

## 32. Virtual water trade means ‘trade in water services’

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Disenchantment with the virtual water concept (Allan 1998) is summarised in Merrett (2003) and Iyer (2014). One concern is with the characterisation of virtual water, with Merrett (2003) noting that the ‘forging’ of appropriate terminology is ongoing and that, at this stage, the appropriate language is ‘still in the furnace’. Beyond the issue of terminology, these authors argue against the idea that virtual water can somehow be viewed as being traded.

Disenchantment also arises when virtual water is promoted as a framework for making water-allocation decisions. Critics point out that virtual water measures cannot serve as an indicator of environmental harm, or quantify the marginal value of water across time or space — at least without a good deal of additional information. A third general reason for disenchantment is that empirical studies show that relative water endowments, by country, are poor predictors of trade in water intensive goods (Reimer 2012).

In this paper I will address these concerns from the perspective of an international trade economist. With Merrett’s observation that the language is still in the furnace, I argue that what is needed is a new name: ‘trade in water services’. Why such a change? The phrase ‘virtual water’ has led to confusion. For example, Allan (2003) states that it is ‘confusing to suggest that water was being traded in the process of moving water intensive commodities, such as grain, from one place to another’. Building on this point, Merrett (2003) calls for an end to the term virtual water, suggesting that the phrase ‘import of virtual water’ be replaced by ‘the import of food’.

This latter approach has important limitations. First, it eliminates any reference to water. Second, there are many products, other than food, that are traded and which place a heavy burden on water supplies. Third, this phrase does not acknowledge that virtual water is a new twist on an old idea, as I explain below. For these and other reasons I propose the name ‘trade in water services’.

To understand my reasoning, it’s important to emphasise that there are two legitimate ways to view trade between regions (Davis and Weinstein 2003). The first is as the overt exchange of a product, such as wheat. The second way is as the international exchange of the ‘factor services’ that were used to

produce the wheat, with ‘factors’ referring to natural and other resources such as water, labour, land and capital used to produce wheat or its intermediate inputs. A major point of this paper is that virtual water is this latter approach of viewing trade between regions.

The associated theory, trade in factor services, is a long-standing way of viewing trade between regions, with contributions dating back to economists Heckscher (1919), Ohlin (1933), Samuelson (1949), Leontief (1953) and Vanek (1968). The idea is that when factors of production are immobile across regions, trade in products allows regions to consume more of something than they otherwise would. Regions specialise in the activity for which they have comparative advantage, according to relative factor abundance, and import products for which they are at comparative disadvantage. The associated theorem is called the Heckscher–Ohlin–Vanek theorem. A lengthy subsequent literature shows that many new insights are available when one works in terms of factor services.

In this framework, when we focus on labour as a factor of production, we use the term ‘labour services’. When we focus on land as a factor of production, we use the term ‘land services’. It follows that there is also something called ‘water services’, and that this includes all the water that was necessary for production and distribution of a product.

Let us turn now to Iyer’s (2013) statement that “‘Virtual water’ tends to be regarded as a real commodity in which trade is taking place, and this in turn leads to the compilation of statistics of that unreal trade.’ Far from characterising it as unreal trade, economists routinely calculate the exchange of factor services (Reimer 2006, 2011; Reimer and Hertel 2010). Calculations of this sort date back at least to the time of Leontief, who won the Nobel Prize in economic science in part for his use of input-output analysis to examine trade flows in labour services and capital services (Leontief 1953).

Many interesting findings come out of such calculations. For example, when a US citizen buys a garment manufactured in Bangladesh, he is importing not only the services of Bangladeshi water, labour and capital, but also — if the shirt was made of US-grown cotton — some services of US water, labour and capital.

In this light, Iyer’s (2013) concerns about theoretical challenges are undue. Instead of saying ‘import of food’ (suggested by Merrett), which eliminates any reference to water, I believe we should refer to ‘trade in water services’, and acknowledge that this is but a particular application of a long-established theorem.

We should not expect relative water endowments, by country or time, to be a strong predictor of trade in water intensive goods, when we are looking at a broad sample of goods and countries. This point is emphasised by Iyer (2013)

and especially Wichelns (2004), who suggests that international technology differences are significant in agriculture, for example, and may be a source of comparative advantage alongside relative abundance of water. Policy-related trade barriers, such as tariffs, can also be high in water-intensive sectors, such as agriculture, and therefore obscure the role of water (Reimer and Li 2010). This does not nullify trade in water services as a framework for analysis of water in the international economy. It simply means that additional information is needed if one is to fully account for observed patterns of trade. This is routinely done in the literature (Reimer 2006, 2011; Reimer and Hertel 2010).

The concept of trade in water services is linked to the literature of trade policy and its insights into how international border policies (subsidies, tariffs, quotas) influence water use in ways that are otherwise hard to discern. For example, suppose that export of agricultural products is associated with the depletion of an aquifer. It may not be politically feasible to intervene directly at the level of production, due to producer resistance. A more politically attractive approach might be to discreetly inhibit water use — say by export restriction. Yet any kind of policy undertaken at a national border often has hard-to-anticipate consequences on consumption and production in multiple regions. The international economics literature contains analysis of many such examples, and a means for comparing alternative policy choices.

## Concluding thoughts

I have attempted to demonstrate that the virtual water concept is but a special case of a general theory in international economics, a venerable theory taught to virtually every undergraduate student who takes a course on international trade. I argue that the name we should use is trade in water services. This name emphasises that it is the services of water (as embodied in a product) that get traded, not the water itself. This is a wholly legitimate way to view trade, and such calculations are routinely made for land, labour and capital. I believe it is fine to do this for water as well, and that many insights can be gained in the process.

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