3

Economic and Social Impacts

Wirtschaftliche und gesellschaftliche Auswirkungen

Impacts of TC on Economy

- Output growth
- Scale and scope economies
- Productivity and efficiency
- Prices
- Variety, complexity, quality
- Division of labor

Impacts of TC on Growth

- Direct: Output growth
  (new products/services)
- Indirect:
  -- Productivity growth
  -- Price declines
  -- Quality improvements
- Indirect:
  -- Less *in* per *out* (resource sparing)
  -- More *out* per *in* (yet more growth)

Output

Growth of Mass Production/Consumption

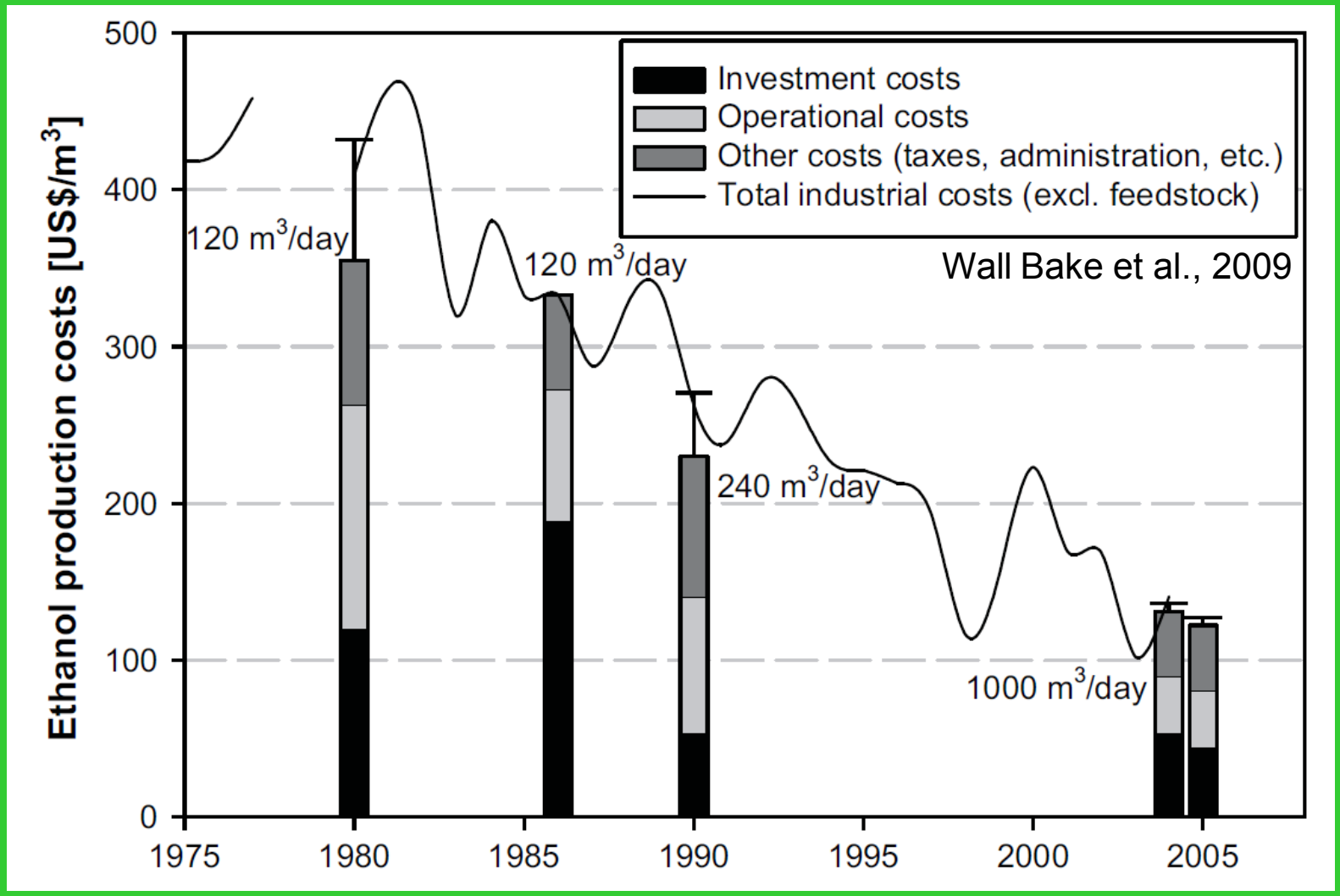
	1950	2005	Factor increase
Objects in Use:			
Merchant ships (10^6 dwt)	**93**	**633**	**7**
Motor vehicles (10^6)	**70**	**882**	**13**
Telephones, fixed+mobile (10^6)	**70**	**3480**	**50**
Radio sets (10^6)	**226**	**2505**	**11**
TV sets (10^6)	**45**	**1988**	**44**
Annual Production:			
New book titles (10^6)	**<200**	**~1000**	**>5**
Raw steel (106 t)	**188**	**1147**	**6**
Paper (106 t)	**50**	**364**	**7**
Fertilizer (106 t nutrient-equiv)	**13**	**171**	**13**
Activity per Year:			
International tourists (10^6)	**28**	**811**	**29**
Air passengers (10^6)	**23**	**1970**	**86**

Data sources: UN, World Bank, ITU, IISI

Scale

Increasing Scale → Economies of Scale

ex. Brazil ethanol (scale and production costs w/o feedstocks)

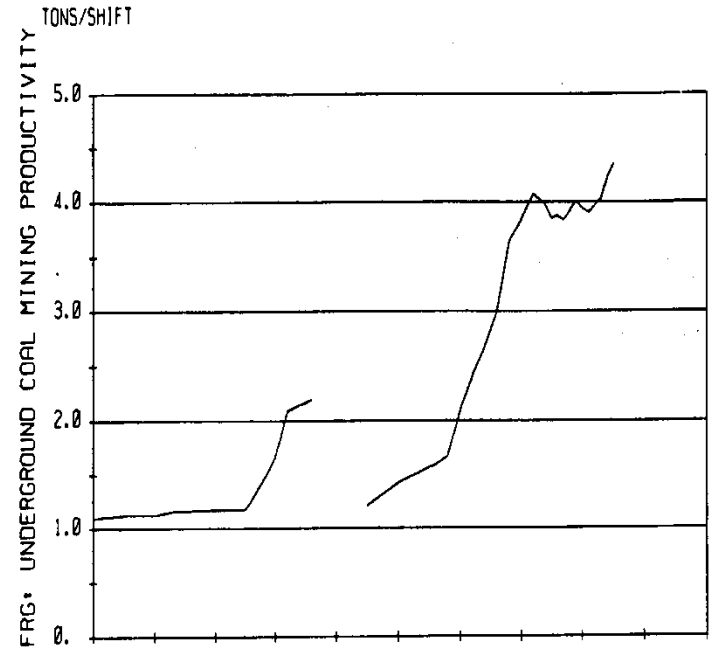


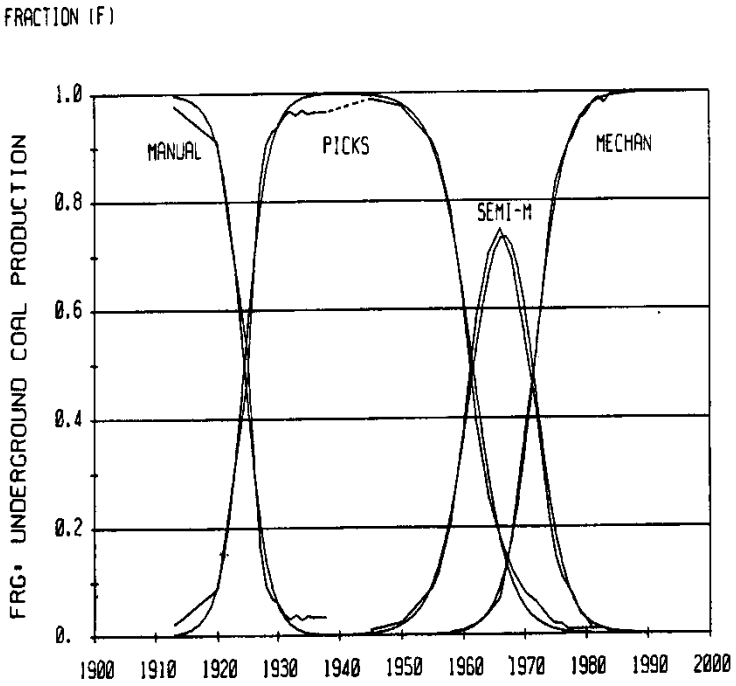
Productivity

Examples of Productivity Growth

	Factor	% / year
Costs of overseas telephone call (New York – London) 1925-1995	300	8.5
Output/hour per industry worker (UK) 1800-2000	200	2.8
Primary energy use per GDP (USA) 1800-2000	~7	~1.0

Labor Productivity





vs winning: German Coal Mines

Technik & Umwel

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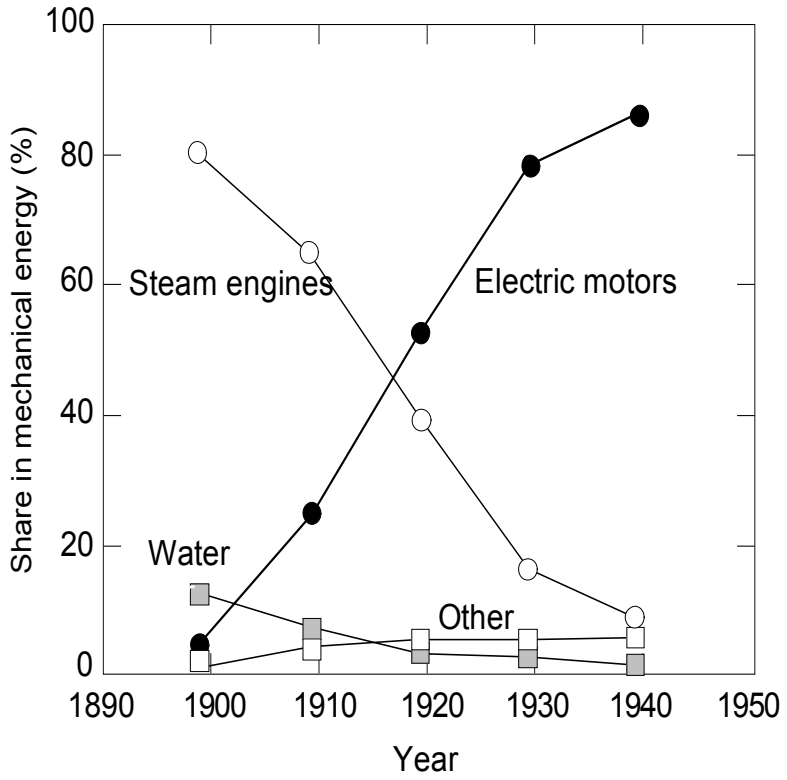
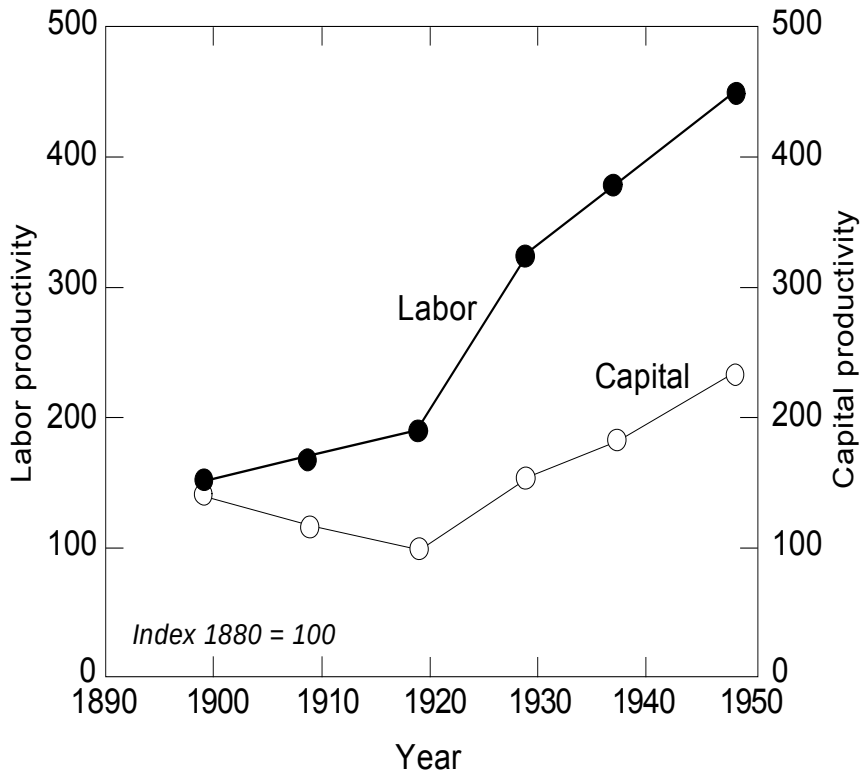
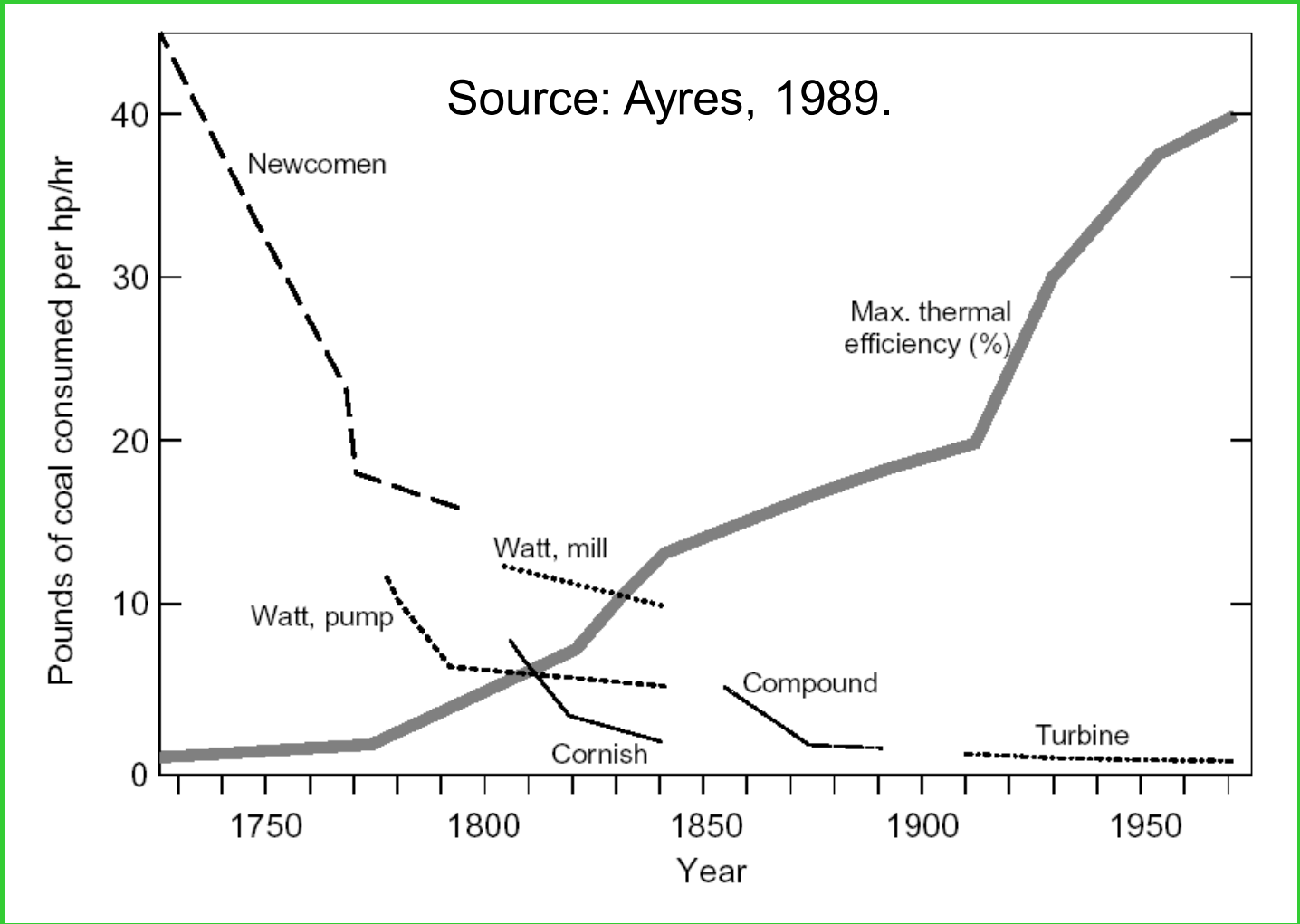
Electrification in US Industry and Impact on Productivity (Threshold Effect)





Productivity 2: Resource Efficiency

(Energy Use of Steam Engines)



Costs and Prices

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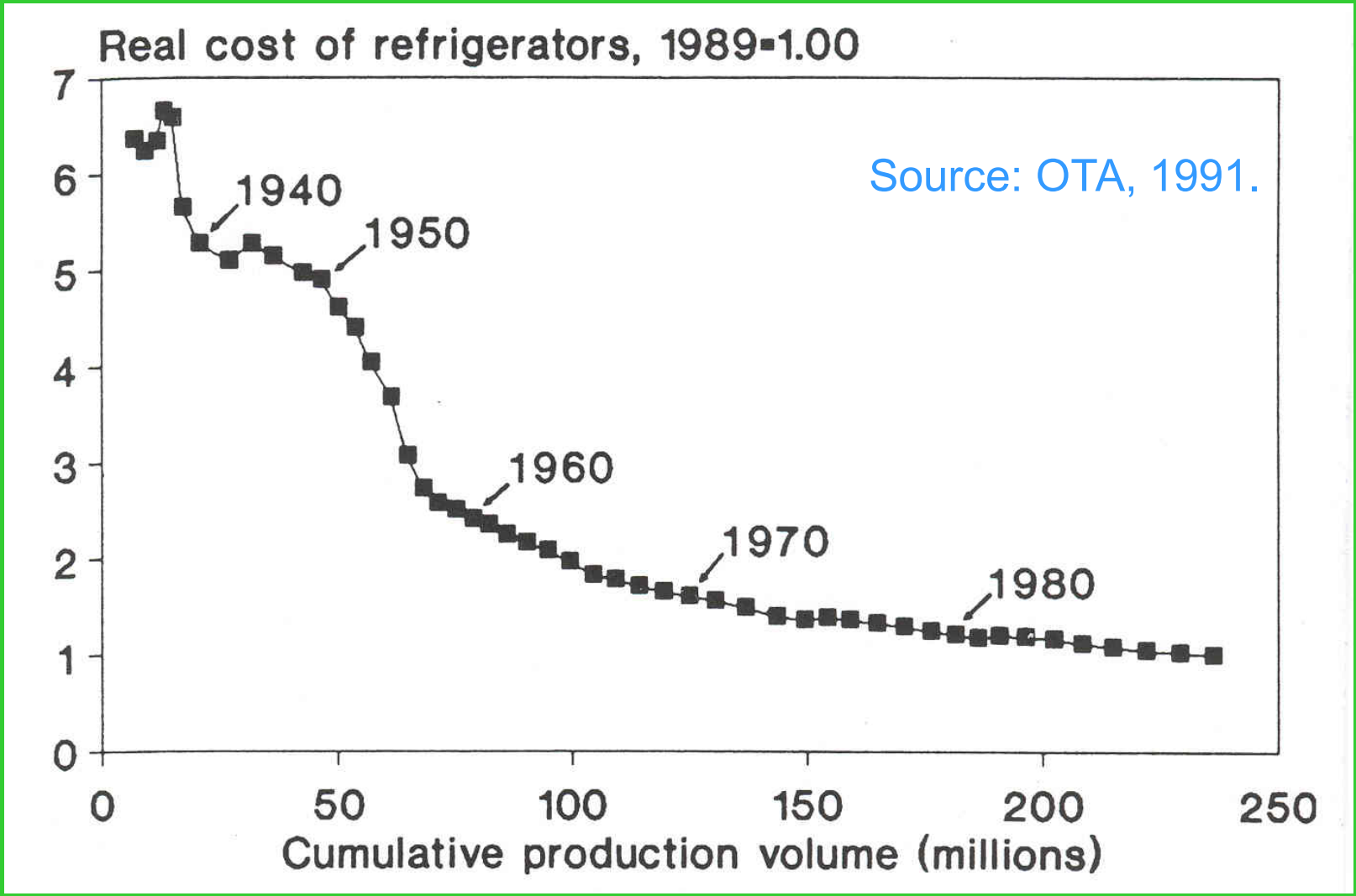
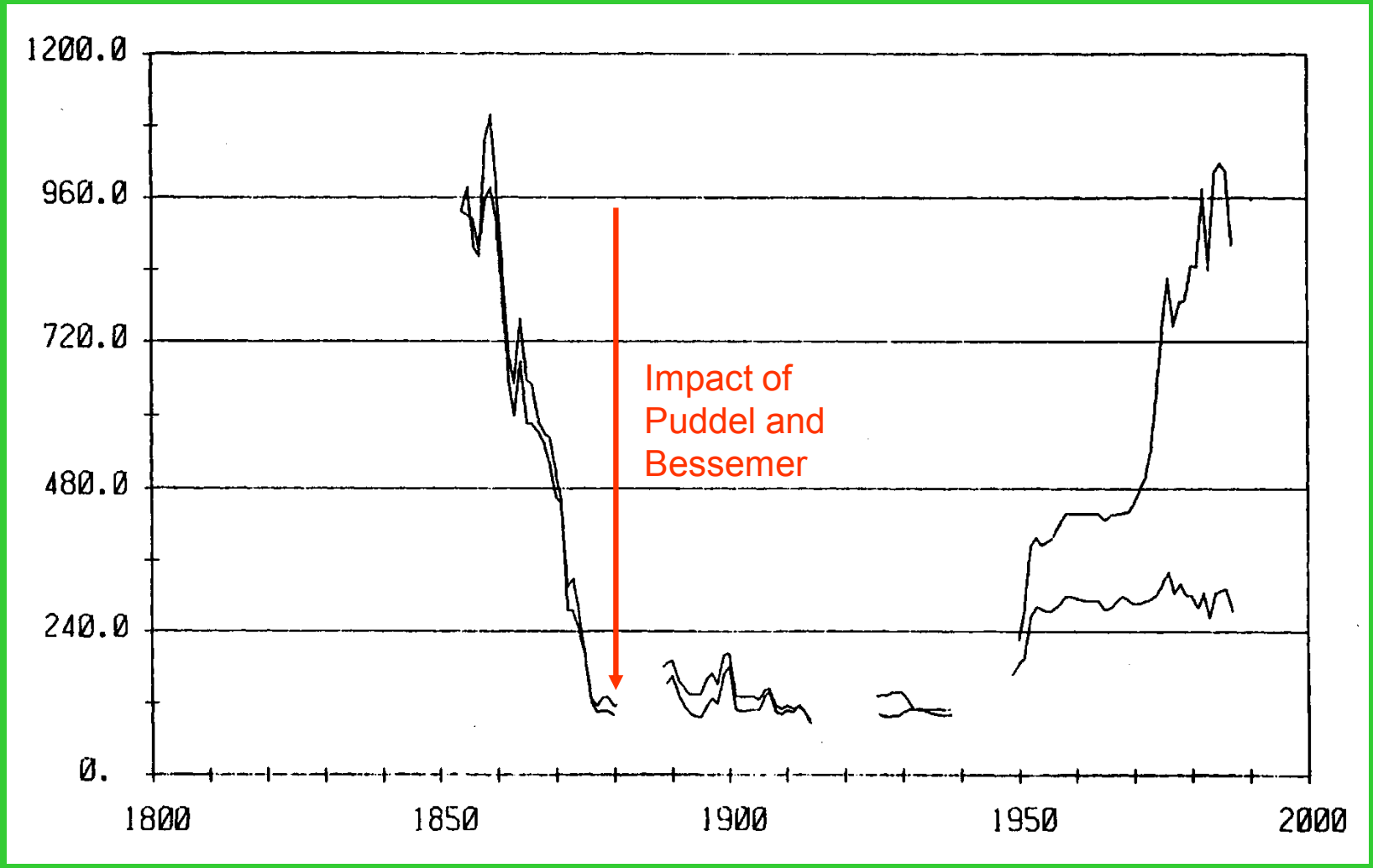
Cost Declines in Refrigerator Costs in US



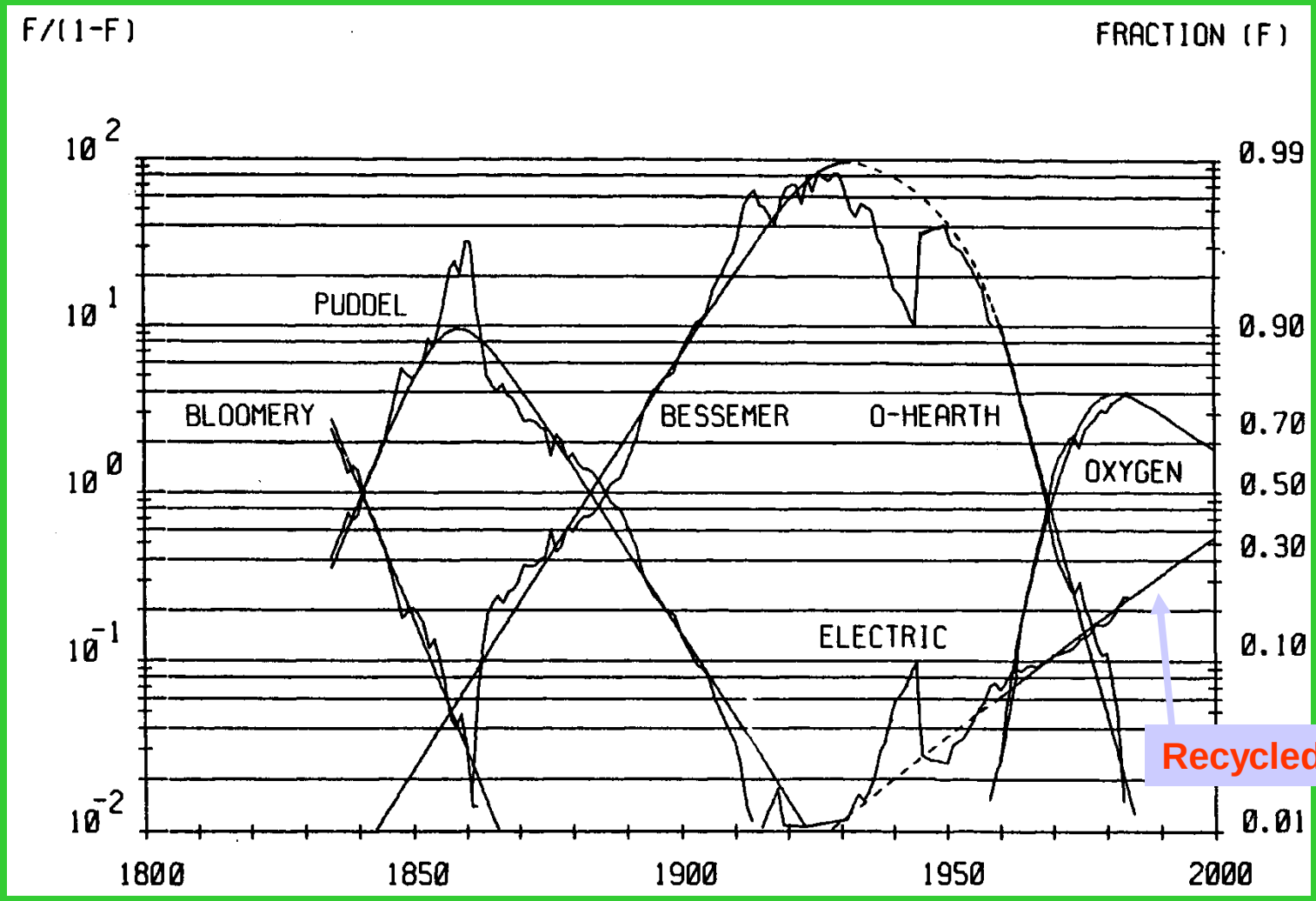
On example of cost declines + quality improvements (efficiency) see Bill Nordhaus example of Light
Posted on the class server: nordhaus_lighting_1998.pdf

Germany – Steel Prices (Current and Constant Mark/Ton)



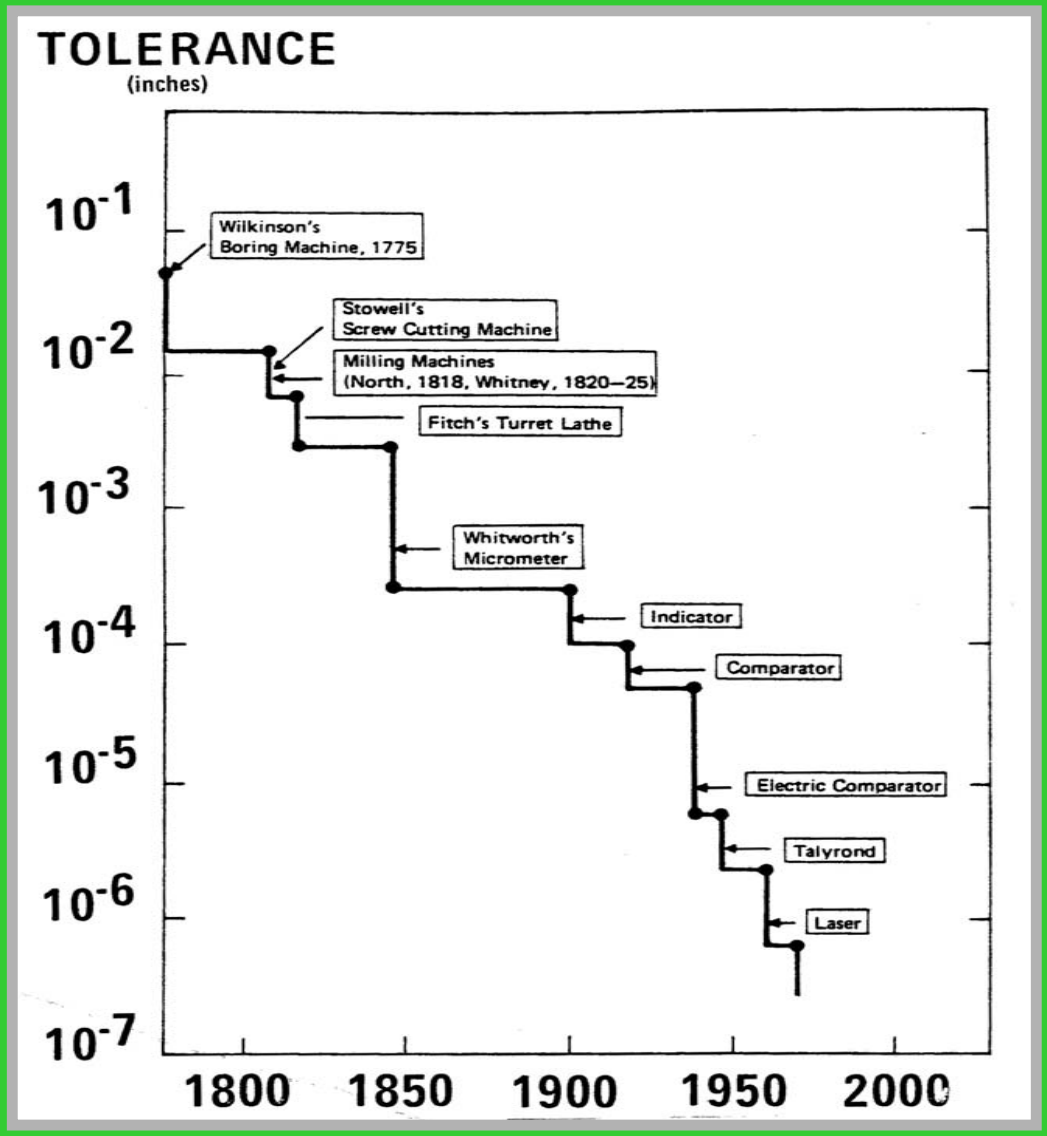
Costs Improve via TC

(German Steel Production Process Change)



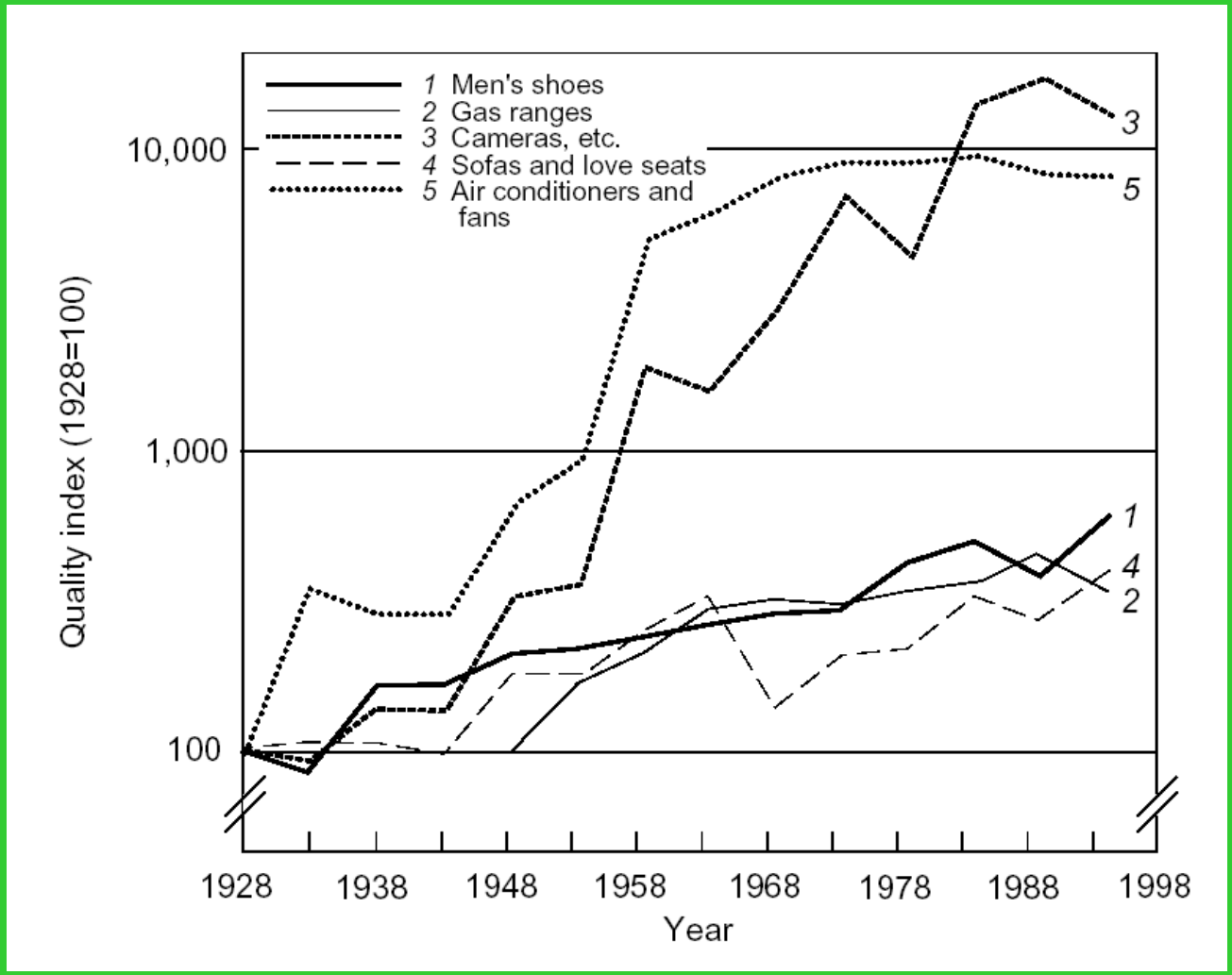
Quality:
Accuracy, Performance, Variety
(economies of scope)

Quality 1: Accuracy of Metal Machinery



Quality 2: Consumer Products

(Lower Price and Higher Quality = Consumer Surplus)



Source: Payson, 1994.

Complexity

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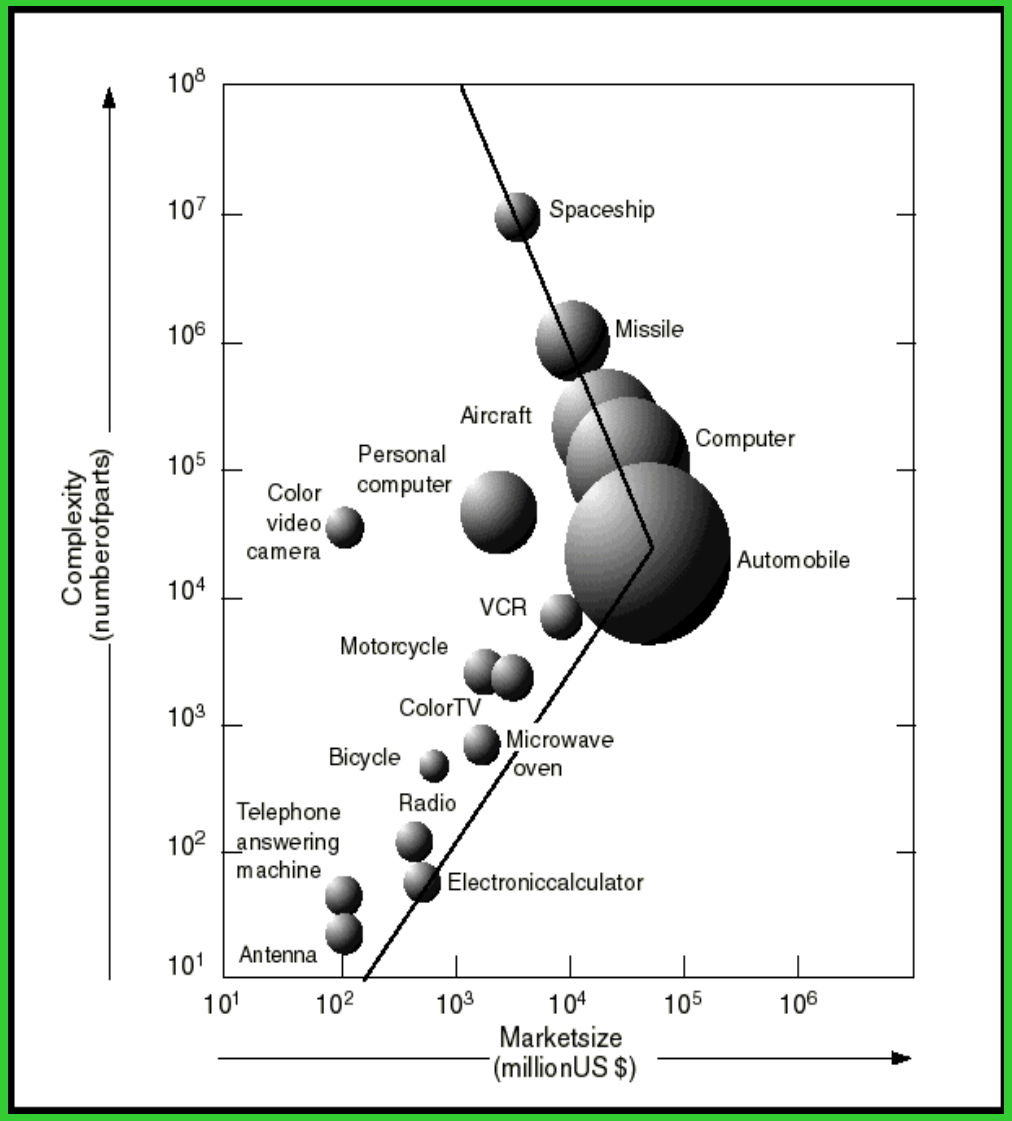
Complexity vs. Market Size of Products

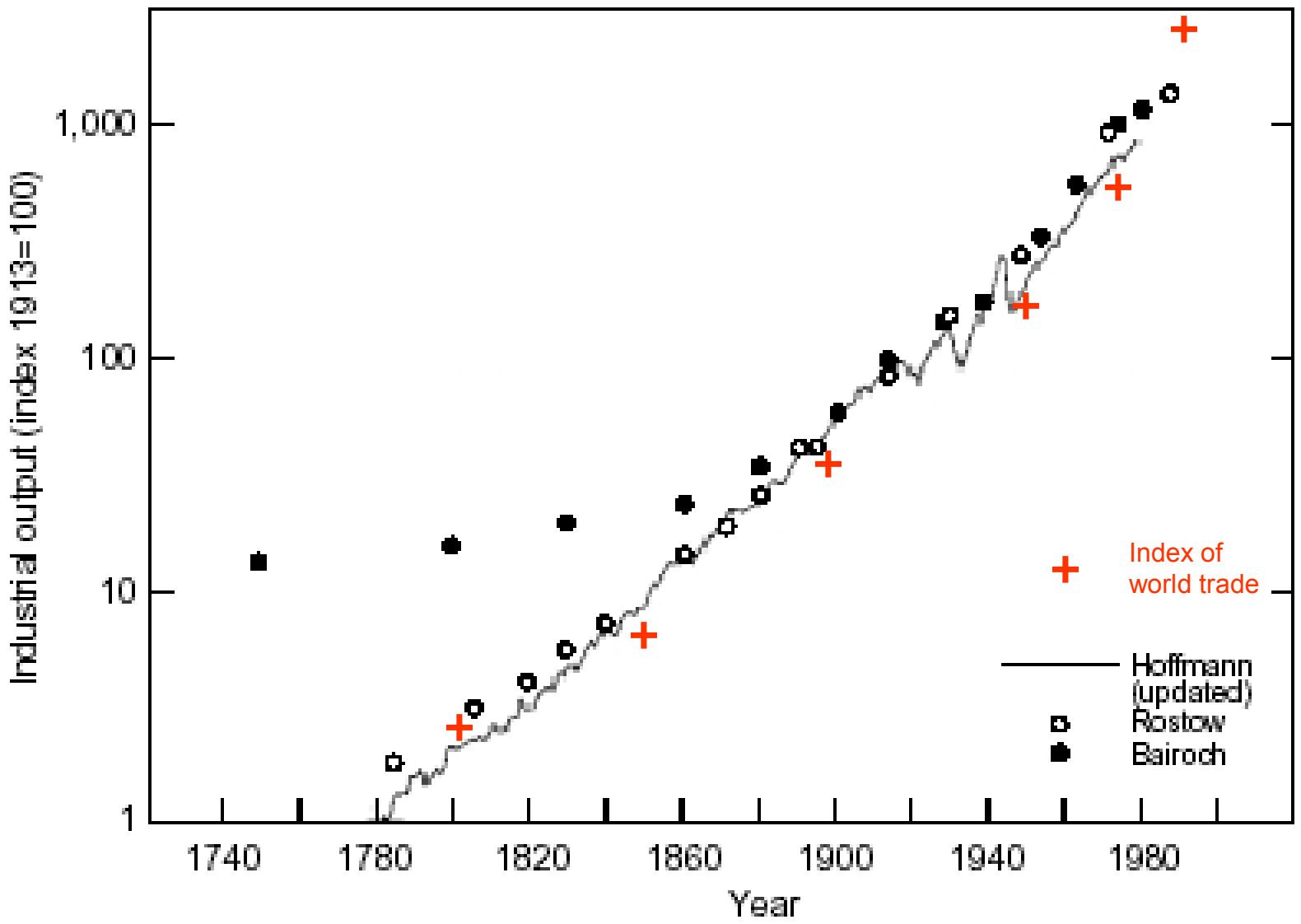


Source: B. Ayres, 1988
based on
Nagayama and Funk, 1985.

Division of Labor

- Functionally: Specialization:
  Engineering; ecology; →
  Industrial engineering; social ecology;→→
  Industrial ecology
- Spatially: Interdependence
  -- local and regional trade
  -- international trade
  -- globalization

World – Growth in Industrial Output and Trade (1913=100)

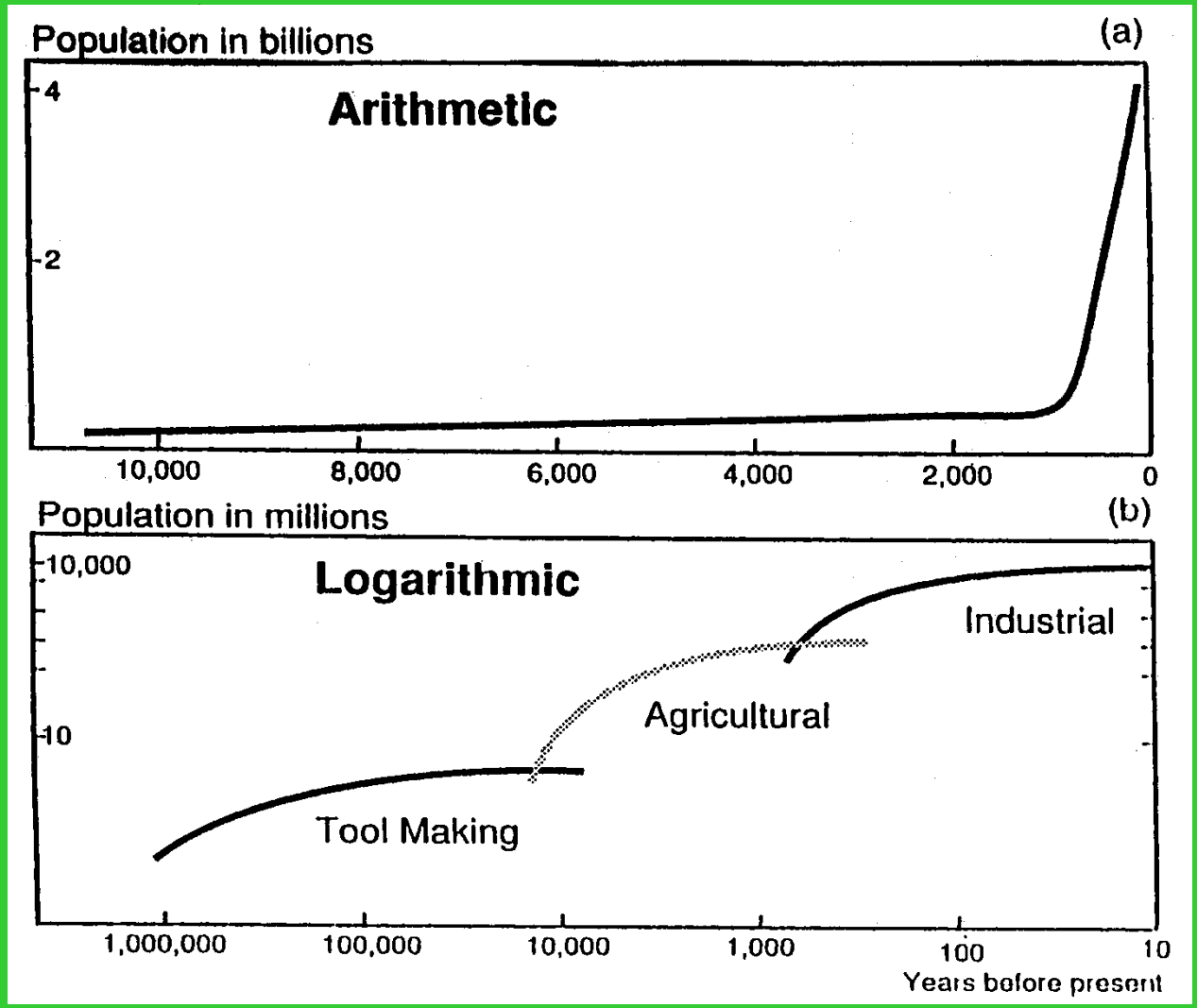


Impacts of TC on Society

- Demographics
- Income
- Working time
- Structural changes:
  - Rural – urban
  - Primary – tertiary
  - Work - pleasure

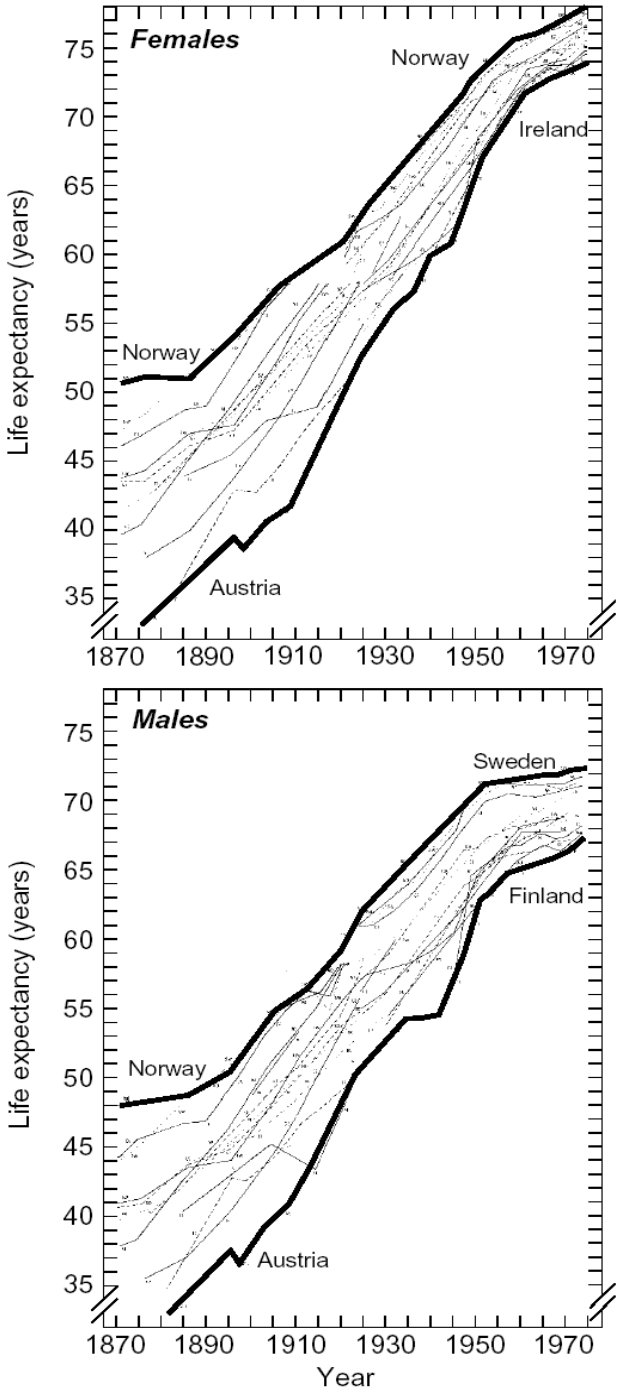
World Population Growth:

2 Mathematical Representations - linear (a) and logarithmic(b).



Source: R. Kates (1997) after E. Deevey (1960).

Life Expectancy (years)



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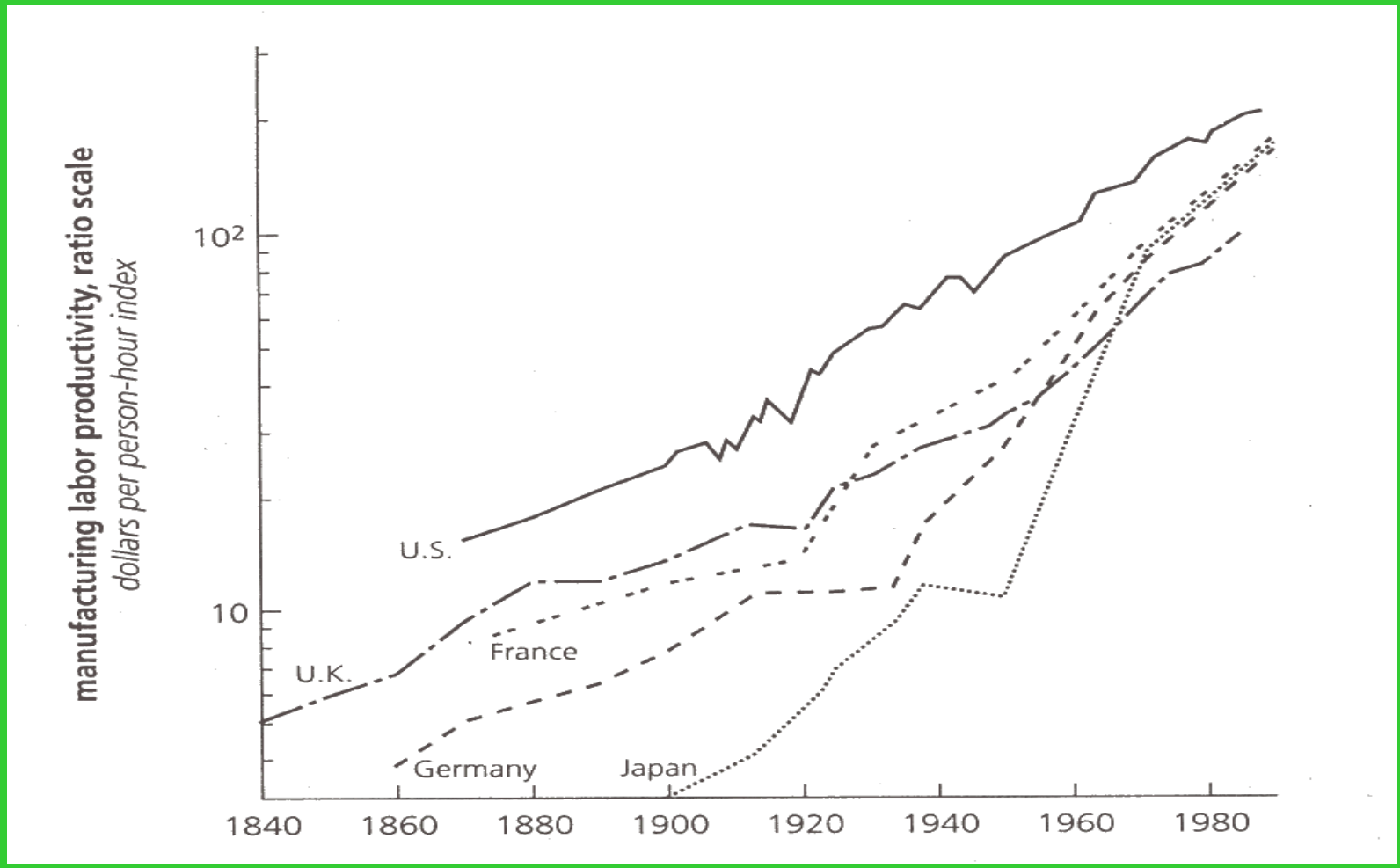
Manufacturing Labor Productivity



Growth in Real Wages

Source: Phelps Brown, 1973.

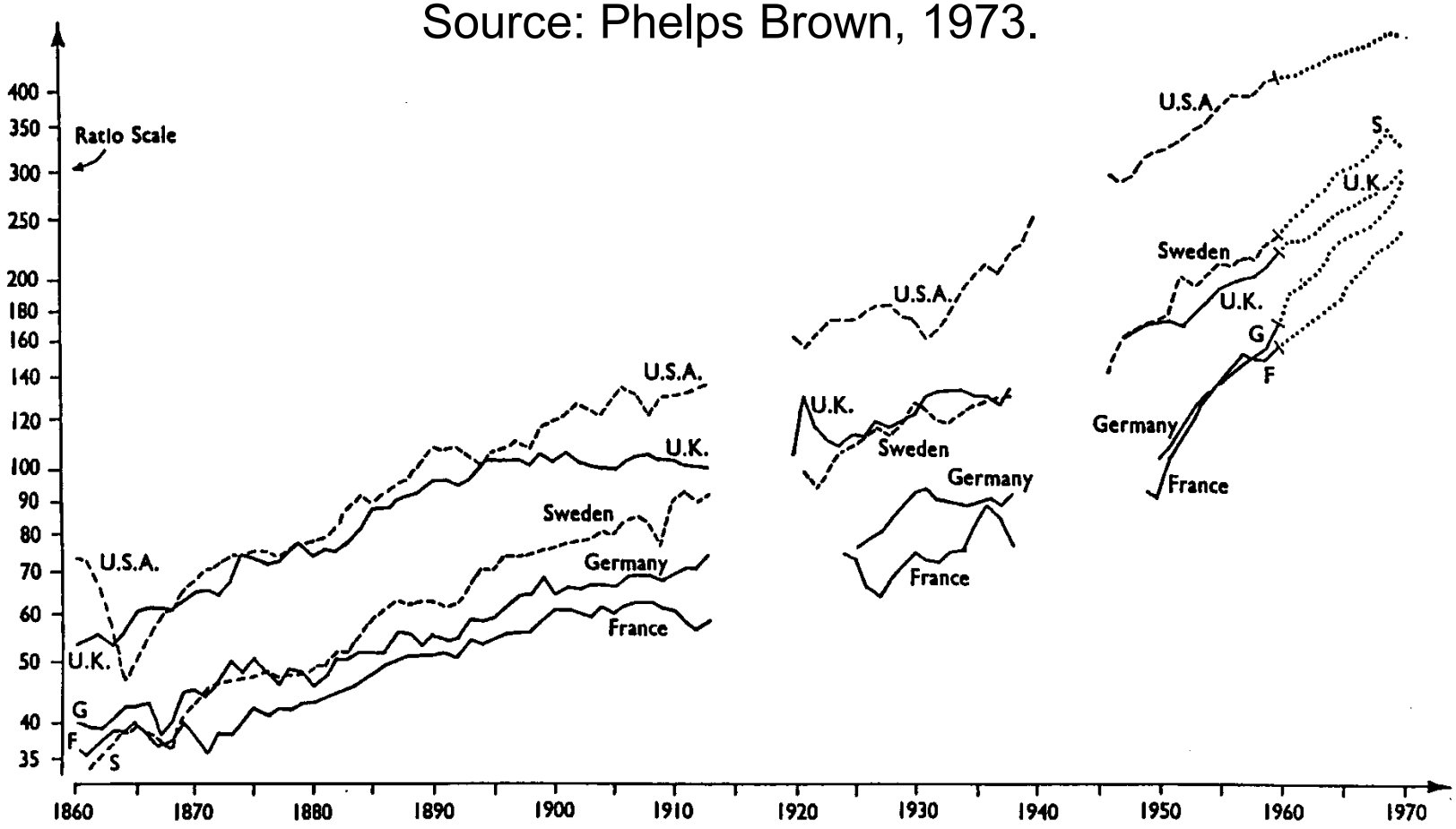
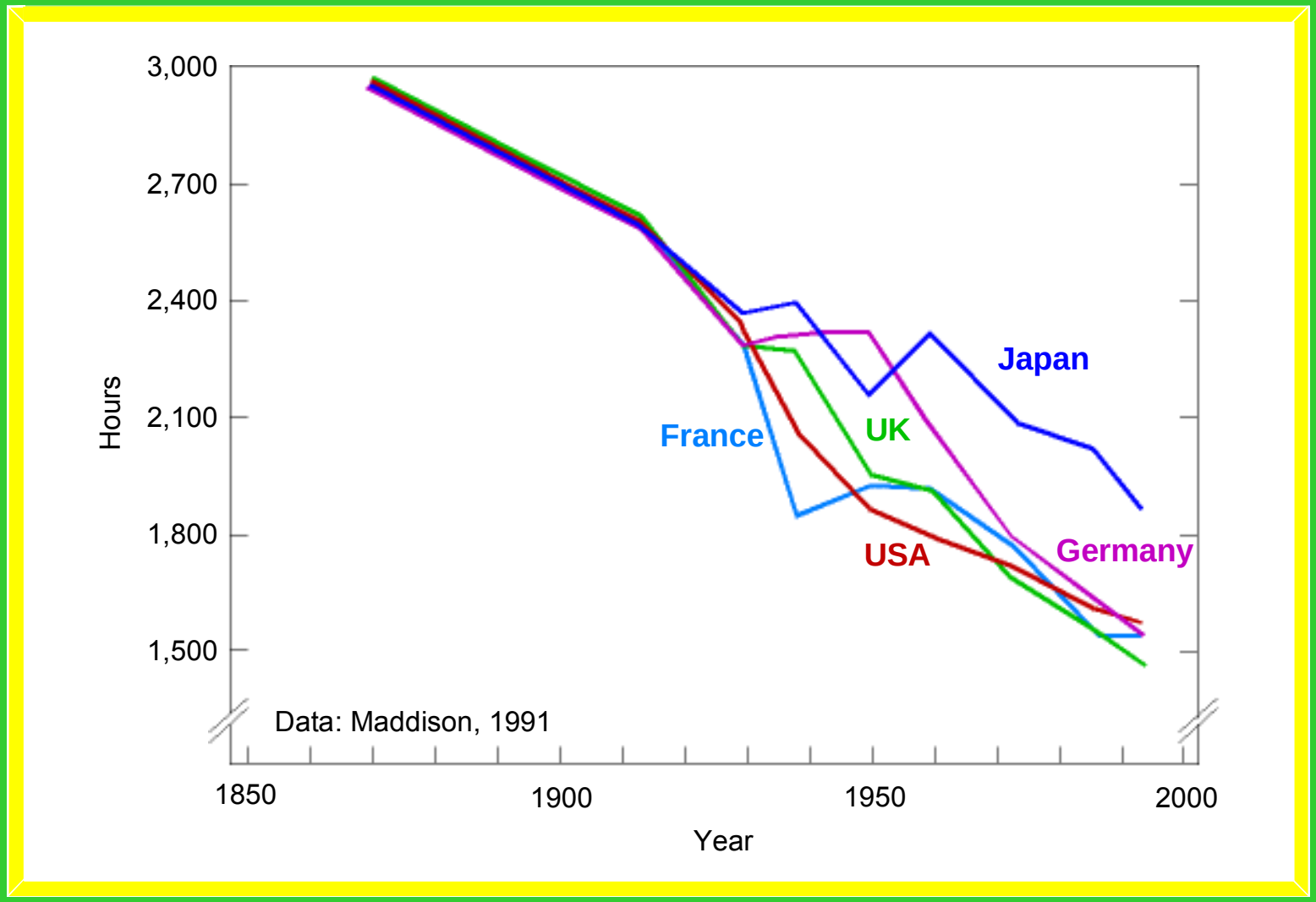


Fig. 2.

Real wages (wage-earnings in composite units of consumables) in 5 countries. Indexes, all relative to the average level of real wages in U.K. 1890–99 = 100.

Reductions in Working Time (hours per year)



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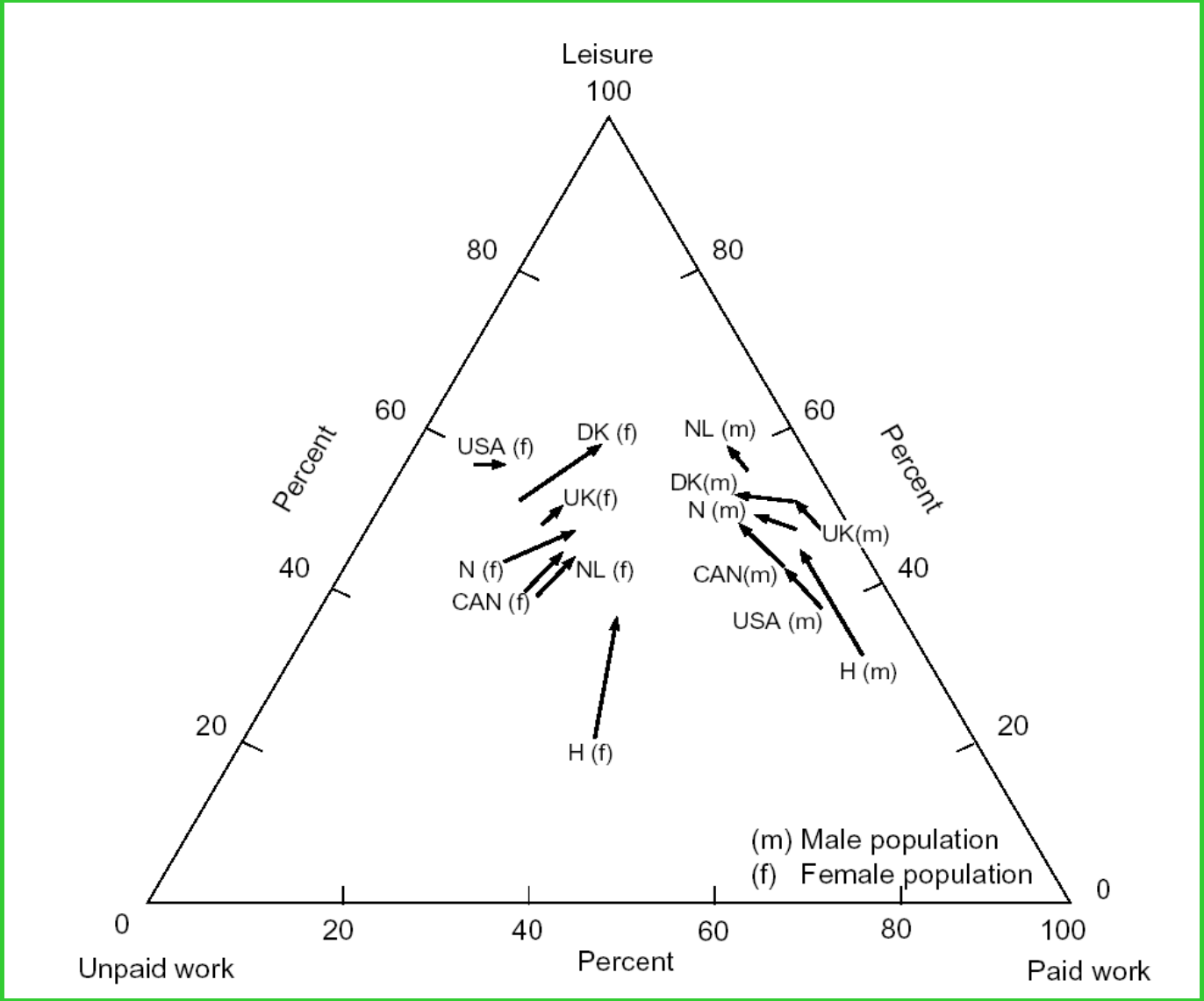
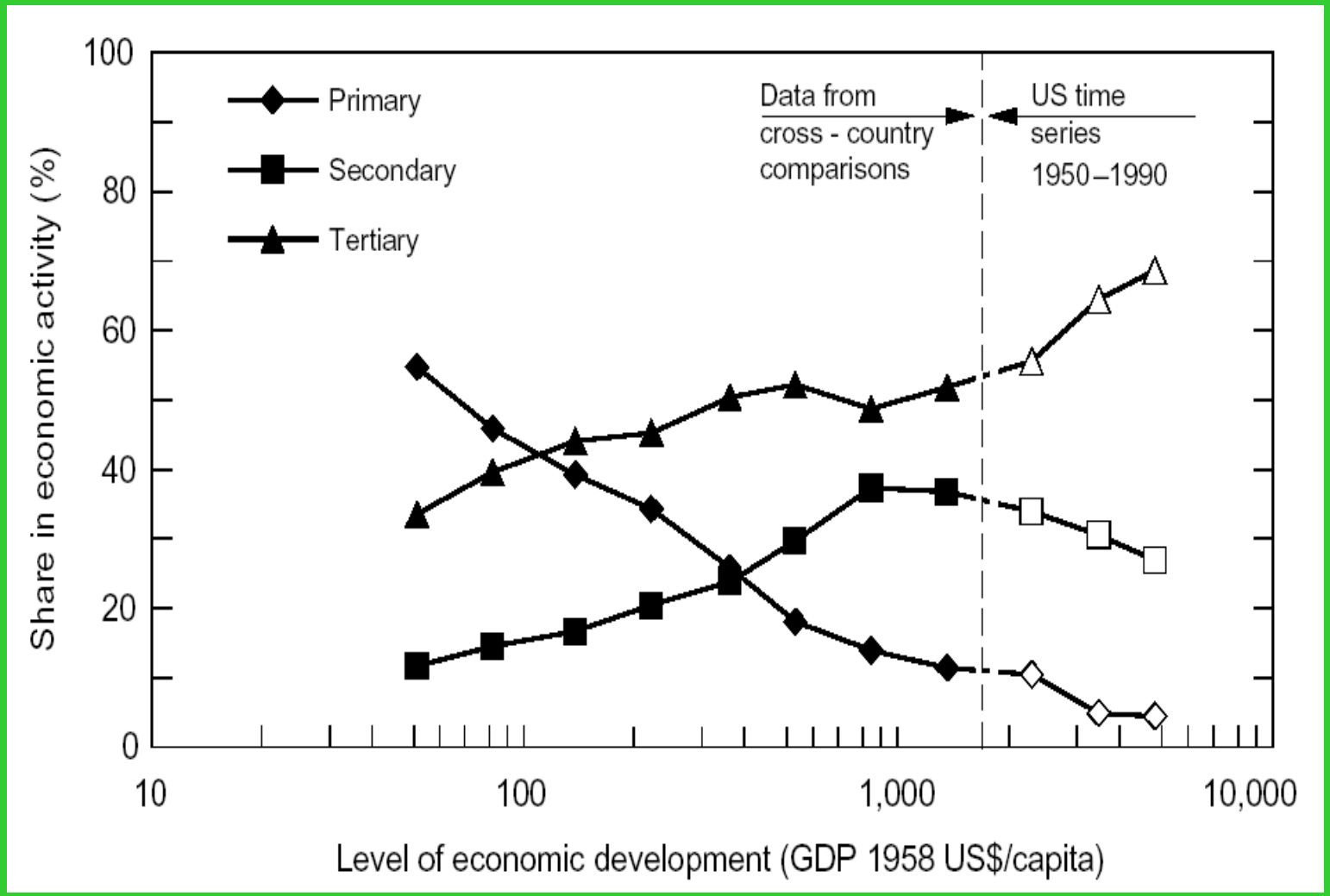
Changing Time Budgets (Gershuny, 1991).



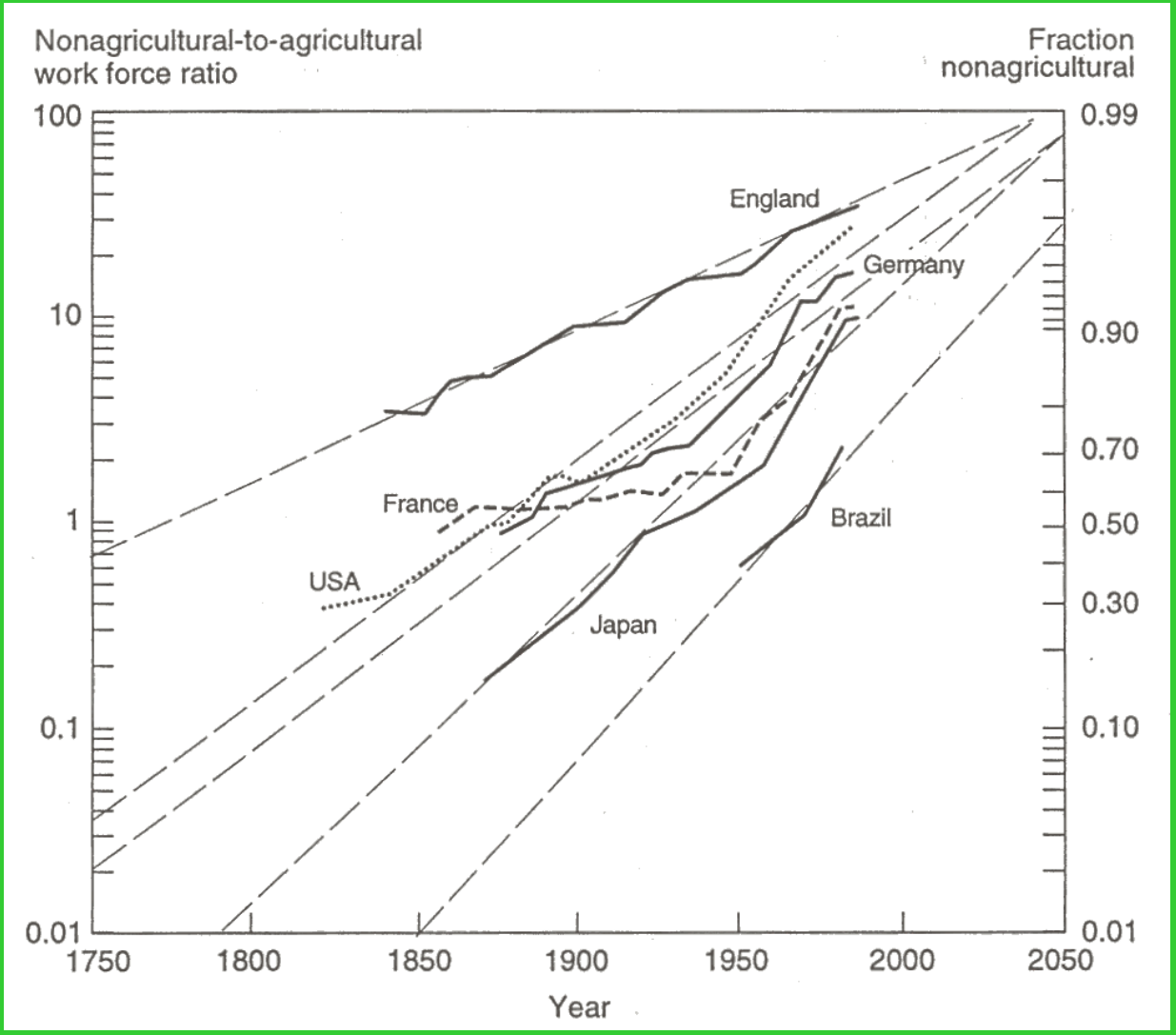
The Original Kuznets (1971, updated) Curve: Economic Structural Change



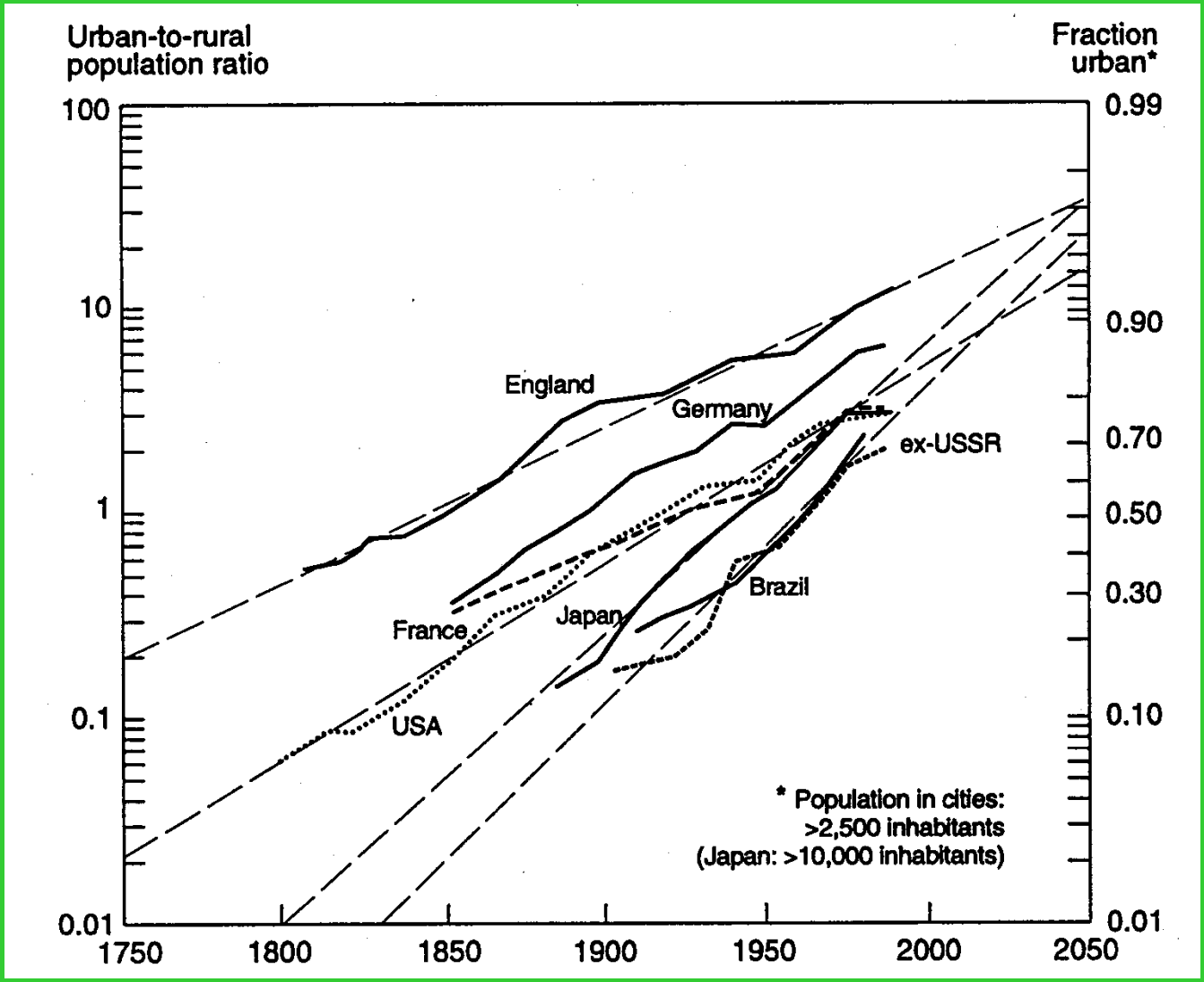
Kuznets Curves

- Originally: Income disparity as a function of income levels (GDP/capita): “Inverted U curve”.
- Industrial Ecology: Environmental Impacts (per unit output, etc..) vs. income levels.
- Evidence: OK for traditional pollutants; none for “modern” (affluence) pollutants like CO_2.
- Empirics: Beware of cross-sectional generalizations (always look at longitudinal trends as well).

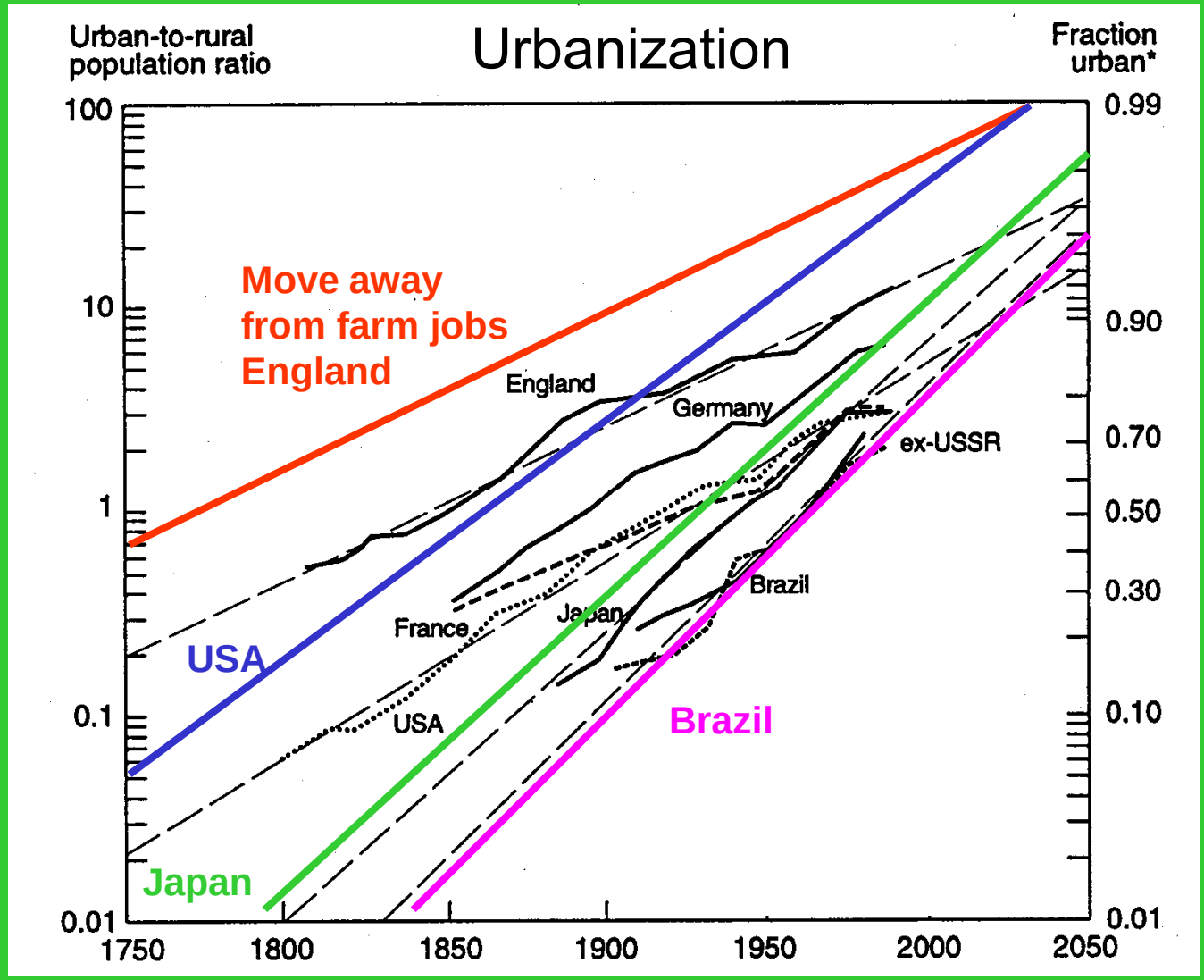
Spatial Relocation 1: Moving Away from Agriculture



Spatial Relocation 2: Moving into Cities



Drivers: What's the Chicken and What's the Egg?



Summary Block 3

-- Economic Impacts = output and scale, productivity and efficiency, costs and prices, variety and complexity, division of labor, interdependence (clusters, network externalities)

-- Social impacts: = population, life expectancy, productivity (less work with higher pay), structural change: work - pleasure, primary - tertiary, rural - urban;