EUROPEAN FOREST INSTITUTE
MEDITERRANEAN REGIONAL OFFICE – EFIMED

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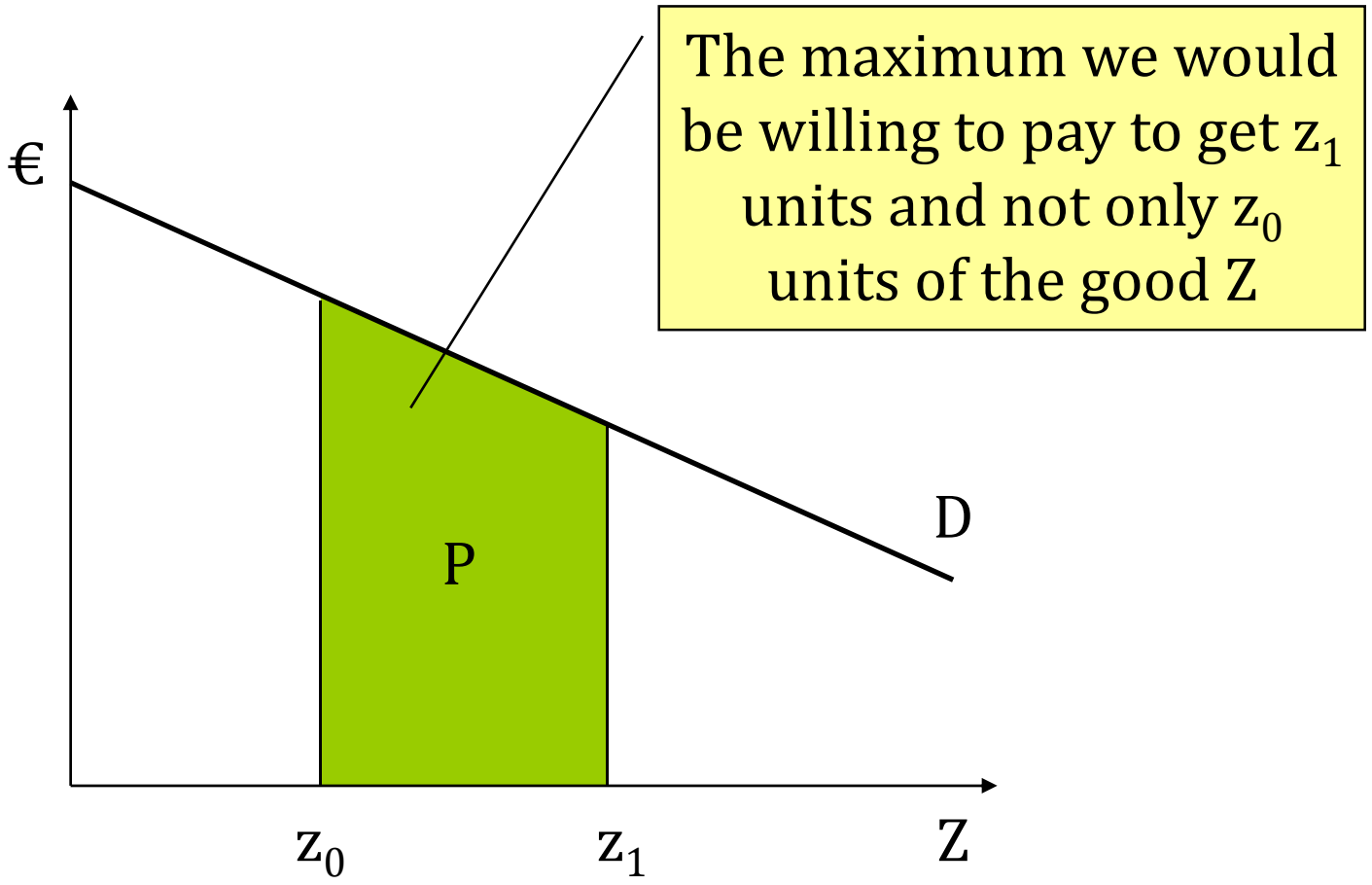
Stated Preference Methods
or
Direct Valuation Methods

Content

- Compensation or payment?
- Stated preference methods
  - Contingent Valuation Method
  - Choice Modelling

Compensation or Payment?

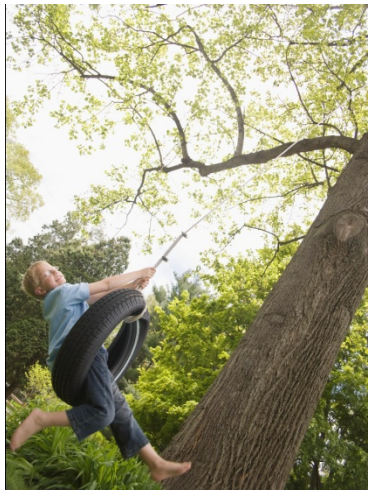


Compensation or Payment?

		Occurs	
		Yes	No
Change	+	**Payment**	**Compensation**
	-	**Compensation**	**Payment**

Contingent Valuation Method

The method is used to estimate economic values for all types of environmental goods and services (use and non use values)!



Contingent Valuation Method

Development

- 1947– Ciriacy-Wantrup – initial idea
- 1958 – Mack & Mayers – entrance fee for US national parks
- 1989 – Exxon Valdez accident-breaktrough

Contingent Valuation Method

The method is based on directly asking the people “how much they are willing to pay?”

Contingent Valuation Method

Theoretical background I.

RUM – random utility model!?

Utility – welfare

Utility (u) increases with the consumption of goods (x).

$$u=u(x)$$

Contingent Valuation Method

Theoretical background II.

How much of these goods can we consume?

Depends on the price of the goods (p_x) and our income (y).

$$x=x(p_x,y)$$

Therefore we can express utility as:

$$u=v(p_x,y)$$

Contingent Valuation Method

Theoretical background III.

Let's add something more…

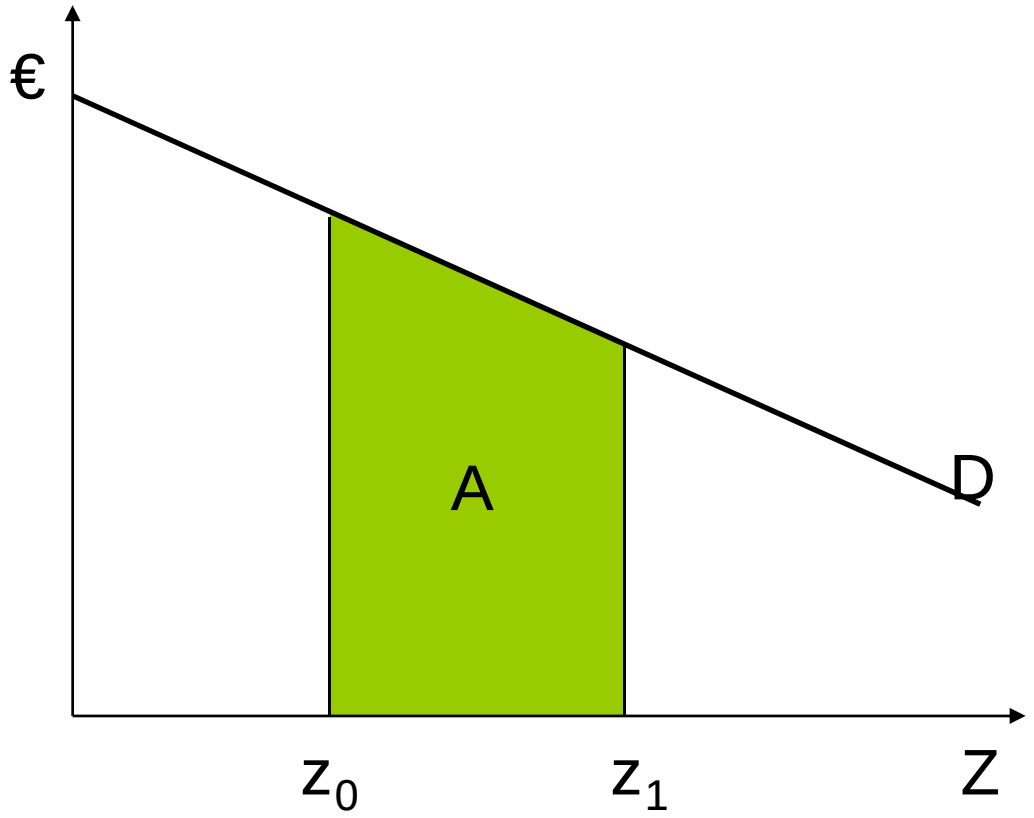
Environmental goods (z)!

Now we get:

$$u=v(p_x,\mathbf{z},y)$$

Contingent Valuation Method

Do you remember?



Contingent Valuation Method

Theoretical background IV.

We have z^0 …

$$u=v(p_x,z^0,y)$$

but by paying A we coud get z^1

$$z^0<z^1$$

$$u=v(p_x,z^1,y-A)$$

Contingent Valuation Method

Theoretical background V.

How much can be A that we would be still willing to pay it?

If $v(p_x,z^0,y) < v(p_x,z^1,y-A)$

If $v(p_x,z^0,y) = v(p_x,z^1,y-A)$

If $v(p_x,z^0,y) > v(p_x,z^1,y-A)$

Contingent Valuation Method

Theoretical background VI.

If A<WTP we pay A for obtaining z^1

If A= WTP we are indifferent

If A>WTP we do not pay A for obtaining z^1

Contingent Valuation Method

Some practical issues

CVM is applied by questionnaires!

Typically we ask: “How much would you be willing to pay for a change in the **quantity** and/or **quality** of a good X?”

Contingent Valuation Method

How to proceed

1. Deciding what change we are going to value
2. Deciding how we are going to implement the questionnaire (type)
3. Design and testing the questionnaire
4. Collecting data
5. Statistical analysis

Contingent Valuation Method

The change to value

- Specify very clear the change (what is z^0 and z^1)
  - for example not enough to say “How much are you willing to pay for 3 additional plant species?”
  - specify when the additional species would be provided (time definition)
  - Are we going to ask for a payment (willingness to pay) or compensation acceptance (willingness to accept)

- If not, you will not know what the responded was valuing

Contingent Valuation Method

Type of questionnaire

- In person (paper, computer) - most reliable but also most expensive and time consuming
- Telephone – less reliable than person but cheaper and less time consuming
- Mail – less reliable, cheap, more information can be given
- Web – less reliable, cheap and fast
- Combined

The type of questionnaire will in most cases depend on the budged!

Contingent Valuation Method

Designing the questionnaire

In general it has 3 parts:

- Introduction – preparation for the central part
- Central part – contains the question on the WTP or WTA
- Final part – collecting socio-economic data

Contingent Valuation Method

Designing the questionnaire

Introduction – preparation for the central part

- presents the good they will have to value
- different aspects of the god to be valuated
- questions to obtain knowledge on persons preferences, knowledge, interest, and to keep the person motivated

Contingent Valuation Method

Designing the questionnaire

Central part I. – contains the question on the WTP or WTA

- Sum up on the change of the good we value
- Explain the way of payment
  - Tax, increase of a certain price (e.g. water bill)
  - Payment mandatory or optional
  - Who will pay
  - Time of payment (annual, monthly, etc.)
  - Period of payment (1 year, 10 years, etc.)
- Explain the consequences if not paying
- Remind the person to take into account her income limit
- Selecting the type of the valuation question
  - Open ended
  - Closed

Contingent Valuation Method

Designing the questionnaire

Types of valuation question

Open ended:

- the person states the amount money

Closed – limited amounts of money to select from

- Payment cards
- Single bounded
- Double bounded

Contingent Valuation Method

Designing the questionnaire

Central part II. – contains the WTP/WTA question

- Questions
  - Why not paying (if the case)
  - What influenced the decision to pay (if the case)
  - How sure about the answer
  - Difficulty of taking the decision

Contingent Valuation Method

Designing the questionnaire

Final part – collecting socio-economic data

- Questions
  - Age
  - Education
  - Occupation
  - Personal/household income
  - Family (children)
  - Member of a certain organisation (environmental,…)
  - Etc.

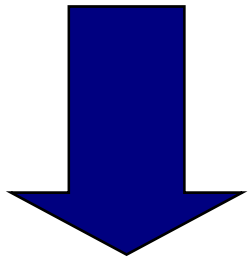
Contingent Valuation Method

Testing the questionnaire

Once the questionnaire is designed, we test it:

- Focus groups (6-8 persons answering and commenting the questionnaire)
- Pilot study (limited sample)

Questionnaire improvement (based on responses)



Start data collection

Contingent Valuation Method

Data collection

- Selecting the target population
  - Who (individuals, families, enterprises, certain professionals, visitors of an area, age, etc.)
  - Territory (city, region, country)
- Sampling
  - Randomly, systematically, quotes, mixed
- Sample size
  - Ideal to meet the statistical requirements (anticipated standard error of the results)
  - mostly depends on the budged of the study
  - 200 – small, 300-500 – medium; >1000 - big

Contingent Valuation Method

Data analysis

- Estimating the average or median WTP (or WTA)
- The statistical method applied depends on the type of valuation question we applied

Contingent Valuation Method

Advantages

- **Very flexible**, can be used to estimate the economic value of virtually anything. However, it is best able to estimate values for goods and services that are easily identified and understood by users and that are consumed in discrete units (e.g., user days of recreation).

- most widely **accepted** method for estimating **total economic value** , including all types of non-use, or “passive use,” values. CV can estimate use values , as well as existence values , option values , and bequest values .

Contingent Valuation Method

Advantages

- requires competent survey analysts to achieve defensible estimates, but the **results** of studies are **not difficult to analyze and describe**. Dollar values can be presented in terms of a mean or median value per capita or per household, or as an aggregate value for the affected population.

- **widely used**, lot of research is being conducted to improve the methodology, make results more valid and reliable, and better understand its strengths and limitations.

Contingent Valuation Method

Issues and Limitations

- widely used for the past few decades, but there is considerable controversy whether it adequately measures people's willingness to pay.

- individuals have practice making choices with market goods, so their purchasing decisions in markets are likely to reflect their true willingness to pay. CV assumes that people understand the good in question and will reveal their preferences in the contingent market just as they would in a real market. However, most people are unfamiliar with placing dollar values on environmental goods and services. Therefore, they may not have an adequate basis for stating their true value.

Contingent Valuation Method

Issues and Limitations

- **Biased answers** – respondent a different question than asked. Rather than expressing value for the good, the respondent might actually be expressing their feelings about the valuation exercise itself.

  For example, respondents may express a positive willingness to pay because they feel good about the act of giving for a social good ("warm glow" effect), although they believe that the good itself is unimportant. Alternatively, some respondents may value the good, but state that they are not willing to pay for it, because they are protesting some aspect of the scenario, such as increased taxes or the means of providing the good.

Contingent Valuation Method

Issues and Limitations

- Possible associations among environmental goods. For example, if asked for willingness to pay for improved visibility (through reduced pollution), the respondent may actually answer based on the health risks that he or she associates to polluted air.

- Difference between hypothetical decisions and actual decisions. For example, respondents do not take questions seriously because they will not actually be required to pay the stated amount.

Contingent Valuation Method

Issues and Limitations

- If first asked for WTP for one part of an environmental asset (e.g. one lake in an entire system of lakes) and then asked to value the whole asset (e.g. the whole lake system), the amounts stated may be similar. This is referred to as the "**embedding effect**."

- expressed WTP for something has been found to depend on where it is placed on a list of things being valued. This is referred to as the "**ordering problem**."

Contingent Valuation Method

Issues and Limitations

- different WTP amounts, depending on the specific **payment vehicle** chosen. For example, some payment vehicles, such as taxes, may lead to protest responses from people who do not want increased taxes. Others, such as a contribution or donation, may lead people to answer in terms of how much they think their “fair share” contribution is, rather than expressing their actual value for the good.

- suggesting a **starting bid** affects respondents’ final WTP.

Contingent Valuation Method

Issues and Limitations

- **Strategic bias** respondents provide a biased answer to influence the outcome. If a decision to preserve a stretch of river for fishing, for example, depends on whether or not the survey produces a sufficiently large value for fishing, the respondents who enjoy fishing may be tempted to provide an answer that ensures a high value, rather than their true valuation.

- **Information bias** when respondents value attributes with which they have little or no experience. In such cases, the amount and type of information presented to respondents may affect their answers

Contingent Valuation Method

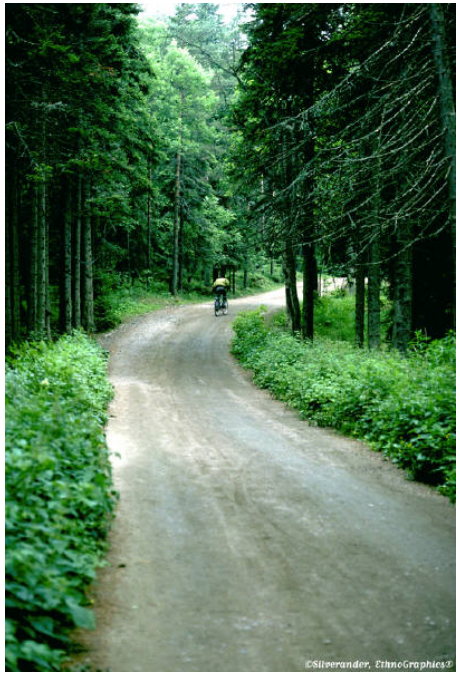
Issues and Limitations

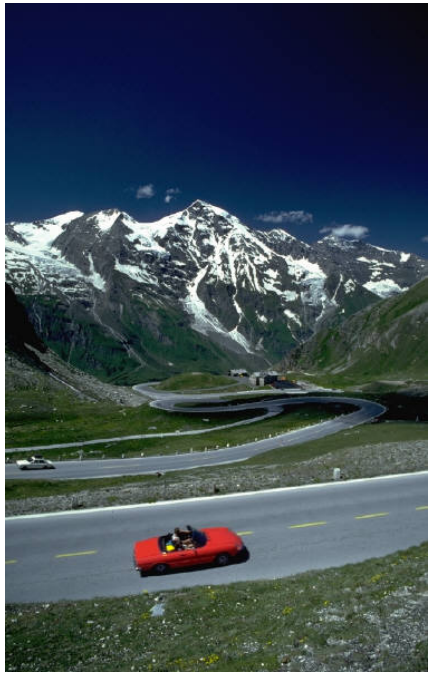
- **Non-response bias**, since individuals who do not respond are likely to have, on average, different values than individuals who do respond.
- Estimates of non-use values are difficult to validate externally.
- When conducted to the exacting standards of the profession, contingent valuation methods can be very expensive and time-consuming, because of the extensive pre-testing and survey work.

Choice Modelling

From the same “family” as the Contingent Valuation Method (stated preference method).

We can value all type of goods and services (use and non-use values)!





Choice Modelling

But…

In CVM:

- the change we value is constant
- the payments can be different

In CM:

- The change we value and the payments are different

Choice Modelling

- Originated from marketing research (conjoint analysis)
- Builds on the idea that the value of a good is reflection of its characteristics (Lanchester 1966)
- Theoretical basis the RUM theory (McFadden 1974)

Choice Modelling

Theoretical basis the RUM theory (McFadden 1974)

Respondents utility to select a certain package of attributes is the sum of known and unknown influences:

$$U_{ij} = V_{ij} + \varepsilon_{ij}$$

The probability *P* that any particular individual prefers the alternative *j* in the choice set to any alternative *k* can be expressed as the probability that the utility associated with alternative *j* exceeds that associated with any other alternative.

$$P_{ij} = P(U_{ij} > U_{ik}) = P(V_{ij} + \varepsilon_{ij} > V_{ik} + \varepsilon_{ik}) = P(V_{ij} + \varepsilon_{ij} - V_{ik} + \varepsilon_{ik}) > 0; \forall j \neq k$$

Choice modelling

- Respondents are asked to compare and select (rank or rate) alternative combinations of goods or policy characteristics

For example:
Implementation of improved forest management that would change the recreation possibilities and biodiversity in the forest

Choice Modelling

Attribute	Levels
Recreation	R_1, R_2
Biodiversity	B_1, B_2, B_3
Payment	A_1, A_2, A_3, A_4, A_5

Choice Modelling

Alternative A	Alternative B	Alternative C	Alternative C
Recreation N_1	Recreation N_2	Recreation N_1	Recreation N_2
Biodiversity B_1	Biodiversity B_2	Biodiversity B_2	Biodiversity B_3
Payment A_2	Payment A_1	Payment A_4	Payment A_3

In total we would have:

$3^4 \cdot 2^4 \cdot 5^4 = 810{,}000$ combinations (choice sets)

Choice Modelling

- Each respondent sees one or more choice sets (in most cases 3-16)
- for each choice sets the respondent has to:
  - Select the preferred alternative (pair wise choice or simple choice)
  - Rank the alternatives (contingent ranking)
  - Rate the alternatives (contingent rating)
- In most cases we include a “status quo” alternative (reflecting actual situation and no payment)

Choice Modelling

Analysis of the results:

- marginal value for each of the attributes
- total value of a scenario

Choice Modelling
Advantages

- used to value the outcomes of an action as a whole, as well as the various attributes or effects of the action.

- allows respondents to think in terms of tradeoffs, which may be easier than directly expressing dollar values.

- Respondents more comfortable providing qualitative rankings or ratings of attribute bundles that include prices, rather than dollar valuation of the same bundles, by de-emphasizing price as simply another attribute.

Choice Modelling

Advantages

- Survey methods may be better at estimating relative values than absolute values.
- The method minimizes many of the biases that can arise in contingent valuation studies where respondents are presented with the unfamiliar and often unrealistic task of putting prices on non-market amenities.
- The method has the potential to reduce problems such as expressions of symbolic values, protest bids, and some of the other sources of potential bias associated with contingent valuation.

Choice Modelling

Issues and Limitations

- Respondents may find some trade-offs difficult to evaluate, because they are unfamiliar.

- If the number of attributes or levels of attributes is increased, the complexity and the number of comparisons increases. This may lead to fatigue and loss of interest, and the application of simplified decision rules.

Choice Modelling

Issues and Limitations

- Contingent choice may extract preferences in the form of attitudes instead of behaviour intentions.

- By only providing a limited number of options, it may force respondents to make choices that they would not voluntarily make.

Economic Valuation of Externalities of Mediterranean Forests in Spain

Problem definition

- Forest provide multiple goods and services
- Mostly valued timber and non-timber products (market prices)
- Other goods and services no value (no market prices) – externalities
- Not social optimal decisions in forest use and management
- High cost – low benefits??

Objective

- obtain the marginal values of main externalities for different Mediterranean forest in Spain

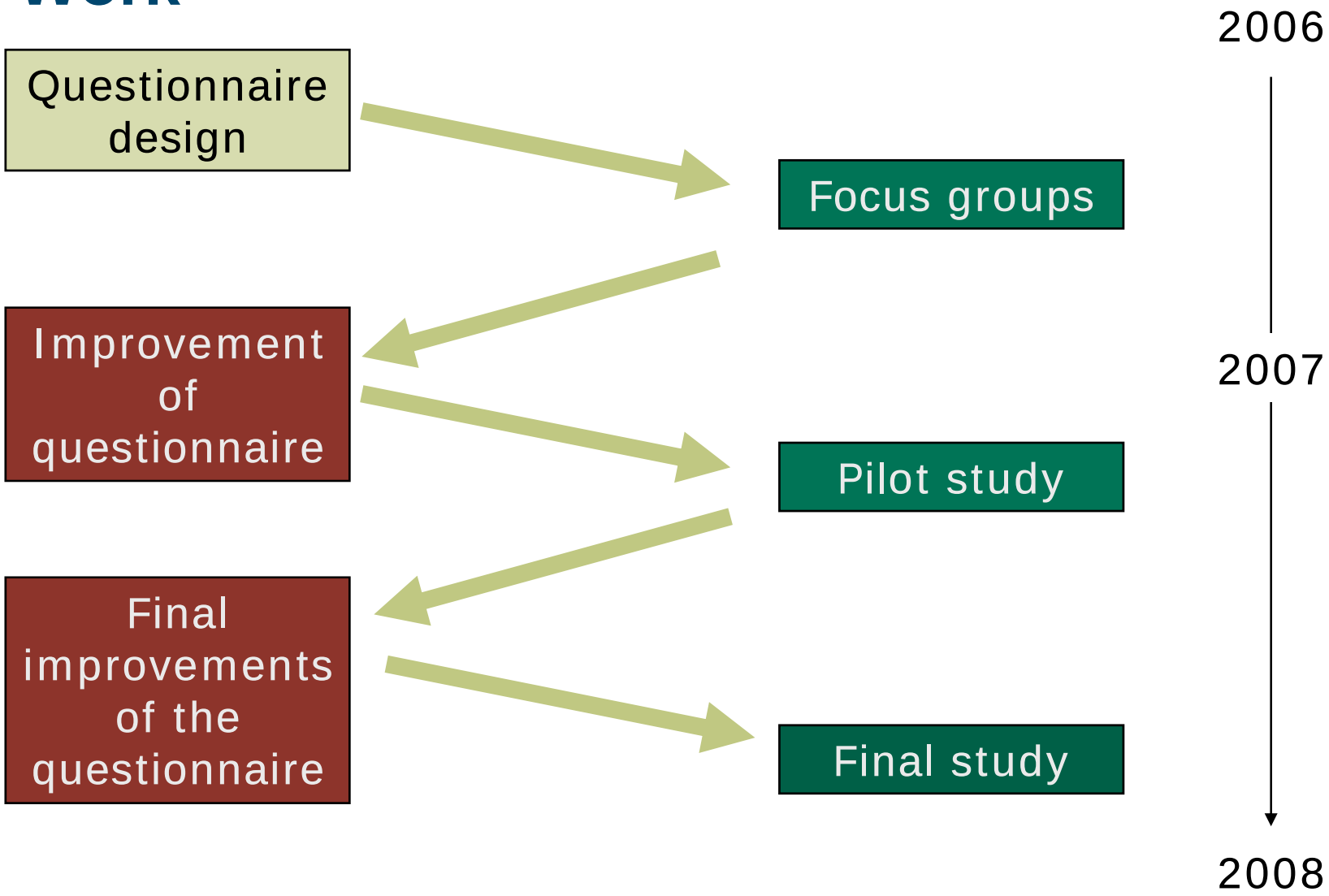
Designing the study

- Where?
  - Spain
- What?
  - goods that do not have market prices
  - benefiting mostly the society, land (forest) owner only limited
  - important for the Mediterranean area
- How?
  - Contingent choice method

Two main forest types

- Mixed Mediterranean Forests (Evergreen oaks and Pines)
- DEHESAS (low density Evergreen oaks)

Work


2006
Questionnaire design
Focus groups
Improvement of questionnaire
2007
Pilot study
Final improvements of the questionnaire
Final study
2008

Design of Questionnaire

Scenario

Affoerstation project in the Mediterranean region. The afforestation would take place on XY ha of abandoned agriculture land.

Selected forest goods

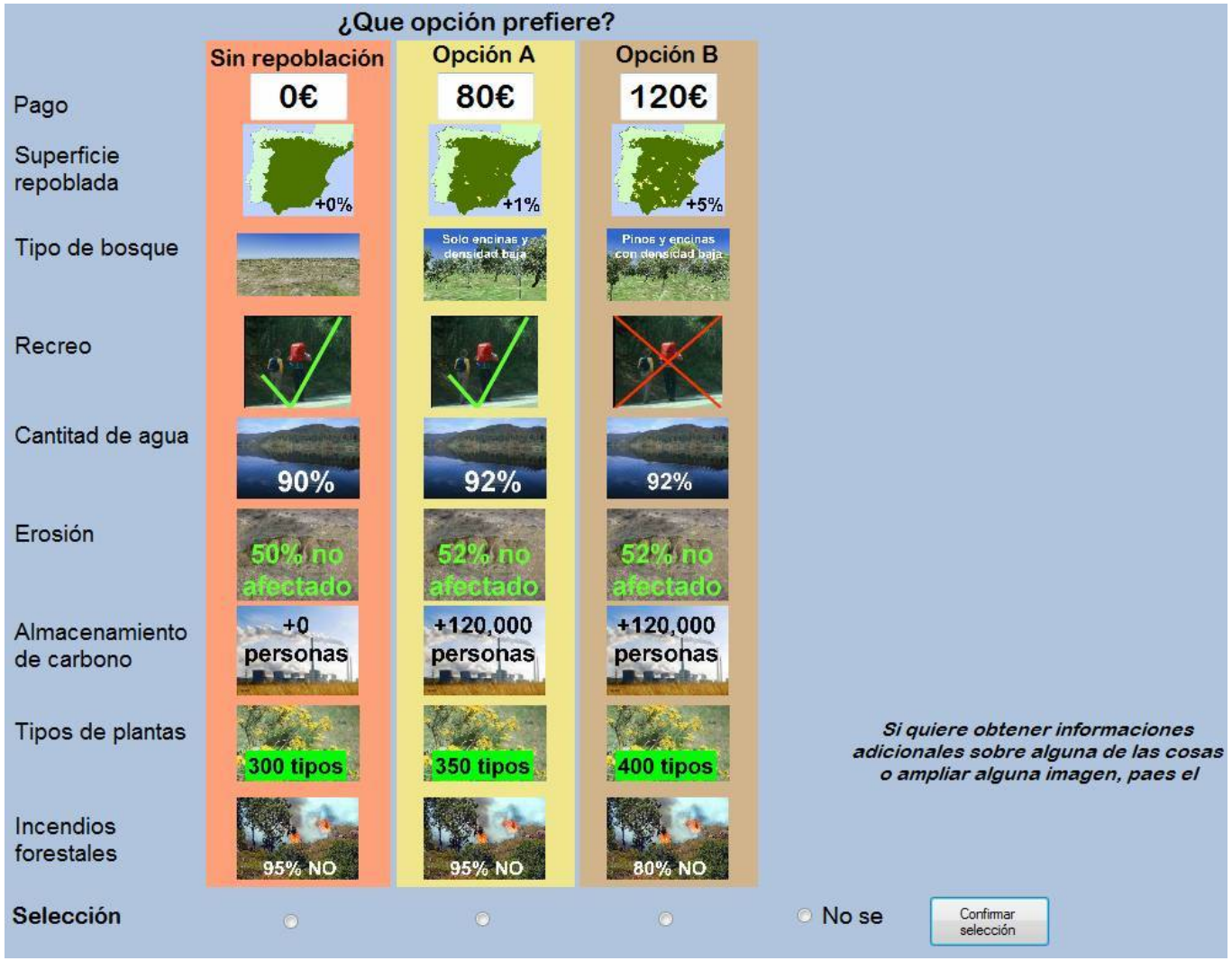
- afforestated **area**
- accessibility for **recreation**
- increment of **water** quantity
- soil **erosion** prevention
- **carbon** sequestration,
- **plant diversity** enrichment
- forest **fire** risk
- forest **aesthetics** (*stand density* and *species mixture*)

Forest goods and levels

Externality	Actual	Future (max.)
Area	+0 ha	+5% +25%
Recreation	Yes	Yes/No
Water	90%	92%
Erosion	50%	45%
Carbon	+ 0 pax	+170,000 pax/ +3,000 pax
Plant	300 spec 40 spec	400 spec 140 spec
Fire	5%	20%
Density	0 trees/ha	800 trees/ha
Mixture	0	Pine:Evergreen oak

Aesthetics

Choice Set


¿Que opción prefiere?
Sin repoblación
Opción A
Opción B
Pago
0€
80€
120€
Superficie repoblada
+0%
+1%
+5%
Tipo de bosque
Solo encinas y densidad baja
Pinos y encinas con densidad baja
Recreo
Cantitad de agua
90%
92%
92%
Erosión
50% no afectado
52% no afectado
52% no afectado
Almacenamiento de carbono
+0 personas
+120,000 personas
+120,000 personas
Tipos de plantas
300 tipos
350 tipos
400 tipos
Incendios forestales
95% NO
95% NO
80% NO
Selección
No se
Confirmar selección
Si quiere obtener informaciones adicionales sobre alguna de las cosas o ampliar alguna imagen, paes el

Application

- Computer asisted (CAPI) questionnaire
- 2 different types of questionnaire
- Voice reading the text
- Face-to-face interviews
- Self administrated or by interviewer
- Sample (following age & gender structure of the Spanish population):
  - Pilot study: 200
  - Final study: 600

Pilot Study


Santiago de Compostela-30
Bilbao-30
Barcelona-40
Madrid-40
Valencia-30
Sevilla-30
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Final Study


Ferrol - 30
Redondela - 30
Cambados - 30
Burgos - 60
Badalona - 30
Esplugues de Ll
Madrid - 90
Arganda del Rey - 30
Manises - 30
Valencia - 30
Cieza - 30
Murcia - 30
Dos Hermanas - 30
Málaga - 30
Ejido (El) - 30
Torremolinos - 30

Results (pine and oak forest)

- all the obtained results coincide with the expectations (all coefficient signs have expected sign)

Attribute	Coefficients	Standard error
Recreation	0,2190**	0,1173
Water	0,2720***	0,0600
Erosion	0,1176***	0,0268
Carbon	0,00001***	0,000001
Plants	0,0032**	0,0014
Fires	-0,0096	0,0104
Mixture	0,1715***	0,0625
Density	0,0007***	0,0002
Area	0,1837***	0,0363
Payment	-0,03217***	0,0028

Results (pine and oak forest)

Attribute	WTP (€/person/year)
Recreation	7.02
Water	8.42
Erosion	3.66
Carbon	0.0004
Plants	0.10
Mixture	0.11
Density	0.02
Area	5.68

Attribut	Scenario 1	Scenario 2	Scenario 3
Recreation	No	Yes	Yes
Water availability	90%	91%	92%
Eroded area	52%	52%	55%
Carbon amount	700,000 tCO_2	1,200,000 tCO_2	1,700,000 tCO_2
Plant species	300	350	400
Tree mixture	Pine(100%)	Pine(50%): Oak(50%)	Oak(100%)
Density	200 trees/ha	500 trees/ha	800 trees/ha
Afforestation area	440,000 ha	1,320,000 ha	2,200,000 ha
Mean WTP (€ /person/year)	45	108,3	175,56
Social welfare increase (million €/year)	1.619,5	3.897,5	6.318,1
Social welfare increase (€/ha and year)	3.680,6	2.952,7	2.871,9

(Some) study conclusions

- Positive social values for the valued forest goods and services
- Afforestation of the abandoned agriculture land would result in a social benefit:
  - between 1,620 and 6,318 million €/year (pine and oak forests)
  - between 1,472 and 7,134 million €/year (dehesa forests)