

## EEP100 Lecture 3 (Sep 3, 2009)

### Damien Bickett

So I'll talk about a few things. David's not here this week. I realize he didn't tell you where he went. I think I should let you know. He went to Burning Man this week. I figured he would tell you guys. But I think he plans to be here the rest of the time. So he's a post-doc, like he said up there. I'm a grad student. I've been working on water markets. We see eye-to-eye on a lot of stuff, so he thought it'd be a good idea if I lectured today. I co-blog a little bit with him on his Aguanomics (by co-blog I mean less than 5%). He's primarily the one there. Are you guys reading that yet? That's probably the best way in figuring out how he's thinking in terms of...if any of you wanted to suck up to him on exams, or whatever. Something along those lines.

So my primary field is economics of water markets and water rights. It's not what I'm going to talk about today, but I did want to talk about...if you guys have any questions from yesterday (or two days ago).

So take about a minute or so to think about some...to think about a two things actually. I want you to think about what I'm going to talk about today, which is some economics of the class pass, the AC transit, public transportation, and congestion—some of those things in the city of Berkeley and on campus.

We'll get into some detailed discussion about that. Primarily what we're going to talk about today—these are some things that I'm particularly interested in, and I have been for the past year or so. So we'll talk about that, but also...so right now I'd like to ask the class...so I'll go through and gather questions from you about either what happened on Tuesday (so think about if anything was unclear and I'll gather some questions about water marketing, and I'm going to address those if I feel like I'm up to it) or if you have questions on this kind of stuff.

Now I'm not saying what we're talking about specifically; I want you to think through about things about public transportation that you've been curious about—class pass, AC transit, whatever. If you have economic questions of those institutions or how we address issues about public transportation in this city, I'd like to hear it. So take about a moment or two; I'll collect questions in a second. And I'll write them on the board. Don't be shy; I like interruptions and questions just like David does.

Anything leftover from Tuesday? Go ahead

*[She mentioned something about the Metropolitan Water District in 2003—that they didn't buy water rights, but I guess it would be cool if you could get at what happened. She was mentioning how they didn't buy permanent water rights so the farmers weren't upset but...]*

They didn't buy permanent water rights, so the farmers weren't upset?

[Yeah, because she was talking about that kind of... (inaudible)]

Okay, I can talk about that. Anything else from Tuesday? Someone's got to have something that was unclear. Did you find it interesting? Good, because David will talk about it more.

*[She was talking a lot about districts...you know...like the water rights...with the government and stuff? But can you talk a little bit about bottled water companies and just tap water? And if you have to have rights to it?]*

Okay, someone had something over here. Go ahead.

*[I had a question about water rights. So if you're a farmer and you don't use the water... do they lose it?]*

So non-use of water. Anything else? Okay good. I'll talk about these three, and we'll move on to talk about...I'll hold off on these questions till later.

Let's talk about...I'll talk about this one first. Farmers losing water through non-use. So there are two...how much did she talk about water rights on Tuesday? No, not much? A little bit.

*[She talked about the market structure]*

*[She said that in the US the rights are either vicarian rights or appropriative rights]*

So appropriative rights are indeed lost through nonuse. Appropriate rights are governed by time of diversion. So the farmers diverting water from like 1915 on, using X number of acre-feet per year. Acre-foot is just a measurement term for covering an acre of land up to one foot—typically the measurement of water.

Suppose you are using some water, and technically the appropriative law says as soon as you stop using that water you do vacate the right to it. In California it used to be—you'd get three years of nonuse, and then now in 1980 it was changed to five years. So a farmer...I guess an idea would be: they stopped farming their orchard and they stopped using that water for a period of five years.

Eventually, if a court ever comes in and looks at their right and tries to quantify it, they could have a reasonable claim to take away half of their water right if they haven't been using it for five years.

It doesn't work that way in California though, typically. I mean, that's the law in the books. What you'll find out, I think, is that rights in the state are very mushy/messy/muddled, I suppose.

And so there isn't an agency that's going around keeping track of water rights to begin with. Therefore, there's very little way that they can identify if you haven't used all of your water right for a period of five years or so. That's one thing.

The second thing, in California, also in 1980 when they changed the forfeiture (that's what it's called. When you stop using your water, you forfeit the right so it's often referred to as forfeiture doctrine).

Anyway, if you forfeit your right (and it was changed from 3 years to 5 years in 1980), however they also added some extra exceptions that if you conserve water by using water more efficiently, you still have right to that conserved water which you can transfer.

So...straight out: not using the water you lose your right. But if you do things more efficiently on your farm, then there are ways to kind of get around that in California.

Colorado is a lot different. Colorado actually measures water rights very well. Every 10 years or so the state engineer goes around. Well I don't think he goes around...whatever he does. He figures out how much is not being used for all the water in the state. And he actually comes up with a list of abandonment and the forfeiture. And so he may chop off half your water right. You can protest in court if you want, but they're much more on top of the game there. It's a whole different story in Colorado

Go ahead

*[If you lose your water right, where does it just go...who has the right?]*

Who has the right? Well, technically it goes to the next junior person in line. Let's think about an irrigation district around Sacramento. So for whatever they stop irrigating as much rights, they're leaving out water in the Sacramento River now.

So whoever's on the Sacramento, if they want to do it legally, they can start diverting more water, if there's more water available. If they can file a permit to appropriate that additional water that's there, and get a right to it, it would be based on...it would probably be based on 2009. But then the next in line can get it.

Typically in California, like I said it's not very well measured, so it's there in some years and not in other years. Anymore questions about that? Go ahead.

*[Can the farmers, instead of just losing it for nonuse, just sell it to another farmer directly?]*

They can, kind of, yeah. So recently what happened, actually, there's a transfer from some place down in King's County. King's County's in Central Valley. There's a farmer (I'm not going to call him a farmer—he's a sandwich partner—some sandwich guy/group that owns land down there that farms almond orchards and what not) So they have a water right. It's actually not a right; it's a contract to the Department of Water Resources to deliver state water—project water.

So they were contacted for some whatever. Anyway, they didn't want to use that water, they wanted to sell it to Mojave Water Agency, which is south of Kern...Southeast of Kern County over the Tehachapes in the Mojave Desert. So they wanted to sell their contract amount from them to the other agency.

They're both state water project users. So they both own the same aqueduct, so they'd just leave the water in the aqueduct, and it would flow down, and they sold it for, I want to say, \$5000 per acre/foot, which is quite a bit.

So they're allowed to do that, and what they're doing instead...I think they're chopping

off like half their acreage and they're also buying, apparently, a 22,000 acre farm nearby which has some groundwater wells which they're going to use instead for their needs. So that's one option. Any other questions?

*[So how do they major how much water taken out of the river?]*

Physically? There are meters...it's probably just like the water meter at your house. There are ways to do it. But typically for a lot of farms in California, like I said measurements are not that spectacular, so typically when you fallow an acre of land... let's say...so for rice growers.

Rice grows typically apply up north; I would say about 8 to 9 acre-foot per year. So that means over a course of a year, if you measure it all, you'd be dropping about this much water on land all year, but only maybe about this much...4-5 foot...is actually consumptively used.

And so what that means is the other 5 acres flow back into the river. The 4-5 consumptively used is what the plant actually takes up and evaporates and it's kind of lost in the system and goes back into the atmosphere or whatever. So the other 5 acre-foot that flows back into the river, other people don't even use.

So they'll make estimates for each crop on how much is consumptively used, and so if you fallow an acre of rice, you'll get credit for maybe 4 acre feet of water that you would otherwise take out of the river but now it'll remain so you can have [inaudible] while still using the 4 acre foot. Any other questions on that topic?

*[Do farmers, when they get water for their house, is it...do they pay for that water in addition to the water they might use for their homes?]*

So two different things. Water in the home is...let me think. Like in East Bay, here in Berkeley, we pay for water through East Bay Municipal Utility District which supplies all the water in East Bay, which gets its water from...it has an appropriative right for the McCullony River in the Sierras.

So that's where the vast majority of the East Bay (Berkeley, Oakland, Richmond) ... anyway that's where they get their water from. So we all pay based on how much we used to the East Bay Municipal Utility District. You can also irrigate with that water too. It's pretty expensive to do so though, but a lot of people do water their lawns, etcetera, with that water.

Many farmers, though, don't have pressurized, don't have treated water. They're using the cheapest water straight out of the river, and they'll pay a district just like East Bay Mud. A district will build a dam and canals so people can deliver water to their fields.

They'll pay the district for that water, and their drinking water will likely come from a different source. If they're out in the rural area, they might have their own groundwater well for drinking water. Or they'll get it from...yeah...perhaps a different source. I'm not entirely sure, but I think I can say for the moment its two different sources. Usually Ag-users specialize just on ag-water—untreated, unpressurized, not on demand water.

Where as in most residential areas—you turn on the tap water and it's pressurized. You turn 24-hours a day it's there. It's also treated which makes the water much more expensive, and that's why water's not cheap. Anything else?

Okay I'll talk about the second question. I'll talk about, actually, Metropolitan Water District. So MWD is the massive wholesaler down South in LA. It covers 20 something member agencies. David knows all about this because he wrote a dissertation on the Metropolitan and how they're dysfunctional. And, at least, dysfunctional in terms of a libertarian economics point of view.

So they give water to LA and Orange County...bunch of folks...San Diego...everybody down there. They were looking for more water in 2003, so they went up north to Sacramento and they offered a couple irrigation districts a lot of money to buy their water. So what happens is your district is set up...I believe the district has set up some sort of sign-up sheet.

Metropolitan would say, "I want 10,000 acre feet from this district." And so the district would have a sign up sheet. And the individual farmers could sign up and say, I'm willing to fallow 10 acres of my land to free up some water. Other farmers would do the same kind of thing, and hopefully they will get all the water the Metropolitan wanted and then the district would take a chunk of that price, and then the farmers would get the majority of the money, and that's how...I mean the water will flow back into the Sacramento River and then they'd pump out more into the state water budget aqua duct.

But the question was about water rights; the question was about how do you do it if you don't have water...

*[Well, she was just mentioning how water markets are kind of tough to set up because the cities like LA and San Diego have junior water rights, so they actually don't own permanent water rights. So she was saying how that's kind of a barrier to creating a water market because farmers don't want to give up their permanent water rights because that means their community of agriculture would have hardship. But she was saying with this was, I guess, a kind of unique phenomenon where the Metropolitan Water District bought some water from the farmers, but they didn't sell their permanent water right. What she was saying was kind of the first, sort of...primitive water market...]*

*[The option contract]*

Yes, these were some of the first option contracts. So that basically means that the Metropolitan Water District...I want to say in the winter time, before they had an idea of what the ratings were going to be, so they set up an option agreement with these growers and said, "Look, it's dry, we'll pay you \$10 now per acre/foot, and if it's dry and we exercise our option, we'll pay you an additional \$240 per acre foot you deliver to us. And then so the farmers then fallow for a year or so, and that's perfectly legal according to California law. They don't have to...the farmers have the rights to the water. Metropolitan is just leasing that water for one year. And Metropolitan does have senior rights, though, to a lot of water. They don't have as much as they like, but they do have

water...at least LA. LA has water rights dating back to 1910 or so in the Owen's Valley, and they also have a bunch of local water rights.

And that's happened a few more times recently too. San Diego this year had an option agreement with some districts around Butte County, where they paid...I think it was like...yeah. They paid them \$10 in the Fall, then said, "Look if it's dry we want the water. We'll pay you \$250 more if you agree to this", and so they did that. And I think they bought 10000 acre-feet. And it ended up costing...what's amazing though is San Diego ended up paying \$250 acre-foot for...I can't remember these figures correctly.

I think it was \$240 was the...it was like the \$10 option price and \$240 was the price per acre-foot, and it ends up...as the water flows down the Sacramento river into the delta, they have to allow for a 23 percent loss for whatever—if it propels [inaudible] in conveyance, if it seeps into canals, whatever.

So that boosts the price up to about \$300 per acre-foot right around Tracy. And then they have to deliver the water all the way south over the Tehachape Mountains into the LA Basin. LA, or Metropolitan, is a wholesaler for San Diego. And so San Diego is paying Metropolitan these conveyance fees, which adds...I think Metropolitan charges them an additional...it's something obscene...it ends up being a total of, with energy costs and everything, close to like \$700 per acre-foot by the time the water gets delivered into the San Diego area.

That's actually before treatment. So treatment, you add about another \$150 or so per acre-foot. So to give you an idea of what these...I'm not sure if you guys have an idea, but anyway...so this is what they're actually paying for water—for treated water in the city of San Diego.

To give you an idea of what some agricultural districts are paying for unpressurized, untreated, not on demand water, unlike this, they're paying...I think Imperial County, which is you know, the Sultan sea; you know the Imperial County down south by the Mexican border? They're paying about...I think their farmers pay \$17 per acre-foot. Rice growers up north, I think the big district up north, charges about \$60 for rice acre, per acre. So if you think about how many you use...that's a pretty sig...if you're using 5 acre-foot consumptive, that's like \$12 an acre-foot. Districts east of here in the valley, Central California Irrigation District are paying, I want to say, \$6 an acre-foot.

Anyway, so a lot of farmers are just paying significantly less, and so if they receive...if they have the option to receive \$240, it's a valuable option for them. However, so economists have always looked at them and said, "Damn, make the trade" right? If it's that much of a difference. But it's not that simple because of water rights. And I can't get into too much depth about that. Any other questions about that? About that transfer or anything else?

I can talk about bottled water too. So I think most of the bottled water...who asked the question? I think most of the bottled water in California...actually I want to say in the country...is ground water. A lot of it is not treated surface water. That's not the case for Dasani and Aquafina.

Those are actually Pepsi's and Coke's version of bottled water. Those are treated surface water, I'm pretty sure. I'm pretty sure it's filtered, reversed osmosis. Nestle has a lot of bottled water contracts. They're actually sucking up ground water in the states. So ground water rights are completely different. So the rights I was talking about before with vicarian or appropriative water rights in California are for surface water. For ground water, it's completely different.

In California, unlike most of the Western states, they have not chosen to institute a permitting or water right system for ground water. So typically, if you own land, you have the right to take ground water. But it's a correlative right. You have to share. A

s in, if your neighbor is also taking from the same lot, (most ground water offers are fairly large) and he's angry at you for...you know...if you're sucking up too much water, it drops the water [inaudible] as well the main cost of pumping ground water is electricity cost to pump ground water back to the surface.

So you're causing an externality on him. As in, he has to pay more for pumping the water up. So there can be disputes like that. So you have to share the water. But generally in California you have a right to pump what is reasonable. And so if a company buys up land that has good ground water underneath it, they have a right to use that water and to bottle it and export it.

Now, typically the issue in California has been...actually the issues in most of the country has been...either the ground water source is in a really pristine area, which people don't want to mess with whatsoever (that's one contention). The other thing is that there is an animosity towards a company coming in and taking water and selling it.

Even though you have an irrigated farm right next door that takes the water, grows the crop and sells the crop. So selling the crop...somehow that extra step means a lot in taking the water and selling the water. And that drives a lot of the contentiousness...even though, if you look at the numbers, irrigating agriculture uses far more water than bottled water. Bottled water is not a...it's a fairly small amount of water being taken up.

My view on the subject...that's what a lot of focus is, actually, about water. If you read the newspapers, a lot of people have been concerned about it, but my view is that it's not as bad as people think it is, I suppose. It's not that bad. And it's also the case that it's probably better for people than Coke.

So if people want to buy it, why the hell should we keep them from buying bottled water if the alternative they're going to buy Coke or something else, and perhaps we wouldn't give them that option. A lot folks say they can go fill up with tap water, like I did. They can do this and take this everywhere.

It's just costly to do this all the time, and some of people don't have the luxury to do that.

*[You said it was a small market...what percentage is bottled water of the market...to get an idea...]*

Oh, minimal. Given the idea that California uses 44 million acre-feet per year. So if we

use about 44 million acre-feet per year (this is our average year...these numbers are highly fluctuated). But anyway, I think urban accounts for...

I think Ag typically uses 75-80 percent, Urban/Industrial stuff is the rest of that. Where bottled water fits in? I want to say...it's probably less than one percent. I don't think even a percent, which would be my guess. It's not much in California. Most of the stuff is going to grow food. Any other questions about water stuff before I change topics?

David will talk about a lot more. So if you have other questions then feel free to ask him because he'll be going on more.

Alright, so I want to talk about public transportation here in the City of Berkeley. First, I need to figure out how you all get to school.

How many people drive to campus? Is that 5? One, two, three...Three. Three or four.

I think this class is about...I'm assuming some of you are on the waitlist for this class? Is that true? A few people?

I'll assume it's about 95 people then.

How many people take the bus? So I would say about 14.

How many people Bart? 4?

Bike? 12.

And are the rest of you walking? Okay. Anything else I missed?

What's left here? 61? Sweet. That's probably not right but it's okay.

So the city of Berkeley, back in 1999, along with the University, wanted to fix two problems. They wanted to fix/address two problems. One was (what they thought) was too much congestion in the city. And the university was primarily interested in congestion shortages.

For the people who drive, where do you park?

*[Lower Hearst]*

Do you pay? You pay the \$355 per semester?

Who else drove? Same thing?

So they want to fix these two things. So I want you to take a couple minutes yourself right now and write down what you think would be the best ways for the city/university to address congestion, as well as what the university can do to address parking shortages on campus.

So take a few minutes to write some ideas down, and we'll talk about what they did and alternatives to these things.

You can talk to your neighbor too. You can do pairs if you want.

Alright, let's consolidate and collaborate for these?

So who would like to offer suggestions for reducing parking shortages?

*[Increasing price of parking spaces]*

*[I'm don't know if they already do this but: Reduce the cost of the parking pass to encourage carpooling, like if you sign up multiple people to carpool with you]*

They already have a carpool pass, but you're saying reduce the price of the carpool pass?

Okay. I'm not exactly sure how the carpool pass works. I think you have to have a couple people involved and you drive to school. But if you don't have people you can still use it but you have to pay \$10 or something like that.

*[Offer free bussing services and stuff]*

*[How about having an off-campus lot and providing a shuttle?]*

Okay this would be under "Build more spaces". *[In less congested places...farther away]*

Push problem elsewhere. This is tremendously important for economics. This...push stuff where it can be most takeable, I guess.

So like New York City doesn't want to...land's expensive. No one wants to dump their garbage around New York, so truck it somewhere else who can take it. That's the basic idea here.

Go ahead

*[You could have two pricing systems. So you make small parking spaces for small cars and bigger ones for a truck. And charge different prices for both so people are encouraged to drive smaller cars and hope we have space.]*

Discriminatory small car pricing. Anything else? Go ahead.

*[You can get a lot of faculty to sell their rights to parking.]*

But I don't think faculty has rights, right? They have to pay.

*[They have central campus priority]*

But they have to pay dearly for those.

*[But they're the only ones who have the right.]*

Okay, okay. You want to park on central campus? Yeah?

Anything else that's substantively different from these?

*[Wasn't the problem that they have to use cars in the first place so what if they, instead of trying to address parking, they try building more units for housing around the area? But I know the area's congested...but then...taller buildings so they can fit more units? So they can fit more housing units]*

*[If we are going to allow people to sell permits, they could do a citywide auction for permits, and you can bid on them, and if there's none left you just don't get to park in the city. So that would increase revenue for the city too.]*

Yeah so actually encourage the university and the city to collaborate on parking, which they don't now. So I'll put UC/Berkeley collaboration. Okay these are all interesting things. Let's see...let's go over here then.

What about congestion ideas?

*[Maybe make more bike lanes? Encourage people to ride bikes.]*

So facilitate bikes. So bike lanes. Okay.

*[You can provide subsidies for people who ride bikes]*

Wasn't that someone's ASUC platform? Was it last year? I think someone wanted to... maybe that was in the City of Berkeley, but I don't remember.

*[Wasn't there a free bike program? Like you can just leave a bike somewhere and somebody else could hook it up and...]*

*[Bike share]*

Does campus have that? We had that at Carleton where I went. It was a yellow bike program. It worked well when the bike was there. Typically they got destroyed after a few uses. We have these little lakes on campus, and typically you can find them at the bottom of the lakes for whatever reason.

All right, what else?

*[Encourage business to have different opening hours, so that people work at different times.]*

So what do you mean by encourage?

*[Well there are probably really popular business times. But if someone wants to start earlier, let's say 6 o'clock...]*

So you want to subsidize them to open at 6?

*[Subsidize, or punish those at 8]*

Okay

*[Make public transportation more reliable, so if people knew the bus was going to come*

*on time they would rely on it more]*

So make the busses more like Bart, basically. So they're typically always on schedule.

*[You could institute a congestion fee to drive around town, or wherever...]*

To drive in peak times?

*[What about reducing the amount of time you can actually park in a space, and then making tickets really expensive, which is pretty much the way it already is...]*

That's the way things are going, right? So this is basically, increase cost of driving, or parking I guess. Like missing your meter, and having the city stick you with a \$50 fine.

It's really frustrating though. But we'll get back to that. Anything else?

*[Or we should do the opposite and just have all-day parking because]*

Where?

*[In the city. Because people run out and have to move their cars every two hours or so, which causes traffic...]*

It's an hour around campus, right?

*[Yeah, some are two hours, some are one hour. And so if you get all day parking people are not going to move until they leave...]*

I see, so this reduces the temporary congestion because people are moving their cars, right.

*[Or they can issue all day permits]*

So all-day parking. The issue is, there is all-day parking but people aren't using it though. Or anyway, we'll get back to this. Anything else?

*[More parking near public transportation like Bart stations]*

I'll put that under "Bike Lanes/Encourage alternatives/Facilitate alternative uses of transportation"

*[Design the streets to reroute people out of the area, so circles in the intersections to calm traffic]*

Traffic calming circles. They're actually going to put...you know the Gilman/I-80 interchange? It's horrible. It's where you have...I think it's an 8-way...you have I-80 getting off here and getting on here. And then I-80's here, and also entering here. And there's also...there's a street coming on here and a street here and a street here and a street here. And they you also have a street that's going back this way. This is Gilman. And there's no...there's stop signs and that's about it.

And the reason why I finally realized why...I read an article about why they haven't put a

traffic light (Berkeley puts a traffic light everywhere it's possible, it seems). And they haven't stuck one here because they claim that if they put a traffic light here, it would back up cars onto west-bound I-80 too much. Something like that. That was their claim. So their goal now, apparently, is to put in two traffic circles at each place eventually. That's what they're shooting for.

So that would be...infrastructure improvement. This is actually something I've tried to talk to the City of Berkeley about and gotten nowhere. Tried to get them to improve their traffic light timing to improve congestion, but I've gotten absolutely nowhere. Sometimes that light on Blake. You know when you're coming down on Telegraph towards campus and Blake comes in on your left, and I've repeatedly been there when no one's waiting across the light, and no cars are waiting to come out, and the light flips on Telegraph. And it angers the hell out of me that you can stop a busy intersection for absolutely no reason. I figure that they have technology to avoid that these days.

Okay, so let's talk about what they actually did.

So what they actually did was what? Anybody remember? Back in 2000?

The city and the university kind of...I'm not sure what the city had to do with this, but they were involved because the City of Berkeley likes to be involved in everything the university does, if possible.

They got the class pass program. You guys all have the class pass? Pretty much everybody right? So the class pass, apparently in 2000...the class pass...

For those of you who don't know, I guess, it's a free bus ride on the AC Transit whenever you want. And it passed with 88.8% of the vote, apparently. And 31% turnout. Just to give you some numbers about this. So who voted for this system? Go ahead.

*[It's not free; they charge us]*

You're right, it's \$68 a semester now. Right, it's definitely not free. In fact, if you want to look at what it used to be. I wrote some down. Back in 2000, it was \$18 a semester and \$18 the next year. So they made a two-year contract. So it was 18 and 18, doubled the next two years to \$34/34, then 37/37, then 57, 58, 58, and now it's 68. 2/3 of which go to financial aid of some sort. I can't exactly figure out what that means. Financial aid for...?

Not all of it goes to AC Transit. But 2/3 of it does. Sorry, 1/3 goes to financial aid. So it's definitely not free.

Who voted for this? Who's happy to vote yes on this procedure? Right, of the student population who's voting yes on this. People who ride the bus, right. So people who find it worth it.

*[People who can't find a place to park]*

Yeah, basically those who wanted...I guess people who wanted...those who wanted the pass subsidized by their friends, so they find the pass valuable, but they don't want to pay

the full...at the time was \$18. Or actually no, at the time was \$60,

AC Transit, the year before, offered the pass for \$60, which 1800 students actually purchased.

So to give you an idea of how...what they thought it was worth. So I guess in 1999 there was a pilot program. And the pilot program the year before, I guess 1800 students purchased a \$60 pass. And I guess that wasn't good enough, and so they had to give it to everyone.

Probably those who don't pay tuition directly...so perhaps those whose parents pay tuition? Scholarships, yea.

And the other 60% of the people who didn't vote either don't care or just didn't feel like coming out. It's been voted for, and it's been reauthorized every time. But now it's up to \$68 per person, which is a fair a bit of money.

*[Would the AC Transit offer a pass to normal citizens? How much would that be?]*

Yeah, the normal pass right now is a monthly pass. And the monthly passes are like \$50 a month. And the faculty pass, the bear pass, is I want to say like \$440 a year...something like that. And that's also subsidized a little bit too though. So the normal monthly pass is unsubsidized is like \$50 a month.

In 2003, almost every student picked up a pass. They claimed about \$150 trips per year per student from the class pass. And this is about 27000 out of 30000 students picked it up. The question is...how does this program actually address these two things, or why wouldn't it address it?

So who uses a class pass here?

Does five times a week seem reasonable? 150 per year is about 5 times a week. Does that seem reasonable? For those who use it? No.

10? So you use it all the time? What would you do if you didn't have the class pass?

*[I'd have to pay for the bus]*

So you'd pay for the bus.

*[I wouldn't park here...]*

So you're the type of student where your behavior doesn't change. You'd take the bus no matter what. And now, the rest of us help pay for you.

I want to say one more thing. This I find interesting. This is the increase in AC Transit fees over the years. From \$18 in 2000. I was on the same webpage looking for the health insurance fee, by the way, for undergrad. Back in 1994, it was about \$195. And it's been about \$200 up until the year 2000. And then it shot up to 230, 250, 400, and now it's \$698. Is that true? Per semester? Yes.

And for grad students like me it's like \$850. Anyway, they both have shot up quite a bit. They actually kind of track themselves pretty well. What's interesting though is what happened here. That's a whole separate topic.

Let's talk about how much the class pass actually affected these things that they were trying to do. First of all, they didn't adjust the price of parking at all. So they could've done this, of course, but it probably would've done something. What do you think the reasons are that they didn't address this? Didn't bother to go that route; jack up the parking.

*[Unpopular]*

*[Hurt local businesses?]*

Yeah, a combination of those things, I think. And I think that especially university (this is mainly UC parking)...it would already cost parking passes about \$355 an hour.

*[I think they lowered it 8%. I went on the site...to \$298?]*

So it's approximately \$300. And it's been that way for a while, as far as I can tell. So they haven't chosen to really touch this subject. Probably because yes, it'd be fairly unpopular. What's the other reason? Think about elasticity of the folks that are parking on campus and their decision-making.

*[I think if you can afford a car and a few hundred dollar parking pass, then you don't have to worry about the few dollars more or less]*

Right, would you agree with that?

*[Yeah, up to a certain point.]*

Where do you live?

*[Marin]*

Right, if you live in Marin, you don't have an option. Who else drove? Where do you live?

*[Vacaville]*

Is there a public bus you can take that comes down the 80?

*[I didn't look into it that much]*

Okay. So that's an important thing. So if their goal is to reduce parking shortages, it's a fairly inelastic demand for parking because you have people that don't have very many choices. The alternative choices are to basically take a series of busses that would connect up in Richmond right? It would take you about 3 hours.

*[I live 5 minutes from the ferry terminal. So I would take a ferry to the bart...I don't like Bart. I don't do subterranean]*

That's like my parents. She's worried about taking the bart underneath the tube. She doesn't want to go on the bridge either though, so I don't know what the alternative is. So that's a big problem. The big issue is that drivers that definitely dominate the demand for parking as well as congestion, drivers are not really motivated by free bus passes that can take them from Oakland to the city. Other way to say that is—your demand is fairly high.

[Although, wouldn't it not so much depend on the bus pass, but more on the cost of housing? Because I would think that most people who drive cars figure, "okay, I could stay with my parents which would cost nothing. Or I could get a really cheap apartment there." Versus an expensive apartment here. But if driving, gas, the car—got so expensive and you could live here, for example, in a cheaper area like Oakland, and get the free bus pass, it might affect the decision to just say okay I will change the situation entirely.]

Okay so you could have a few people change their behavior. As in, I used to want to...I used to live next to Berkeley with a free bus pass, but now it's worth it for me to live farther away and rely on the bus. That's a possibility. So there was a survey that looked into all this stuff and found that that really wasn't the case. That people did change, of course. People change their housing situation all the time, like the students. But their reason for changing it was very rarely based on the bus pass, on the AC Transit bus pass.

*[Why do drivers not really feel motivated by free bus passes?]*

Basically adding a free alternative that can take them from Oakland or Richmond to the city of Berkeley, which is now free. Previously it was \$2 or whatever the fare was. That doesn't make them better off at all because it costs them too much time to get to campus. In order to take advantage of that. To get here from Marin, you have to do something else. You have to be able to use the AC Transit buss pass in the first place.

There are definitely some that will be motivated. But the other thing is that the cost of the actually driving...sorry, the variable cost of driving, which is the gas...that kind of thing? That's kind of a pittance compared to parking on campus and other concerns.

*[My parents live in Marin and, actually, I have a car there, and my apartment has free parking, but I didn't decide to bring my car over. So my car is at my parent's home in Marin. And I was going to bring my car, but because of the free bus, I didn't. I mean, I could sell the parking permit, so that could seem like a better thing for me]*

Where do you live in Berkeley?

*[I live on Blake and Dana.]*

How much do you sell your parking space for?

*[It's \$35 a month? It's already sold, sorry]*

*[On Craigslist and from a couple people I've heard of...they're roughly \$80-\$100 a month for like closer spots to campus]*

Does that mean the university is passing a good deal then? I mean, if they're charging \$292 or whatever it is per semester...

*[I would say yeah...]*

*[If you can find a spot...]*

Is that what it is. So you're not guaranteed a spot? Is that the case?

Are you guaranteed a spot if you buy a parking pass?

*[I get here at 8, I have class at 8...]*

So yes.

*[I say it's filling up at around 11 now, it gets pretty full]*

So if you pay for a pass and you get here at 11 what do you do?

*[If there's no parking? I haven't ran into that yet, we'll see]*

I suppose you could park at residential parking permits and move your car every hour, but that's a real pain in the ass. Especially because they're very restrictive. Their little parking enforcement vehicles...? Like little bees.

I think one of the proudest moments? Well I guess not the proudest moments...I was ticketed for parking on Shattuck...you know the Wells Fargo ATMS right down town? There's a red curb right there, and I parked there for some idiotic reason just to go to the ATM and back. They got me within two minutes. And I didn't realize at the time...but it's a \$250 parking fine.

And I looked at the ticket and I was like, "Oh you know, \$50 whatever." But I looked at the ticket and it said \$250, and it just kind of floored me. So I disputed, was denied. Asked for a rehearing, met with the person, and during this time the place was changed. Center Street is now a one-way street. They constructed it and tore out some signage. My claim was that, how could I have possibly known that it was \$250 because there was no sign there. Which is true. There are other signs on bus stops that say, "Parking here, \$250 fine". This particular spot did not have it. However, the sign's been removed if they were there. She thought there was one there, I said, "No there wasn't". She called the transportation-engineering people, and they either never got back to her or said that I was right. So they took away my ticket, which is really, really nice.

Because the alternative...Berkeley has about 90 different citations...or things to screw up in parking, basically. 90 different possibilities. You can park at a red curb, you can park at a disabled spot, you can park too close too a sign...whatever. All kinds of stuff.

About 95% of them area bout \$35 and less. And there are about 2 or 3 that are about \$250. And I was like...how could I possibly know, even if I was able to find these fines...my expectation is not \$250. So if I'm not getting the right incentive, how do I know whether or not to park here?

But then she also told me more, that it wasn't her choice. And that, she actually agrees with that point of view. It wasn't the City of Berkeley's choice to charge \$250. This is a state legislature thing based on a couple old people and disabled people being frustrated with people parking in the bus zones, complaining to the state legislature, and the state imposing. California's locked in now, a \$250 fine for a bus, for red zone violation. Disabled and bus zones. Anyways. And that's a good lesson (and this is another lesson that David would talk about)...that's a lesson in applying a one-size-fits-all thing when you don't have knowledge about how the local situation is.

What I want to say more about this...

So who's the primary beneficiary of the class pass? Who's mainly using it now? If you have a continuum of distance from campus.

Distance from campus...

Suppose you have...

I imagine if you live really close to campus...

I'm not sure what the graph...the PDF would look like. I'm going to say it maybe looks like a lot of people live close to campus, and then you get down to Oakland—less and less. And it kind of tails like this, and you get a long skinny tail like this because you have Vacaville, and then you have other people who commute from a long distance.

So before the class pass, what are these folks doing here? Walking, right.

They're walking.

As you keep going down, what happens?

*[Bus]*

*[Bike]*

Bus and bike, yeah.

*[Bart]*

Bart. And perhaps drive somewhere out here.

So with the addition of the class pass, what's changing?

*[You're removing bikes and the people who take Bart, which isn't really solving anything]*

Yeah so there's a lot of shifting. So that's basically what the survey found. So there's a lot of shifting from the people that used to walk. Obviously the people who live back here, you know, these guys aren't going to change their behavior. It's idiotic to wait for a bus if you live that close to campus. Well, okay I take it back. Because I've taken a bus that far too. But I don't wait for it. If it comes by, you just grab it, right? Yeah you don't wait for it. It's idiotic to wait for it, I suppose. Unless you're crippled, or you have a

broken leg.

So those people aren't changing. The people that used to walk or slash bike from in here, some of the bikers may change. You might put your bike on the Bart, or the bike on the bus or whatever. So you get some shifting of behavior here. And suppose the bus took up this chunk. So as you got to about...from 2-4 miles, everyone, just for example, took the bus. After class pass, that shifts in a little bit. I assume this comes closer, because you're having an easier time, or it's free.

So those folks, now that they see that it's free, they can crack the shift out a little bit here.

But yea, you're eating into those who formerly walked and who formerly took Bart or biking. It's not touching these people that much. This is what the survey found. Let's see if the survey found any numbers that were interesting.

I think some guy did his whole dissertation on...this is one of the examples I guess. About pricing and that sort of thing.

Does this make sense? Why a program like this wouldn't expect to help either congestion or parking shortages? It seems to make sense to me. It seems odd that these would be the goals, and yet they implement this program. Given that these are the goals. I feel like they would understand that.

Let's talk about what the actual class pass is priced. So the class pass is \$68, and it's free. So you pay a one-time fee, and then you get to ride free all semester. So the fixed cost of the class-pass is now \$68 and the marginal cost is 0.

I'm going to back up one second.

What do economists like to aggregate for efficiency in terms of pricing?

It's efficient when you price at marginal cost...does this ring a bell?

The idea being: if it costs something...if the marginal cost is like \$5 to produce a burrito on the street for me, and my marginal benefit is higher than that, it'd be nice if we could make a trade, and it's efficient if you extract all the consumer surplus that's possible and producer surplus that's possible. And you want to price at the marginal cost where there's no difference between the marginal benefit they get from something and the marginal cost they take to produce that item.

Speaking of street food vendors though...it's not the case in Berkeley that this is going on. In fact, Berkeley regulates that quite a bit, as they do everything else. I might mention that later on.

Do we want to price...

Think about AC Transit and busses. What is the marginal cost of picking up a passenger?

Zero? Can't be zero?

*[Depends on how many passengers are on the bus, doesn't it?]*

What do you mean?

*[The more people on the bus. That split second...the 5 seconds it takes for one person to get on the bus, there are going to be multiplied by all these passengers' time. So basically you are losing a lot of time with more passengers]*

Yeah. What if do a graph like this? So this would be "passengers served".

Think about one bus. So that first...it's effectively...it's pretty damn close to zero. It does take a few seconds to get on. But as you approach capacity you're saying it starts to shoot up a little more.

And say let's say the capacity of the bus is here. This is capacity. And capacity is loosely defined. I guess you can always jam more people in the bus. But anyway, suppose that the marginal cost maybe shoots up a little bit more.

What about the very first bus rider?

*[Zero]*

Yeah, I guess it depends on how you define the problem. You could define the problem as: if there were no passengers, you wouldn't put the bus out there. So that was 0. But if you want to pick up that first passenger, it costs quite a bit. You have to pay a driver, get a bus going.

*[Well is the price of gasoline, and the price of running the bus, and the price that it takes for...every time you stop you use more gasoline...wouldn't that...is that a fixed cost then?]*

It is variable. It comes to like 5 cents a person. I'm saying, suppose once you start riding the bus. Let's say that initial first chunk is very high. Let's just say it's...whatever this value is. After that first passenger, though, it drops precipitously. So once you decide to run the route, and pay that cost, then you're running your route, and the cost to pick up that additional person is practically nil. Because you're already going on your route. You open the door, you let them in. The cost...it does cost a little bit of time. But even the time cost is suspect, because they're all on a fixed route and a schedule. If there aren't people on board, which is really frustrating, they actually have to wait to stay on schedule. Which would be really annoying if you're on a bus late at night, and there's no one coming on. And they have to stop for no reason. You were going to say something?

*[Wouldn't it cost more the more stations they have to put in for picking up people?]*

What do you mean?

*[Well to pick up passengers if you just put one stop then it's fairly cheap, but if you have several stops on the line, the more passengers you want to pick up, you have to increase the number of stop, which costs money, right? To put in the bus stop?]*

Oh okay, I'm a step beyond then. Once the route is kind of fixed, the idea of...

*[So everything is already done]*

Basically, yeah. You need to run the bus or not. Okay, that's an interesting point. So the average cost to the rider looks somewhat similar. Average cost looks like, you know, it comes down from here and looks...and it kind of asymptotes towards here, and there's X.

So let's talk about where you actually want to price. What's fair? What fare do you want the bus to charge? What fare is efficient? Given that we said that efficiency, we want to price at marginal cost. We said the marginal cost is effectively zero.

What price do you want to charge?

*[You should charge zero.]*

So one option is charge \$0.

*[I would say average cost at capacity.]*

Could charge average cost at capacity, that's one idea.

Charge some sort of average cost so you don't...this assures that you don't lose money, right? Ensures that you break even.

Any other ideas? What does the class pass look like? What is the structure they've chosen to charge? It is zero. You pay zero on the margin, but you pay the \$68 chunk. This is a way of getting around the problem when you have a marginal cost that is below average cost when you come towards capacity. So if you charge marginal cost, there's a couple problems.

One, if it's free, AC Transit is going to lose money. They're not going to make any money back on this. However, if you don't charge...what you could do is you could charge nothing, and then you could charge a fixed fee for the right to buy in the systems.

This is what the AC Transit has done. They charge you a fixed fee for \$68 and then, because once the bus is running, it makes sense to pick up passengers until the marginal cost equals the marginal benefit.

You want to charge at about zero dollars. This is the case in AC Transit. There aren't many busses at capacity around campus. Occasionally, that's not the case. Sometimes you have busses that are maxed out and charging at zero price screws you up a little bit.

But for the most part, this is the option they have chosen to do. Because it is efficient, in some sense, to use the entire capacity. Given you have a bus; you're going to use it as much as possible, because it's practically free to pick someone up.

What is the problem, I suppose, with...

From AC Transit's perspective, suppose they're charging zero dollars. And you realize, with a class pass, it costs nothing. So you realize...this is line 51, and the 1R. Actually, the 51 goes down college. And so it's particularly crowded on some days. So AC Transit looks at that and thinks, look our bus is jammed to capacity. What should we do?

Their answer is, “Well, if people want this, we should put another one out there”. What’s the folly in that reasoning?

*[You’re not going to make any money]*

Yeah, if they’re charging zero they’re not going to make any money. Let me talk about a different situation. This goes back to water. The Central Valley Project delivers water, like I said, for really cheap rates to farmers in the agricultural state of California. In the order of 18 or 20 bucks per acre-foot or less.

Farmers complain about a shortage, then, at those rates. So the US Bureau of Reclamation says look, there’s a shortage. We ought to expand capacity, build more dams. Supply this water. It’s really demand for it. We’re charging \$15 an acre-foot. People want more water; you have to meet that demand.

The folly in that reasoning, though, is that building additional infrastructure is tremendously expensive. And it only appears that you have a shortage because you’re charging very, very cheap rates.

And if AC Transit prices at zero dollars, and then observes a bus maxed out to capacity and says look, we have to put another bus on there—they are ignoring that this signal... the cost of running that second bus is actually fairly high.

And if you actually raise the rates to price it a little more efficiently, you perhaps wouldn’t need that demand. I think David will talk a little more about this in detail a little later. I don’t want to get into too much detail here about Long Run Marginal Cost pricing versus Short Run Marginal Cost pricing. It’s kind of the same thing with airlines. If you run an airline you want to fill capacity. You never want to let an airplane go empty. But you also can’t charge the marginal cost, which is like 5-10 bucks for the peanuts and the service. Or negative \$5, whatever it is.

*[Aren’t you supposed to charge where average cost equals marginal cost?]*

Well it depends on the demand...let’s just throw a demand curve on here. Demand curve probably looks something like that. I don’t care...it probably asymptotes towards the origin a little bit.

But this would be the breakeven point, where they demand equals to average cost. You can see this point here. But ideally, you want to charge at where marginal benefit equals marginal cost, which would be out here.

And so if you do...if you charge average cost and you’re sure you break even, you’re still having some extra capacity that’s...you’re losing out...it’s deadweight loss, is the idea. This little triangle would be deadweight loss. This picture’s way too clouded now to get an idea. But that’s the basic idea. I’m going to stop there. If you have more questions, you can talk to me for about five minutes. I’ll be up here for a little bit, but I will stop there. David will be back next week. He can fill in for my deficiencies.

**Transcribed and checked for accuracy by Brynna Bunnag**