

# **Decision Making in Energy Efficiency Investments**

A Review of Discount Rates and **Their Implications for Policy** Making

Dr Ruben Kubiak **Energy Efficiency Unit European Commission** 

13 September 2016



# Should I buy it or not?

Inter-temporal choices are at the core of every investment decision

- When do we invest?
- Do we invest differently if it is "energy efficient"?
- Are we all behaving the same?
- What effect does our bounded rationality have?
- How can policy help overcome it?



## The ugly math...

# Paul Samuelson's discounted-utility model:

 $U\uparrow t (c\downarrow t, ..., c\downarrow T) = \sum k = 0\uparrow T - t \equiv D(r,k) u(c\downarrow t+k)$ 

## with

 $D(r,k) = (1/1+r) \uparrow k$ 

Very similar to the financial NPV calculation:  $NPV(r,T) = \sum k = 0 \uparrow T \equiv (1/1 + r) \cdot k \quad u \downarrow k$ 





#### **Overview of scientific literature**





### Is the data reliable? And can we use it for EE?





#### Are we all the same?





# Why do individuals discount differently?

Many socio-economic aspects such as income, age or education have a significant influence on exhibited discount rates, but:

- gains are discounted more than losses
- people tend to stick to the 'default'
- small amounts are discounted more than large amounts
- investments are discounted less if there is only one option
- risk aversion: has a decreasing effect on discount rates
- procrastination: a better deal might just be around the corner
- perspective: presenting future (nominally higher) rewards reduce discounting compared to NPV
- strategic ignorance: once a decision has been made there will be no change (even if new information comes in)





#### How about legal entities?



N = 32,273 investments:

- >50% of all legal entities have a payback horizon of 6 months or less
- the average discount rate is 43%
- many firms only use payback periods as decisive criterion
- the majority of all profitable investments were never realised



# Why do firms discount differently?

Decision makers are boundedly rational individuals:

- no use of appropriate & sophisticated financial analysis
- strict budgeting rules increase discount rates
- small amounts are discounted more than large amounts
- investments with link to core business have smaller discount rates
- owner/employer-dilemma & employees' strict performance evaluation
- further effect of EE investments is overlooked
- non-profit entities have highest discount rates
- strategic ignorance: once a decision has been made there will be no change (even if new information comes in)



### How large is the energy efficiency gap?



Only 42% of all profitable EE investments are made
Only 60% of all EE investments with r>17.5% are made



### How can policy counteract? Example: Energy Label





# How should we design public policy?

- economic gains of energy efficiency investments presented as losses from not doing them
- the expected returns presented before the required costs
- only one decision for energy efficiency investments, ideally as the 'default' one with only an active opt-out
- appropriate (mandatory) financial assessments
- easing the access to appropriate funds is crucial
- Not: higher energy taxation (if, then on the investment costs)
- Not: information & best practices (if, then individualised)
- Maybe: risk reduction





## **Thank you!**



