



TECHNISCHE
UNIVERSITÄT
WIEN



Energy system modelling under disruption from energy economic point- of view

Reinhard Haas
Energy Economics Group
TU Wien

- 1. Motivation**
- 2. Basics of energy modelling**
- 3. The impact of price and income**
- 4. What is really a disruption?**
- 5. Dynamics & irreversibilities**
- 6. Policy strategies**
- 7. Conclusions**

1. Motivation

- Heading towards sustainable energy systems
- Identifying the major impact parameters – drivers / slowers – in the energy system
- Deriving efficient and effective energy policies

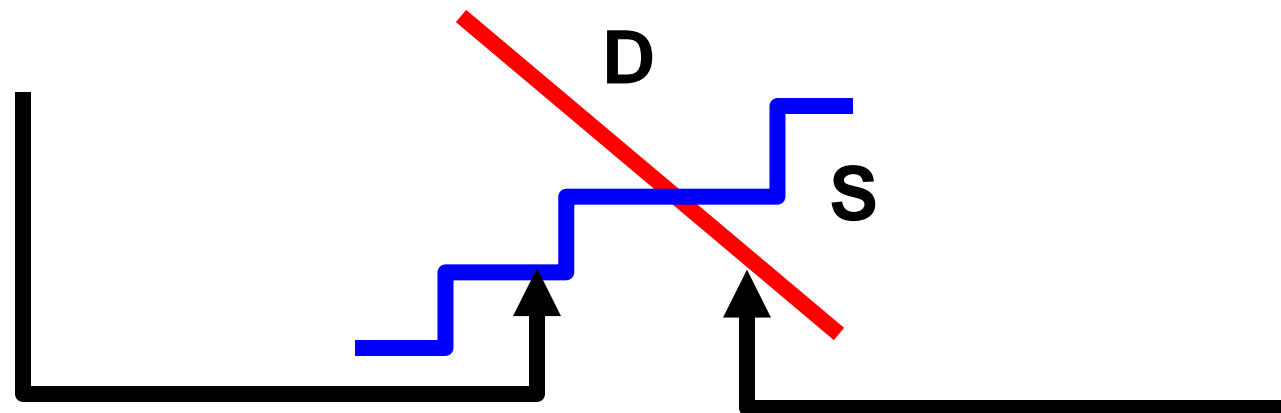
Energy supply
model:
Linear programming

$$E_S = f(C(E), p, E_D)$$

Energy demand
model:
Econometric model

$$E_D = f(p, Y, HDD)$$

Price,
 $E_S = E_D$



Energy market model

3. The major impact of price and income

Econometric analyses I

Basic equation:

$$E_t = C p_t^\alpha Y_t^\beta \text{HDD}_t^\gamma E_{t-1}^\lambda$$

p_t Energy price

Y_t Income

HDD_t Heating degree days

λ „Lag“

In logarithmic form:

$$\ln E_t = C + \alpha \ln p_t + \beta \ln Y_t + \gamma \ln \text{HDD}_t + \\ + \lambda \ln E_{t-1}$$

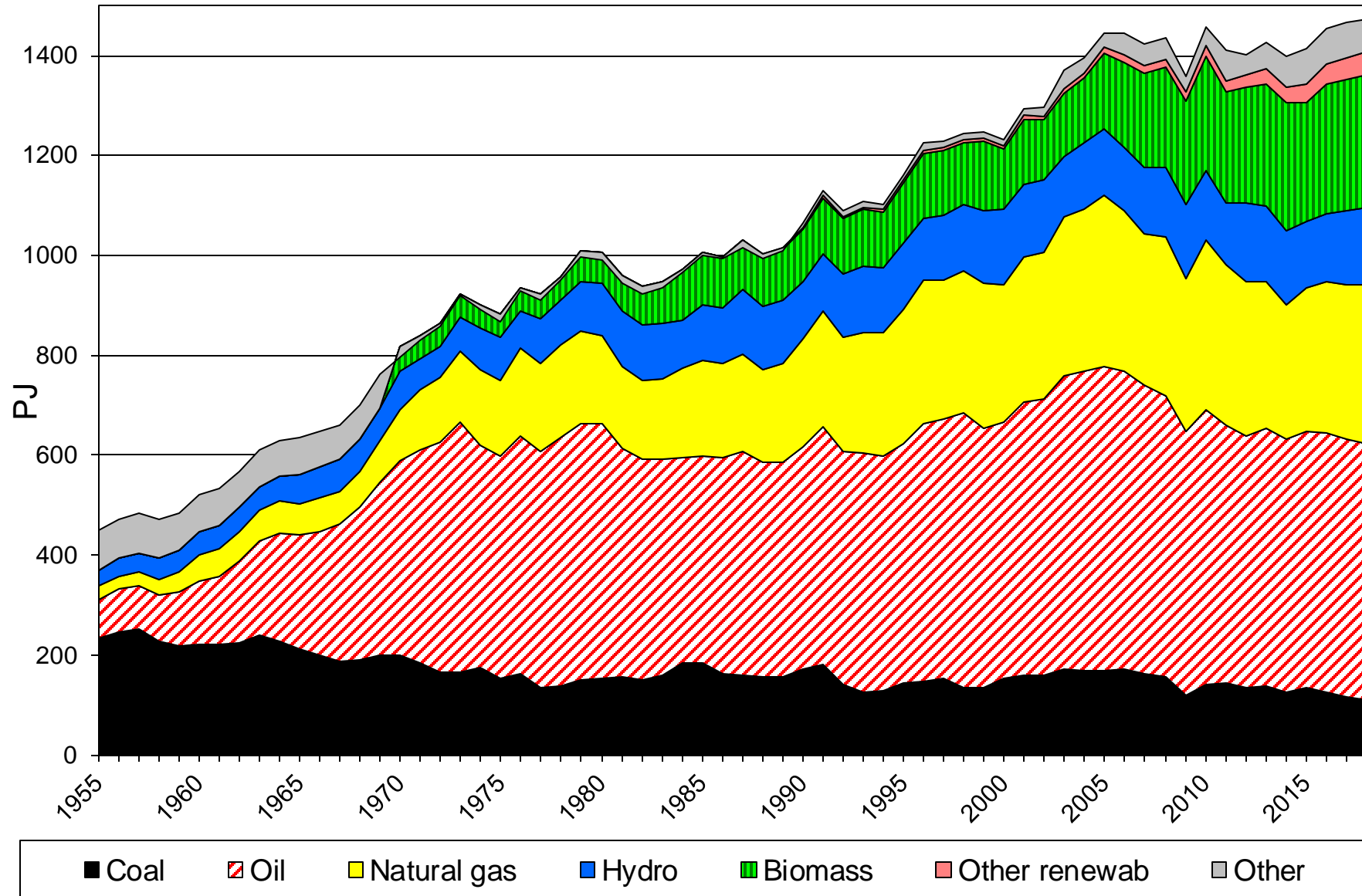
→ Cointegration

→ ARDL (Autoregressive distributed Lag)

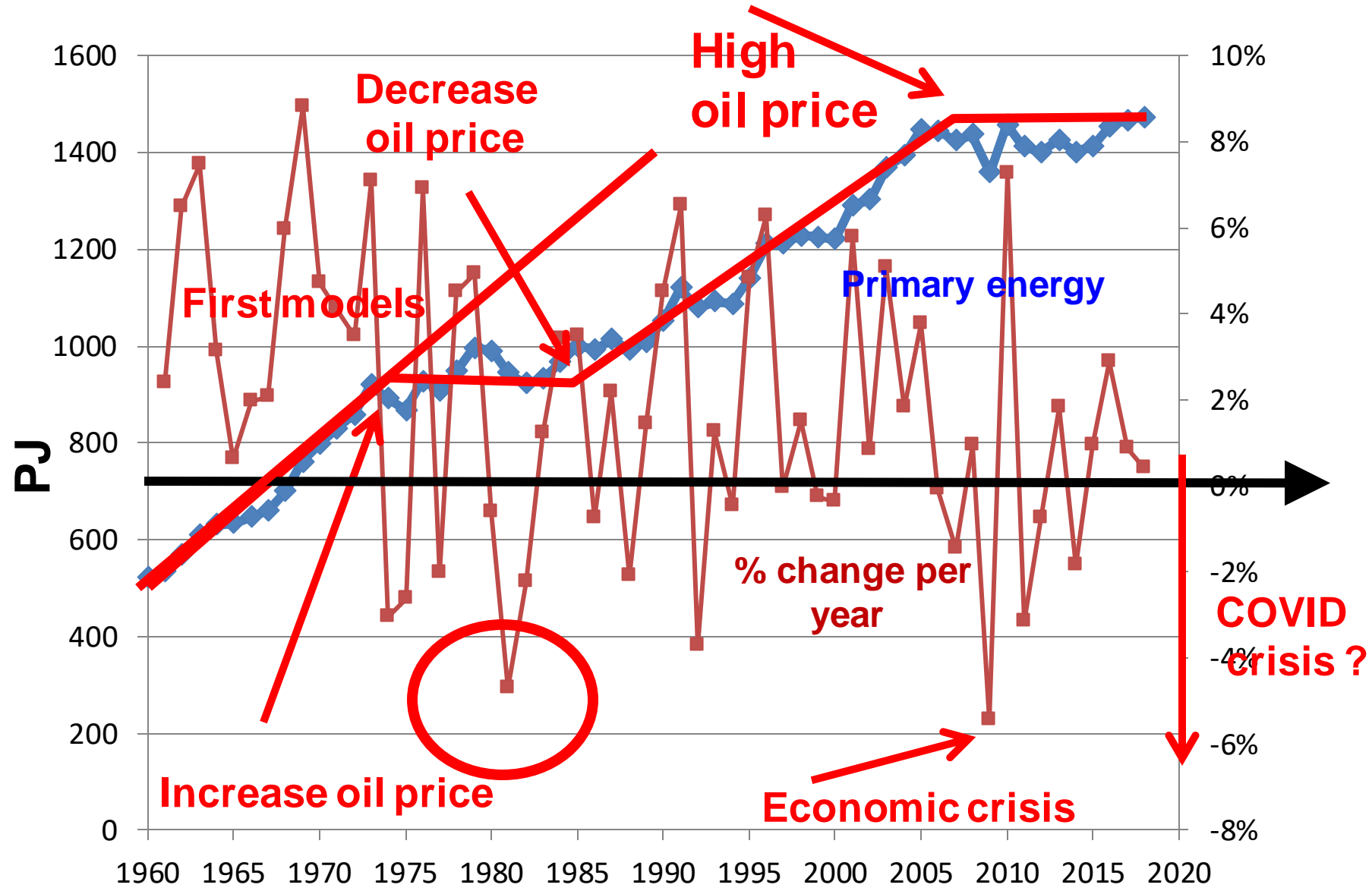
→ ECM (Error-correction models)

→ allows to capture short- and long-term effects of all variables separately

Primary energy demand Austria



4. What is really a disruption?



Extended equation:

$$E_t = C p_t^\alpha Y_t^\beta e^{aD1+bD2}$$

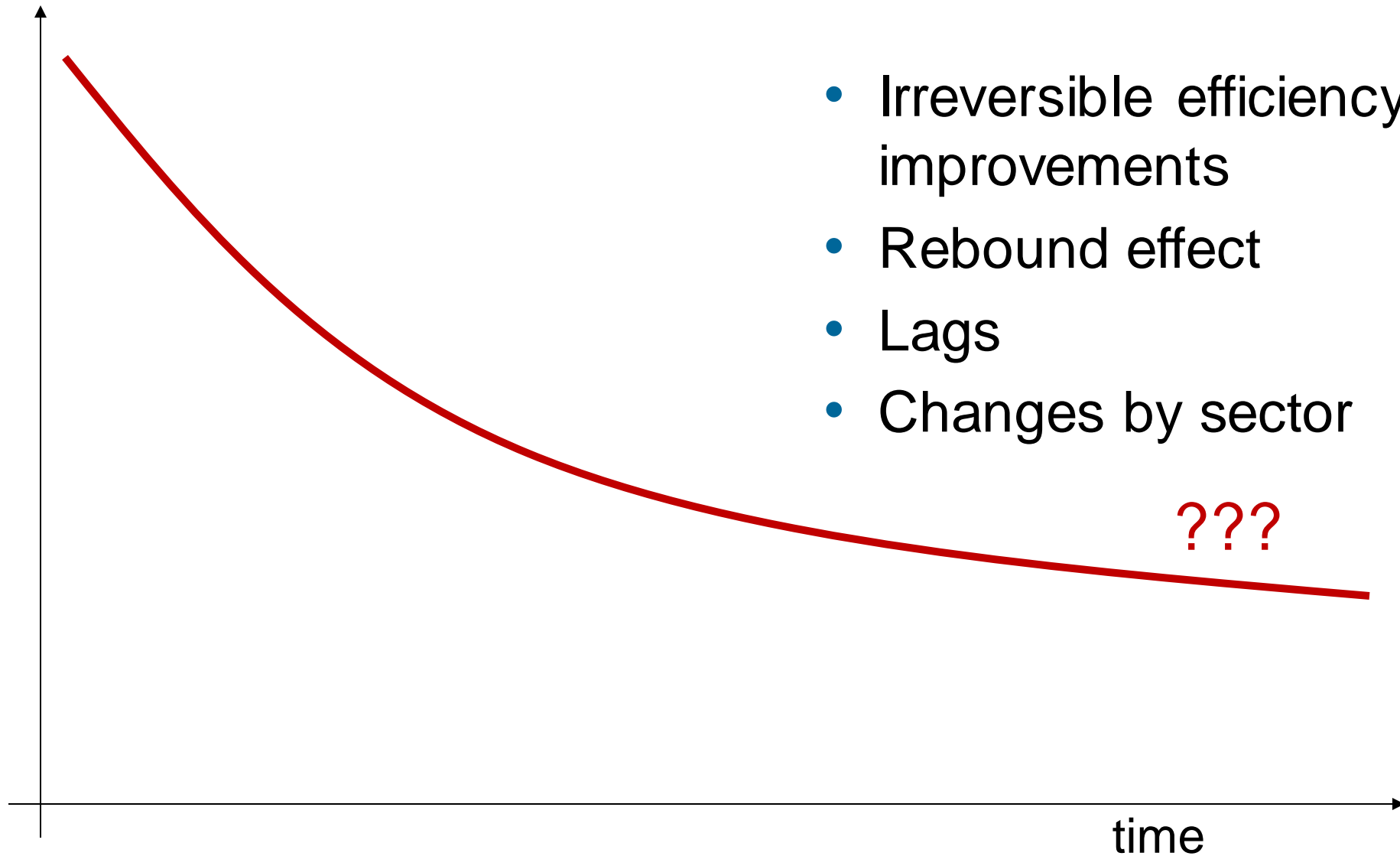
p_t Energy price

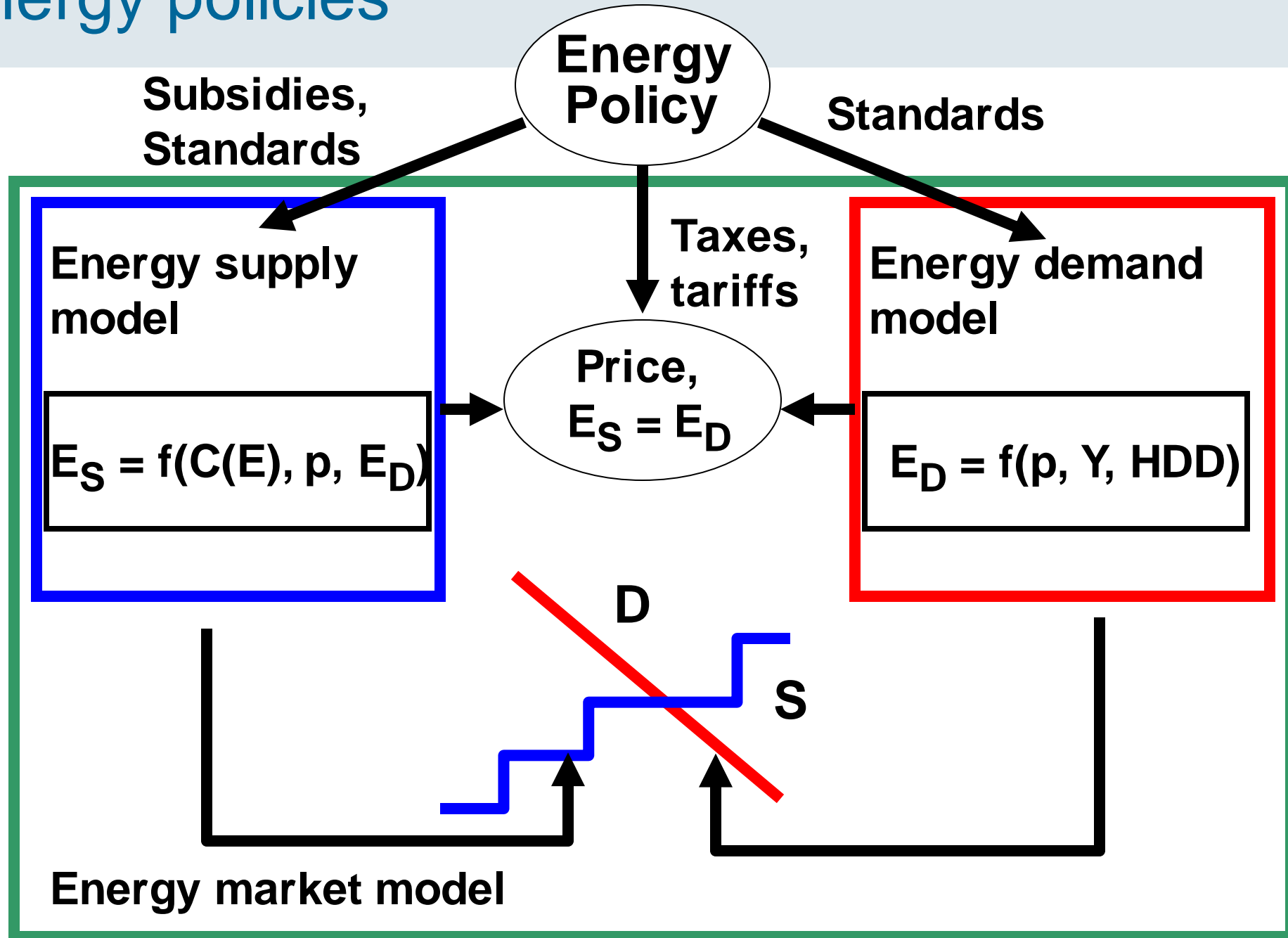
Y_t Income

$D1, D2$... Dummy variables (e.g. a specific year)

a, b Coefficients of the Dummy variables

5. Dynamics: Example income elasticity





7. Conclusions

- What are real disruptions?
- Most can be explained by changes in GDP
- Important are considerations of dynamics (e.g. of elasticities)
- Modelling service demand instead of energy ?
- As simple as possible, as complicated as necessary
- Good ideas!