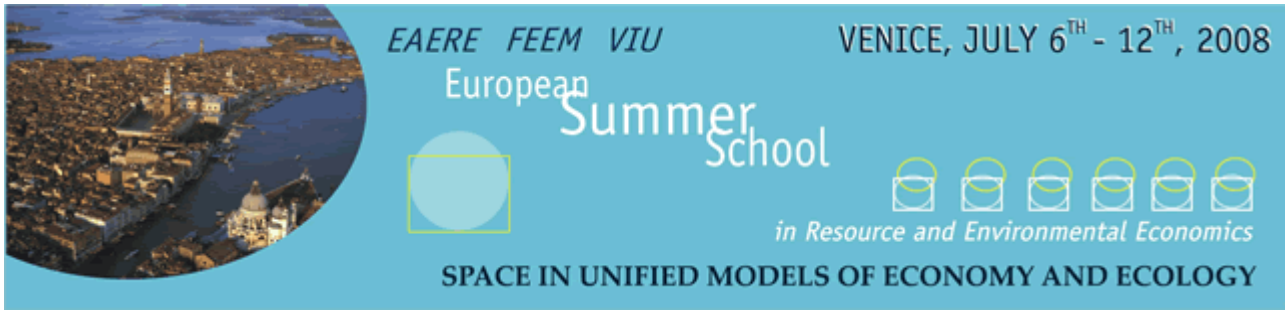

Lecture's Outlines – Prof. Aart DE ZEEUW

LECTURE 1 AND LECTURE 2:
STABILITY OF INTERNATIONAL ENVIRONMENTAL AGREEMENTS

Outline of the lectures

This topic is somewhat different from the other topics in this workshop. It is about the environment but not directly about ecological systems. It is about scale but not about spatial patterns. The issue is that many environmental problems facing us today (such as climate change) are global problems and require voluntary cooperation between the jurisdictions. There are incentives for cooperation, because negative transboundary externalities are internalized, but there are also incentives to defect because of free-rider benefits. The question is what level of cooperation can be expected and in which way this level can be improved. Voluntary cooperation on global pollution problems is discussed by country representatives in international settings aiming at International Environmental Agreements. The basic concept in the theory on this issue is stability of these agreements, meaning that countries neither have an incentive to leave nor to join the agreement. The theory, however, gives contradictory conclusions. Parts of the theory predict large stable agreements but other parts conclude that only small stable agreements can be expected. The purpose of these lectures is to clarify these issues and to discuss the assumptions and the models that are used. Furthermore, attention will be paid to dynamic aspects and to the effects of technological development.

Lecture 1: "International Environmental Agreements: a game theory approach"

In this lecture the different approaches will be discussed. The non-cooperative game theory approach was introduced by Barrett (1994) and relies on the internal/external stability concept for cartel theory introduced by d'Aspremont et al (1983). This leads to the pessimistic view that only small stable agreements can be expected. This result is confronted with the cooperative game theory approach introduced by Chander and Tulkens (1995), based on the γ-core concept, which leads to the optimistic view that the grand coalition is stable. The underlying model assumptions are discussed in order to explain this contradiction. Recent

developments employ the farsightedness concept which in a way reconciles the two approaches but at the same time leaves all options open. It will be shown, however, that dynamic considerations lead to the conclusion that it depends on the characteristics of the problem whether a large or a small stable agreement can be expected.

Lecture 2: "The effect of technological development on the stability of IEA's"

In this lecture two approaches for integrating technological development into stability analysis will be discussed. Starting point is internal/external stability and the question is whether the usual grim picture improves when technological development is taken into account. The first approach is based on the idea that countries in an agreement can share fixed costs or R&D costs, inducing an extra positive externality within the agreement, and that in this way the stable coalition is enlarged. It will be shown that this is indeed the case. The second approach considers "breakthrough technologies" which is particularly relevant for the climate change issue. Breakthrough technologies fully erase emissions but a high cost. First, it will be shown that increasing returns to scale enlarge the stable coalition. Second, by connecting the adoption costs of such a technology to the level of R&D, it will be shown that a non-cooperative equilibrium in R&D levels may exist, leading to full adoption, but that a large stable coalition will form that corrects part of the inefficiencies of such a non-cooperative equilibrium.

Reading list

Barrett, S., Self-enforcing international environmental agreements, *Oxford Economic Papers* 46, 878-894, 1994.

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Background

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Barrett, S., *Environment and Statecraft, The Strategy of Environmental Treaty-making*, Oxford University Press, Oxford, 2003.

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Finus, M., Stability and design of international environmental agreements: the case of transboundary pollution, in: H. Folmer and T. Tietenberg (eds.), *The International Yearbook of Environmental and Resource Economics 2003/2004*, Edward Elgar, Cheltenham, 2003, 82-158, 2003.