WATER WORKING GROUP, UNIVERSITY OF CALIFORNIA, BERKELEY
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"Water re-allocation in theory and practice"

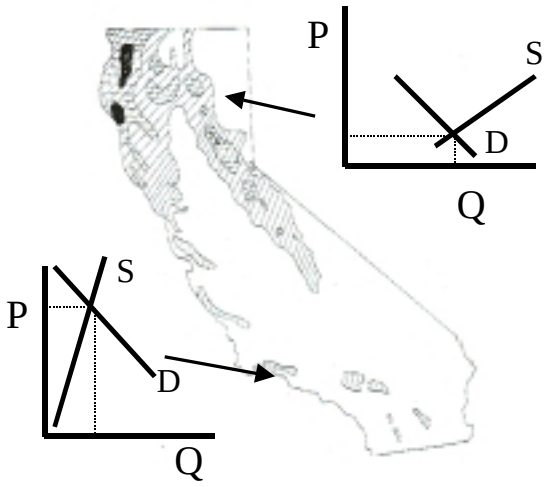
It's a real pleasure for me to be here. I want to thank you for the invitation and for coming. What I'd like to do today is talk about water reallocation and talk about it on two levels. One is sort of the epistemological or intellectual level of what do academic inquiries of water reallocation entail? The other level is the more practical policy level of how do we do something that actually leads to a desirable social change. So, that's just sort of two levels of the discussion and I think that we can start with a couple of points.

One is in a vibrant society we can expect that the locations and uses of water are going to change, it will evolve over time, and so that's a context for thinking about water reallocation. But at the same time I think, as we all recognize, there are unique characteristics to water that make it harder to transfer from an original use or an original place because you may, well… there are these other aspects of water like the multiple use that it entails, and as Dave (*meaning David Sunding*) was talking about, the issues of common pool resource questions for ground water, and even the effects the spillover effects for rural communities, rural economies. And so it leads us to this question of how, more narrowly put, how do you enable a reallocation of water, that is consistent with a vibrant society, but also minimizing potential adverse impacts of transfer. Another way to say that is just to apply two broad categories -- a reallocation that is feasible and appropriate. And also for our purposes today whether we can make intellectual sense of how we get it. And so what I'd like to focus on, as Isha described, is California's efforts -- it's sort of gone into a decline for the time being -- of creating a long, a large scale inter-regional, rural-to-urban, essentially, market for water that spans the state.

And in terms of intellectual guidance, Henry Vaux and Dick Howitt made a really, they made a very important statement about this about 15 years ago in their article "Managing Water Scarcity." They basically developed a spatial equilibrium model and they used it to identify efficient water allocation throughout the state.
(Figure 1)

Vaux and Howitt, 1984. "Managing Water Scarcity"

a spatial equilibrium model that identifies efficient water allocations. Original conditions (simplified) :



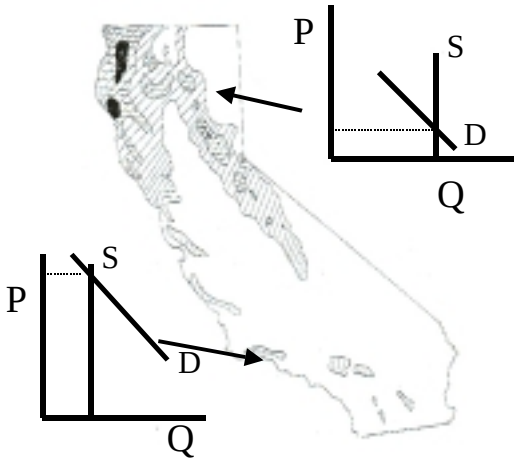
They had actually several (supply and demand scenarios) throughout the state, but to make the point I've simplified it to two. Essentially we're summing supply curves and demand curves, identifying a (market-clearing) price for the state. They were factoring in transportation costs and then estimating the quantity of water that would be allocated, reallocated through a market and comparing that to projections of demand. And they found that to implement a statewide water market you would, over 25 years, you'd only have to develop

about 100 thousand acre-feet of new supply; not the millions that people were anticipating.

When I got into water marketing and started studying it I started thinking well, how did they gather this data? And I actually asked Dick Howitt. I said "how did you come up with supply curves, in these regions up here, and the demand curves?" and he said it was extremely challenging to develop those curves. Because they couldn't really base -- now let's just focus on supply curves -- they really could not base their supply curves on evidence of market transactions, because there were no transactions, and water was basically staying put, so it was hard to imagine that there would be some dynamic change in quantities in a particular region. And so the reliability of the placement of those supply curves came into question. So how do we deal with that? One way to deal with that is to say well, there's actually no change in the (water) quantity in the various regions throughout the state. Maybe what you have is an inelastic supply curve, in which case you'd be looking at something like this. (figure 2)

<u>In the absence of water reallocation, Option 1:</u>

Completely Inelastic Supply Curves

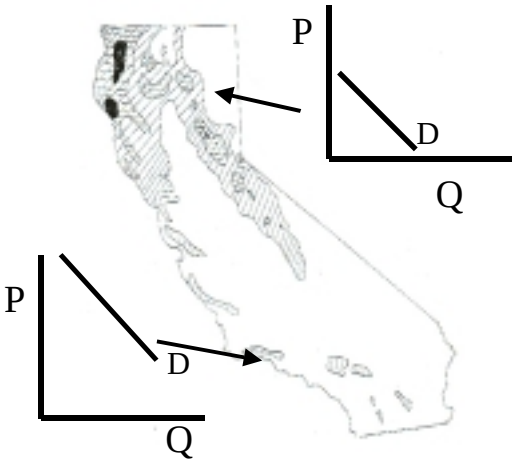


…implies the same quantity *transacted* at any price

And so now we've solved the problems of water quantities not changing from year to year, region by region. But still our models suggest that there are transactions taking place, and even that wasn't occurring. And so we can then say -- why don't we posit this model differently again? And that is to have model that has no supply curves. And this in a sense is accurate because, while you can posit the demand curve -- because what you're asking is to be forward looking and imagine what they would pay for a constellation of rights -- when you're talking about a supply curve, you're making a statement about an existing set of institutions. And if that existing set of institutions is inconsistent with enabling someone to sell water then there really isn't a theoretical basis for actually even positing these structures, laws, rules, customs, regulations. If those (don't) enable one to transfer water, then the (posited) supply curve can really get onto shaky ground. But that doesn't mean that we'll never have the water transfer. What it does mean is that we have to engage the institutions that are stopping at least a market-based transfer of water. (figure 3)

<u>In the absence of water reallocation, Option 2:</u>

No Supply Curves



…implies no transactions at any price

So, when you start coming at this question from this direction the broad policy you can count on is to engage institutions and make recommendations detailing policy content, that will lead to a reallocation of water that is feasible and appropriate but more specifically, from an economic perspective. As Dave was describing, designing institutions that enable voluntary, compensated transfers of a water. markets.

Okay, so how do you do that? Here are some of the disciplines that one could engage, and I think are engaged when people take up this challenge. And I think, let me make this normative statement, I like the idea of net social utility. There are different ways to design society. You can design societies to glorify the ruler, to glorify the power of the state, and you can also design a society that says we're going to maximize net social utility and I guess I'm just being parochial, but why don't we stick with that one. And so that's guidance to economics, because economists have really refined this idea, operationalized it. We can also look to institutional economics and institutional economics tells us to focus on contractual relations, economic organizations, and suggest case study approaches. And also, if you're not in a context to work with supply curves, you can't posit them. Why not look at the assumptions of economic models, that lead you to posit and supply curves, and say, why don't we try to implement those assumptions. Assumptions like information, concentrated property rights in one seller, reduction of third party impacts, all these are substantively built in to economic models, you can use them as touchstones for proposing policy.

And now let's go on; sociology tells us about the importance of social organization and path-dependency, basically says institutions existing today – (rather), existing tomorrow *ceteris paribus* look a lot like institutions existing today. And then I have law and economics as a discipline, but that's a bit of an overstatement, but that's a question of understanding property rights in their fundamental form and what that means about the ability to transfer that unit of property. And that's just from the social sciences. You can just jump over that fence and start trying to go natural sciences, hydrology, ecology, and engineering and so forth. But let me just mention before we move on that even the most hard

core, unrepentive, neo-classical economist that deals with water, still has to deal with all of these disciplines, with all of these issues. That's what economists are good at. They're really bringing in the elements of other disciplines into their tools and their ways of thinking to come at a complicated problem and so I think that this, what I've described here, is not here terribly unique.

Okay, how do we sort of take this intellectual menu and start applying it? I suggested to Isha that if folks take a look at one of the chapters of my book -- which is about the two-year test land-fallowing and water transferring between the Palo Verde Irrigation District and the Metropolitan Water District in Southern California -- that we could sort of take these ideas and apply them to that particular chapter. So, what is the intellectual approach of that chapter and then we'll get to how did I do it and then (what can we learn from it).

Well, first it's case studies and basically I set it up with physical, biological, and legal parameters as the background, and then, in describing the case study, there's this sort of central hub, which is the signing of the contract between Palo Verde (Irrigation District)and Metropolitan Water District. The first part of the case study brings us to the contract. And the second part of the case study -- this is where you have two separate parties who have separate interests, who are to some extent adversaries, independent, negotiating to an agreement, they reach agreement. Now it's implementation and cooperation and also efforts to avoid -- there wasn't gaming, or anything like that going on, you could see that. But in any event, the tone changes once there is a contract. The contract signing itself is like the hub. And then the other thing that I looked at was trying to address in great detail the property rights involved with this effort to transfer water. And finally, looking at all the different parties that could have blocked the transfer and why didn't they? Why did this one happen to the extent that it did? And just to briefly summarize what was in the chapter, the hydrology was feasible because both Metropolitan and the Palo Verde Irrigation District, which is located right on the Arizona-California border on the California side. They, it was relatively straightforward for Palo Verde to leave water in the river and Metropolitan was the lone appropriator to take the water out. At the time of the

transfer, both, and especially Palo Verde, had a very strong incentive to transfer because commodity prices were low, and there was a white-flight infestation which suggested that farming as usual is a no go for a few years, so this was an opportunity because the timing was right.

The next element is that it took them years to come to an agreement. The agreement had many stages where it fell apart, got back together and so it was a huge investment of time and effort. Another thing is that these negotiations -- it was between Metropolitan and the Palo Verde Irrigation District -- and what they finally got to was an agreement that did not actually change anyone's water rights. It was simply one higher appropriator leaving water in the river, a lower appropriator taking it out, and they did. And also, (an agreement that) the intermediate appropriator would let it flow by. No property rights were ever transferred. And they also came up with these enforcement mechanisms -- because there was going to be some fallowing involved -- that were low-cost and effective. And they also had a system which we called *land plan,* which anticipated some of the problems that could arise in these third party impact problems and said here's how we're going to deal with them if they arise. Not all of them, but a number of them. And so implementation came. And as it turned out there were very few labor, social or environmental impacts. There isn't much data on labor impact but it appears that only out of 20, a little over, about 22% of all the irrigation district was fallowed for 2 years but, according to at least farmers' statistics, only about 3% of farm labor jobs were lost throughout that period of time.

Another thing that came out (of this case study): Metropolitan took ownership of this fallowed water, but they couldn't ship it to the coast because it didn't have the capacity in its aqueduct. So it had a very weak storage agreement with the Bureau of Reclamation in Lake Mead behind Hoover Dam and they lost the water. Flood conditions arose and the Bureau of Reclamation spilled their water and that was just a weak ownership right and so the water never got to the coast.

So, now what can we learn from this? Let me preface this by saying, before we get to the rest of it, is that, it's one thing to say, when you (talk about lessons), how do we know these are the lessons? And I don't like saying, oh we know these are the lessons just because it's our intuition. I would much rather say, here is an analytical, we took these analytical steps and got to these lessons. And I have to admit, one reason I'm very happy to be here is to try to talk this through and think this through, and get to the point where we can talk about analytical stuff to get to lessons from this kind of an approach. In any event, let me just suggest that from this particular case we can draw a few lessons. One is: feasible hydrology matters. I think this is consistent with the free trade zone idea, that Dave suggested. Another thing is the initial private negotiations, where these were people interested in making the transaction work, led to a whole bunch of very interesting, innovative, cost reducing features that allowed this transfer to go forward. And then also the land plans they created allowed them to anticipate in advance some of these third party rights, third party problems and address them and create systems to address them. Those are three policy lessons, (and I wanted) to link them back to their disciplinary content. All of us can help meet part of that challenged water reallocation.

(*Note*: This is a transcribed talk. It has been only minimally edited, so that the speaker's individual "voice" still comes through -- Isha Ray.)