

Towards a More Conducive Use of GMOs:

On Politics and Institutional Arrangements

Ernst-August Nuppenau

Justus-Liebig-Giessen Germany

Problem Statement

- There have been several discourses on bio-technology and GMOs; almost completely they failed. Why?
- One can conclude that there had been a huge dissent in posting of positions.
- Especially risk mitigation (reduction of spread of genes and cross pollination) and co-existence (scaling freedom of farmer choice) had been subject to dispute.
- No measures were foreseen that could solve the conflict.
- It can be predicted that regulations may be found which give more room to commercial interests looking for lifting bans than ecological concerns.

What to do?

Objectives

1. To analyze the GMO debate from an institution economics background.
2. To find instruments and exchange in a power oriented political economy approach.
3. To apply political economy modeling of Harsanyi and Zusman.
4. To define a bargain that reduces risks from GMOs.
5. To define stakeholders' interests and externalities with respect to uncertain effects of GMOs.
6. To find a compromise which could be built on reciprocity and that can abate risk.
7. To clarify on property rights and regulations that shall help to conduct bargains in a given institutional framework.
8. To clarify how an attribution of property rights, its acceptance by parties, and exchange of immaterial goods such as risks for nature and humans can result in a cooperative solution.

Results of recent discourses

- It would be naïve to think decisions are based on pure science or moral arguments.
- A bargaining situation, instead of a market solution, exists if the property rights are not fully set.
- There is also a liability problem for the effects of GMOs for statuses of the environment and other businesses such as organic farming.
- So to say gene proliferation and health risks of GMOs are negative public goods.
- The moral argument is: is it justifiable to give a right to business with genes and a right to buffer crops if minimal risk can be achieved on mutual considerations.

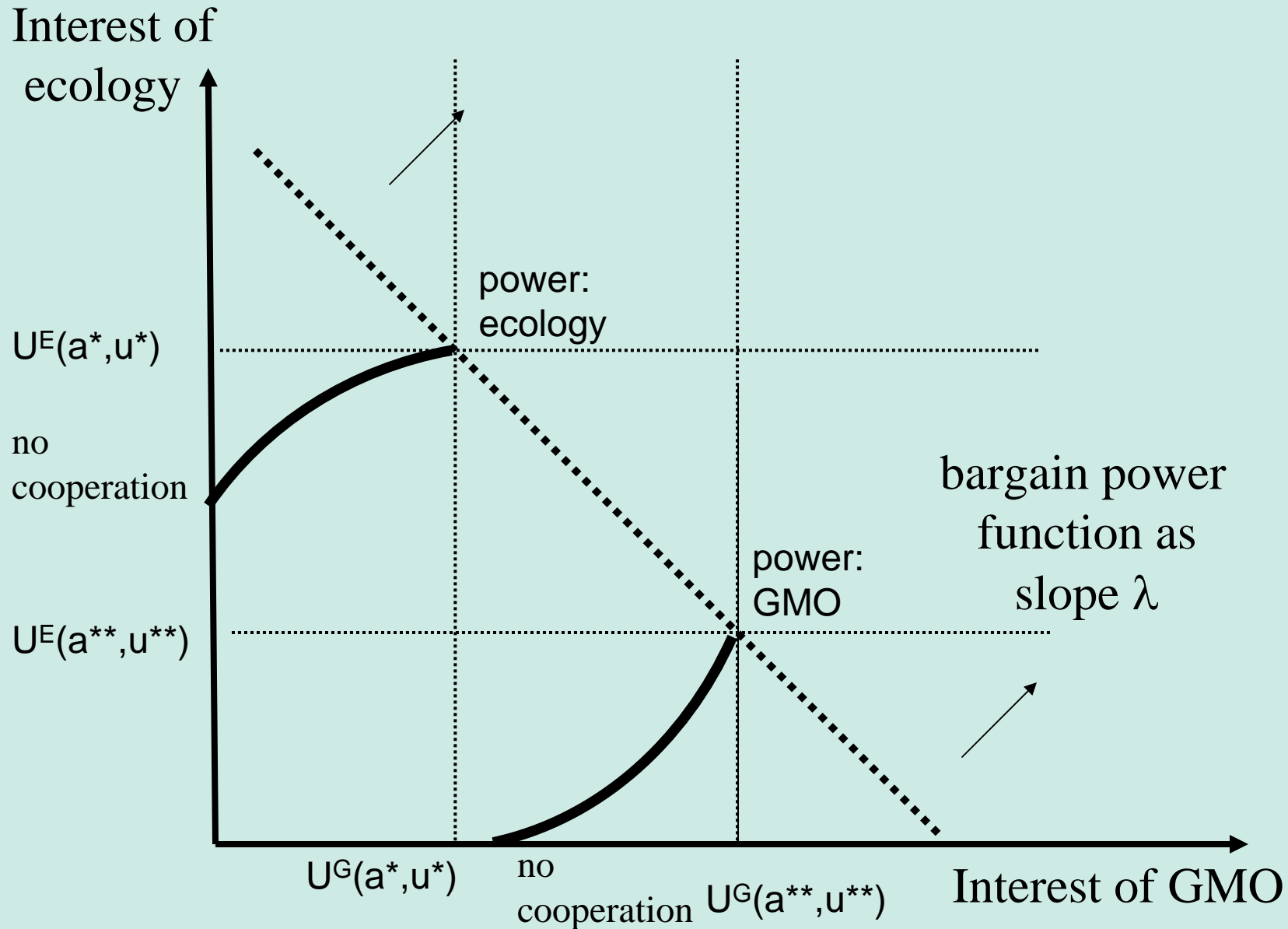
Idea

- The basic idea of political economy bargain is that both sides of a bargain become interested in establishing a dialogue.
- This dialogue shall result, in our case, in reduced risk and giving up positions.
- Note that not all is messy in politics.
- We suggest looking at two measures that are typically talked about if it comes to a reduction in probability of gene proliferation (risk) as envisaged:
 - (1) having buffers strips or
 - (2) higher costs in bio-technology screening in labs.
- This new suggestion of assigning property rights (on the above two aspects) to conflicting partner shall help to reduce risk. Note assignment is a tricky thing.

Concept of risk communication and objective functions

- We see two measures to reduce risk behind the negotiations:
 - (1) buffer strips around GMO fields, already today requested but increased (cost increasing).
 - (2) biotechnological safeguards such as care in selection of genes, avoiding large changes in gene modification and applying techniques to reduce the risk of gene transfer.
- Another, third aspect is: who offers what: strips for costs?
- An exchange is a mutual thing according to property rights.
- Bargaining, themselves, specifies the exchange ratio.
- The exchange ratio is like a price ratio (optimal allocation).
- We presume that ecologists have right to strips↓, but not costs↑
- Right of low costs, initially with companies, is traded for strips.

1. Step in Bargaining on Cooperation



interest functions of GMOs

$$I^{GMO}(a, u) = R - m \cdot l \cdot (a^0 - a) - (1 + u) \cdot l \cdot c_0$$

where: variables

a: change in the buffer strip (reduces the buffers strip)

u: percentage change in unit costs coefficients given:

and: a_0 : buffer strip in percent (reduces the land)

R: old revenue

m: margin per unit of land sowed

l: land sown

c_0 : unit cost for technologies based on land

additionally we determine:

$$c_0 = \alpha_0 + \alpha_1 l \Leftrightarrow l = -\alpha_0 + \alpha_1^{-1} c \Leftrightarrow l = -\alpha_0 + \alpha_1^{-1} c_0 (1 + u)$$

interest functions of ECOs

$$I^{ECO}(a, u) = M(1 - p(a, u)) + (M - D)p(a, u)$$

where additionally: given

M: margin earned by organic farmers

D: depreciation (loss if genes are detected)

variable:

p: probability

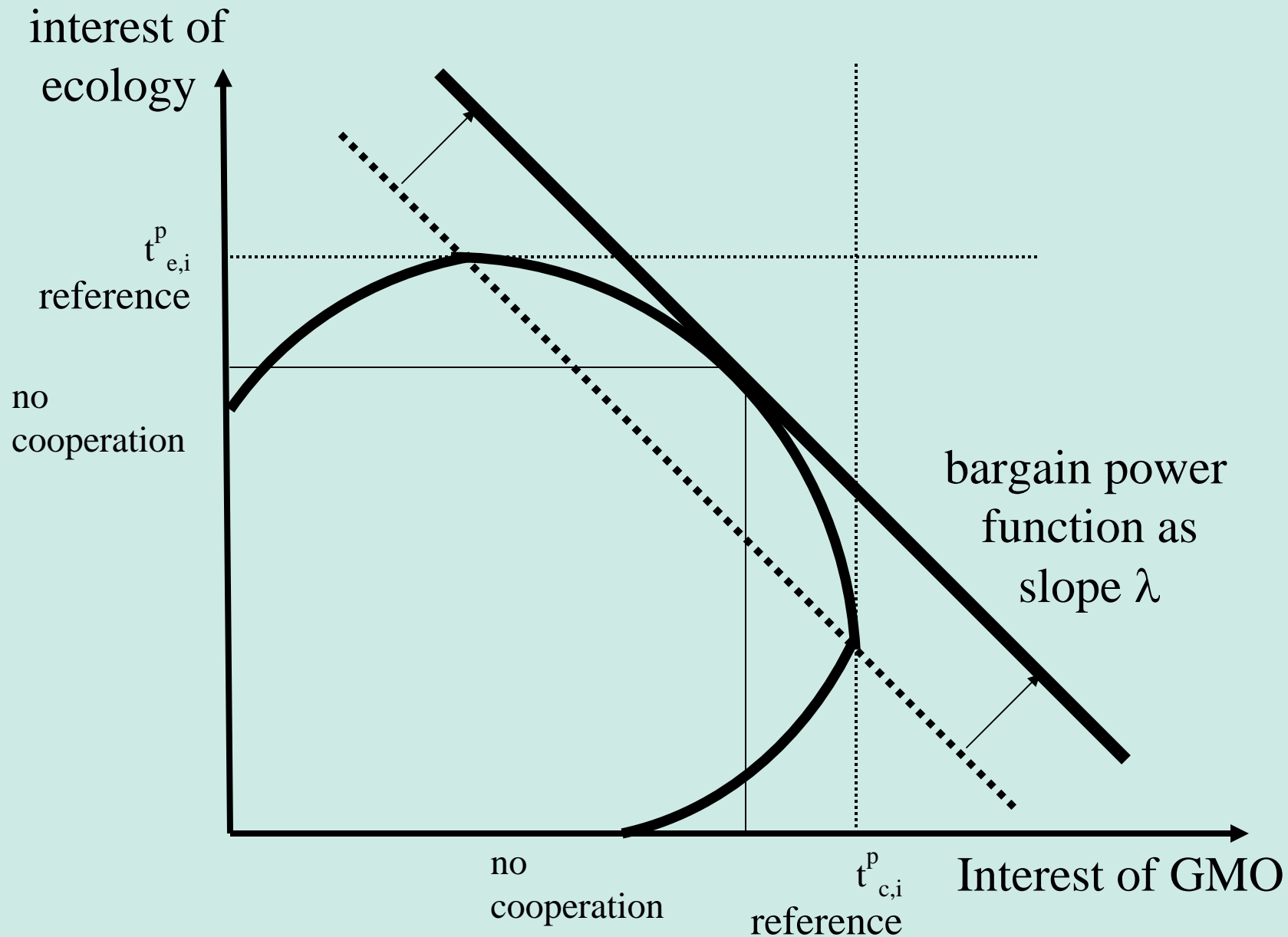
additionally we determine: a margin that depends on the trust

$$M = M_0 - \xi(a^0 - a)$$

and we regress the probability on the size of margins and costs

$$p(a, u) = \varphi_0 - \varphi^*_1 (a^0 - a) - \varphi^*_2 c^* (1 + u)$$

2. Step in Bargaining on Cooperation



Method

co-operative behavior and joint objective function:

$$W(a,u) = \lambda \cdot ([p - c_0(1+u)] \cdot l \cdot (a^* - a) - c_0(l_0 + \alpha_1^{-1}(1+u))(1+u)) + M^* - D[\varphi_1 a - \varphi_2 c_0 \cdot u] - M_0 \varphi_3 u \cdot a - M_0 \varphi_4 a^2$$

including a power coefficient:

$$\lambda = \frac{[I^{GMO}(a^*, u^*) - t^{GMO}(a^{**}, u^{**})]}{[I^{ECO}(a^{**}, u^{**}) - t^{ECO}(a^*, u^*)]}$$

Optimization of variables:

$$\frac{\partial W(a,u)}{\partial u} = \lambda \cdot (c_0 \cdot l \cdot (a_0 - a^{**}) - c_0(l_0 + \alpha_1^{-1}(1+2u^{**}))) - M_0 \varphi_3 \cdot a^{**} = 0$$

$$\frac{\partial W(a,u)}{\partial a} = \lambda \cdot ([p - c_0(1+u^{**})] \cdot l - D\varphi_1 - M_0 \varphi_3 u^{**} - 2M_0 \varphi_4 a^{**}) = 0$$

Summary

- It was argued that there could be a joint bargaining between GMOs and ECOs on measures to reduce the risk of GMOs.
- We developed a concept based on property rights on:
 - buffers trips
 - costs in biotechnology.
- A political economy model on bargaining and risk was outlined.
- The presented concept uses a power measure of GMOs and ECOs.