Sex, Gutenberg, and the Steam Engine: The English Industrial Revolution

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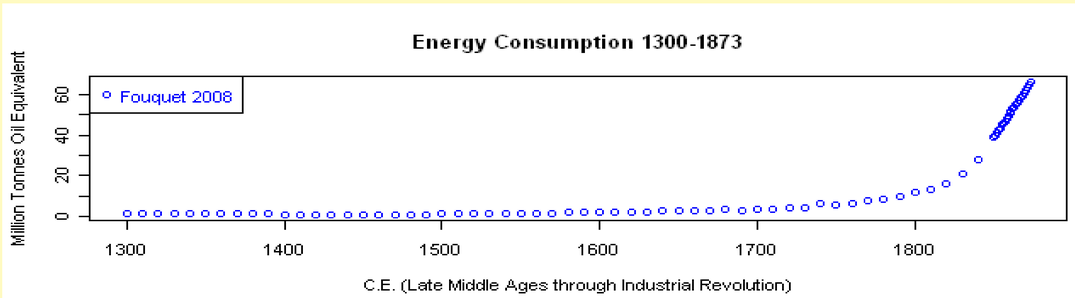
Contribution

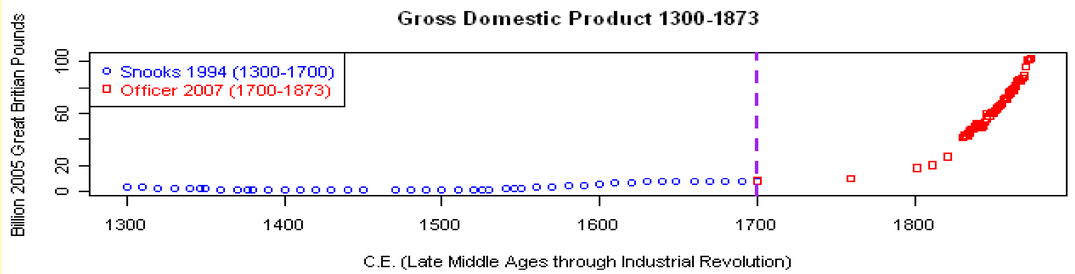
- The English discovered how to consume an unlimited quantity of mineral (coal) energy, and thus for the first time created sustained per-capita growth in the Kuznets sense. I introduce a new approach to quantify the major outcome, the major invention, and the primary institutional support for the English Industrial Revolution.
- I use Copenhagen School Cointegrated Vector Autoregression methods, with a vector error correction model if indicated by statistical testing, over long historical series to describe the structural dynamics and key drivers of the Industrial Revolution.

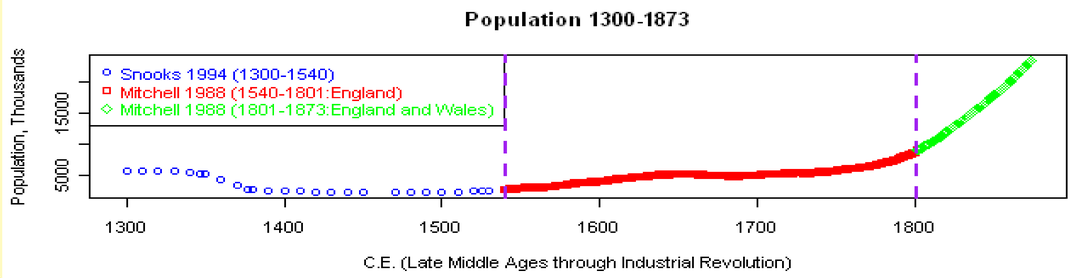
Research Questions

Why England? Why then?
Without relatively cheap tidewater coal . . .
and "sex" – a general increase in aggregate demand due to the rise of the European Marriage Pattern (EMP) . . .
and Gutenberg – knowledge accumulation and dispersion. . .
and export growth – a state supported boost to aggregate demand . . .
would there have been an English Industrial Revolution there and then?

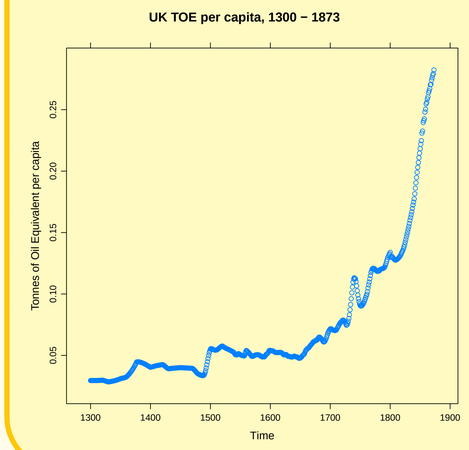
The English Data Series



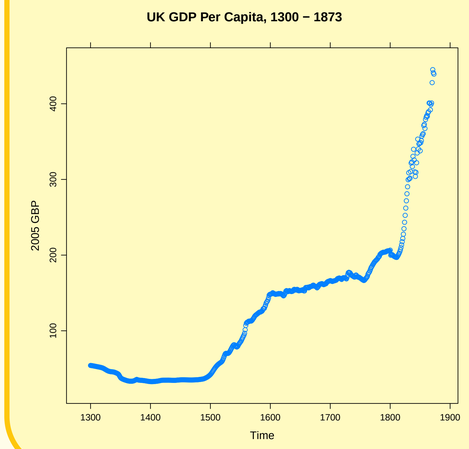




English MTOE Consumed p. Capita



English GDP per Capita

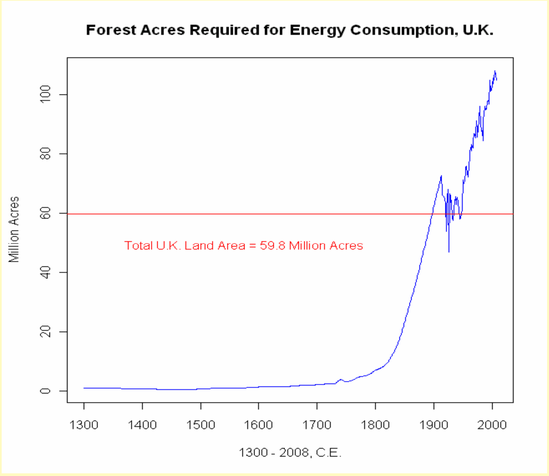


Cointegrated Vector Autoregressive Error Correction Model

$$\mathbf{x}_t = \mathbf{\Pi}_1 \mathbf{x}_{t-1} + \cdots + \mathbf{\Pi}_k \mathbf{x}_{t-k} + \mathbf{\Phi}_{s1} D_{sDemandChange_t} + \mathbf{\Phi}_{s2} D_{sTechnicalChange_t} + \mathbf{\Phi}_{s3} D_{sExports_t} + \mathbf{\Phi}_{trend} t + \boldsymbol{\mu}_0 + \boldsymbol{\epsilon}_t,$$

where $\mathbf{x}' = \{ln(energyConsumption), ln(GDP), ln(population)\}$,
$\mathbf{\Pi_t}$ is a time-varying coefficient matrix,
k denotes the lag length structure,
$\mathbf{\Phi_{s1}}$ is a mean-shift dummy variable vector for the social-institutional change in income levels and distribution reflected in rising consumer demand,
$\mathbf{\Phi_{s2}}$ is a mean-shift dummy variable vector for for inventor/entrepreneurs to accumulate and disseminate technical knowledge,
$\mathbf{\Phi_{s3}}$ is a mean-shift dummy variable vector for the social-institutional change in export levels reflected in rising external demand,
$\mathbf{\Phi_{trend}}$ is a deterministic time trend vector, and
$\boldsymbol{\mu}_0$ is a vector of constants.

Organic Energy Counterfactual



Book Consumption