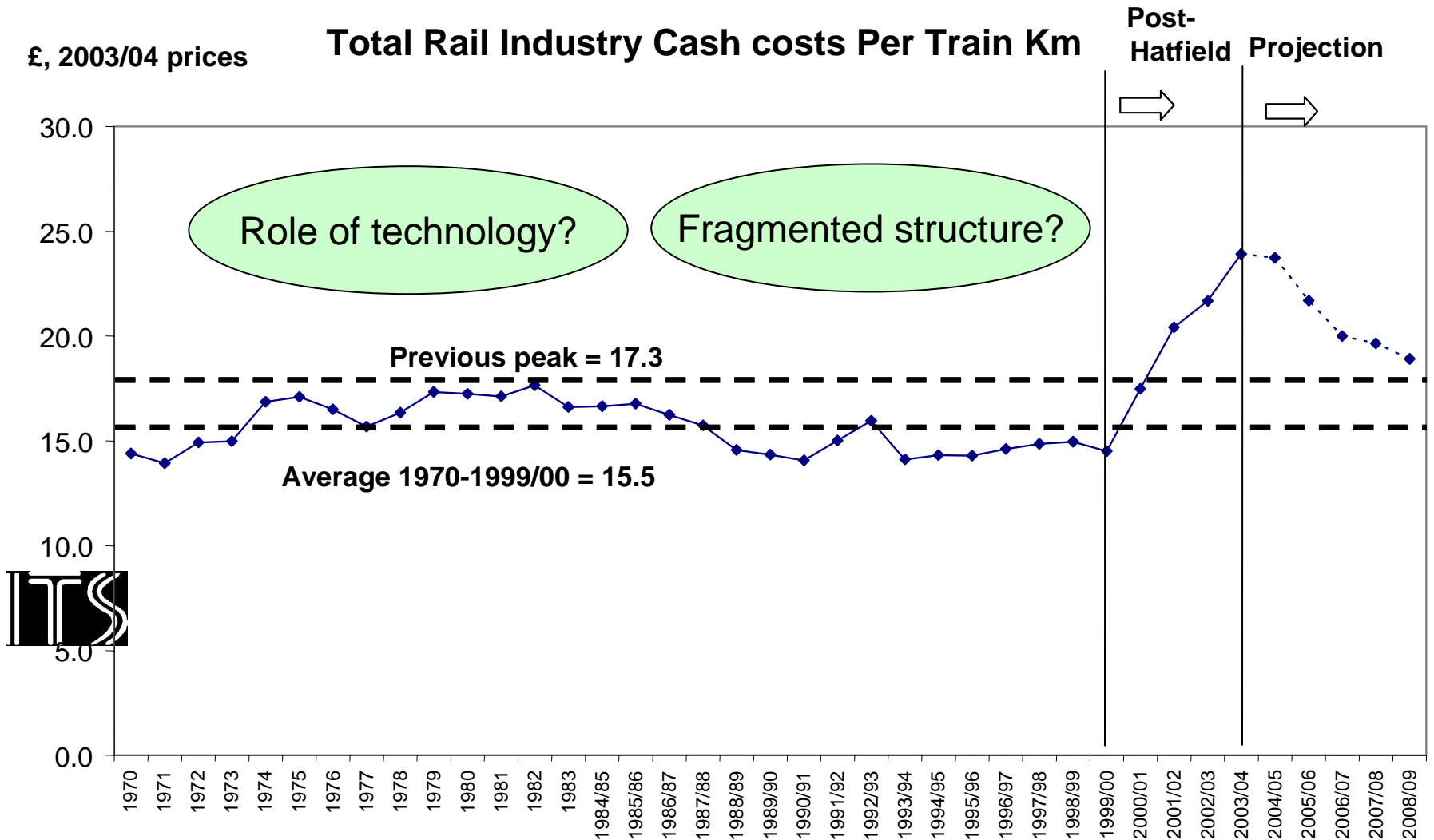
Source: Analysis carried out by Andrew Smith, ITS. See also Smith (2006)

# A renewed interest in cost modelling



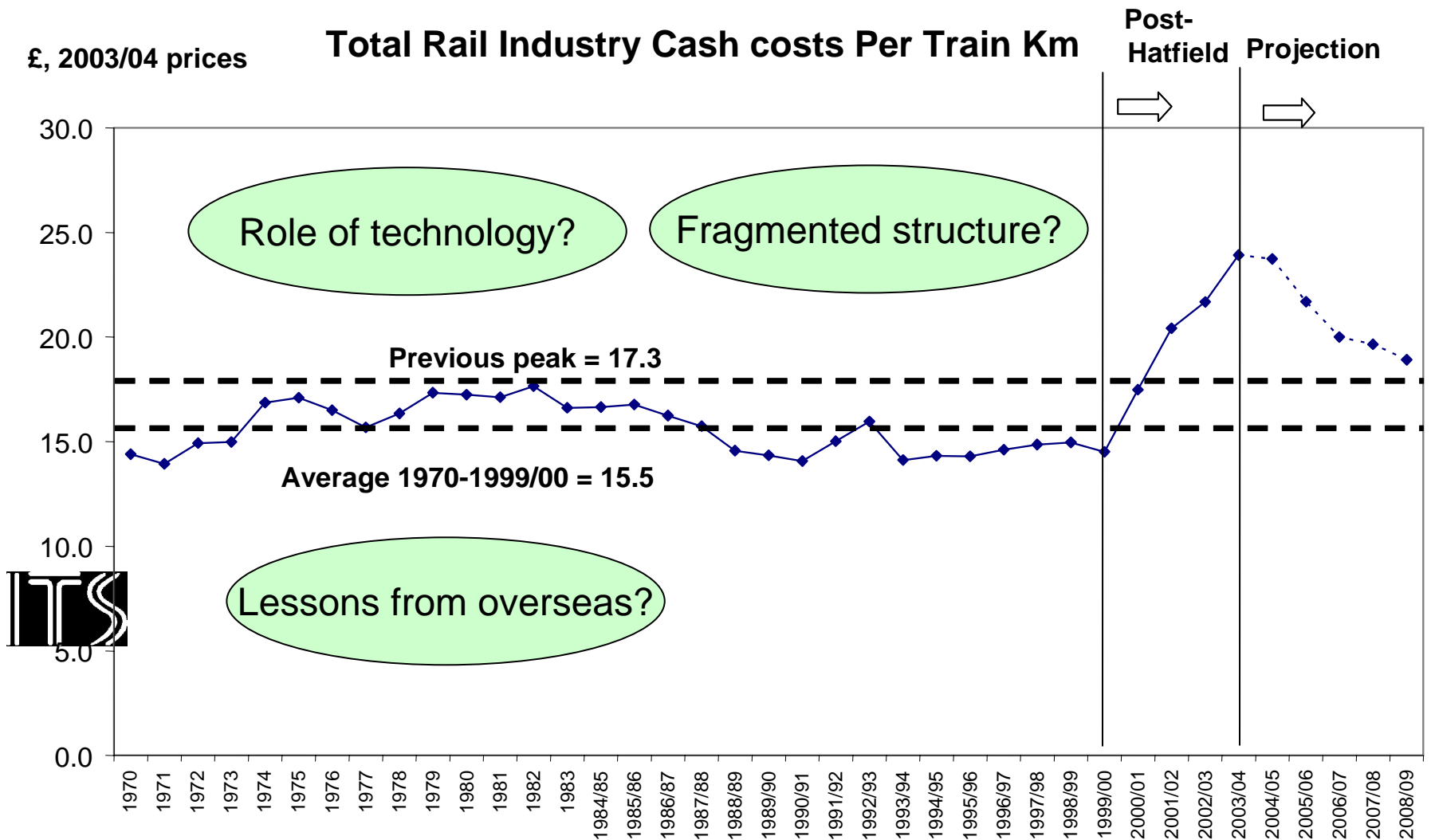
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# Agenda

- Latest thinking on what we are planning for project B7: “Rail Industry System Cost Model”
- Aim to get comments to feed into planning
- But first, reminder of where we left off on previous projects



# Work done on previous projects

- Project B4: identify + quantify techno-economic trade-offs
- Review of industry cost trends
- Statement of methodology for cost-technology model
- New econometric work to inform model parameters



Collection of international data (project B5)

# TOC cost trends

Drivers of TOC cost rises (£m, 2003/04 prices)	2003/04	Post-HF % growth
TOC own costs	3,097	47.5%
- Of which, staff costs	1,376	32.7%
- Of which, other costs	1,720	62.0%

- TOCs taking greater financial responsibility for maintenance?
- Complex new trains expensive to maintain?
- Cost of introduction and dual running of new and old rolling stock?
- Tighter specification of quality (e.g. cleaning and information)?
- Rising fuel costs?
- Increased pension and policing costs?
- Insurance costs?
- Replacement bus services?



# Permanent Way Costs

Costs 30%  
variable  
with traffic

## Model Summary

Model	R Square	Adjusted R Square
2	0.742	0.681

## Coefficients<sup>a</sup>

	Unstandardized Coefficients	
	B	T ratio
(Constant)	6.324	5.215
ln(TRACK LENGTH)	0.517	6.418
ln(TRAIN MILES PER TRACK MILES)	0.302	3.525
ln(AVERAGE WEIGHT OF TRAIN)	0.399	3.100
PROPORTION OF TRACK LENGTH WITH MAX AXLE LOAD > 25 TONNES	-0.383	-2.116
PROPORTION OF TRACK WITH MAXIMUM SPEED > 100MPH	-0.430	-2.190
PROPORTION OF TRACK CWR	0.811	2.146
Ln (WAGE RATE)	0.425	2.055

a. Dependent Variable: ln(PWAY AND GENERAL EXPENDITURE)



# TOC Cost Variabilities: Staff costs – Some emerging results

**Model Summary**

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.975	.950	.948	.23361

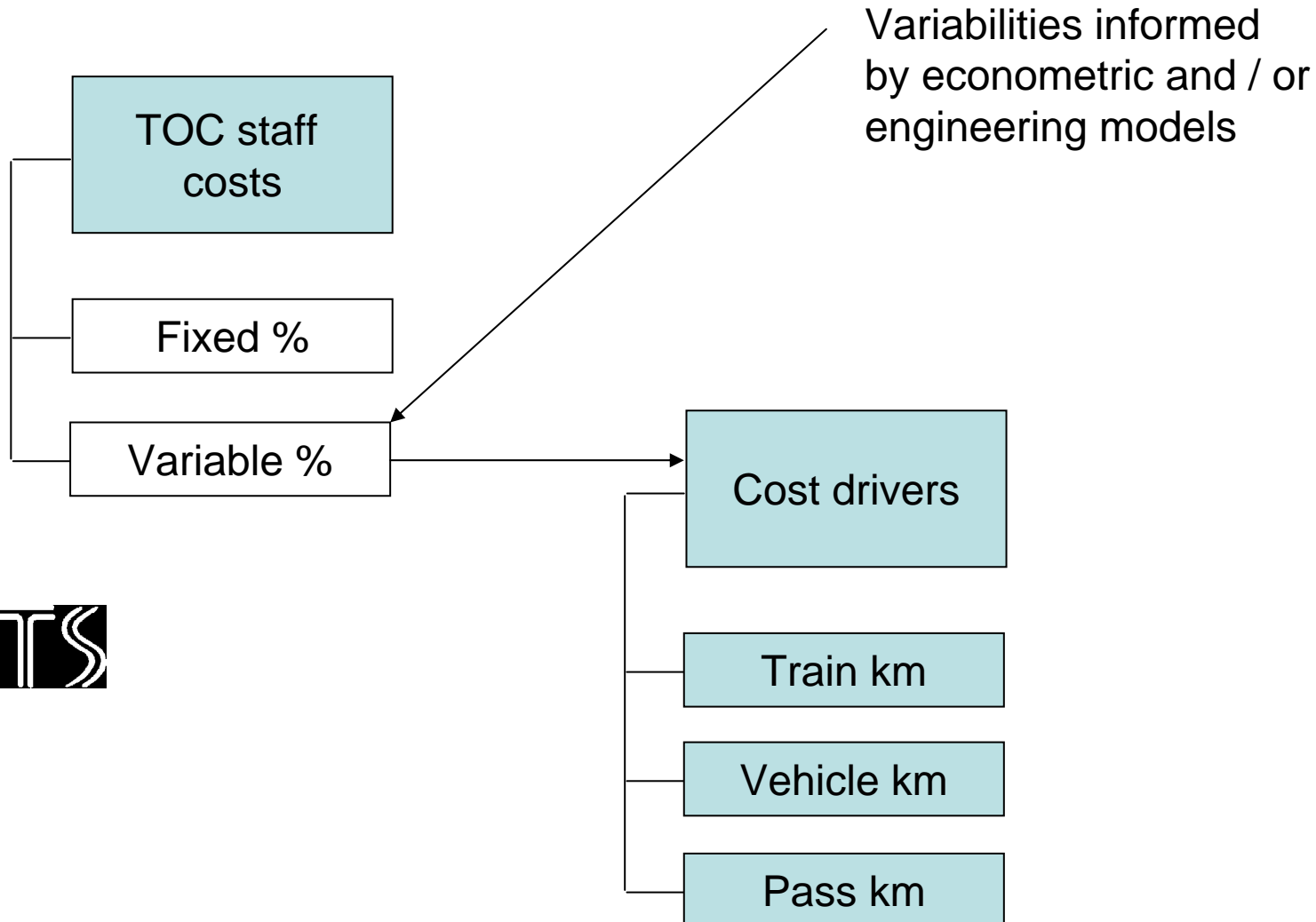
**Coefficients<sup>a</sup>**

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	5.306	.805		6.589	.000
	Regional	.095	.084	.045	1.140	.257
	Intercity	.660	.099	.247	6.680	.000
	log number of stations	.195	.043	.223	4.502	.000
	log Train Miles	.449	.088	.465	5.091	.000
	log Passenger Miles	.294	.071	.398	4.164	.000
	log Average Salaries	.396	.207	.042	1.916	.058

a. Dependent Variable: log Staff Costs



# A cost allocation model - example



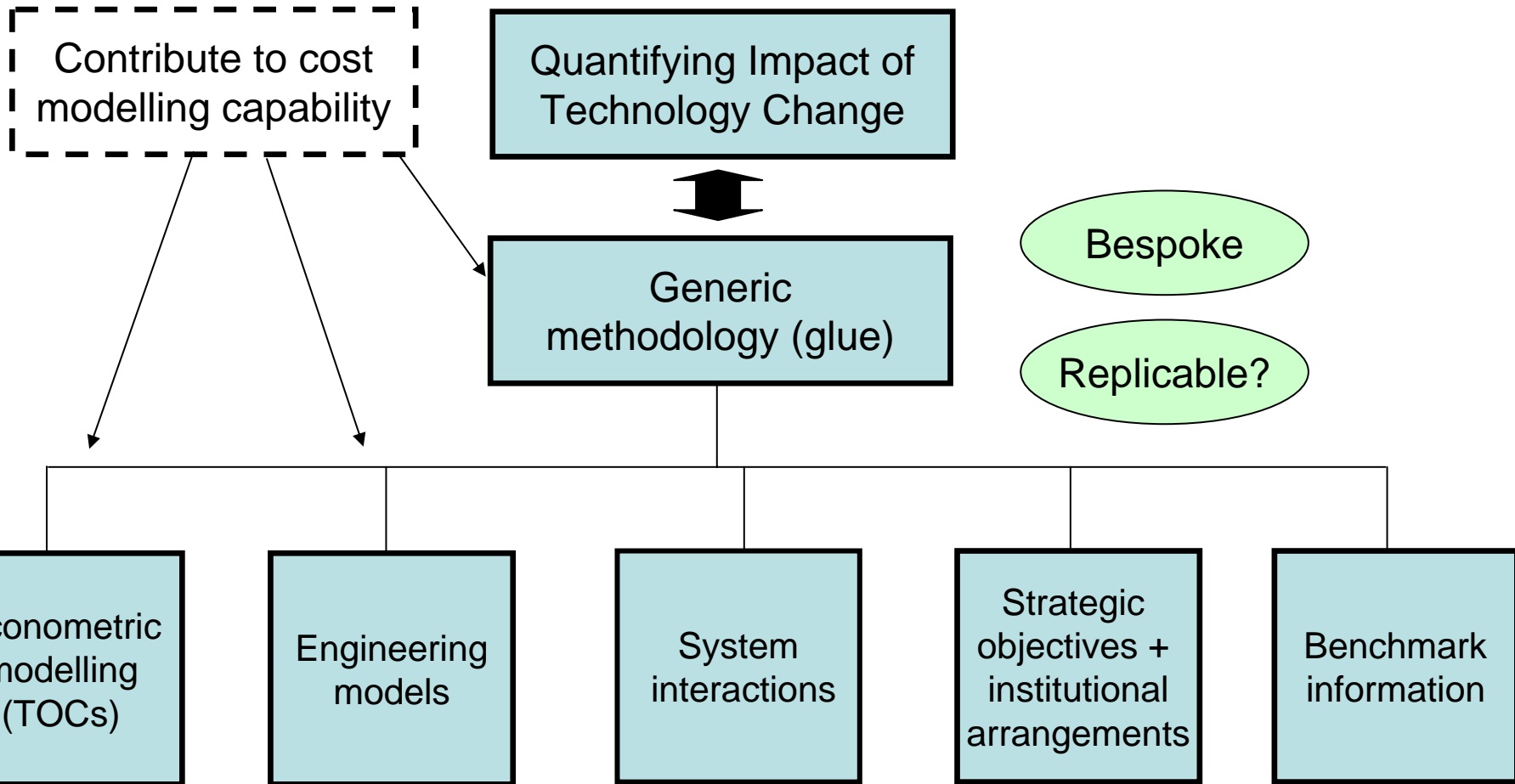
# Lessons from previous work

- Generic methodology required – draws on other models
- System interaction model crucial
- Bespoke engineering models needed
- Costs departed from efficient levels – but more to learn
- Potential for new econometric work on TOC data



- Non-published data likely to be required (Britain and overseas)

# Project B7 – current thinking




# Selecting a technology

- Aim to test two technologies
- Suggested first technology case study: light weighting of trains
- Trace system-wide impact:
  - fuel usage;
  - track maintenance;
  - train capital and maintenance costs;
  - capacity implications



- Re-use of existing engineering models in the main
- Second case study to be determined

# Econometric modelling: proposal

- Quantitative study of TOC costs and efficiency (96-date)
- DfT and ATOC interest in the research
- Five key research questions / areas:
  - How have different cost elements contributed to cost changes?
  - How do costs vary with volume? Scale economies?
  - How far can cost trends be attributed to changes in quality?
  - Are some TOCs more efficient than others?
  - How did franchising policy impact on the evolution of costs?
-  Interest in its own right; link to overall system cost model; provides direction for engineering research

# Next steps

- Development of technology case studies and econometric work
- Data availability – non-published data
- Review of existing models
- Exploring international angle – engineering focus
- Comments?

