Was Allen right?

Energy prices in Great Britain and Sweden in historical perspective

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1 Introduction

2 Energy and the industrial revolution
   5 stylized facts of the Industrial revolution
   the high wage economy debate

3 Energy prices in the long run. Sweden
   Firewood
   Coal
   Ratio and long run trend

4 Preliminary conclusions
Classical Economists

- Smith, Malthus and Ricardo coincided in the limits of the organic economy
Classical Economists

- Smith, Malthus and Ricardo coincided in the limits of the organic economy
  - Three factors: $Y = K + L + Ln$
  - $K$ and $L$ could be reproducible
  - $Ln$ is finite
Classical Economists

- Smith, Malthus and Ricardo coincided in the limits of the organic economy
  - $Ln$ is finite
Debate around Coal

- Clark and Jacks [2007] emphasise the possibilities of England (+Wales) to do the Industrial revolution without coal
  - Firewood as substitute
  - Institutions are the main causes of the IR
- The *classical* explanation [Wrigley, 1962, 2010] has been reinforced by the cliometrics analysis [Allen, 2009; Rourke and Fernihough, 2014]
  - [Allen, 2009] exposes that the energy/labour ratio is lower in England than in the rest of Europe → incentive to invest in saving labour machinery
  - [Rourke and Fernihough, 2014]
5 stylized facts of the Industrial revolution

Voth [2003]

- Slow productivity and output growth
- Stagnant living standards
- Rising labour input
- Structural change
- Rapid demographic growth
5 stylized facts of the Industrial revolution

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Slow growth

Output and productivity growth

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Stagnant living standards

GDP per worker and wages
Rising labour input
GDP per capita and working hours (weekly)

<table>
<thead>
<tr>
<th>Country</th>
<th>GDP per Capita</th>
<th>Hours/Weekly</th>
<th>Country</th>
<th>GDP per Capita</th>
<th>Hours/Weekly</th>
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<td>Sri Lanka</td>
<td>47,4</td>
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<td>Germany 1820-30</td>
<td>937</td>
<td>75</td>
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<td>Ecuador</td>
<td>1150</td>
<td>44,0</td>
<td>Germany 1870-80</td>
<td>1300</td>
<td>72</td>
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<td>UK 1856</td>
<td>1888</td>
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<td>48,6</td>
<td>UK 1856</td>
<td>2610</td>
<td>56</td>
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<tr>
<td>Egypt</td>
<td>620</td>
<td>56,0</td>
<td>France 1856</td>
<td>1379</td>
<td>72</td>
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<tr>
<td>Kenya</td>
<td>300</td>
<td>42,0</td>
<td>France 1910</td>
<td>2734</td>
<td>60</td>
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<tr>
<td>Bolivia</td>
<td>440</td>
<td>44,9</td>
<td>USA 1832</td>
<td>1048</td>
<td>67,8</td>
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<tr>
<td>Chile</td>
<td>1410</td>
<td>43,1</td>
<td>USA 1880</td>
<td>2247</td>
<td>60,5</td>
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<tr>
<td>Uruguay</td>
<td>1500</td>
<td>43,4</td>
<td></td>
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<td>Paraguay</td>
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<td>47,0</td>
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<td>Costa Rica</td>
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<td>Poland</td>
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<td>38,3</td>
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<tr>
<td>Portugal</td>
<td>2220</td>
<td>38,8</td>
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<td>Average</td>
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<td>45,0</td>
<td>Average</td>
<td>1768</td>
<td>66</td>
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## Structural change

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<th>1760</th>
<th>1840</th>
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<td><strong>Employment (male)</strong></td>
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<tr>
<td>Agriculture</td>
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<td>61,2</td>
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<tr>
<td>European average</td>
<td>72</td>
<td>66,2</td>
<td>54,9</td>
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<tr>
<td>Industry</td>
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<tr>
<td>Great Britain</td>
<td>18,5</td>
<td>23,8</td>
<td>47,3</td>
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<tr>
<td>European average</td>
<td>12,6</td>
<td>16,9</td>
<td>25,3</td>
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<tr>
<td>Services</td>
<td></td>
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</tr>
<tr>
<td>Great Britain</td>
<td>20,3</td>
<td>23,4</td>
<td>24,1</td>
</tr>
<tr>
<td>European average</td>
<td>15,4</td>
<td>16,9</td>
<td>19,8</td>
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<tr>
<td><strong>Output</strong></td>
<td></td>
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</tr>
<tr>
<td>Agriculture</td>
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<td></td>
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<tr>
<td>Great Britain</td>
<td>37,4</td>
<td>37,5</td>
<td>24,9</td>
</tr>
<tr>
<td>European average</td>
<td>51,4</td>
<td>46,6</td>
<td>37,2</td>
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<tr>
<td>Industry</td>
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<tr>
<td>Great Britain</td>
<td>20</td>
<td>20</td>
<td>31,5</td>
</tr>
<tr>
<td>European average</td>
<td>19,3</td>
<td>21,3</td>
<td>25,2</td>
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<tr>
<td>Services</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Great Britain</td>
<td>42,6</td>
<td>42,5</td>
<td>43,6</td>
</tr>
<tr>
<td>European average</td>
<td>29,3</td>
<td>32,1</td>
<td>37,6</td>
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<tr>
<td>Income per capita (1970 US dollars)</td>
<td>333</td>
<td>399</td>
<td>567</td>
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</table>
Rapid demographic growth

Demographic growth, England and Wales

<table>
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<tr>
<th>Year</th>
<th>Population (Millions)</th>
<th>growth rate</th>
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<tbody>
<tr>
<td>1700</td>
<td>5,50</td>
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<td>1750</td>
<td>6,50</td>
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<td>1800</td>
<td>9,00</td>
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<tr>
<td>1850</td>
<td>17,90</td>
<td>1,38</td>
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<td>1900</td>
<td>32,50</td>
<td>1,20</td>
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<tr>
<td>1950</td>
<td>43,60</td>
<td>0,59</td>
</tr>
<tr>
<td>2000</td>
<td>52,00</td>
<td>0,35</td>
</tr>
</tbody>
</table>
High wage economy debate

Main ideas by Allen

- The wages in Britain are comparative (and in relative terms) higher than the rest of the world
- The energy prices are cheaper than Europe because the existence of abundant coal mines [Allen, 2009]
- The energy/labour ratio is an incentive to invest in machinery
High wage economy debate

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High wage economy debate

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- The energy/labour ratio is an incentive to invest in machinery.
Relative wages
Daily salaries in silver grams. Several European cities

Antwerp

Amsterdam

London

Paris

Strasbourg

Florence

Milan

Valencia

Madrid
Coal prices in Great Britain
Coal prices £ 2000 in TOE

![Graph showing coal prices in Great Britain from 1700 to 1900. The prices fluctuate significantly over time, with peaks around 1820 and 1870.]

\[ \log Y = -3.01 + 0.0161t \]  
(annual growth 1.62%)
• **Data Reconstruction on prices since XVIth century**
  
  • Firewood Consumption Lindmark & Olsson Spjut (2016), ”Industrialization and the transformation of the organic energy system: revisiting Sweden 1800-1913”, forthcoming
  
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Firewood price in the long run

Grams of silver per MJ
Coal Price in the long run

Coal prices in grams of silver/MJ 1700 - 1913
Ratios between Firewood and Charcoal with Coal

Firewood/Coal and Charcoal/Coal grms of silver/MJ. 1700 - 1913
• The energy price plays a role in industrial revolution
• The role is not so clear in latecomers
• Energy matrix is important to understand the incentives
• Two Papers
  • Allen was right? Cobb - Douglas estimation including energy
  • Energy price elasticities in the long run. Capital and Energy by sectors


