Urban economics and energy use: from pounds to electrons

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Outline

- Context
- Research question
- Background
- Approach
- Steps forward

Changing supply mix & marginal costs

- Climate Change Act (2008)
- European targets
- Intermittency
- Marginal cost of electricity
- Bridge et al (2013), Balta-Ozkan et al (2015): spatially uneven development

Agglomeration economies

- Marshall (1920): benefits from the reduced costs of moving goods, people or ideas
- Consumers benefit from variety
- Industrial zones, local enterprise partnerships, shopping districts, CBD

Research question

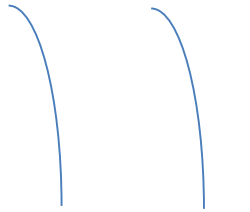
- Shops with similar demand patterns
- At what level of economic concentration do the marginal costs of electricity provision outweigh the marginal benefits of agglomeration?

Background

- Lack of marginal pricing of new infrastructure – urban sprawl (Brueckner 2000), traffic congestion
- Rivera-Batiz (1988) agglomeration economies in consumption and production
  - Consumer & producer services, industrial good
- Verhoef and Nijkamp (2002) trade-off for pollution control vs expansion of economic activity
- General equilibrium analysis based on micro-economic theory

Pollution externalities

- Verhoef and Nijkamp (2002): mutual interactions between Y, E, z, L
- U=f(industrial good, space, leisure, env quality)
- Excess land rent, R; city population N
- Budget constraint
  - $R/N+w(T-T_{commute}-T_{leisure})-py-rs=0$
- Production= f(labour, energy)
- 2 types of agglomeration benefits: learning by doing (linked to output) or larger labour size (specialisation)



Pollution externalities (2)

Maximize $$U(z) = y(z)^{\alpha_y} \cdot s(z)^{\alpha_s} \cdot T_f(z)^{\alpha_f} \cdot \mathrm{Eq}(z)^{\alpha_e}$$

with: $$\alpha_y + \alpha_s + \alpha_f = 1$$

Budget Constraint $$\frac{R}{N} + w(T - t \cdot z - T_f(z)) - p \cdot y(z) - r(z) \cdot s(z)$$

Urban aggregate Production function $$Q = A((\delta_L \cdot L)^{\rho} + (\delta_E \cdot \mathrm{En})^{\rho})^{1/\rho}$$

Reflections

- Social planner's optimisation problem
  - Agency: network assets vs local benefits/ disbenefits
- Cooperative vs non-cooperative solutions
  - Storage?

Next steps

- Solve the model for optimal solution
- Estimate the model with real world data
- Possible data issues:
  - Scale of analysis: hourly or half hourly?
  - Sales data?
  - Electricity consumption

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