

ECON-A4000: Economics of Global Challenges

Lecture 3: Moral duties and economic analysis

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Plan for the lecture

This lecture is loosely connected to unit 20 in the book. The lecture material supports the classroom work on the reading assignment, "Do not ask for morality", by John Broome. Some key questions are the following:

- The discounting dilemma. How to account for future generations' costs and benefits?
- Pareto efficiency and justice
- The moral foundations of cost-benefit analysis

Welfare changes and efficiency

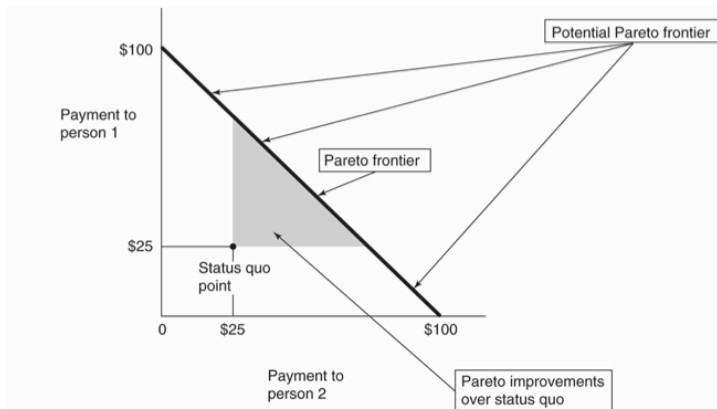
A useful concept for understanding the reading:

Potential Pareto Efficiency vs. Pareto Improvement. If net welfare changes are positive, then it is possible to find a set of transfers that makes at least one person better off without making anyone else worse off. Economists often recommend focusing on **Potential Pareto Efficiency**, see next Figure. Typical arguments in favor of this approach are:

- Society maximizes aggregate wealth
- If different policies have different winners and losers, then, in aggregate, costs and benefits will average out over the entire population
- It counters incentive to give too much weight to organized groups and too little weight to unorganized groups
- It is possible to do redistribution wholesale rather than within each separate policy

Pareto improvements depend on status quo

Pareto efficiency and Pareto improvements



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Questions on the reading

- The concepts of justice and beneficence.
 - ▶ How is the conflict between the moral duties of justice and beneficence related to cost-benefit analysis?
 - ▶ What is the connection to Pareto efficiency?

Questions on the reading

- Private and government morality and limitations.
 - ▶ What is the economic phenomenon that leads to the failure of morality?
- Self-interest in solving the externality problem.
 - ▶ How does the bargaining over externalities work? Does it work for generations living in different times?

Questions on the reading

- Injustice.
 - ▶ Pareto improvement can be unjust – how precisely?
- Maldistribution
 - ▶ Is it possible that climate change reduces intergenerational inequality?

Questions on the reading

- Figure 2.1.
 - ▶ Why is Pareto improvement not the best response by the current generation?

Questions on the reading

- Borrowing to compensate those who suffer from carbon taxes
 - ▶ Could the "World Climate Bank work"?

Refresher on discounting

From Principles I (lecture 11):

- **Interest rate** $r > 0$ determines how individuals can transfer income across time periods
- Lender: transfer 1 unit of current wealth to the future to obtain $1 + r$ units in the future
- Borrower: transfer 1 unit of future wealth to the present by promising to pay $1 + r$ in the future
- With $1 + r$ we can transform "values" (money, benefits, environmental damages) to present values. As in Principles I, the present value of an income stream $\mathbf{y} = (y_0, y_1, \dots, y_T)$, where $t = 0, \dots, T$ are periods, is

$$PV = \sum_{t=0}^T \frac{y_t}{(1+r)^t} = \sum_{t=0}^T \delta^t y_t$$

where $\delta = \frac{1}{1+r} < 1$ for shorthand. This term is called the **discount factor**.

Discounting in climate change

From Lecture 2 (last week Tuesday), we learned that the impacts of current emissions are very long-lasting (figure below)

- Similarly as for incomes we can take a stream of climate damages $\mathbf{d} = (d_0, d_1, \dots, d_T)$ and express these in present value terms:

$$PV = \sum_{t=0}^T \delta^t d_t$$

- Marginal external cost (MEC) is the present value of damages over long time horizon. The Pigouvian tax (i.e., carbon tax) is equal to this MEC: It critically depends on the discounting

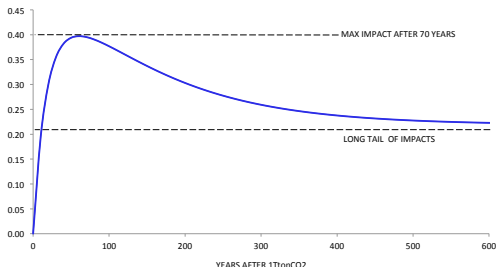


Illustration: discounting climate damages

- The table below gives the present value of the climate damage in the previous page when one degree warming causes loss of 1000 per year. That is, the peak loss after 70 years is 400, and the sequence of damages is 600 years long.

discount rate	0	1%	5 %	10%
Present value	200 000	36920	5321	1790

- How should we think about discounting over such long time periods?
- The social discount rate is the rate at which the society discounts benefits and costs of the future generations.

The social discount rate

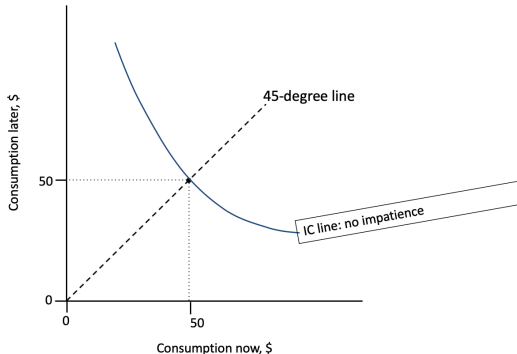
There are three critical items determining this rate

- **pure impatience**: caring less about individuals far in the future
 - ▶ increases the social discount rate
- **consumption smoothing**: aversion to large changes in consumption over time
 - ▶ can increase or decrease the social discount rate, depending on expectations of future welfare
- **technological progress**: determines the returns to savings
 - ▶ highly productive economy increases the social discount rate

The social discount rate: the effect of impatience

How much more do you value a good now than later, if your endowments are the same in both periods?

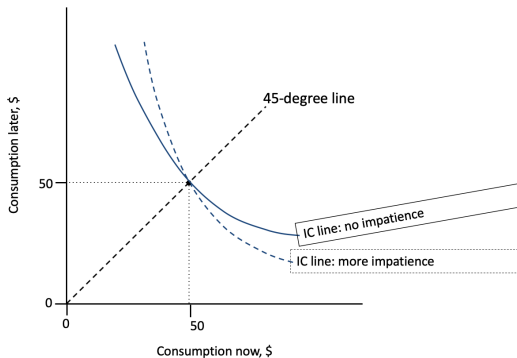
- If MRS equals one in this situation, there is no impatience
- The society makes the same evaluation when comparing benefits and costs over time



The social discount rate: the effect of impatience

If MRS exceeds one in this situation, there is impatience

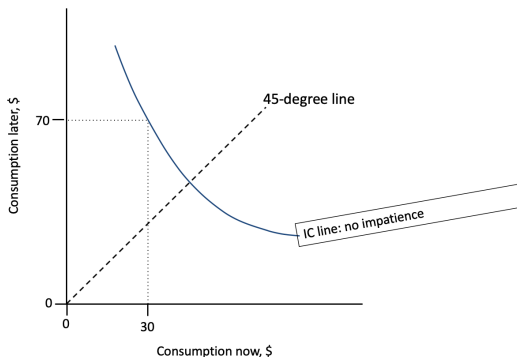
- In the same endowment situation, the society values the present consumption more
- Note that while indifference curves cannot cross for an individual (or for society) for given preferences, they can cross when we compare different preferences.
- An increase in impatience is change in preferences, towards steeper indifference curves
- Societal impatience is an ethical statement as it puts different generations in different positions just because of their different appearances on the timeline. Yet, one may justify some impatience also by the risk of extinction.



The social discount rate: the effect of consumption smoothing

Diminishing marginal returns to consumption = The value of an additional unit of consumption declines, the more consumption the individual has

- An individual smoothes consumption to avoid consuming a lot in one period and little in the other
- The society can reason in a similar way: if the future endowment is bigger, there is more aversion to contribute more in favor of the future generation
- Consumption smoothing may appear as being impatient but this is not the case

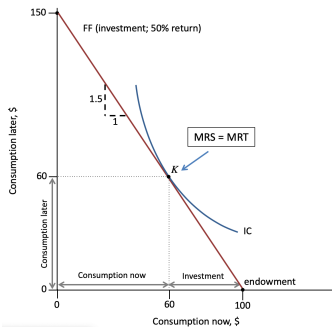


The social discount rate: the effect of technology

Recall from unit 10: consumption and saving at the point where discount rate = interest rate

- discount rate is impatience+consumption smoothing. Let us call this rate ρ
- interest rate is given by the investment opportunity. We have denoted this by r
- putting together gives $MRS = MRT \Rightarrow 1 + \rho = 1 + r$

When technology improves, r will change as well: better investment opportunities increase the weight given to the future

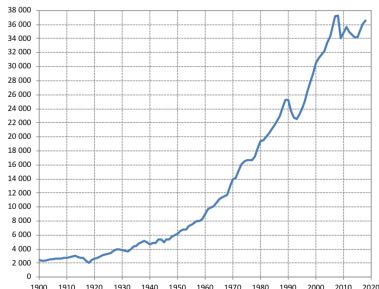


The social discount rate: all effects included

GDP in Finland (2010 prices) over the period 1900-2018. Thought experiment: consider standing in 1900

- How important to you is the wealth in 2018? → pure impatience
- What are the incentives to save for the benefit of individuals that are 15 times wealthier (as measured by GDP)? → consumption smoothing
- labor productivity has increased by factor 25 → technology

These factors determine jointly the interest rate over long time horizons



Credit: Matti Pohjola

The carbon tax recommendations differ because of discounting choices

The book (p. 951) discusses how economists have different views on discounting the climate change damages.

- Nordhaus used estimates based on market interest rates as measures of how people today value future versus present consumption. Using this method, he came up with a discount rate of 3% to measure the way people discount future benefits and costs that they themselves may experience. Nordhaus included this in his discount rate
- Stern selected a discount rate to take account of the likelihood that people in the future would be richer. Based on an estimate of future productivity increases, Stern discounted the benefits to future generations by 1.3% per annum. To this he added a 0.1% per annum discount rate to account for the risk that in any future year there might no longer be surviving generations. Based on this assessment, Stern advocated policies that would have implemented substantial abatement investments today in order to protect the environment of the future.

Table 1 Carbon taxes 2010 US Dollars	2015	2020	2025	2030	2050
Optimal (Nordhaus's best parameter guess)	29.5	35.3	49.1	64.0	153.5
Optimal (Temperature Limit <2.5°C)	184.1	229.0	284.0	351.0	1008.4
Optimal (Stern discounting at 0.1%)	256.5	299.6	340.7	381.7	615.6

(Link to the source)

Summary

Reading: we learned the moral content of the efficiency concepts used by economists

- self-interested action can in principle motivate the climate action
- moral motivations are in conflict with incentives to free-ride

Discounting: we learned how both ethical and economic choices determine the perception of the climate damages inflicted

- pure impatience, consumption smoothing and technology
- this closes our discussion on optimal carbon taxes

Next Lecture

In the first half, we will focus on

- Bargaining over externalities: theory
- Types of climate agreements: practise

In the second half, our guest will tell us how the climate negotiations are conducted in practise

- Your questions to the guest will in part shape the lecture