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

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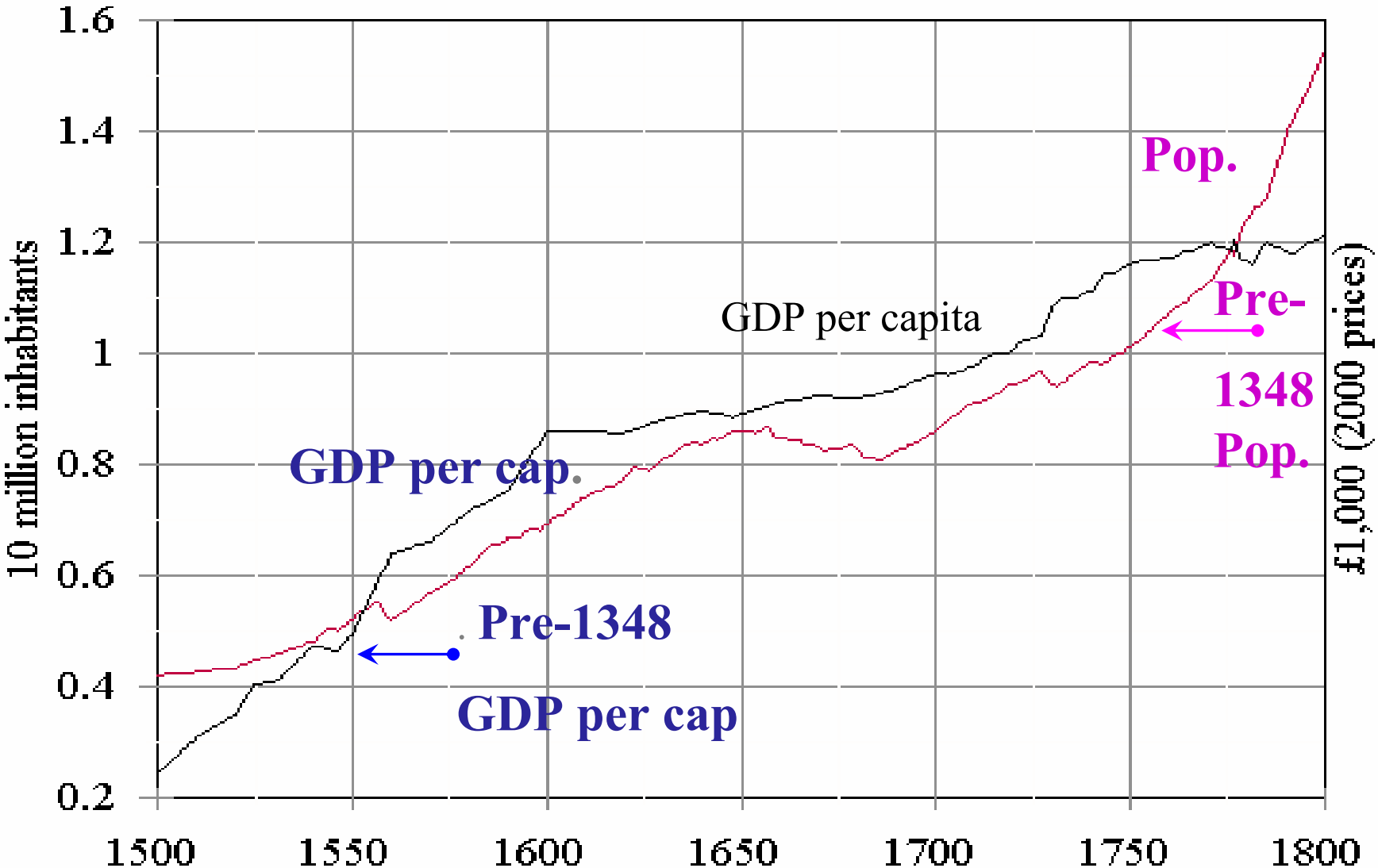
Energy use and energy services

- 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

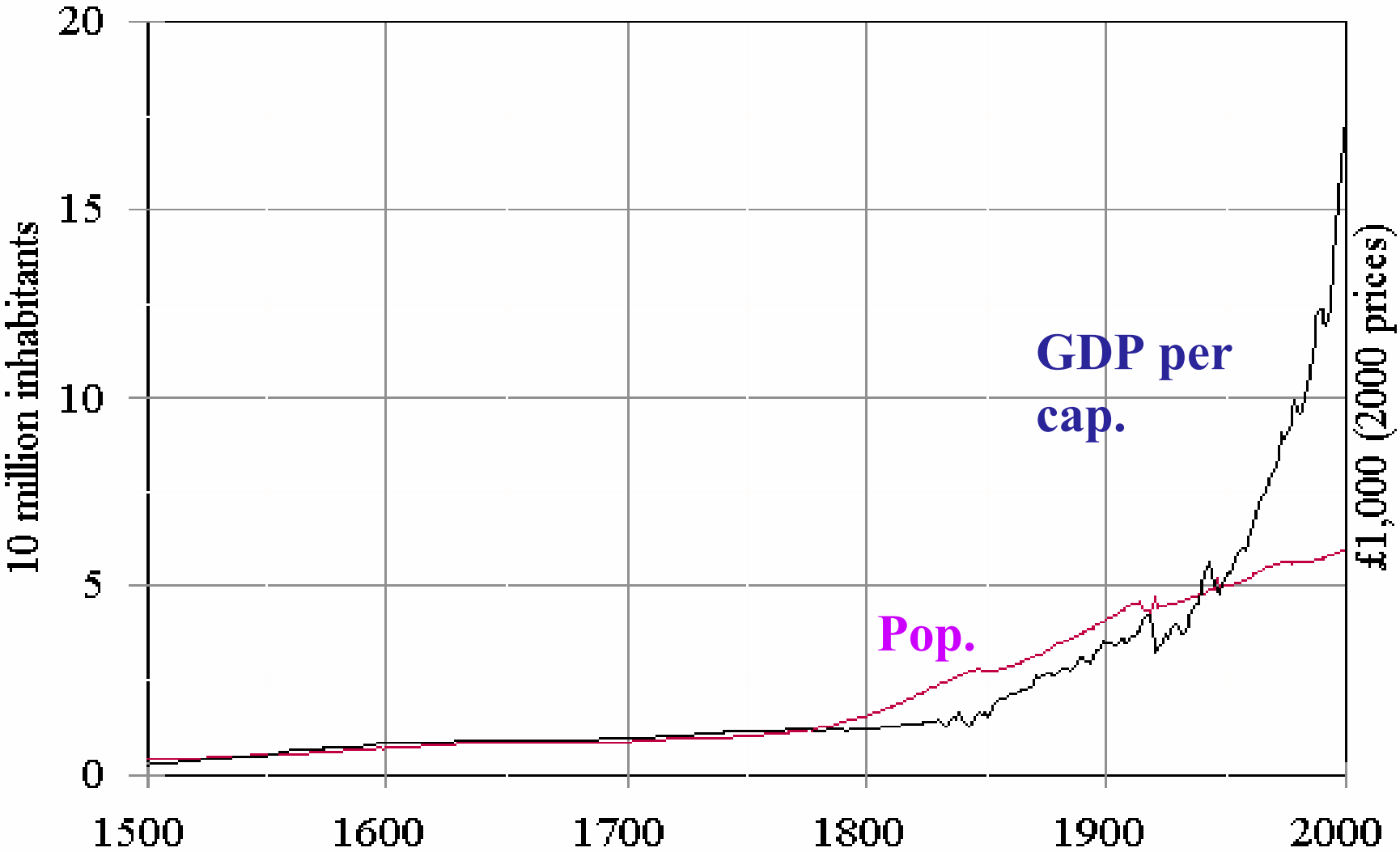


Fig. 1: Price of Tallow Candles and Whale Oil Light in the UK, 1300-1900 (£ per million lumen-hours)

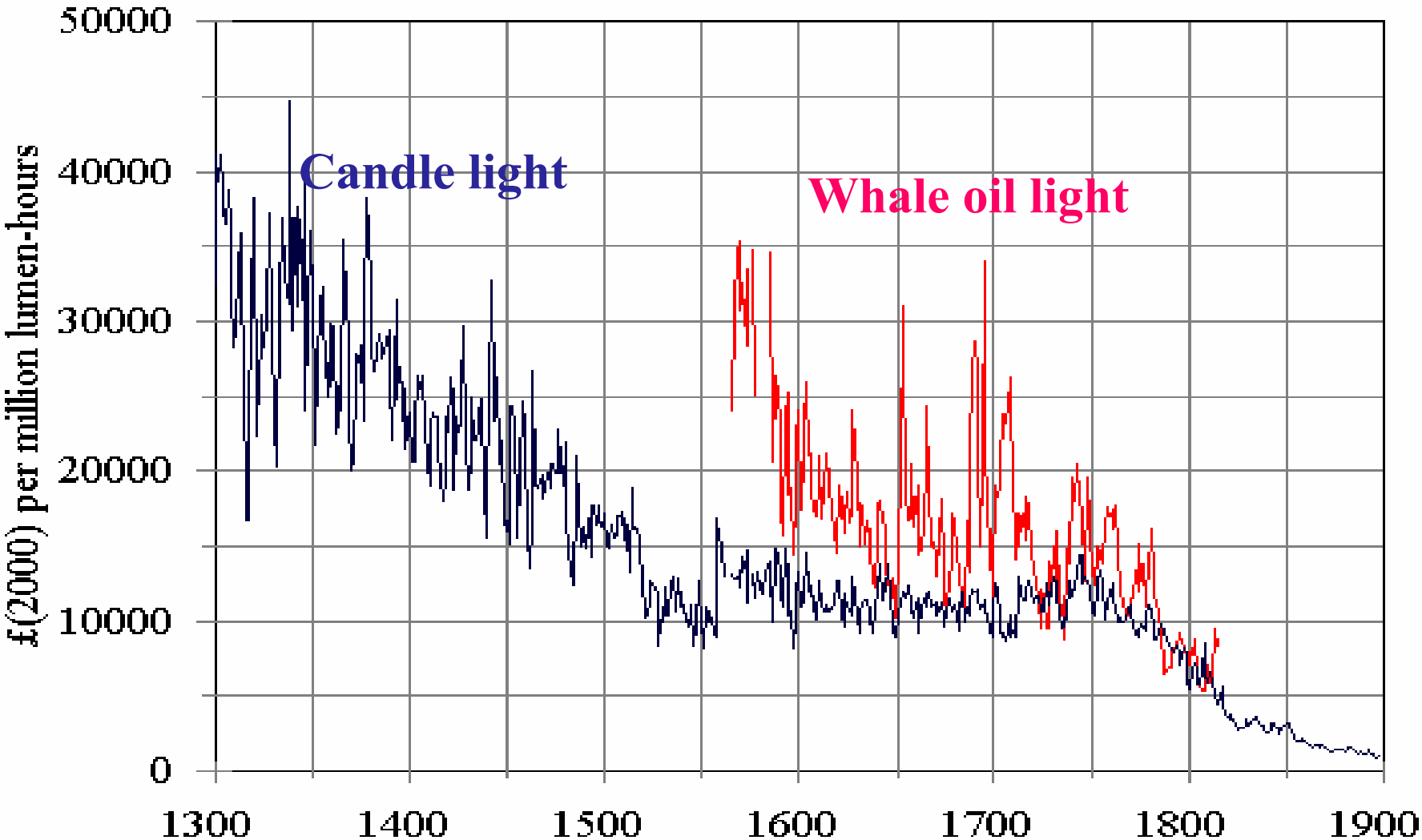


Fig. 2. UK Consumption of Tallow Candle & Whale Oil Light, 1711-1900 (billion lumen-hours),

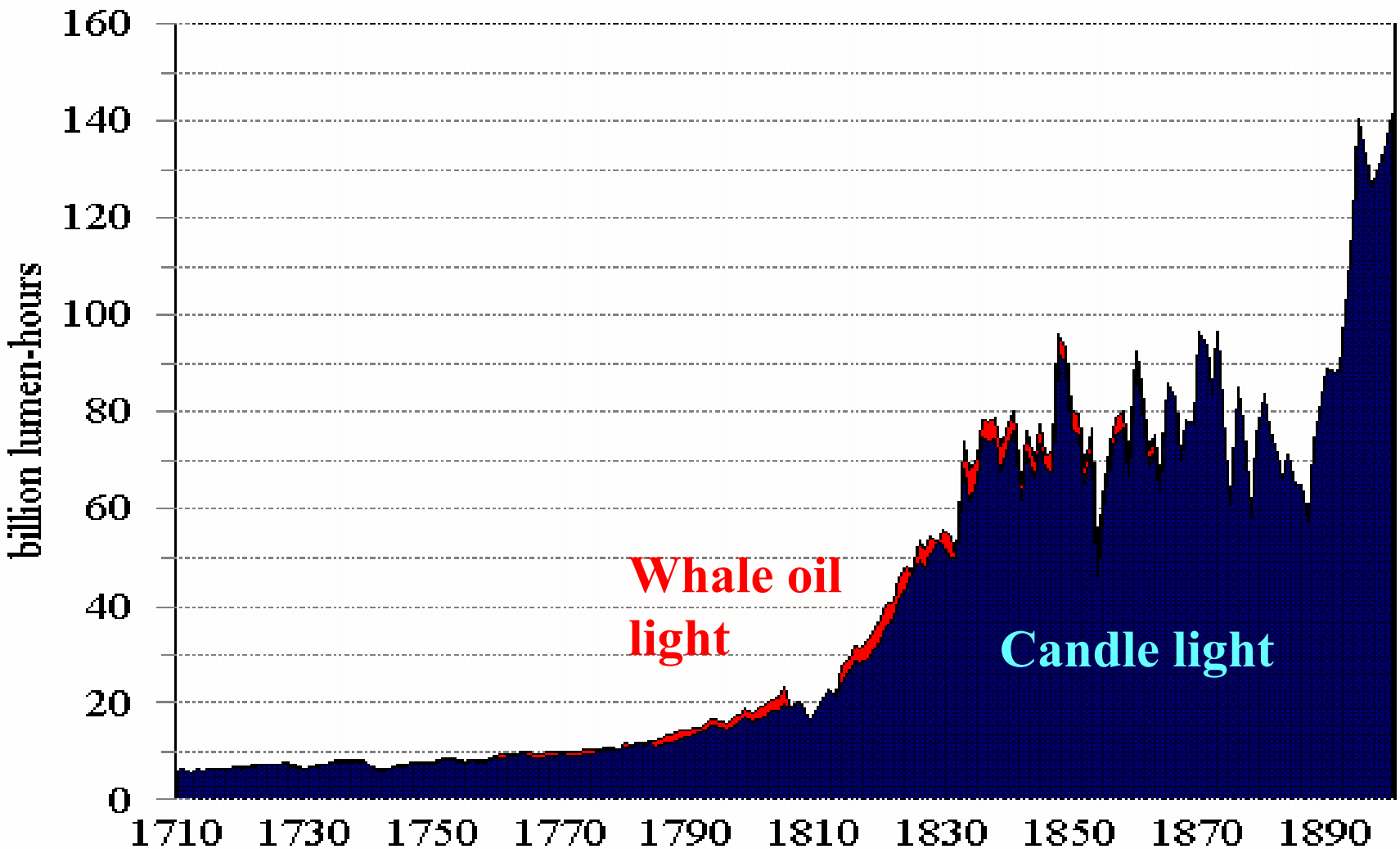


Fig. 3. UK Consumption of Gas, Kerosene & Candle Light, 1800-1900 (billion lumen-hours)

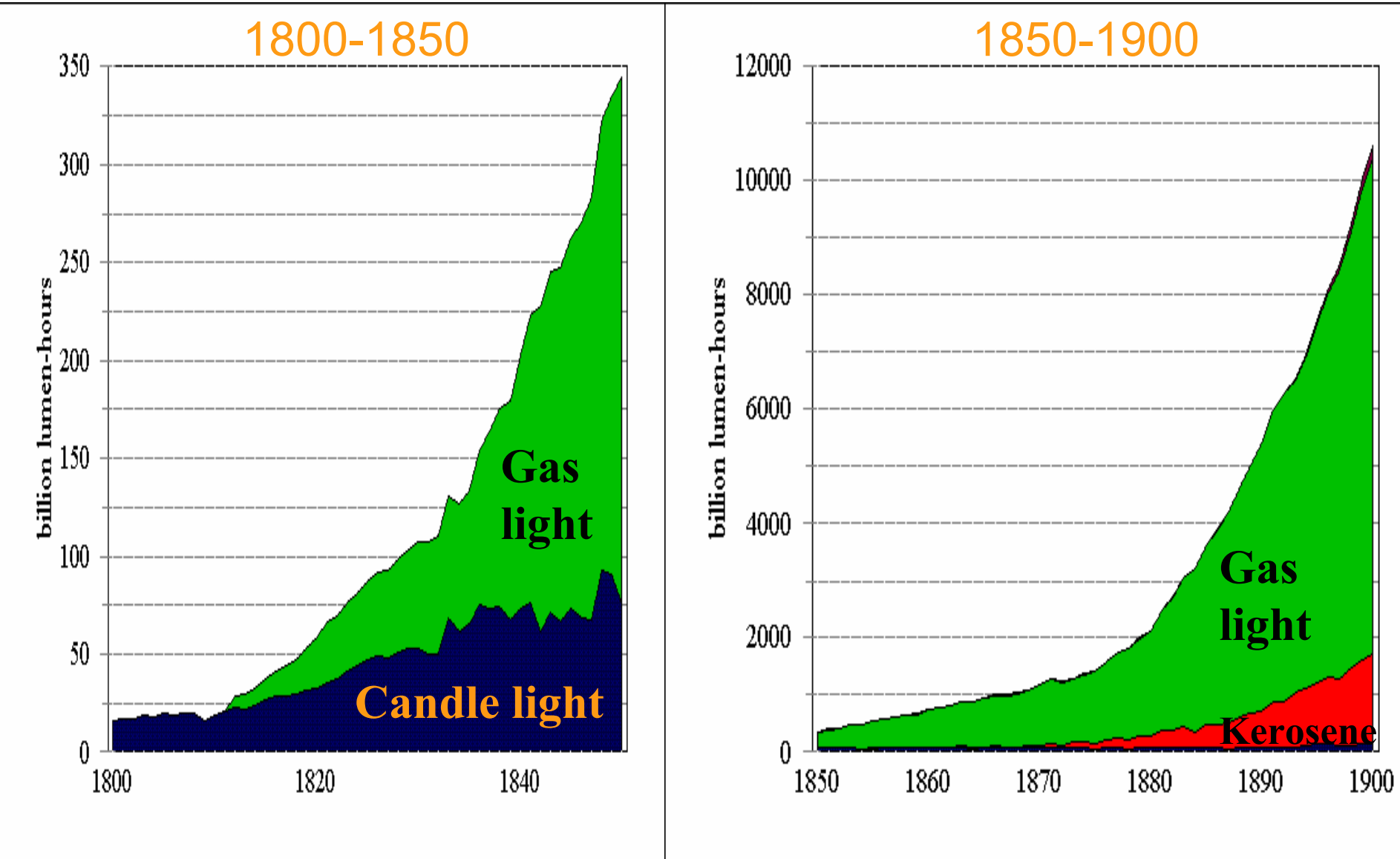
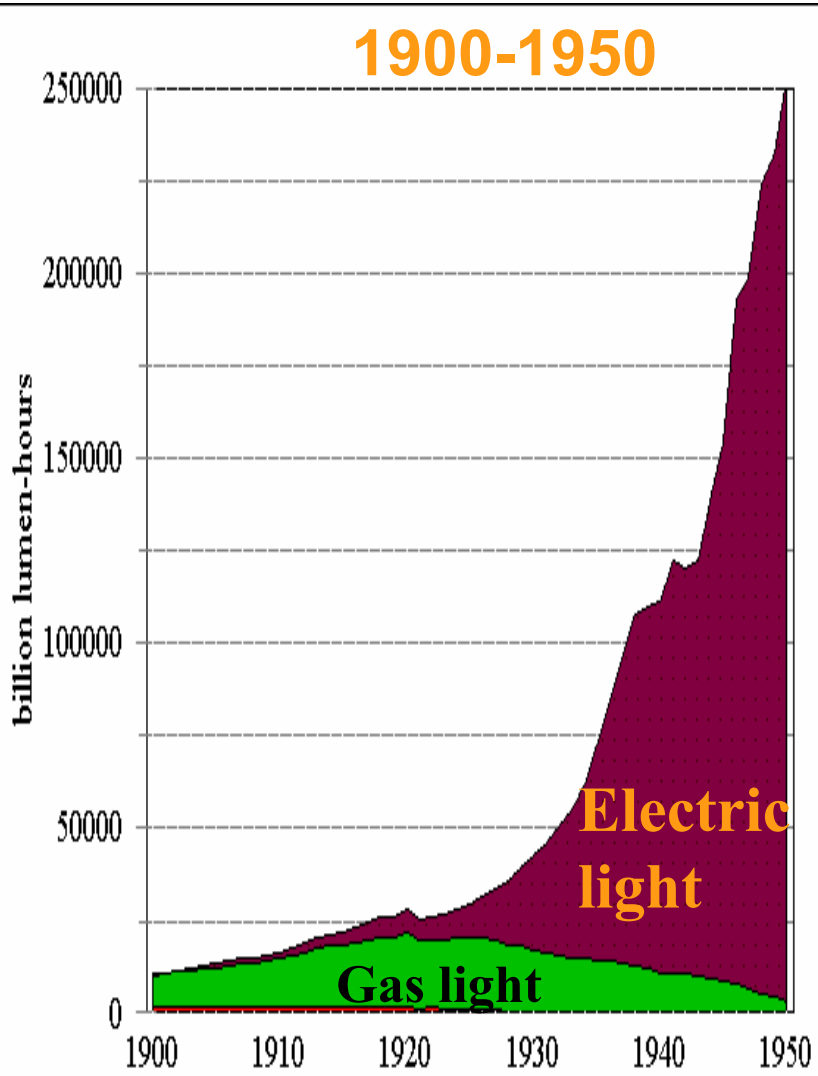


Fig. 4. UK Consumption of Kerosene, Gas and Electric Light 1900-2000 (billion lumen-hours)



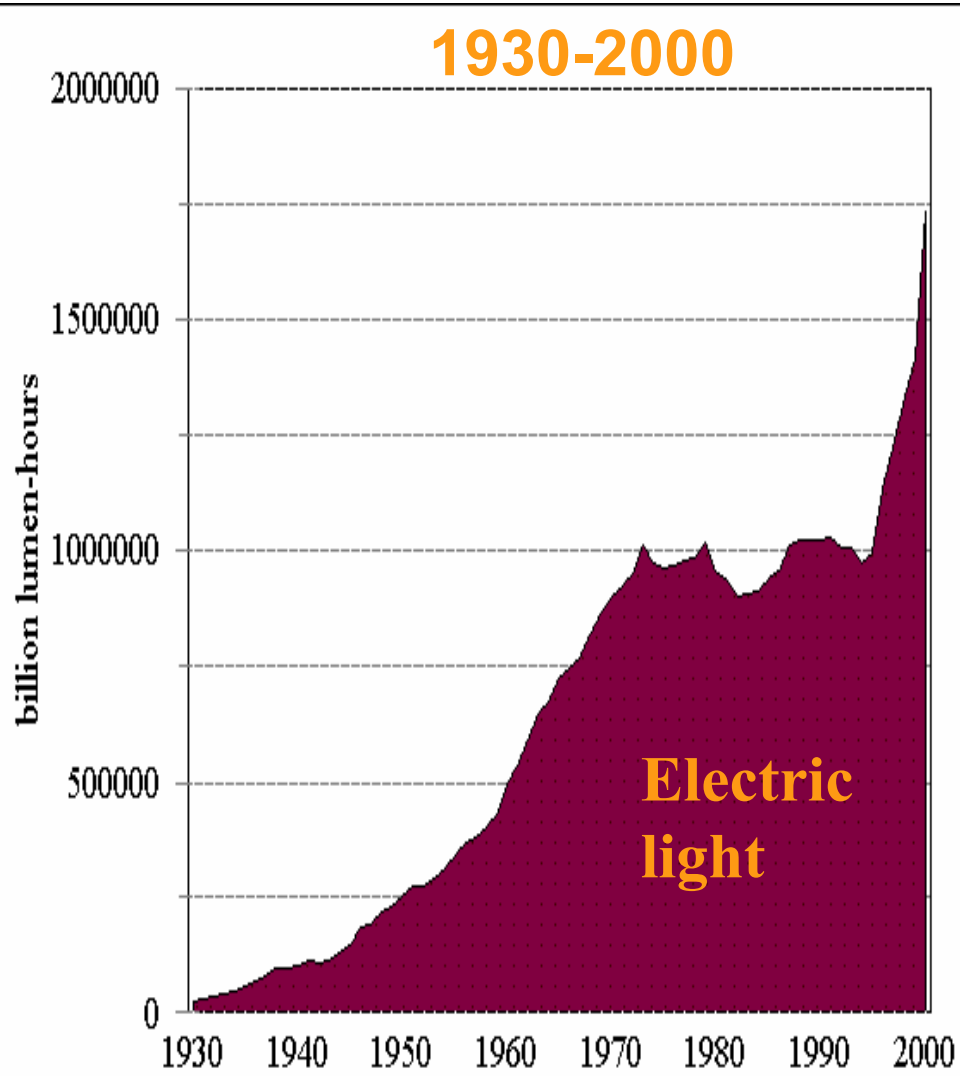


Fig. 5. UK Price of Gas, Kerosene & Electric Light (£ per million lumen-hours), 1800-2000

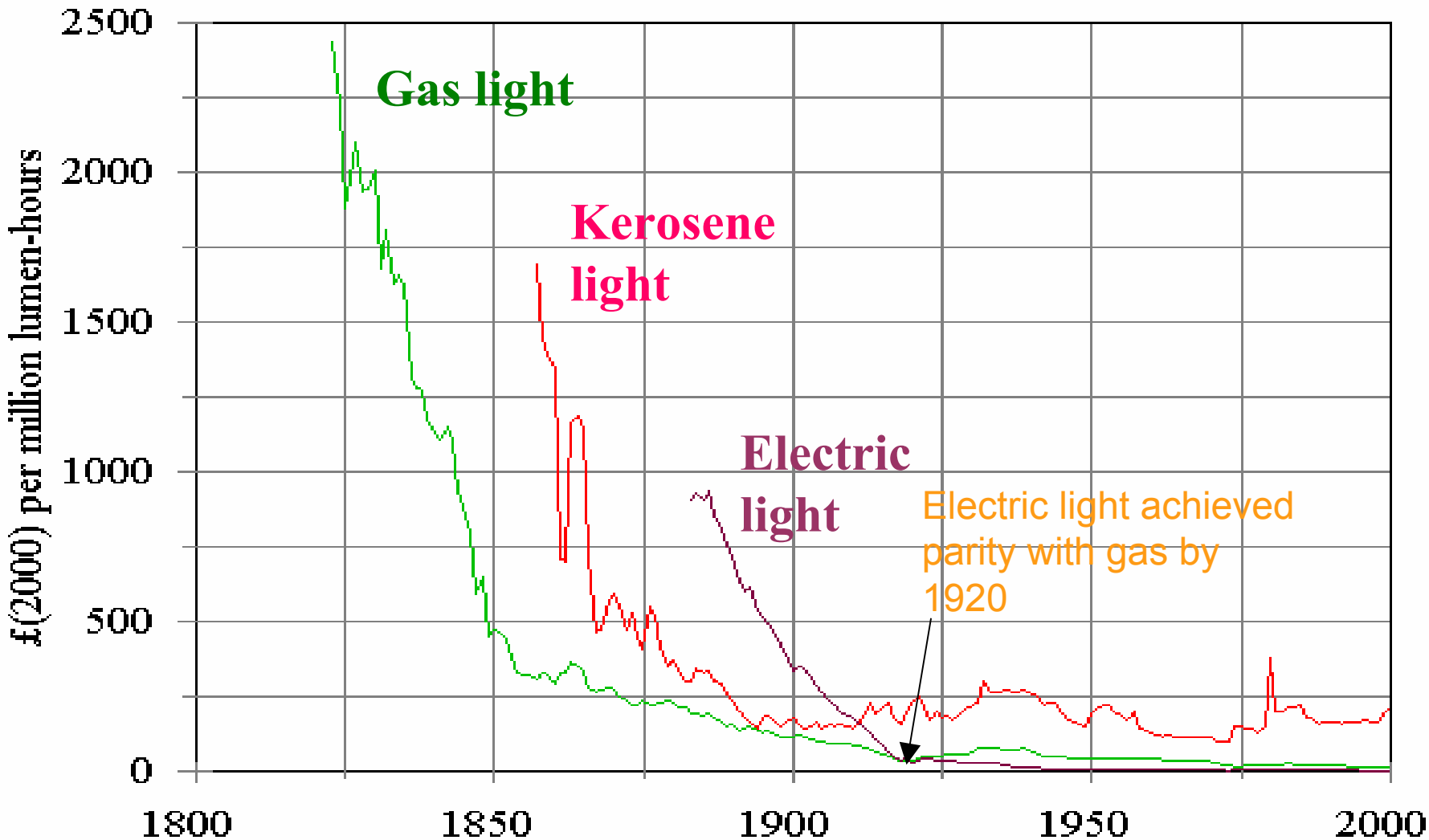


Fig. 6: UK Weighted Average Price of Lighting, 1300-2000 (£ per million lumen-hours)

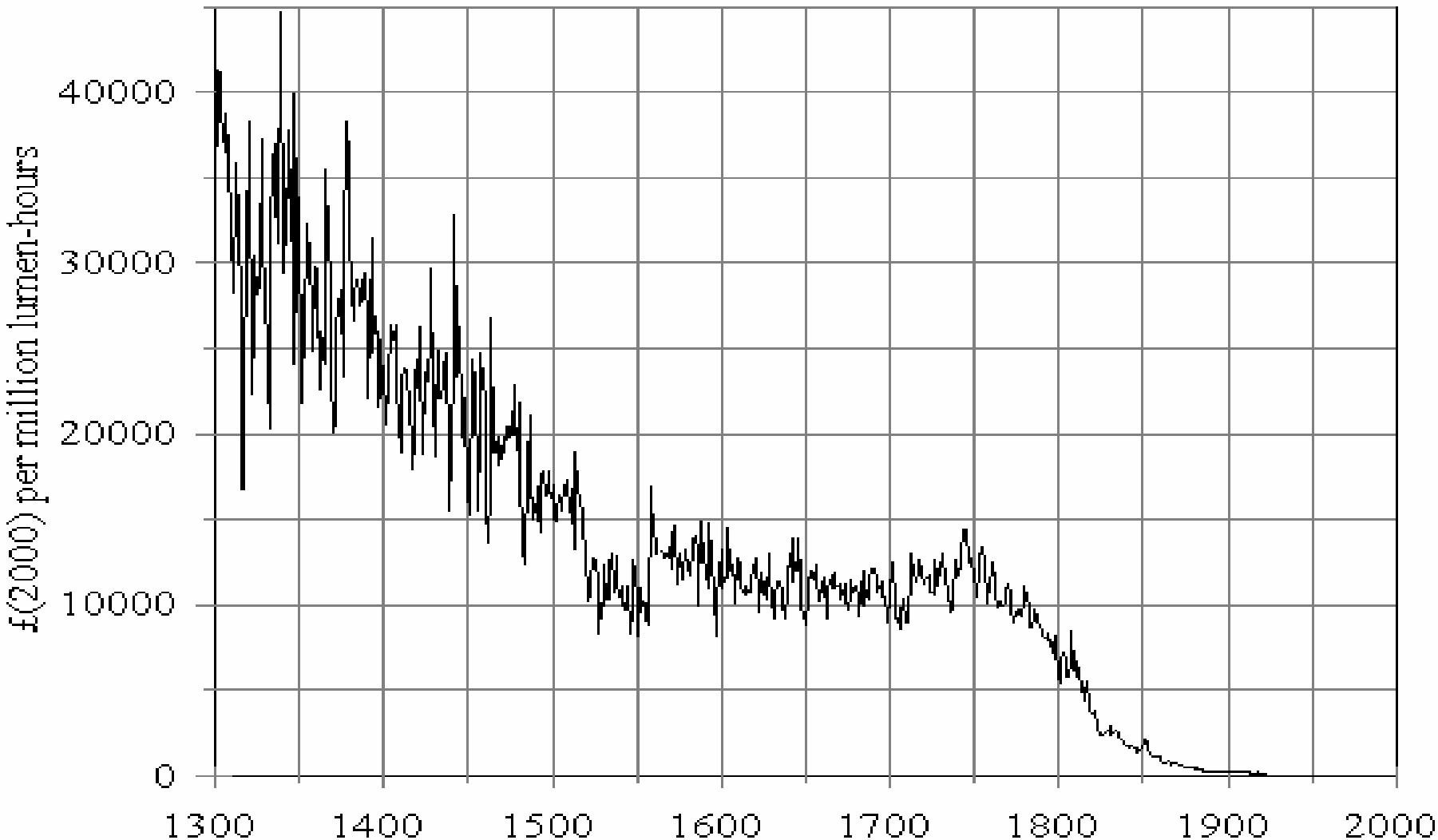
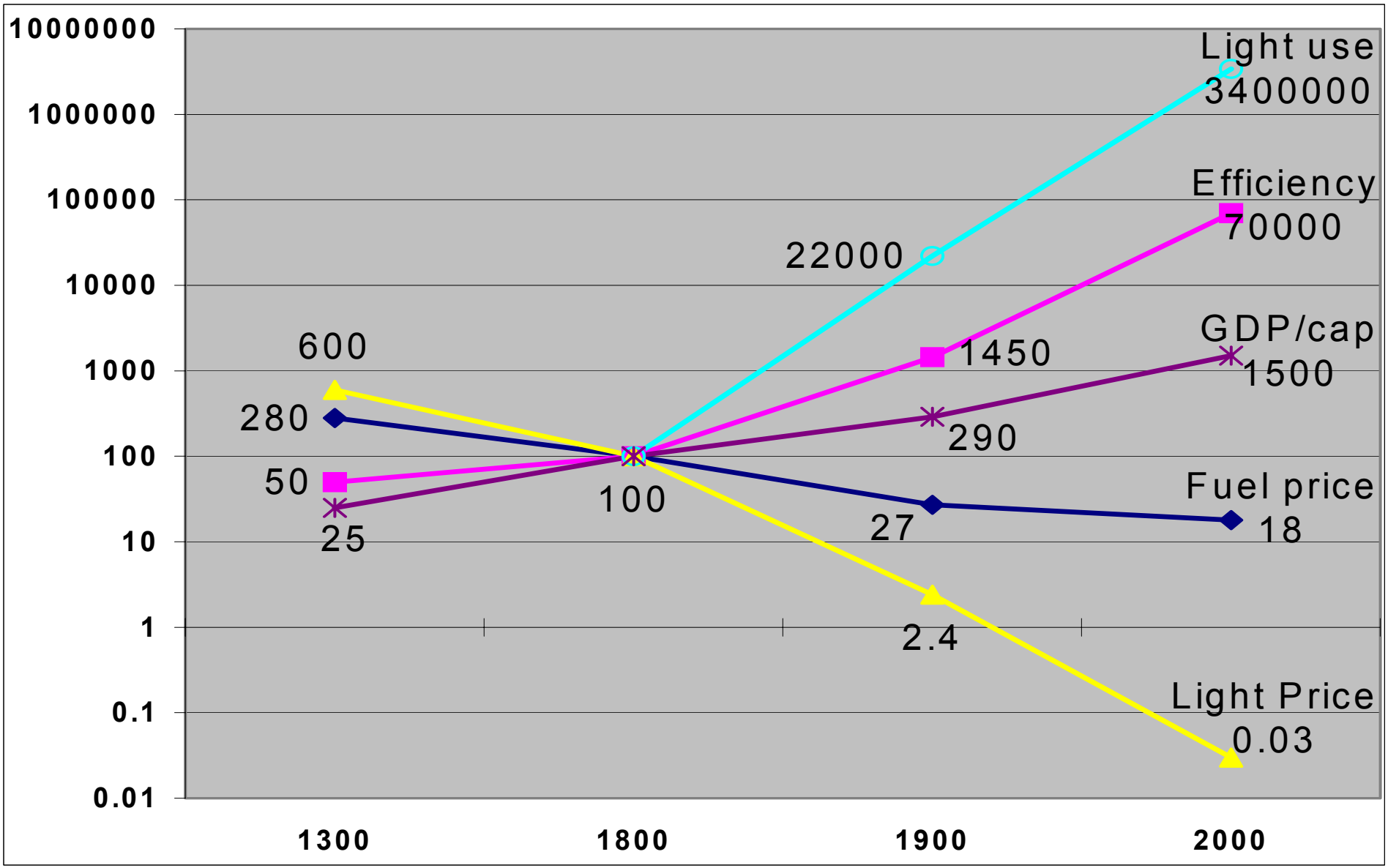


Table 1. Estimated Indexes of Key Lighting Variables in the UK (1300-2000)

	Real Price of Fuel	Efficiency of Lighting	Real Price of Lighting	Consumption of Lighting	GDP per capita	
Year	**Index**	**Index**	**Index**	**Index**	**Index**	**£(2000)**
1300	280	50	600	-	25	300
1800	**100**	**100**	**100**	**100**	**100**	1,200
1900	27	1,450	2.4	22,000	290	3,500
2000	18	70,000	0.03	3,400,000	1,500	17,500

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

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