Incorporating wider economic impacts with cost-benefit appraisal:

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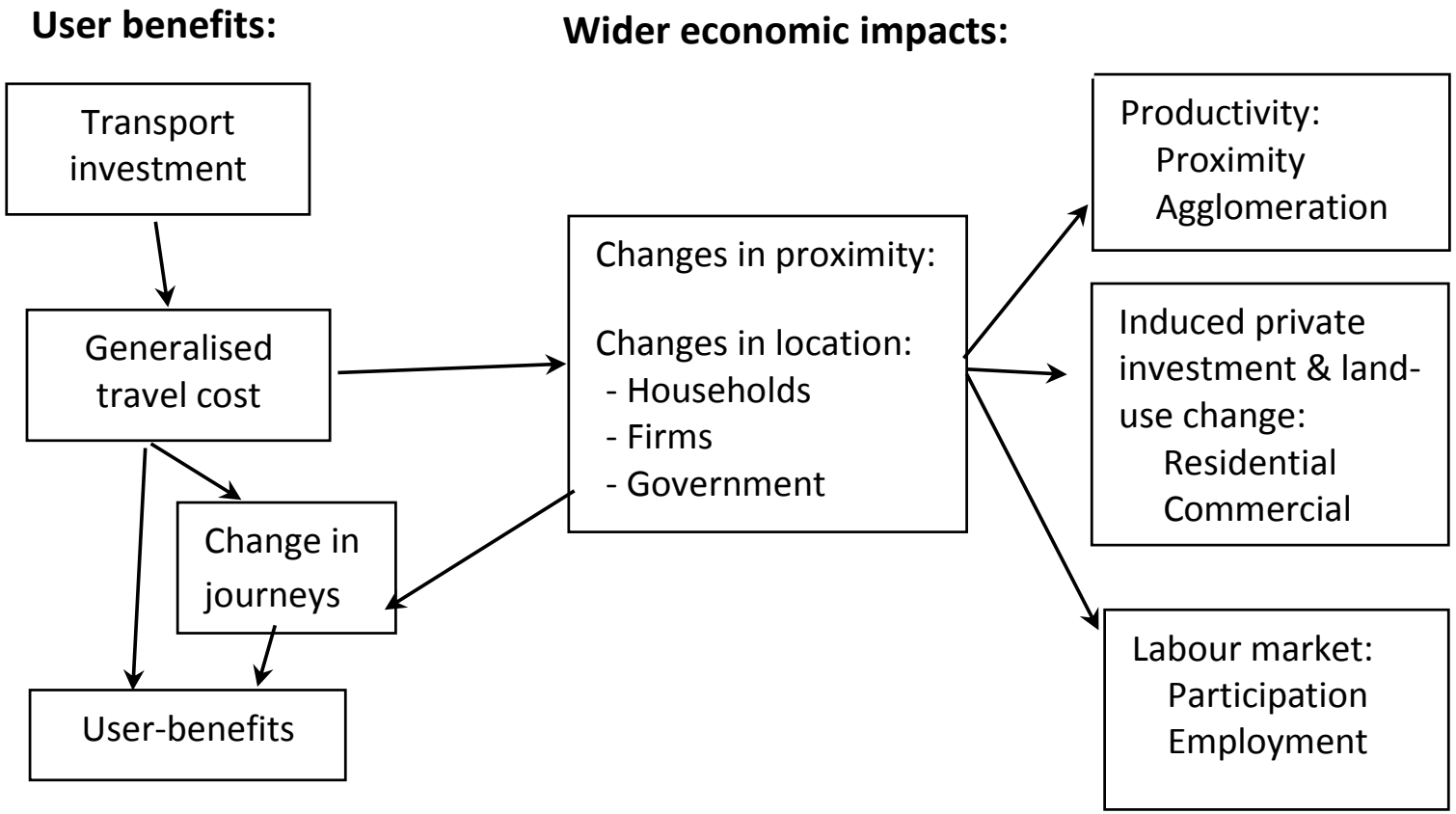
Wider economic impacts:

Motivation:

- Standard user-benefit approach to CBA
  - Any changes beyond the direct benefits are of zero value
- Transport is fundamental in shaping economic performance
- Formalise and capture the arguments in a way that imposes the discipline of rigorous economics
- Engage fully with other stakeholders
  - Who measure GVA not welfare (inappropriately)
  - Who care about spatial distribution of effects (legitimately)
- Approach
  - Integrate the strategic and the economic cases for a transport project
  - Recognise that induced quantity and GVA changes are of interest....even if they don't lead to welfare gain
  - Identify and measure the wider benefits… and reduce to one-dimensional value
  - Do so in manner that is feasible, proportional, and transparent…. and not excessively dependent on running large models.

Wider economic impacts



For each of these:

- Mechanisms and narrative: is the effect relevant to a particular project?
- Social valuation of change: real gain or transfer? to whom?
- Quantification: is there a well-grounded methodology?

I: Productivity: proximity and agglomeration

- Mechanism: *Transport enables connectivity*

  Thick product and labour markets enable scale and specialisation

  - Matching workers and jobs
  - Firm scale ***and*** intense competition
  - Incentive to acquire specialist expertise

- Social value:
  - Raises productivity:
    - NB: beyond the direct effect of increased productivity of e.g. truck/ driver and consequent reorganisation of logistics (= user benefit, captured by 'rule of half')
  - Underlying market failures from reciprocal externalities, increasing returns to scale (i.e. specialisation is limited by the size of the market).

- Quantification:

  2-step methodology for establishing productivity effects of transport improvement:

  Transport → access to economic mass = $\Sigma_j f(d_{ij}) Emp_j$ → productivity:

  (effective density)

I: Productivity: proximity and agglomeration

Quantification 1: access to economic mass $= \Sigma_j f(d_{ij}) Emp_j$ → productivity:

Econometric evidence:

	elasticity
• Evidence base: data from areas/ firms/ individuals.	
• Elasticity of productivity w.r.t. city size/ access to mass:	0.02 – 0.04
• Varies across sector (higher in tech, business services):	0.08
• Controlling for occupational composition/ skills:	0.03 - 0.05
• Controlling for unobservable personal attributes (i.e. individual fixed effects, identification from individual moves):	0.02 – 0.01

Issues:

- Spatial range?
  - Travel to work area?
  - Wider area, e.g. 'Northern power-house'
- Attribution to particular transport mode?
- Appropriate controls?
  - Skills intrinsic to people or depend on jobs that are accessible?

I: Productivity: proximity and agglomeration

Quantification 2: Transport improvement → access to economic mass $= \Sigma_j f(d_{ij}) Emp_j$

Forecasting: source of information?

- 'Static clustering':
  - Change d_{ij}: Even if nothing moves, activities become effectively closer
- 'Dynamic clustering':
  - Change Emp_j: Relocation in response to the transport improvement.
  - Locally: Capacity/ design of project
  - Nationally: Requires modelling?
    - Inter-city links
    - Displacement? Highly context specific

Conclusion:

- Reasonably robust evidence on parameters
- Forecasting: context specific, but does not necessarily require full modelling exercise

II: Induced investment and land-use change

- Mechanism: *Transport enables better use of land*

  Two examples:

  - Dependent residential development
  - Large scale retail (or office) development

- Social value:
  - If initial position sub-optimal
  - Expansion of activity brings benefit > cost

II: Induced investment and land-use change

i) Dependent residential development

- Transport improvement opens up area for residential development
- Initial planning restriction is relaxed
- Value is user-benefit (rule of half) + element related to price-cost gap (P_C).

$\Delta W \approx RoH + \{Q_1 - Q_0\} x \{P\_C_1 + P\_C_0\}/2.$

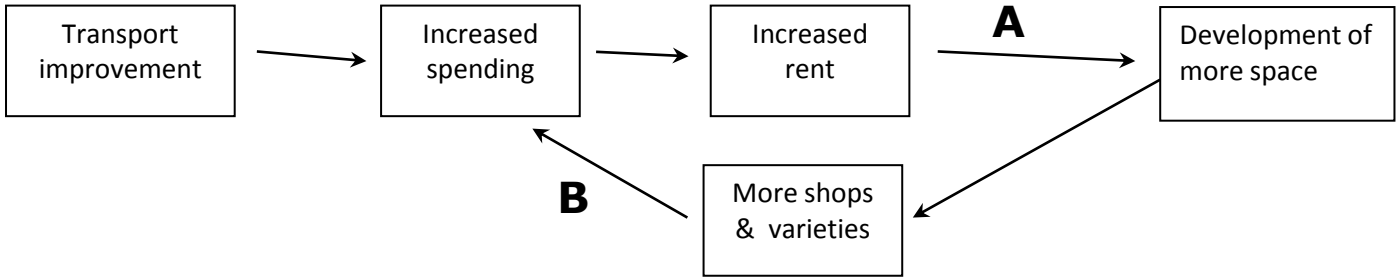
$RoH = - \Delta t\{Q_0 + (Q_1 - Q_0)/2\}$

- NB: Planning controls might be tight…. but optimal given externalities etc
- NB: Both planning change and transport improvement are necessary (but not sufficient) so no way of allocating ΔW between the two policies
- NB: ΔW on new land area equal to land value uplift only if elasticity of demand = ∞, i.e. no price change passed on to consumers.

II: Induced investment and land-use change

ii) **Large scale retail (or office) development**

Capture idea of places becoming more 'attractive'



……..and displacement effects elsewhere.

Two sources of sub-optimal development

A) Developer has monopoly power; (supplies sub-optimal amount of space as knows that development will reduce rents paid)

B) Tenants (retailers) fail to capture all the consumer surplus from the new 'varieties' that they introduce

II: Induced investment and land-use change

Large scale retail (or office) development (continued)

Two sources of sub-optimal development

A) Developer has monopoly power;

B) Shops don't capture all the consumer surplus.

'Wider benefit' if ***either*** A ***or*** B, ***and*** less than 100% displacement from other retail locations.

- ***A***: Price-cost wedge due to monopoly power

  $$\Delta WA \approx \{Q_1 - Q_0\}P\_C = \Delta space \times P\_C = \Delta space \times rent / \eta$$

- ***B***: captures idea that location becomes more attractive:

  $$\Delta WB \approx \Delta consumer\ surplus = (\Delta expenditure)/(\sigma - 1)$$

- $\Delta W \approx RoH + \sum\{\Delta WA + \Delta WB\}$

  Displacement handled by summing over all places.

- NB: Completely different from land value uplift

II: Induced investment and land-use change

Large scale retail (office) development (continued)

- This provides the basis for a workable methodology
- *NOT* derived from an 'attractiveness' shift in the demand curve
- Derived from expected changes in sales at each place and
  - Price-cost gaps
  - Ratio of consumer surplus to expenditure (simplest case, $1/(\sigma - 1)$)

-- grounded in numbers that are subject to commercial test.

- Completely analogous example with office development & change in attractiveness due to agglomeration benefit to firms occupying offices.

III: Labour market: labour force participation

Mechanism: *Transport increases labour force participation*

- Better access to jobs/ job search
- Mitigates discouraged worker effect
- Move to better jobs

Social value:

- Positive value if tax wedges ➔ barriers to work
  - Income tax
  - Benefit withdrawal
- $\Delta W \approx$ RoH + {pre-tax wage – post-tax wage}.Δemployment
  $\approx$ RoH + change in tax revenue

III: Labour market: employment & unemployment

Mechanism: *Transport creates jobs (reduces unemployment*).

- Induced investment ➔ job creation
  - Locally
  - Nationally

Social value:

- Wage > 'shadow price of labour'
- DISPLACEMENT
  - 100% displacement if economy at 'natural rate' of unemployment
  - 100% the benchmark for long-run project?

  → No value from job 'creation' – unless social value of a job varies across place

- Conclusion:
  - Context specific case for valuing participation effects (≈ tax revenue)
  - Job creation: valuable only if regional case is made

Forecasting the quantity changes

Is it possible to forecast the quantity changes?

Under what circumstances do we need models (CGE, LUTI)?

- Local effects:
  - Information from project design, capacity, traffic forecasts
  - Associated commercial case (office space, retail capacity etc.)

- National effects:
  - Need to know changes elsewhere ***only if*** these are subject to the imperfections that create wider benefits (costs)

Forecasting the quantity changes

	Scope of appraisal	
	Local project information	Wider modelling (SCGE, LUTI)
User-benefits	- Direct user-benefits	No: (changes are of zero value)
Productivity	- Static clustering - Dynamic clustering:	No: (changes in 'distance' given employment) No: If employment change determined by project design/ capacity. Yes: If likely displacement of activities with agglomeration potential
Investment & land-use change	- Residential - Commercial:	No: (constrained elsewhere) No: If activity change determined by project design/ capacity. Yes: If likely displacement of activities with similar market failures
Employment	- Participation & better jobs - Unemployment	No: (local effects only) Yes: If regional distribution is of interest If national displacement < 100%

Forecasting the quantity changes

Many cases can be handled by modular approach

- Add up user-benefits and wider effects
- 'Bottom-up' approach:
  - local knowledge
  - Sector specific estimates of displacement

Where modelling is undertaken

- Needs to capture the strategic arguments: – tailor to the context.
- Simple targeted models better than large black box
- Use scenarios --

Concluding comments

- Capture idea that transport brings benefits over and above user-benefit
- Incorporate changes in location attractiveness
  - To producers: agglomeration
  - To consumers: 'variety' and choice
  - Other effects.... Coordination failures of various types?
- Ground firmly in tradition of applied welfare economics
  - Identify the market failure and build up.
- Evidence base
  - From evaluation of previous transport improvements?
    - Important but: identification/ endogeneity/ generalisability
  - From researching the key parameters
- Application
  - Context specificity: link strategic and economic case
  - Toolkit that does not always require large scale modelling
  - Base on variables that are observable and parameters that are well-researched.
  - Transparency: need for appraisal to be comprehensible and hence inform public debate.