Energy Services and Energy History: Lighting and Transport in the UK

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Energy use and energy services

- Energy economists focus on costs of fuels & energy technologies, which are traded and have a market price.
- But benefits from energy access involve satisfaction from energy services (like illumination, comfortable temperatures & transportation)
- Got from combinations of fuel, appliances, energy infrastructures & institutions.
- Access to modern fuels/technologies enhances quality & affordability of energy services
  - hence big welfare gains.
- Analysis of history of services
  - Helps understand innovation and increases in efficiency
  - And how energy (service) markets are born, develop and decline
- This is illustrated in the case of lighting & transport services.
Lighting services

• Over the past three centuries industrialized societies have been freed from dependence on sun & moonlight
• Technological innovation, mass production, improved infrastructures, falling fuel costs & rising incomes have revolutionized our ability to illuminate.
• Aim – look at UK evidence on:
  – Falling cost of illumination & rise in light use
  – From 1300-2000 in the UK
Population & GDP per cap. (at year 2000 prices), 1500-1800
Population & real GDP per cap. (year 2000 prices), 1500-2000
Fig. 1: Price of Tallow Candles and Whale Oil Light in the UK, 1300-1900 (£ per million lumen-hours)
Fig. 2. UK Consumption of Tallow Candle & Whale Oil Light, 1711-1900 (billion lumen-hours),
Fig. 3. UK Consumption of Gas, Kerosene & Candle Light, 1800-1900 (billion lumen-hours)
Fig. 4. UK Consumption of Kerosene, Gas and Electric Light 1900-2000 (billion lumen-hours)
Fig. 5. UK Price of Gas, Kerosene & Electric Light (£ per million lumen-hours), 1800-2000

Electric light achieved parity with gas by 1920.
Fig. 6: UK Weighted Average Price of Lighting, 1300-2000 (£ per million lumen-hours)
<table>
<thead>
<tr>
<th>Year</th>
<th>Real Price of Fuel Index</th>
<th>Efficiency of Lighting Index</th>
<th>Real Price of Lighting Index</th>
<th>Consumption of Lighting Index</th>
<th>GDP per capita Index</th>
<th>£(2000)</th>
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<tbody>
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<td>1300</td>
<td>280</td>
<td>50</td>
<td>600</td>
<td>-</td>
<td>25</td>
<td>300</td>
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<tr>
<td>1800</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>1,200</td>
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<tr>
<td>1900</td>
<td>27</td>
<td>1,450</td>
<td>2.4</td>
<td>22,000</td>
<td>290</td>
<td>3,500</td>
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<tr>
<td>2000</td>
<td>18</td>
<td>70,000</td>
<td>0.03</td>
<td>3,400,000</td>
<td>1,500</td>
<td>17,500</td>
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</table>
Fig. 7: Indexes of Key Lighting Variables in the UK (1300-2000) – log scale on y axis
Long Run Trends in UK Lighting Services (1300-2000)

- By 1800 lighting services cost 1/6th of their 1300 value.
- By 1900 lighting services cost 1/40th of their 1800 value.
- By 2000 lighting cost
  - 1/80th of its cost 100 years ago (in 1900)
  - 1/350th of its cost 200 years ago (in 1800)
  - 1/2000th of its cost 700 years ago (in 1300)

- GDP per capita has risen 15 fold since 1800, i.e.
  - Three fold from 1800-1900, then five fold from 1900-2000
- And total UK lighting consumption has risen 34,000 times
- Average UK household consumes 200 times more lighting than in 1800

- And in rural areas of poorer countries today?
Transport Services: Long Run Trends in UK Road and Rail (since 1700)

- Speed: 20-fold increase
- Prices: 400-fold decrease in Freight Prices
  150-fold decrease in Passenger Prices
- Income: 20-fold increase
- Consumption: 1,000-fold increase in Freight Use
  350-fold increase in Passenger Use
Implications (1)

• Highlights big & increasing gaps between rich and poor

• Arising from differential access to modern fuels, technologies, energy infrastructures & institutions
  – the poor often pay more per unit of energy service

• So innovations in energy service provision vital for increasing welfare
Implications (2)

• Energy service innovations also play important role in
  – energy & environmental resource depletion
  – and local, regional & global pollution.
• Insights about fuel use and emissions trends might be got from enhanced understanding of relationships between:
  – energy use, energy technologies & delivered energy services, and
  – between energy service consumption, GDP growth and energy service prices.
• We have limited understanding of impact of innovation on energy service costs and evolution of demand over waves of socio-economic & technological development.
Innovation, Energy Services and Policy Mixes

• Local, regional & global sustainability challenges suggest value of focus on
• Innovations in
  – Fuels, appliances, energy infrastructures & institutions
  – Leading to step changes in energy resource efficiency => quantity & quality of service attributes => costs & prices => economic welfare
• So need to understand:
  – Forces influencing innovations in energy service supply & prices
  – Role of policy interventions
• Suggests need for
  – Innovation policies that address energy/environment concerns
  – Energy/environment policies that address innovation
  – Sustainable energy policy mixes that act synergistically not antagonistically.
Sources


