The credit economy and the economic rationality of science

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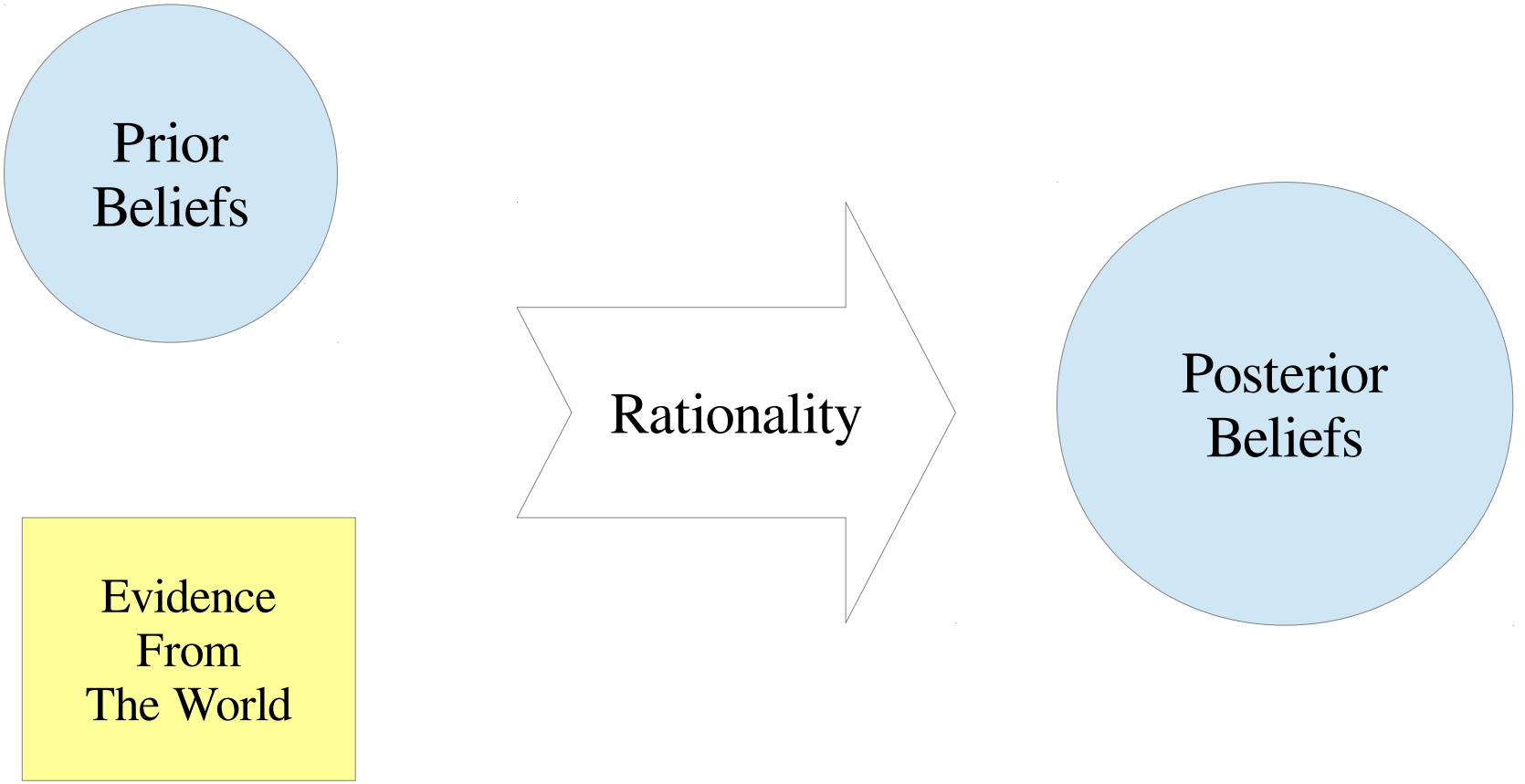
Philosophy of science



Standards

- Convergence in the limit (statistical consistency)
- Conservatism
- Accuracy

Arational choices?

- How much time should I dedicate to science?
- What experiments should I perform?
- What project should I work on?
- Should I publish now or later?
- Where should I publish?

Etc.

Epistemic vs. instrumental rationality

- Some have suggested there are two senses of rationality

- The progress of science depends critically on both epistemic and instrumental choices

Irrational choices

Many of these decisions are governed by concern for:

- Career advancement
- Credit
- Prizes
- Friendship

Etc.

Social versus individual rationality

- Social norms govern incentives
- We can ask whether the social norms are "rational"

Credit

Credit

Solves a public goods problem

Dasgupta, P., & David, P. A. (1994). Toward a New Economics of Science. Research Policy, 23(5), 487–521.

Credit

Solves a public goods problem

Solves a labor allocation problem

Kitcher, P. (1990). The Division of Cognitive Labor. The Journal of Philosophy, 87(1), 5–22.

Strevens, M. (2003). The Role of the Priority Rule in Science. Journal of Philosophy, 100(2), 55–79..

Credit

Solves a public goods problem

Solves a labor allocation problem

Effects the “communist norm”

Michael Strevens (forthcoming) Scientific sharing: Communism and the social contract. In Thomas Boyer-Kassem, Conor Mayo-Wilson, and Michael Weisberg, editors, Scientific Collaboration and Collective Knowledge. Oxford University Press, Oxford.

Heesen, Remco (manuscript) Communism and the incentive structure of science

Credit

Solves a public goods problem

Solves a labor allocation problem

Effects the "communist norm"

Causes errors or fraud

Ionnidis, J.P. (2005) Why most published research findings are false. PLoS Medicine 2: e124

Heesen, R. (manuscript) Expediting the flow of knowledge versus rushing into print

Features of particular credit systems

File drawer problem

Significance chasing

Low risk versus high risk science

Gender and racial disparities

Credit

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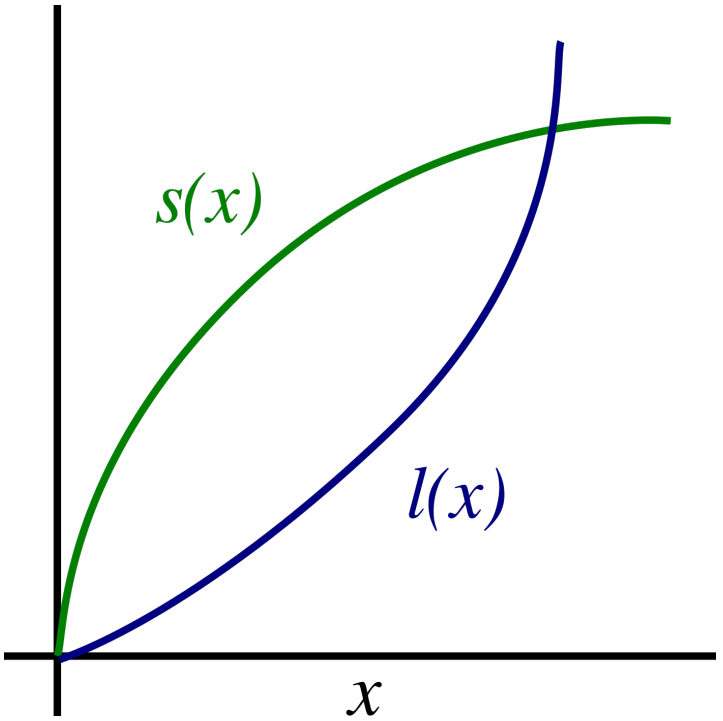
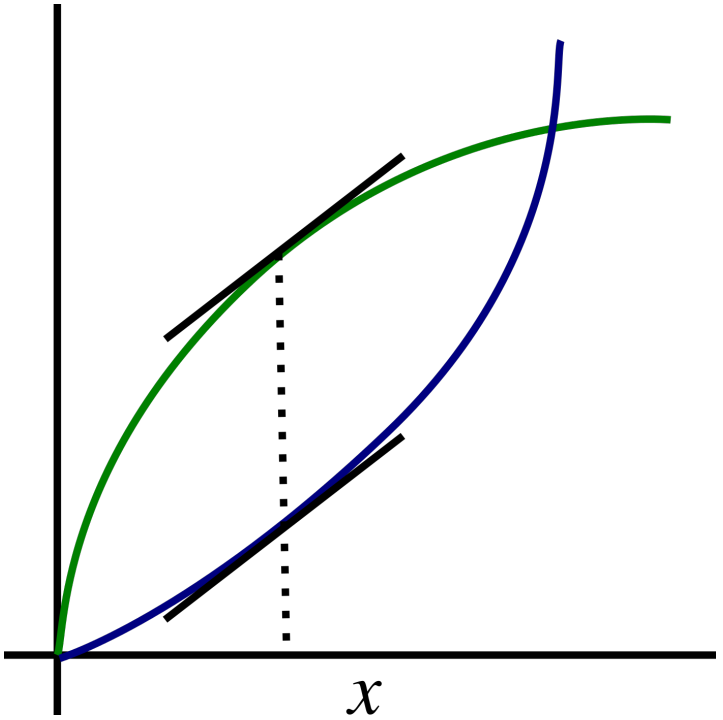
Prof. Crusoe



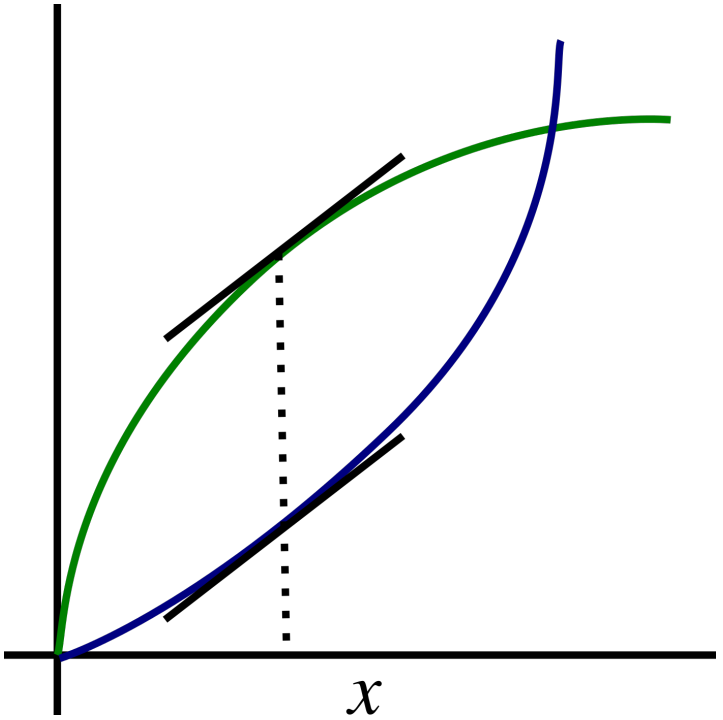
$$u(x) = s(x) - l(x)$$

Prof. Crusoe



$$u(x) = s(x) - l(x)$$

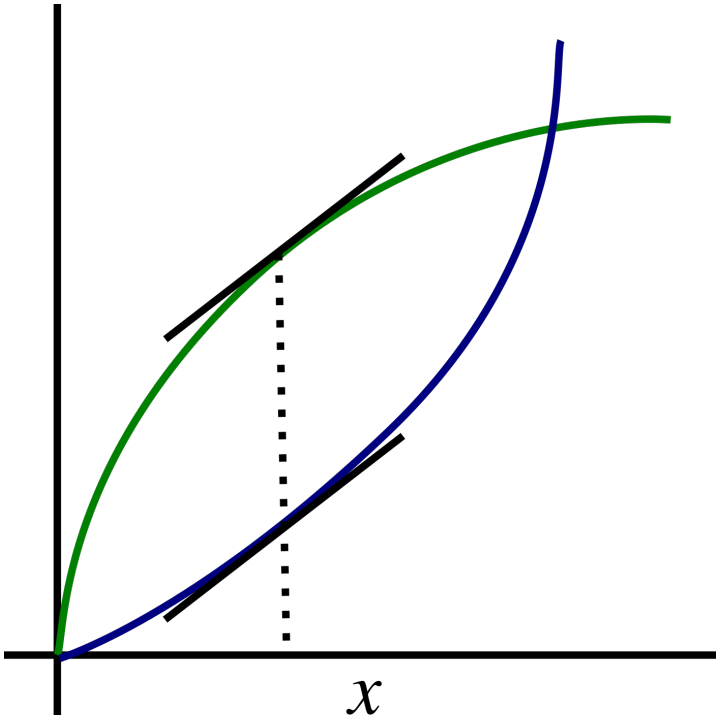
Society of scientists



$$u_i(\boldsymbol{x}) = s_i(\boldsymbol{x}) - l_i(x_i)$$

- Each scientist individually chooses how much effort to dedicate
- Every scientist benefits from everyone's effort
- Each pays a private cost

Society of scientists



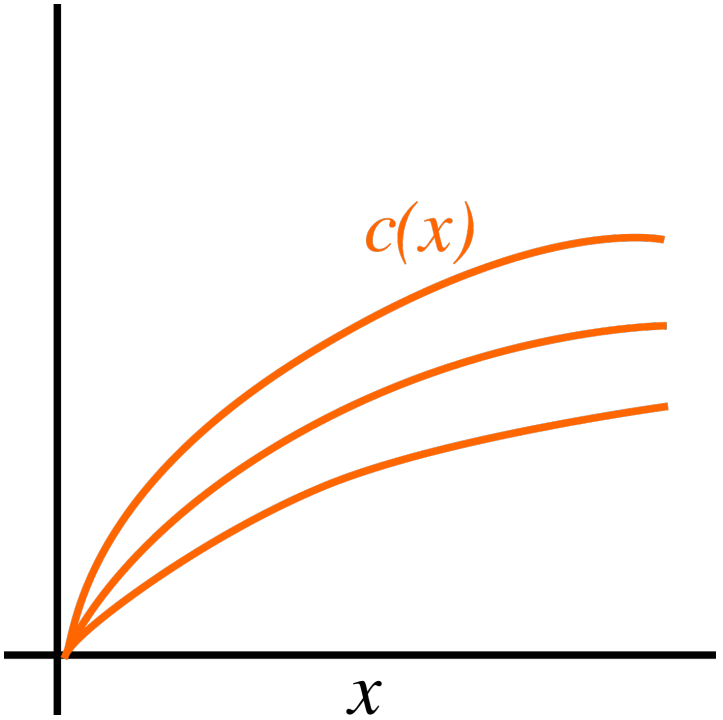
$$u_i(\boldsymbol{x}) = s_i(\boldsymbol{x}) - l_i(x_i)$$

- Creates a public goods problem
- Private choices are worse than centralized control

Inhomogeneity

- Value of leisure
- Production of science
- Value of (own or others) scientific production

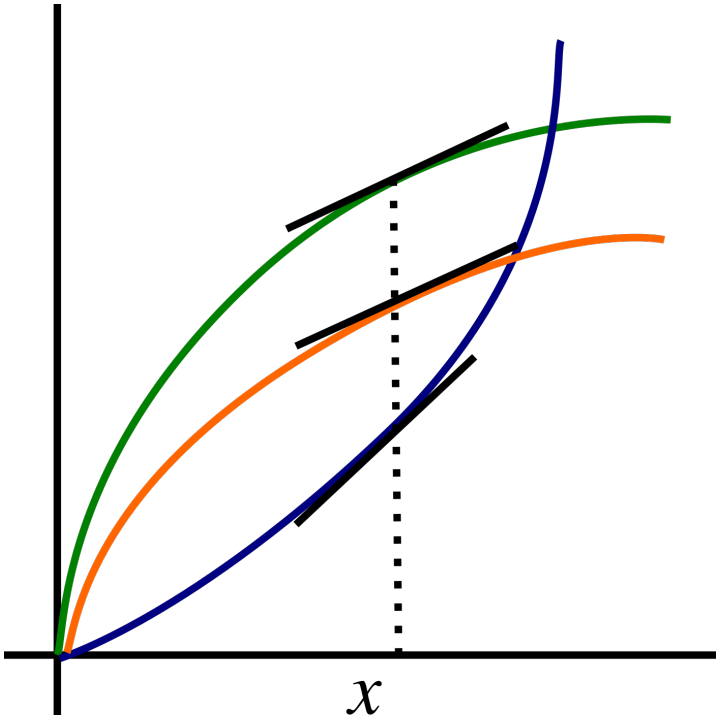
Adding credit



- Expected credit is increasing in my effort
- Expected credit is decreasing in others' effort

$$u_i(\boldsymbol{x}) = s_i(\boldsymbol{x}) - l_i(x_i) + c_i(\boldsymbol{x})$$

Adding credit



$$u_i(\boldsymbol{x}) = s_i(\boldsymbol{x}) - l_i(x_i) + c_i(\boldsymbol{x})$$

- This increases the equilibrium allocation
- It may not "solve" the public goods problem
- It may even "overshoot"

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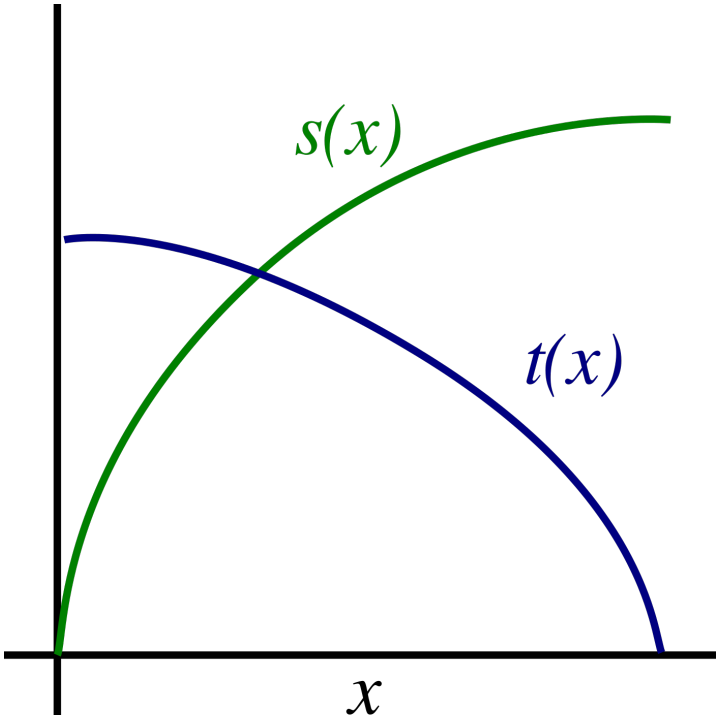
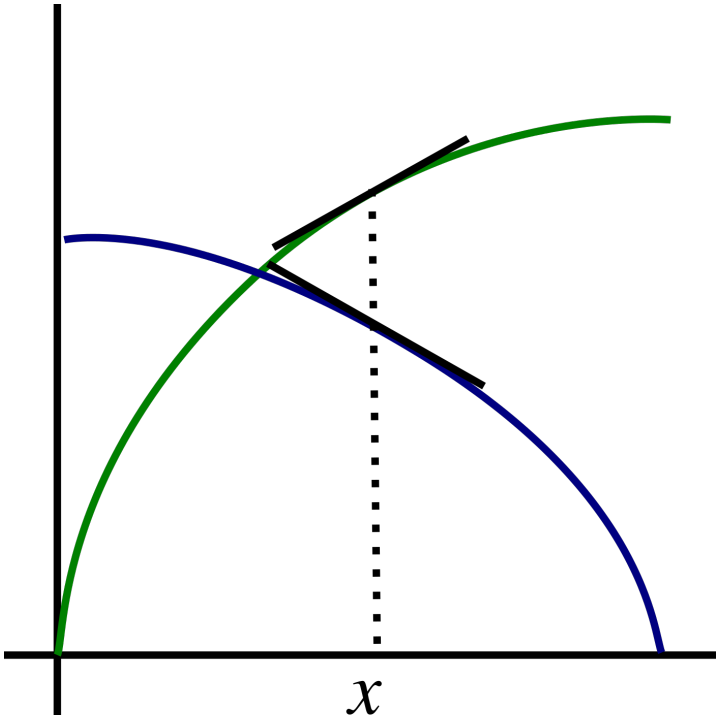


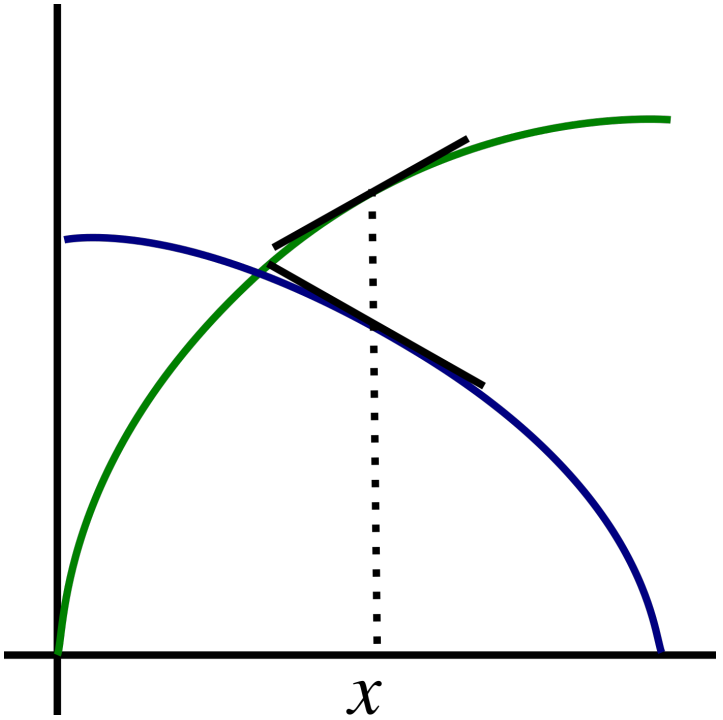
$$u(x) = s(x) + t(x)$$

Prof. Crusoe



$$u(x) = s(x) + t(x)$$

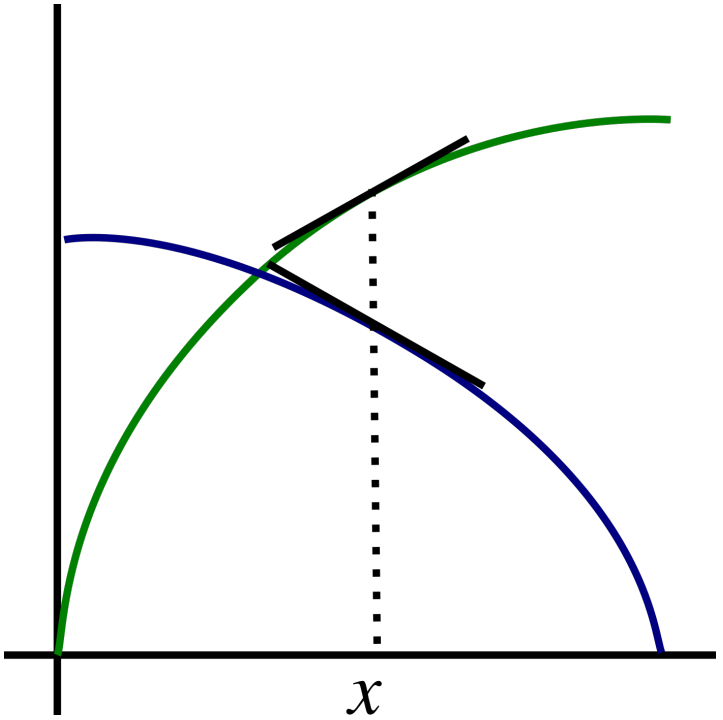
Society of scientists



$$u_i(\boldsymbol{x}) = s_i(\boldsymbol{x}) + t_i(\boldsymbol{x})$$

- Each scientist chooses individually how much to allocate to each project
- Everyone benefits from each others' allocations

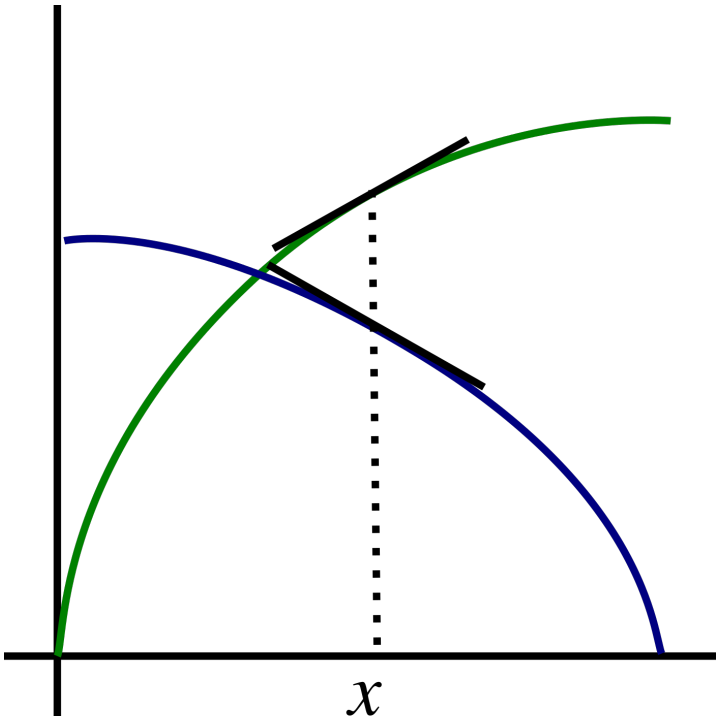
Society of scientists



$$u_i(\boldsymbol{x}) = s_i(\boldsymbol{x}) + t_i(\boldsymbol{x})$$

- Sometimes there is a gap between the socially optimal allocation and the equilibrium allocation
- If we assume a certain level of homogeneity, there will not be a gap

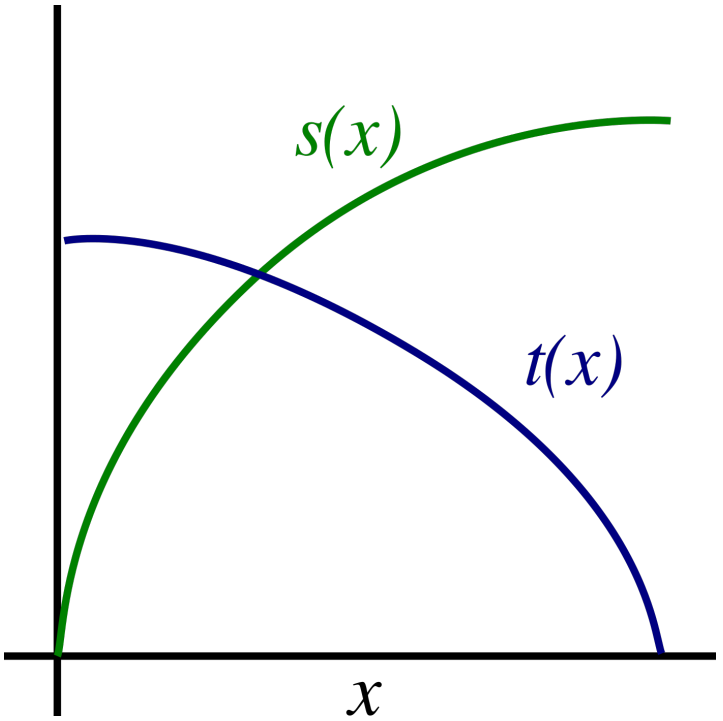
Adding credit



$$u_i(\boldsymbol{x}) = s_i(\boldsymbol{x}) + t_i(\boldsymbol{x}) + c_i^s(\boldsymbol{x}) + c_i^t(\boldsymbol{x})$$

- Credit will sometimes help and sometimes hurt
- The “priority rule” will hurt in highly homogenous situations (contra Kitcher and Strevens).

Kitcher and Strevens



$$u_i(\boldsymbol{x}) = s_i(\boldsymbol{x}) + t_i(\boldsymbol{x}) + c_i^s(\boldsymbol{x}) + c_i^t(\boldsymbol{x})$$

- Both assume that without credit scientists will choose the project will the higher slope (project *s*)
- This assumption is derived from a lingering connection to the philosophical view of scientific rationality.

Idealizations

- Additively separable utilities
- Scientists cannot fake effort
  - Expected credit is a function of effort
  - All effort is valuable
- Single shot decisions

The credit economy

- The credit economy helps to solve the public goods problem.
- The credit economy might help to solve labor allocation problems (but often will make the situation worse).
- How does one weigh these two considerations?