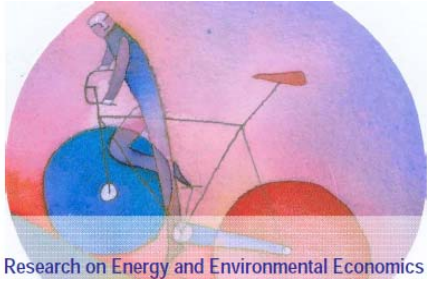


# Climate Change and Economic Growth: Impacts and Interactions

Roberto Roson  
Ca' Foscari University, IEFE and CMCC

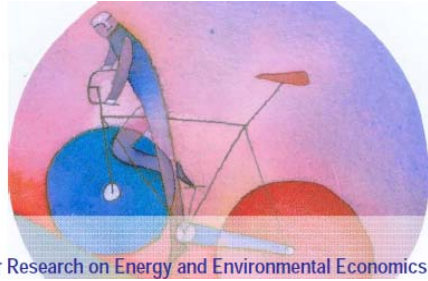
Bocconi University, Milan, October 21st, 2010





## Motivation and some Historical Background

- Numerical modeling in Environmental Economics
- Advantages of Computable General Equilibrium models:
  - Trade effects
  - Disaggregation
- GE modeling of climate change impacts at FEEM
- The birth of an environmental modeling team at IEFE
- The partnership with DECPG / World Bank



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## **Climate-change feedback on economic growth: explorations with a dynamic general equilibrium model**

FABIO EBOLI

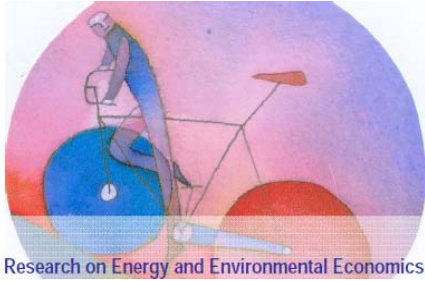
*Fondazione Eni Enrico Mattei and Euro-Mediterranean Center on Climate Change, Venice, Italy*

RAMIRO PARRADO

*Fondazione Eni Enrico Mattei and Ca' Foscari University, Venice, Italy*

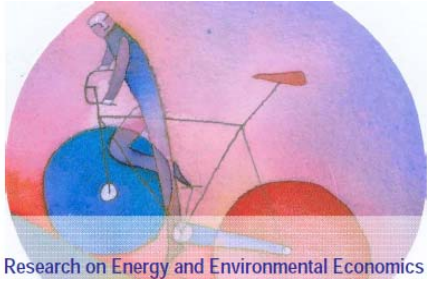
ROBERTO ROSON

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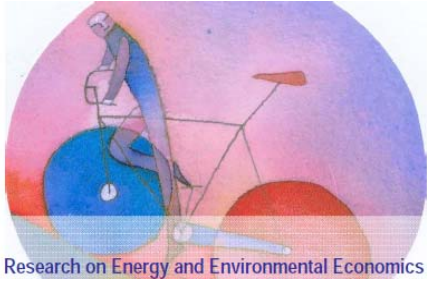
## Comparing ICES and ENVISAGE models (1)

|                       | ICES                   | ENVISAGE       |
|-----------------------|------------------------|----------------|
| No. Sectors / Regions | Variable               | Variable       |
| Dynamics              | Recursive              | Recursive      |
| Solving software      | GEMPACK                | GAMS           |
| SAM Data Base         | GTAP                   | GTAP           |
| Extended calibration  | No                     | Yes            |
| Endogenous Climate    | No                     | Yes            |
| End Year              | 2100                   | 2100           |
| Steps                 | Annual                 | Variable       |
| Income effects        | No (limited)           | Yes (flexible) |
| Macroec. scenario     | Econometric / other m. | Econometric    |
| Sticky capital stock  | No                     | Yes            |



## Comparing ICES and ENVISAGE models (2)

|                          | ICES  | ENVISAGE  |
|--------------------------|---|---|
| Saving rate              | Exogenous   | Endogenous  |
| International capital f. | Yes   | No  |
| GHG gases                | CO <sub>2</sub> , N <sub>2</sub> O, CH <sub>4</sub> | CO <sub>2</sub> , N <sub>2</sub> O, CH <sub>4</sub> , F-g |
| Sea level impacts        | Yes   | Yes   |
| Agriculture impacts      | Yes (linear)  | Yes (non-linear)  |
| Water impacts            | No  | Yes   |
| Human health impacts     | Yes   | Yes   |
| Tourism impacts          | Yes   | Yes   |
| Energy demand            | Yes   | Yes   |
| Labor productivity im.   | No  | Yes   |



## Simulation Design

- Both models have been used to simulate climate change impacts without policy intervention
- This is the base for subsequent adaptation and mitigation policy assessment
- #1) Construction of a baseline scenario w/o cc
- #2) Simulation of a counterfactual scenario
- For ENVISAGE, this has been done with two different regional disaggregations
- One disaggregation was specifically designed for IEFE with single European countries, including Italy

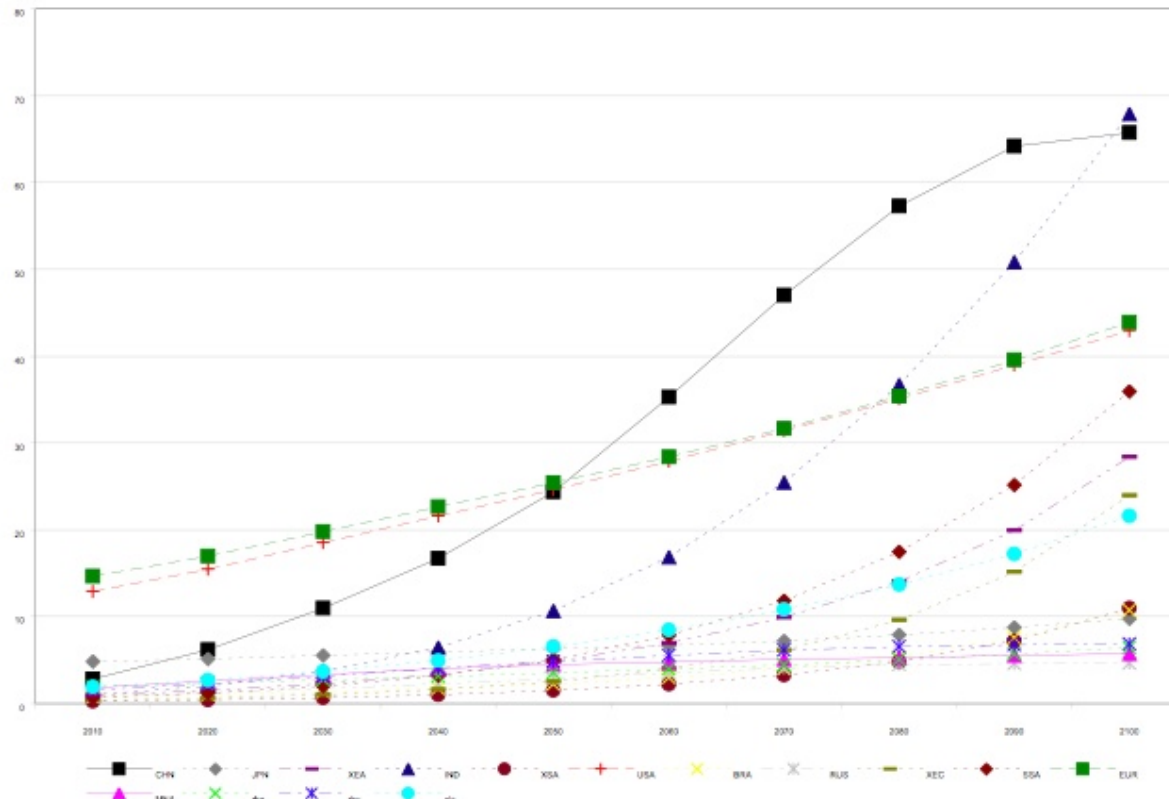
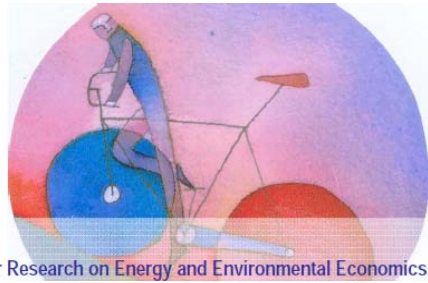


Figure 3 – Benchmark growth path for regional GDP 2010-2100



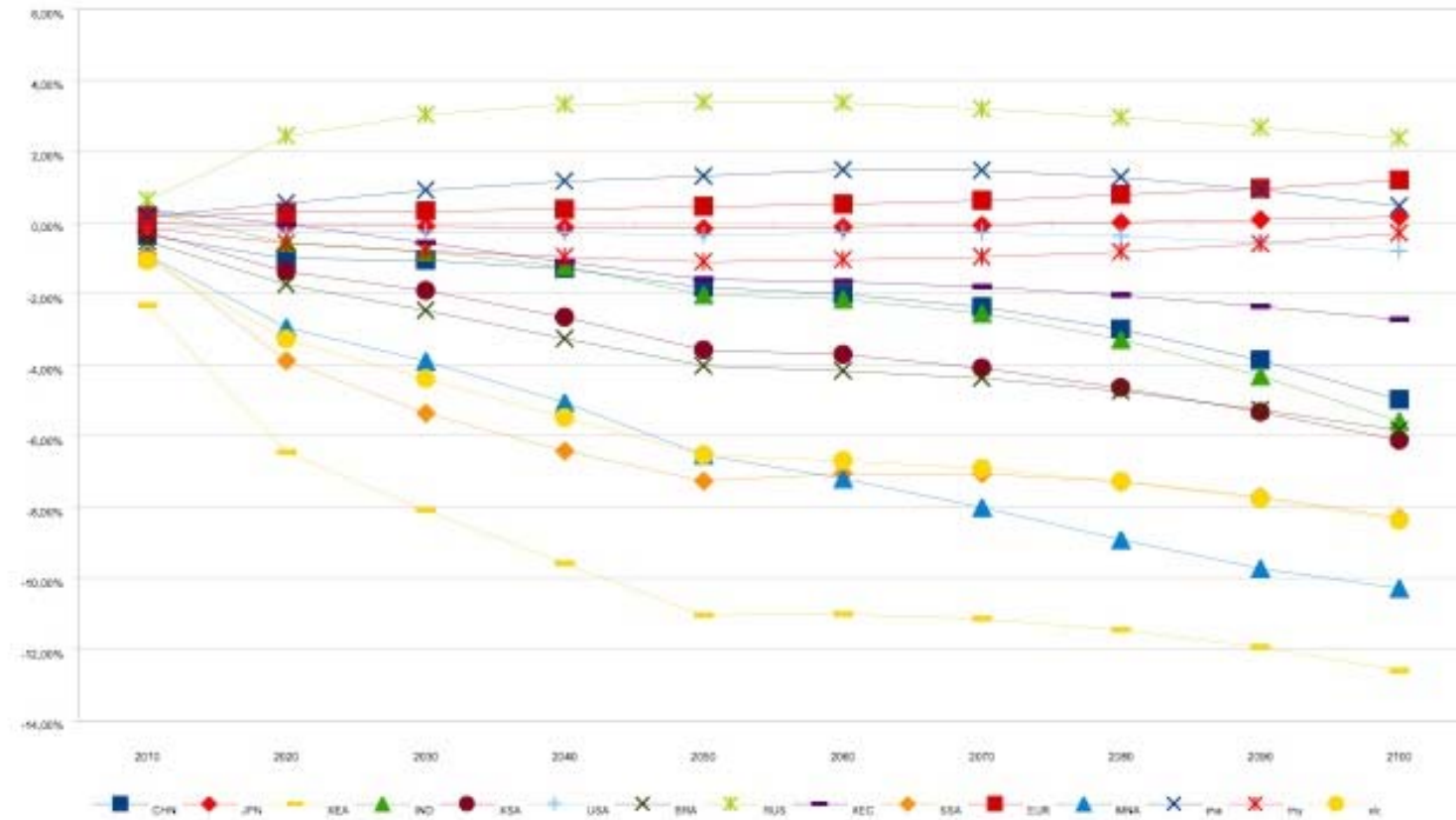
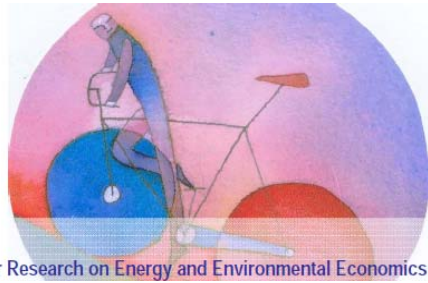
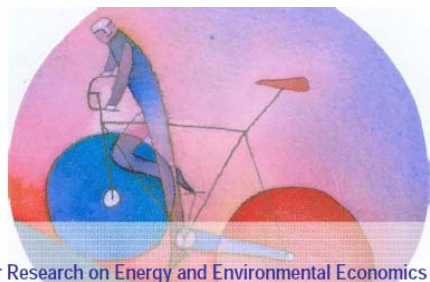


Figure 5 – Deviations of regional GDP from the baseline 2010-2100





|     | 2010   | 2020   | 2030   | 2040   | 2050    | 2060    | 2070    | 2080    | 2090    | 2100    |
|-----|--------|--------|--------|--------|---------|---------|---------|---------|---------|---------|
| CHN | -0,03% | -0,56% | -0,41% | -0,44% | -0,93%  | -1,14%  | -1,49%  | -2,13%  | -3,02%  | -4,13%  |
| JPN | -0,02% | -0,10% | -0,11% | -0,14% | -0,18%  | -0,14%  | -0,11%  | -0,05%  | 0,03%   | 0,13%   |
| XEA | -2,05% | -5,89% | -7,30% | -8,71% | -10,20% | -10,36% | -10,77% | -11,44% | -12,35% | -13,47% |
| IND | 0,71%  | 0,17%  | 0,05%  | -0,29% | -1,08%  | -1,23%  | -1,67%  | -2,48%  | -3,65%  | -5,21%  |
| XSA | 0,30%  | -0,46% | -0,90% | -1,65% | -2,63%  | -2,85%  | -3,39%  | -4,25%  | -5,38%  | -6,76%  |
| CAN | 0,68%  | 1,89%  | 2,80%  | 3,59%  | 4,22%   | 4,44%   | 4,13%   | 3,24%   | 1,67%   | -0,70%  |
| USA | -0,07% | -0,23% | -0,22% | -0,24% | -0,26%  | -0,07%  | -0,01%  | -0,09%  | -0,35%  | -0,86%  |
| BRA | -0,52% | -1,69% | -2,23% | -2,85% | -3,53%  | -3,67%  | -3,87%  | -4,21%  | -4,78%  | -5,61%  |
| FRA | 0,33%  | 0,58%  | 0,64%  | 0,70%  | 0,79%   | 0,81%   | 0,77%   | 0,68%   | 0,51%   | 0,29%   |
| DEU | 0,20%  | 0,40%  | 0,48%  | 0,57%  | 0,72%   | 0,82%   | 0,97%   | 1,15%   | 1,39%   | 1,73%   |
| ITA | 0,14%  | 0,10%  | -0,05% | -0,19% | -0,31%  | -0,42%  | -0,51%  | -0,55%  | -0,51%  | -0,35%  |
| ESP | 0,01%  | -0,20% | -0,56% | -0,86% | -1,11%  | -1,33%  | -1,48%  | -1,56%  | -1,52%  | -1,33%  |
| GBR | 0,18%  | 0,38%  | 0,50%  | 0,62%  | 0,76%   | 0,88%   | 1,02%   | 1,22%   | 1,48%   | 1,87%   |
| RUS | 1,22%  | 3,63%  | 4,08%  | 4,20%  | 4,14%   | 4,03%   | 3,88%   | 3,67%   | 3,37%   | 2,98%   |
| XEC | 1,15%  | 1,18%  | 0,74%  | 0,26%  | -0,30%  | -0,50%  | -0,87%  | -1,47%  | -2,30%  | -3,39%  |
| REU | 0,31%  | 0,56%  | 0,58%  | 0,60%  | 0,61%   | 0,62%   | 0,64%   | 0,70%   | 0,84%   | 1,11%   |
| SSA | -0,66% | -3,34% | -4,67% | -5,67% | -6,57%  | -6,41%  | -6,57%  | -7,10%  | -8,01%  | -9,22%  |
| MNA | -0,87% | -2,91% | -3,90% | -5,05% | -6,38%  | -6,89%  | -7,54%  | -8,28%  | -9,02%  | -9,58%  |
| RHY | -0,07% | -0,42% | -0,58% | -0,74% | -0,86%  | -0,79%  | -0,74%  | -0,72%  | -0,78%  | -0,90%  |
| XLC | -1,01% | -3,12% | -4,17% | -5,22% | -6,25%  | -6,42%  | -6,70%  | -7,16%  | -7,80%  | -8,61%  |

*Table 2 – Deviations in regional real GDP*

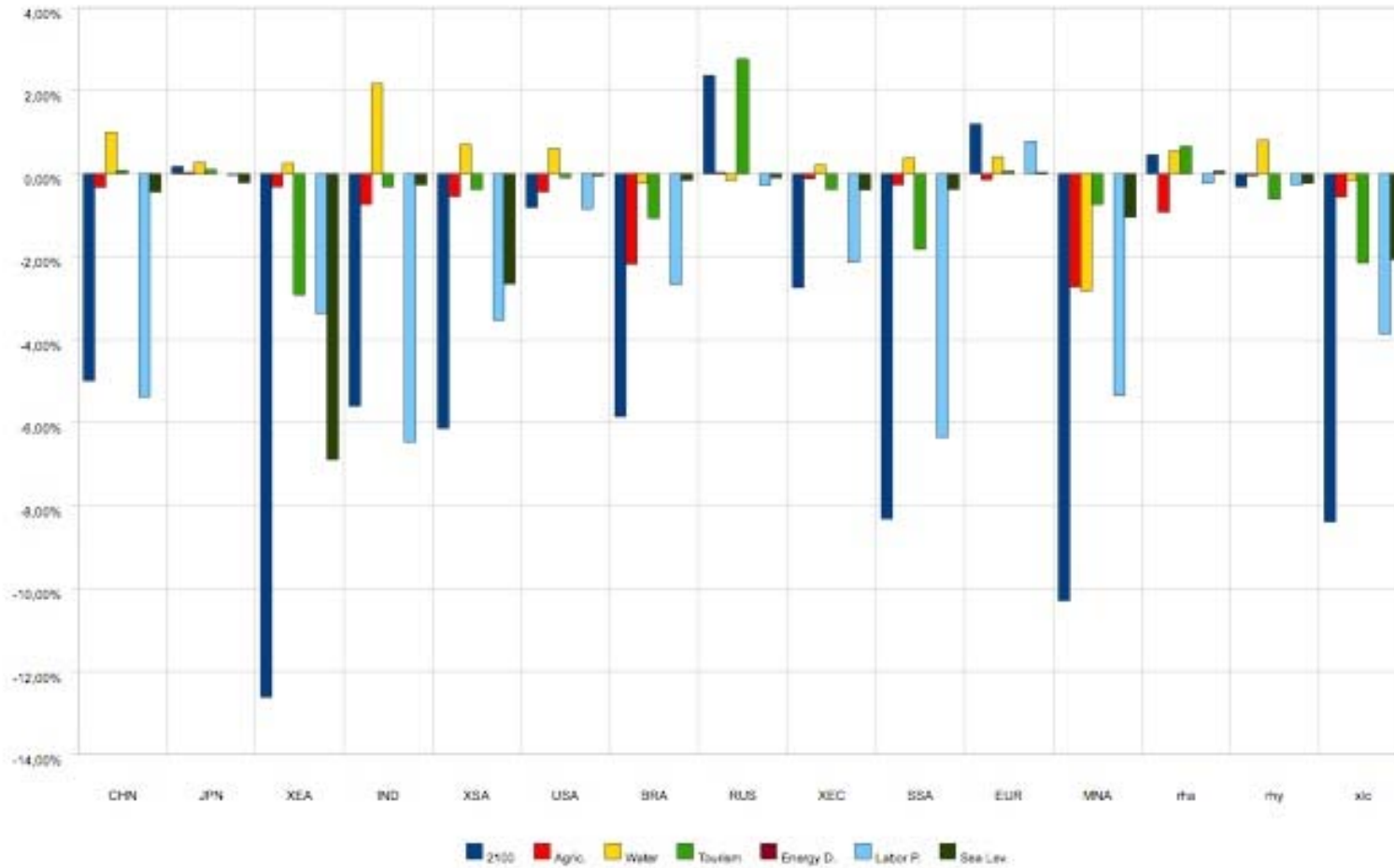
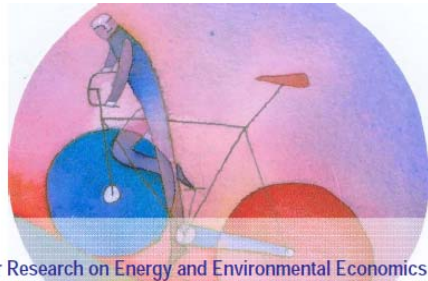


Figure 6 – Decomposition of real GDP deviations in terms of impact contribution

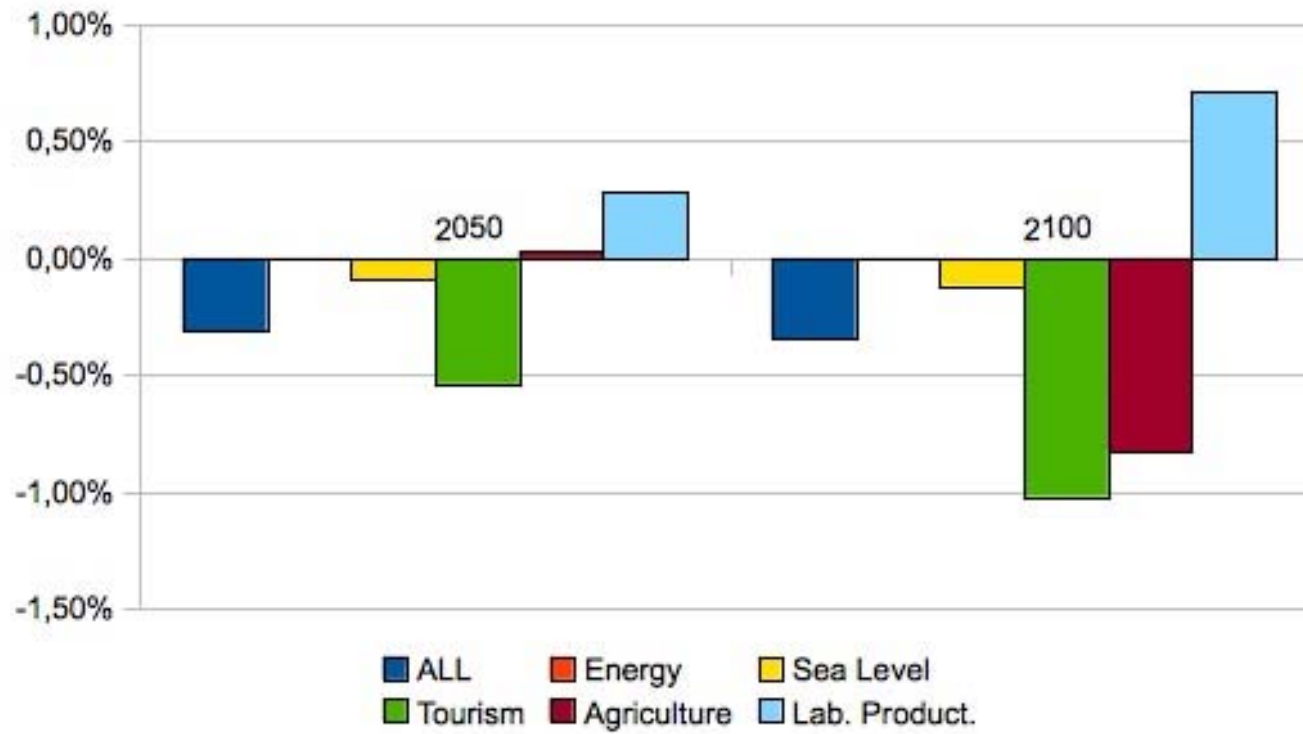
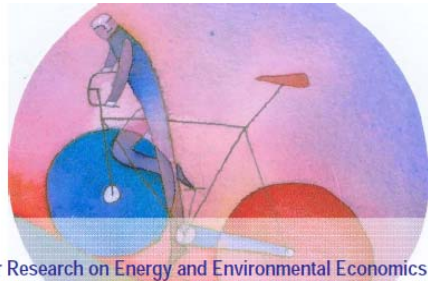
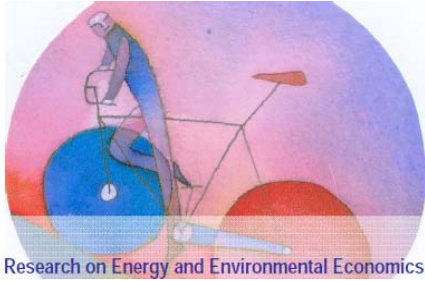


Figure 2 – Decomposition of effects for the Italian real GDP



# The End

Thank you for your attention,  
comments welcome

