



Contested water rights

Erik Ansink*, Hans-Peter Weikard

Department of Social Sciences, Wageningen University, P.O. Box 8130, 6700 EW Wageningen, The Netherlands

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ABSTRACT

In many international river basins disputes over property rights to water lead to inefficient water allocation and a waste of resources. In this paper, we examine how contested water rights impede water trade. To show this, we use a model in which property rights to water are contested because countries have overlapping claims to water. In the model, countries decide whether to bargain over the allocation of contested river water or not. If not, they engage in conflict. In the conflict, countries spend their resources on production, which also requires water, or on fighting to secure part of the contested water. The resulting equilibrium is inefficient as both countries spend a positive amount of resources on fighting which is not productive. However, a third party may be requested to intervene in the looming conflict and allocate the water in an equitable way. The results show that for certain model parameters countries prefer not to bargain an efficient allocation, but to engage in conflict, hoping for third party intervention. The mere possibility of third party intervention may give rise to an inefficient equilibrium. Two new features of this paper are the application of a conflict model to the issue of water rights and the introduction of (overlapping) claims to non-cooperative bargaining problems.

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1. Introduction

With growing population and increasing water demand, competition for water in international river basins gets fiercer. In many cases, water rights are contested and a source of conflict. In this paper we want to shed light on the question under which conditions countries will jointly define property rights to contested water in transboundary river basins. Our motivation for this analysis is the general absence of international trade in river water.

The economics discipline advocates water trade in order to maximise the basin-wide benefits of this scarce resource (Easter et al., 1998). Even in situations without a social planner who can allocate water to maximise benefits, efficient outcomes are expected to prevail through bargaining. When water is scarce and when property rights are well defined, a difference in the marginal value of water between two users—greater than the costs of transferring the water—is expected to lead to a trade in water (Rosegrant and Binswanger, 1994; Holden and Thobani, 1996). Nevertheless, the International Freshwater Treaties Database (Wolf, 1998) contains only nine (out of 49) water allocation agreements where payments are explicitly coupled to water delivery, see Table 1 in the Appendix. This is a surprisingly low fraction of transboundary river basins where contractual agreements on water are established. Especially so given the existence of over 250 transboundary rivers world-wide, many of which face water scarcity.

The presence of contested water rights is, in our view, a major cause for missing international water trade. We argue in this paper that if water rights are contested, this may obstruct water trade. To show this, we use a conflict model in which water rights are contested. Conflict models have been introduced by Bush and Mayer (1974); for an overview of the economics of conflict see Garfinkel and Skaperdas (2007).

* Corresponding author. Tel.: +31 317 484255; fax: +31 317 484933.
E-mail address: erikansink@gmail.com (E. Ansink).

The core idea is as follows. Two countries share a river and each claims a portion of river water. Water is scarce and claims are overlapping, making water a contested resource. Countries bargain over the allocation of contested river water. If the bargaining succeeds, property rights to water are defined, based on which countries may trade water. If not, they engage in conflict. In the conflict, countries spend their resources on production, which also requires water, or on fighting to secure part of the contested water. The resulting equilibrium—the “natural distribution” (Buchanan, 1975)—is inefficient as both countries spend a positive amount of resources on fighting which is not productive. The natural distribution serves as the disagreement point of the bargaining game. During the bargaining each country may use its outside option and request intervention by a third party.¹ This third party would settle the conflict and allocate the water in an equitable way. Successful intervention, however, cannot be expected with certainty, so that conflict may still emerge. Hence, the mere possibility of third party intervention may give rise to an inefficient equilibrium.

Our contribution to the literature is twofold. First, we apply a conflict model to the issue of water rights. Although the lack of property rights has been recognized as a problem in the water literature (Richards and Singh, 2001), no supporting theory has been constructed yet.² Conventional explanations for missing international water trade in this strand of literature are mostly based on empirical studies of the economic and demographic characteristics of riparian countries. A key finding in this literature is that power distribution, governance, scarcity, and trade relations are important determinants for riparians to either have negotiated water allocation agreements or engage in international water trade (Song and Whittington, 2004; Dinar et al., 2007; Dinar, 2007). In this paper we aim to shed light on these findings from a theoretical angle. A study close to ours is Janmaat and Ruijs' (2006), although they are more interested in the probability of conflict over river water, while our focus is on the role of contested water rights in explaining the general absence of water trade.

Second, we introduce the concept of (overlapping) claims in non-cooperative bargaining problems. These claims can be based on, for instance, historic water use or a perceived “equitable” use of available river water. In this paper, the focus is on river basins with water scarcity, so claims are likely to overlap. The concept of claims has been introduced in the axiomatic approach to bargaining, starting with O'Neill (1982) and Chun and Thomson (1992). The focus of this literature is the characterisation of solutions with certain attractive properties for the division of contested resources. Our focus is on the strategic role that claims can play in non-cooperative bargaining. Note that Grossman (2001) also constructs a conflict model with claims; these claims are, however, not overlapping.

Our results show that, for certain model parameters, countries prefer not to bargain an efficient allocation. Instead, they may prefer to stick to their claims, hoping for a favourable settlement of the bargain by a third party. As intervention might not occur or fail, conflict may emerge. Thus, the prospect of third party intervention can cause persisting conflict and thereby obstruct water trade.

We analyse a bargaining game with probabilistic outside options. If an agreement is reached, water rights are allocated according to the agreement, production takes place and payoffs are realised. If either country opts out, a third party is asked to intervene. Whether or not intervention will settle the conflict is uncertain. If intervention is successful, water is allocated by the third party, production takes place and payoffs are realised. If intervention does not occur or is unsuccessful, or if bargaining breaks down for any other reason, conflict results. Both countries invest in fighting to secure part of the contested water, production takes place and payoffs are realised. We analyse the game backwards. Therefore the remainder of this paper is organised as follows. In Section 2 we present the conflict model and derive the natural distribution of water that determines the disagreement point of the bargaining game. In Section 3 we analyse countries' incentives to bargain over the property rights to water or to take up their outside option. In Section 4 we illustrate the results using a numerical example. In Section 5 we discuss the results and conclude.

2. A conflict model for transboundary rivers

2.1. Model structure

In this section we construct a conflict model inspired by Grossman and Kim (1995). Our conflict model contains two assumptions that are relevant for water allocation, thereby setting this model apart from conventional conflict models. First, we assume that only the water is fought over, instead of produce or endowments. In general, property rights to goods and production factors have been defined and are respected by countries. Countries may, however, contest water resources of a shared river, even when they respect property rights to all other goods. This is caused by the transboundary nature of river water, flowing from one country to the other. In the setting of our conflict model, property rights have been defined over all goods except water. This implies that water is the only good that is contested.

Second, we explore the role of claims to water that make (part of the) river water a contested resource. Ample evidence of the existence of claims can be found in, for instance, Asian river basins; see Wirsing and Jasparro (2007). Clearly, these claims can be

¹ In the setting of international river basins interventions can be expected from international organisations, such as the World Bank or the United Nations. These third parties are expected to allocate the water in an equitable way, based on, for instance, the 1966 “Helsinki Rules” proposed by the International Law Association. Note that the model developed in this paper is applicable to intranational water allocation too. In this case, a national government may act as the intervening third party.

² Various reasons for poorly defined property rights have been proposed in the literature, most of them related to hydrological characteristics. For example, Brennan and Scoccimarro (1999) discuss difficulties of defining property rights to water, given the spatial and temporal setting of the resource; see also Randall (1981) and Ward (2007). Return flows and conveyance losses are two important characteristics that may hamper the determination of property rights too (Griffin and Hsu, 1993; Chakravorty and Umetsu, 2003; Chakravorty et al., 1995).

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