

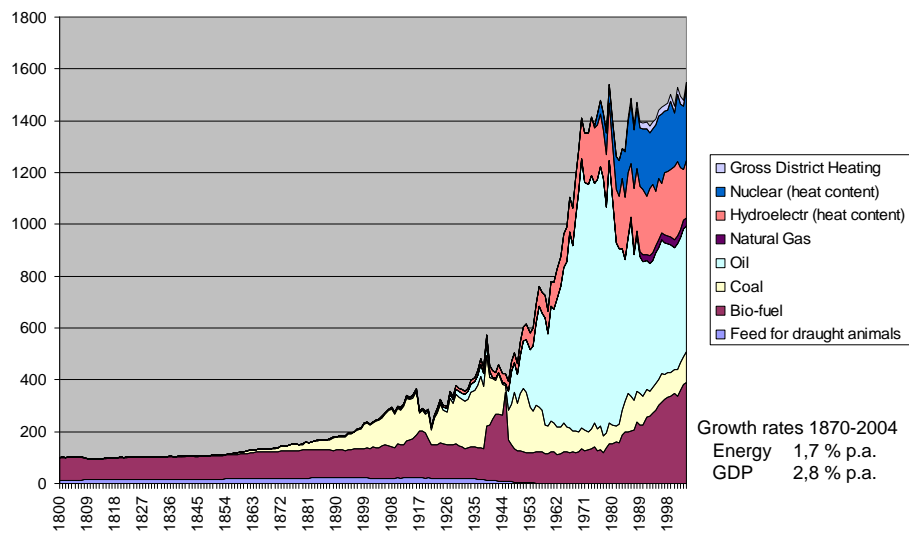
# Economic Growth and Energy

## – some perspectives from Economic History

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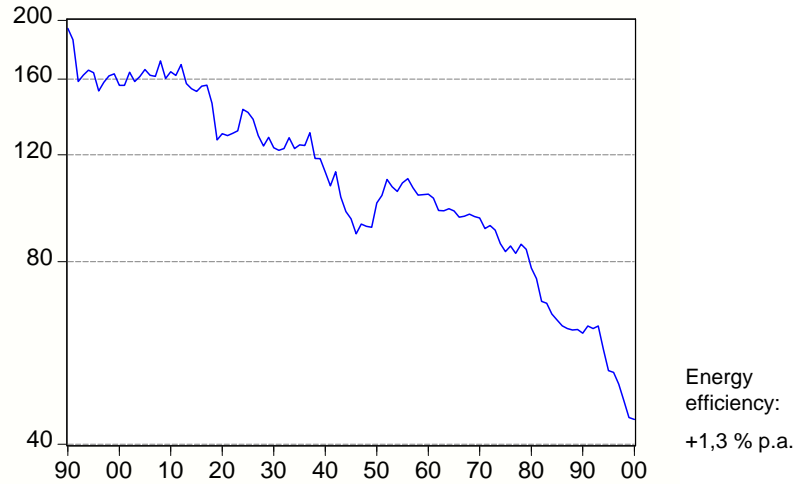
LU Biofuels Seminar October 23, 2009

Figure 1: Swedish energy consumption  
1800-2004, in PJ



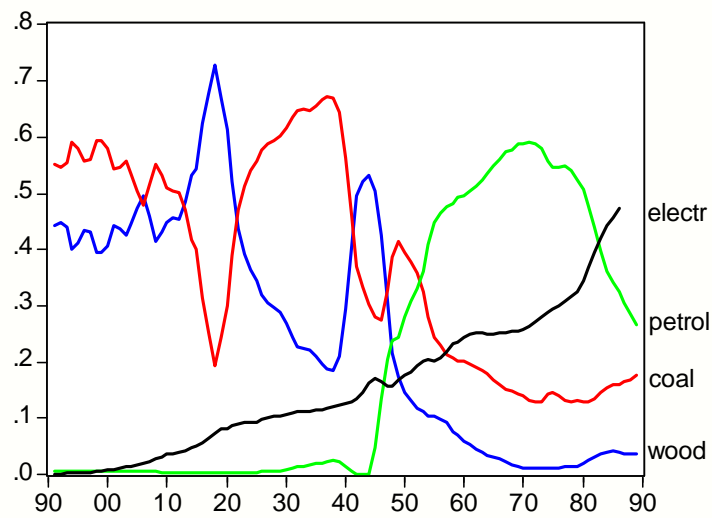
Source: Kander 2008

Specific energy use (energy intensity) in Swedish industry 1890-2000. Index 1950=100.



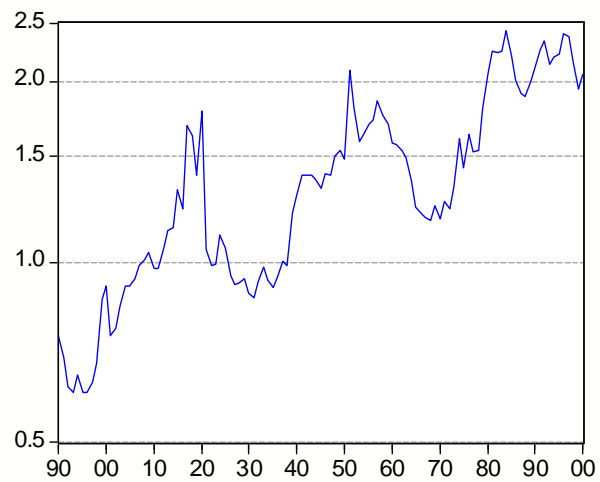
Source: Schön (1990); Statistics Sweden

Energy carriers' share of industrial energy use in Sweden 1890-1990



Source: Schön (1990)

Relative price of energy to machinery 1890-2000. Index 1910/12=1.



### Long term shifts in relative prices of energy

Time perspectives differ between sectors. Generally supply functions in primary sectors (energy) are less elastic than in secondary sectors (manufacturing).

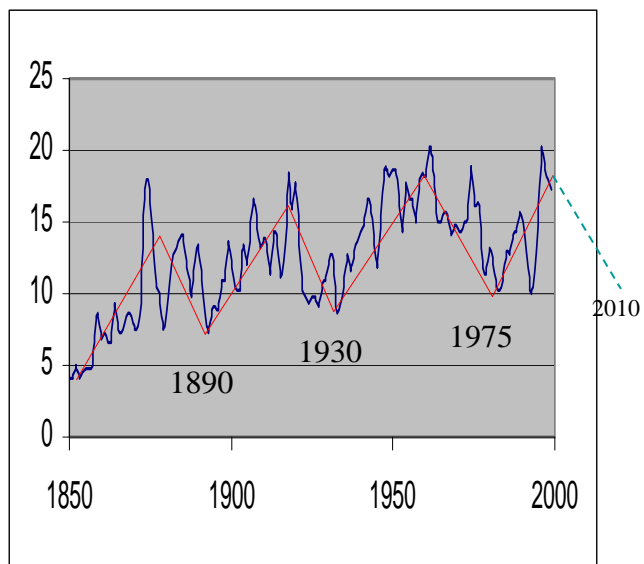
→ the Rostowian long cyclical pattern in relative prices of the primary and secondary sectors

## From a typology of energy epochs to the dynamics of technological and economic change

The Development Block approach (Erik Dahmén 1950)

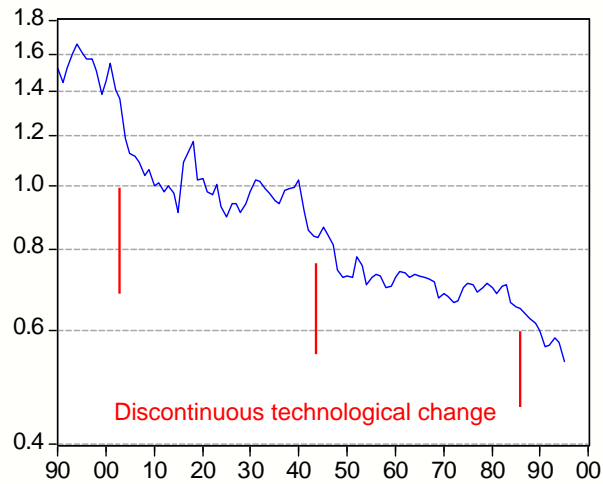
- complementarities around innovations create dynamic imbalances that foster transformation of the economy (and growth)
- the ability to transform the economy (structural change) is vital to long term economic growth'
- energy is crucial in such transformations

### Investment ratio in Swedish industry 1850-2000



Transformation → Rationalisation → Crisis

Relative price of machinery to industrial consumption goods 1890-1995. Index 1910/12=1.



Discontinuous technological change with new generations of motors and machinery part of a broader transformation

- in the energy technology
- in the industrial structure
- in epochs of growth

## Some challenges for the next decades

- Chinese and Indian industrialization – on the energy intensive trajectory?
- The main development blocks: ICT and Biotech - can these development blocks stop the relative price increase of energy?
- Innovative responses: from green biotech and other renewables?