Transport modelling, microsimulation and other issues in land-use/economic/transport modelling practice

David Simmonds

David Simmonds Consultancy &

Heriot-Watt University

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URBAN, REGIONAL AND TRANSPORT PLANNING

The British context(s) – investment issues

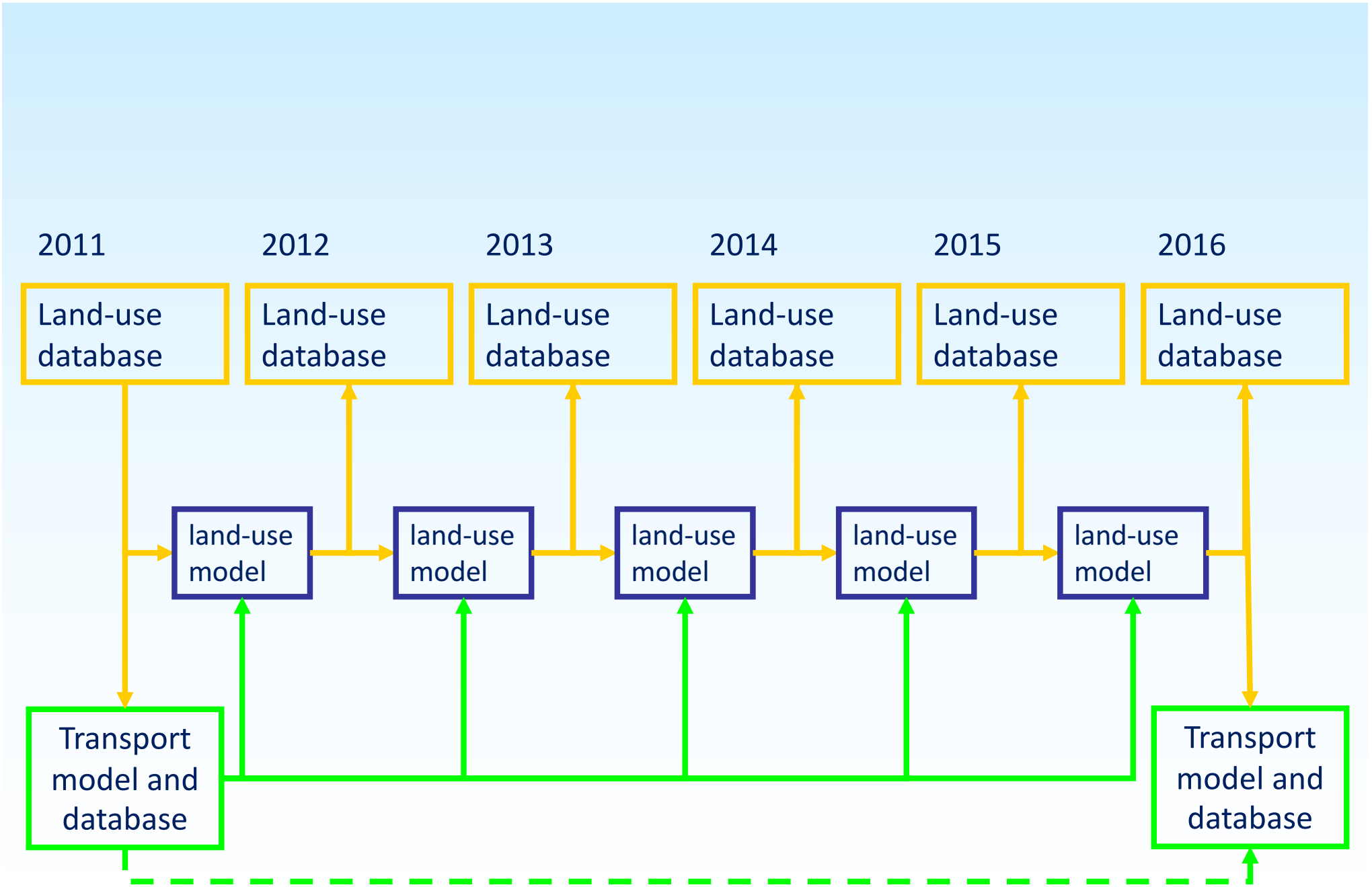
- Major investment proposals and need for investment to renew/extend existing infrastructure (of all kinds)
- Major housing crisis:
  - associated planning arguments

The British context(s) - governance

- Planning and surface transport in Scotland and Wales are devolved to their respective governments (but financial devolution has lagged behind)
- In England, ultimate control of these matters has remained highly centralized but there are initiatives for devolution to city regions within England involving
  - directly elected mayors for these city regions
  - indirectly elected bodies ("Combined Authorities") to whom they will be accountable
  - new borrowing powers and devolution of some tax revenues (mainly property taxes)
  - Central Government support for substantial investment programmes – the "City Deals".

The British context(s) – analytical requirements

- Concern over investment proposals is split between economic and environmental impacts
- …more analysis is being demanded for both
- Transport analysis has remained very conventional but become much more detailed
- …in consequence transport models have got slower, despite faster computing power
- At the same time some of the demands for analysis of alternative investment programmes are set to much shorter political timescales
- Result: impossibility…



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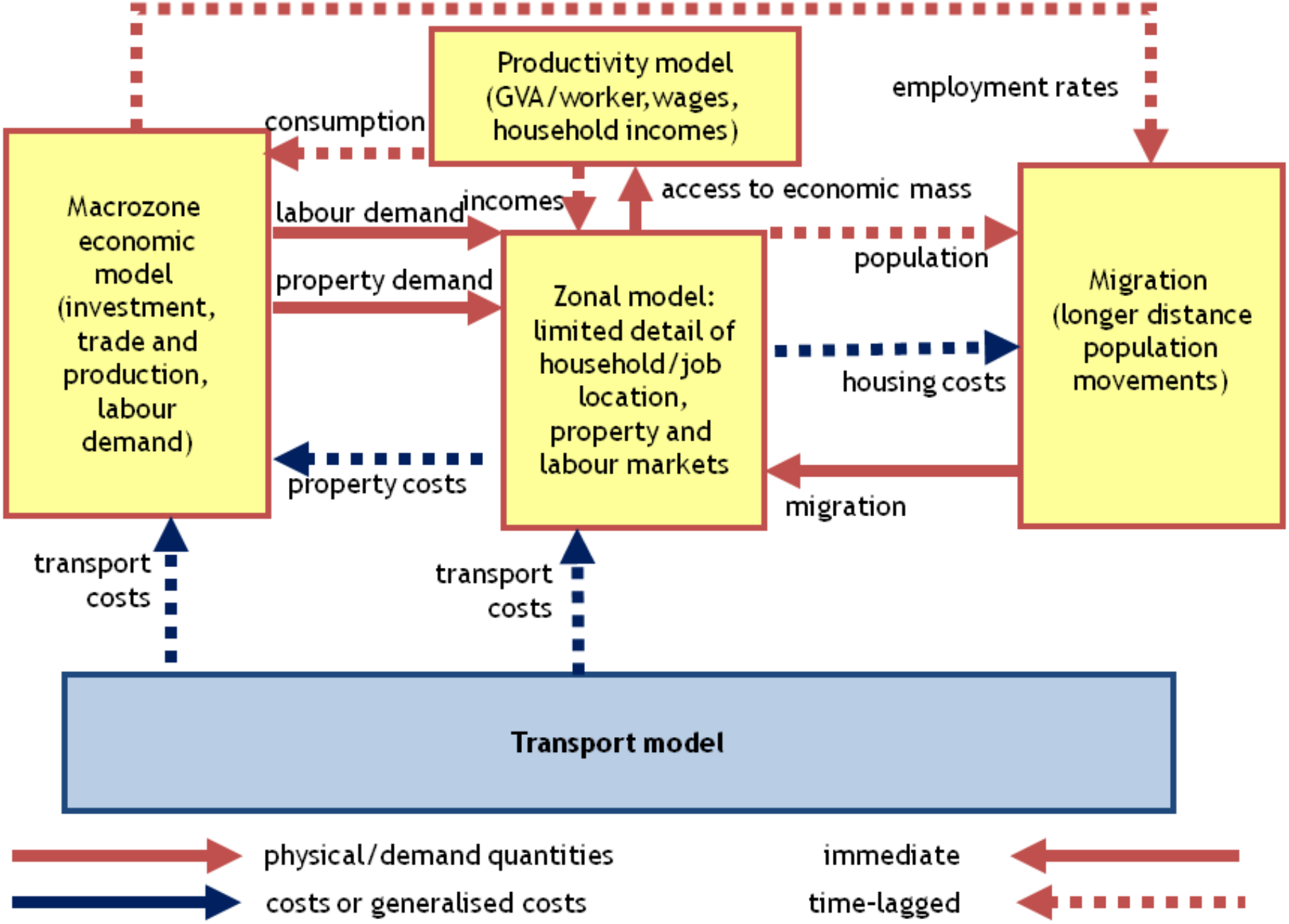
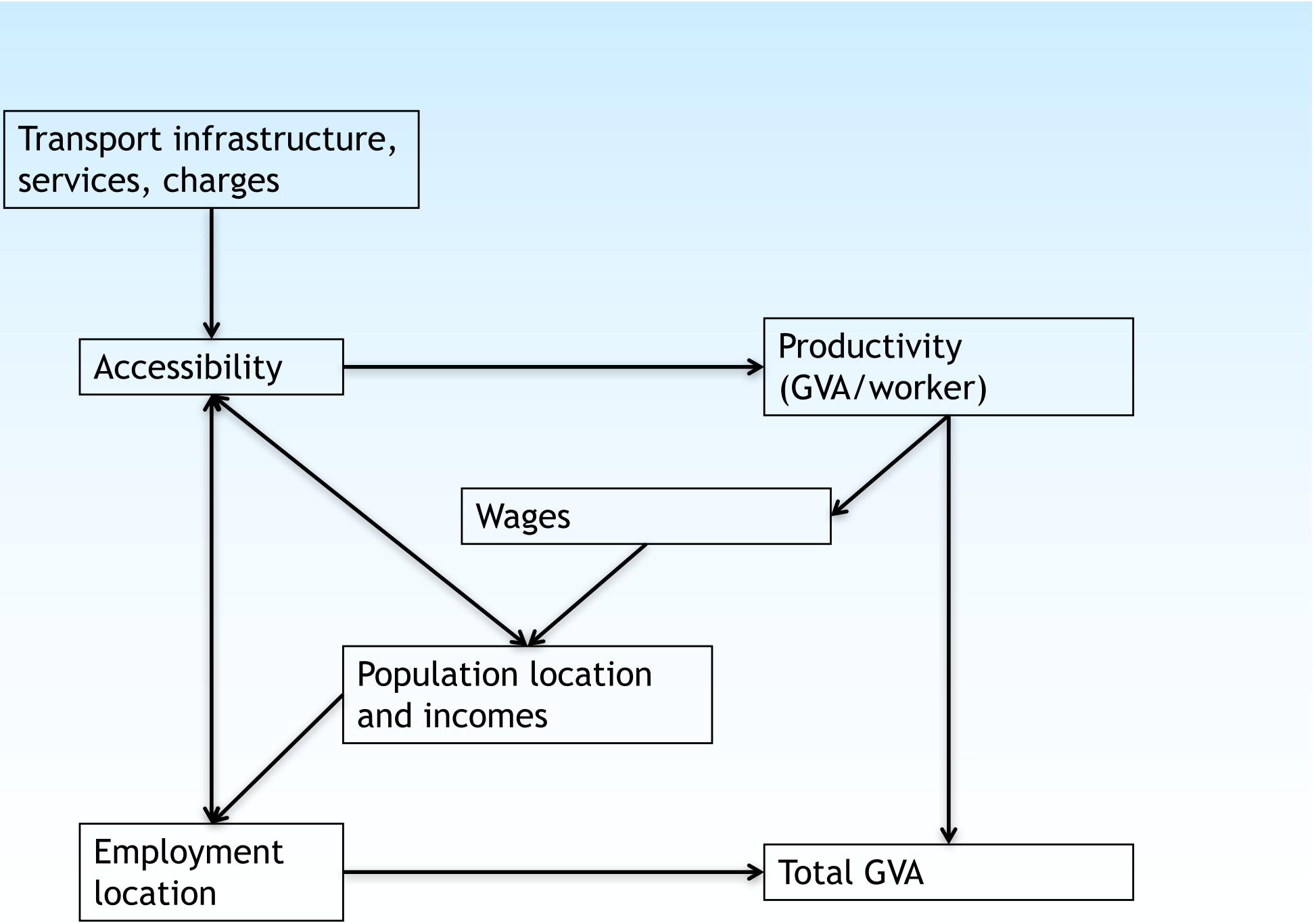
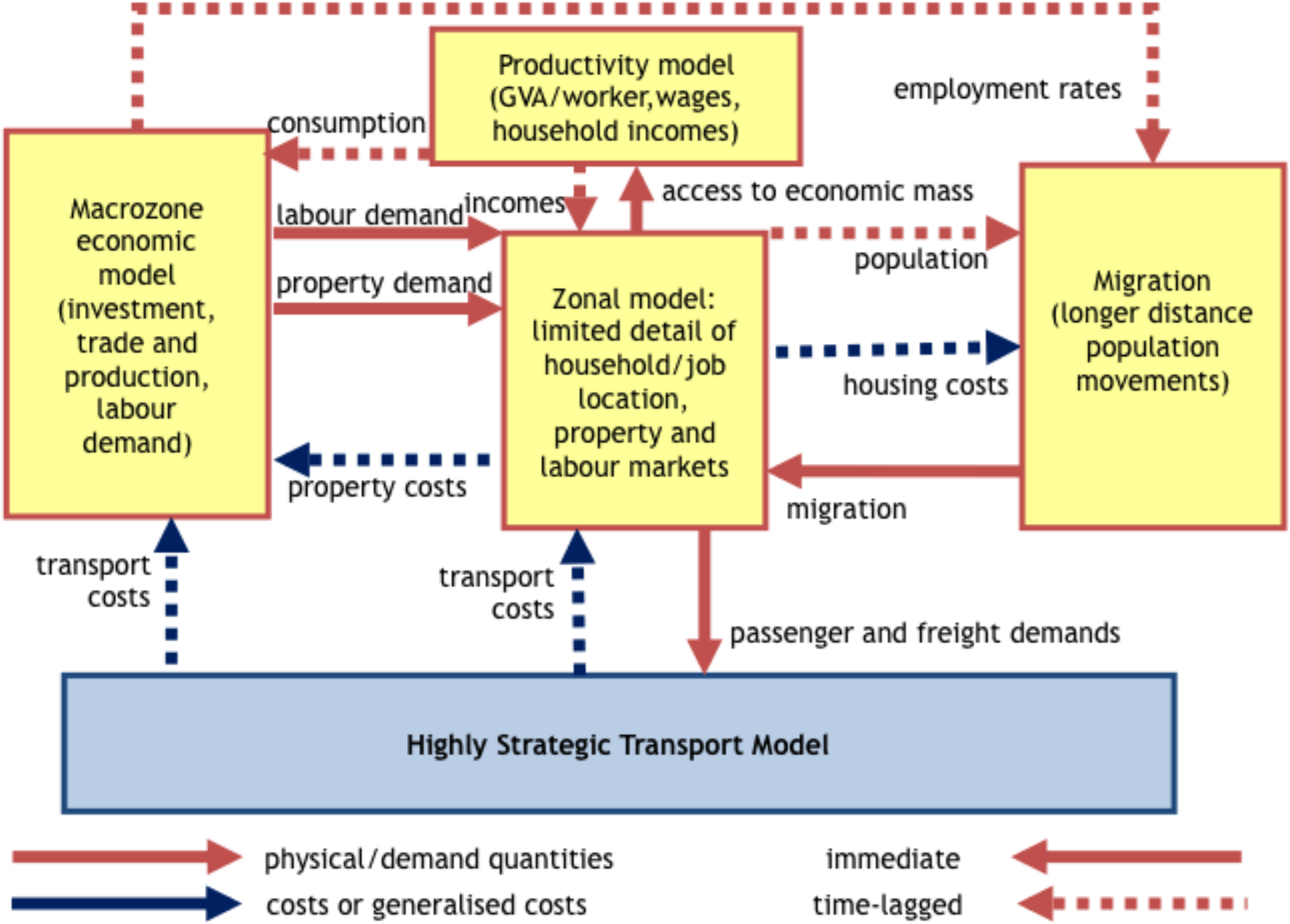

Productivity model (GVA/worker, wages, household incomes)
employment rates
consumption
Macrozone economic model (investment, trade and production, labour demand)
labour demand
incomes
access to economic mass
population
property demand
Zonal model: limited detail of household/job location, property and labour markets
Migration (longer distance population movements)
housing costs
property costs
migration
transport costs
transport costs
Transport model
physical/demand quantities
costs or generalised costs
immediate
time-lagged


Transport infrastructure, services, charges
Accessibility
Productivity (GVA/worker)
Wages
Population location and incomes
Employment location
Total GVA

Meeting these challenges

- Most full land-use/economy/transport interaction models taking days or weeks to run
- A lot of model running done with previously produced transport model outputs (generalised costs and traffic volumes) – the term Land-Use Model Influenced by Transport or LUMIT invented to distinguish this from full LUTI
- "Highly Strategic Transport Model" developed for cases where LUTI is impractical but LUMIT is insufficient – essentially just enough transport modelling to generate approximately located area-level congestion responses to significant levels of development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passenger and freight demands
Highly Strategic Transport Model
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What role for microsimulation?

- Nearly a decade ago we developed a microsimulation version of our DELTA package – called SimDELTA
- SimDELTA was [is?] micro in treatment of households and household members, but aggregate in space (and transport – the implementation of SimDELTA was what we would now call a LUMIT model)
- Lessons from the SimDELTA experience

Lessons from SimDELTA: positives

- The benefits in terms of flexibility (of variables, functions etc) are real *if* the project has the resources
  - to ensure that additional "independent" variables can be forecast
  - to implement and calibrate functions that go beyond conventional logit models
  - to deal with other complications arising...

Lessons from SimDELTA: negatives

- The use of Monte Carlo simulation creates
  - significant problems in model testing
  - major issues of stochastic variation in results, especially where there is a requirement to produce results for relatively small areas [or simply to test the impact of relatively small changes].

Lessons from SimDELTA: conclusions

- Use of microsimulation seems strongly indicated for research aimed at better understanding of the processes of urban change
- It is strongly *contra-indicated* for application work which requires rapid production of results for relatively subtle interventions (and combinations of these interventions)
- A potentially valuable way forward is to use outputs from well-calibrated microsimulation models to produce synthetic data on which aggregate models can be calibrated for use in particular situations. So far this has been done for demographic transitions

Current/future developments

- Improved modelling of labour market and other supply constraints
- Very selective extension of the Highly Strategic Transport Model for car parking and travel time reliability?

Thank you for your attention!

David Simmonds

david.simmonds@davidsimmonds.com

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