

#### **Energy services and demand**

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## Agenda

- Introduction
- Long Run Demand for Energy Services in UK
- Some reflections



#### The energy system - concept

Consumer group:

- Residential
- Commercial
- Industry
- Institutions

Energy services/ energy carriers:

- Electricity
- Heating
- Cooling
- Gas
- Transport/Mobility



- Energy services groups:
- Electricity (power network, micro grid technologies i.e. solar PV, small wind turbines)
- Heating (heating network, micro grid technologies i.e. solar heating, local boiler, heat pump)
- Cooling (cooling network, micro grid such as HVACs, Air Cons/ heat pumps)
- Gas (gas network, gas boilers, gas cooking)
- Transport/Mobility (fuel stations for cars/buses, electricity for cars/trains, hydrogen stations)

# Lon Run Demand for Energy Services: the Role of Economic and Technological Development

- Roger Fouquet
- BC3 Working Paper Series
- March 2013
- A case of United Kingdom

# Consumption of Energy Services in the United Kingdom, Index 1900=100, 1700-2000





# GDP per capita, in real terms (2000 values), and Population in the United Kingdom, 1700-2000



# Price of Consumer Energy Services in the United Kingdom (Index 1700=100), in real terms (2000 values), 1700-2000

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#### Long run technological change and prices...





## The Price and Consumption of Domestic Heating, Land Passenger Transport and Lighting in the United Kingdom, Index 1900=100, 1700-2000.

	1700	1750	1800	1850	1900	1950	2000	2010
Prices:								
Heating	325	255	145	120	100	95	42	58
Transport (Land)	153	156	106	161	100	20.7	14.6	15.4
Lighting	5,400	5,325	2,950	950	100	6.3	0.79	0.69
GDP								
(per capita)	27	30	37	48	100	166	515	540
Consumption:								
Heating	3.5	4.5	9.0	31.2	100	229	736	772
Transport (Land)	0.06	0.13	4.7	16.7	100	683	2,715	2,890
Transport (Total)	0.06	0.13	4.7	16.7	100	683	3,530	3,840
Lighting	0.06	0.08	0.17	3.5	100	1,390	11,650	17,700

Source: Author's own estimates

Fouquet, 2013



# Actual and Expected (given Unit Income and Price Elasticities) Growth Rates in the Consumption of Domestic Heating, Land Passenger Transport and Lighting in the United Kingdom, 1700-2000

	1700- 1750	1750- 1800	1800- 1850	1850- 1900	1900- 1950	1950- 2000	2000- 2010
Heating (Actual)	1.3	2.0	3.5	3.2	2.3	3.2	1.0
Heating (Expected)	2.4	3.0	2.5	3.3	2.7	5.4	1.8
Transport (Actual)	2.2	36.2	3.5	6.0	6.8	4.0	1.1
Transport (Expected)	2.1	2.7	2.0	3.7	6.5	4.5	2.0
Lighting (Actual)	1.3	2.1	20.6	28.6	13.9	8.4	1.5
Lighting (Expected)	2.1	3.0	4.4	11.6	17.5	11.1	2.2

#### Fouquet, 2013

# The Role of Transitions on Income Elasticities of Demand for Energy Services, 1800-2010



0: 10% increase in income results in 0%
increase in energy services demand
1: 10% increase in income results in 10%
increase in energy services demand
2: 10% increase in income results in 20%
increase in energy services demand



The Effect of

Source: Fouquet (2012); Author s own estimates.

4.0

3.5

Lighting

# Income Elasticities (Top) and Price Elasticities (Bottom) of Demand for Energy Services, 1800-2010





<sup>&</sup>lt;sup>13</sup>Source: Fouquet (2012); Author s own estimates

# Increase in energy consumption England and Wales 1760-2001

Factor inputs and GDP in England & Wales, 1760-2001 (1856=100)



http://www.histecon.magd.cam.ac.uk/history-sust/energyconsumption/#figures

## Some reflections

- No doubt that the Danish history on energy service demand would be quite similar to Fouquets study.
- Will the consumer react to a price signal and how strong should the price signal be?
- Which consumer will react to a price signal and how much will they react?
- Which parts of the consumers energy services are most likely to react to a price signal?
- Is price the most effective measure to force change in consumption patterns (i.e. load shifting)?
- Which alternative measures are available?