

# **EXHIBIT C**

## **OMNIBUS BROWN DECLARATION**

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UNITED STATES DISTRICT COURT  
NORTHERN DISTRICT OF CALIFORNIA  
SAN JOSE DIVISION

IN RE: HIGH-TECH EMPLOYEE )  
ANTITRUST LITIGATION )  
 ) No. 11-CV-2509-LHK  
THIS DOCUMENT RELATES TO: )  
ALL ACTIONS. )  
\_\_\_\_\_ )

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VIDEO DEPOSITION OF KEVIN M. MURPHY, Ph.D.  
December 3, 2012

REPORTED BY: GINA V. CARBONE, CSR NO. 8249, RPR, CCRR

06:07:28 1 But the -- as long as -- if you are willing to  
06:07:30 2 stick to that assumption that it's really conduct by  
06:07:33 3 age, then the age variable can help you identify that.  
06:07:37 4 But what you are fundamentally doing is you are asking  
06:07:41 5 was the age profile different in the conduct years than  
06:07:44 6 in the non-conduct years. It's not surprising that he  
06:07:48 7 gets a result that's actually backwards of what he says  
06:07:50 8 you should have gotten.

06:07:51 9 He gets a result that says that the impact was  
06:07:55 10 greatest on the youngest people and less on the  
06:07:58 11 middle-age people, when his theory was it would be  
06:08:02 12 exactly the reverse.

06:08:04 13 It's not surprising, given the amount of noise  
06:08:06 14 he's got in his estimates. Again, it's an illustration  
06:08:13 15 of how poorly this regression actually performs.

06:08:20 16 Q. So I'd like to direct your attention to  
06:08:22 17 paragraph 128, please. This is the paragraph when you  
06:08:34 18 discussed clustering of standard errors.

06:08:40 19 What I'd like to ask you is towards the middle  
06:08:43 20 of the paragraph you make a reference to -- you say  
06:08:46 21 that, "This exhibit shows that none of Dr. Leamer's  
06:08:49 22 'undercompensation' estimates for any employer or year  
06:08:52 23 is statistically significant at conventional levels  
06:08:55 24 under the properly computed standard errors."

06:08:59 25 What does the phrase "statistically significant

06:09:01 1 at conventional levels" mean?

06:09:04 2 A. I think the most commonly used level that  
06:09:07 3 people use is 95 percent or 5 percent level, however you  
06:09:10 4 want to think about it. I think that's the most common  
06:09:12 5 one. If people talk -- in economics, when people talk  
06:09:17 6 about statistically significant and they don't say at  
06:09:19 7 the 1 percent level, at the 5 percent level or whatever,  
06:09:22 8 I think the shorthand economist typically uses 5 percent  
06:09:25 9 level.

06:09:26 10 Q. Is that a requirement of economic analysis?

06:09:28 11 A. No, it's not a firm requirement. I'm just  
06:09:31 12 saying, you know, that's the conventional level that  
06:09:33 13 people use.

06:09:34 14 Q. Okay. Is that -- if I wanted to sort of look  
06:09:36 15 that up somewhere, would I be able to look it up  
06:09:39 16 anywhere?

06:09:40 17 A. Yeah. Probably econometric textbook would talk  
06:09:45 18 about that. But generally people talk about  
06:09:51 19 significance at various levels of significance.

06:09:55 20 (Reporter clarification.)

06:09:55 21 THE WITNESS: I'm just telling you the common  
06:09:57 22 shorthand in economics is 5 percent, just talking about  
06:10:01 23 statistically significant with no modifier.

06:10:03 24 MR. GLACKIN: Q. So what does statistical  
06:10:06 25 significance mean?

06:10:08 1           A. It means in a classical statistical problem, it  
06:10:12 2 means I achieved a result in terms of my estimate that  
06:10:19 3 is typically, say, large relative to what I would expect  
06:10:22 4 to happen just by chance.

06:10:26 5           So in other words, in a world where there were  
06:10:28 6 no true effect, or no true difference, for example, in a  
06:10:32 7 given sample, you are going to find a difference. Even  
06:10:35 8 if the true -- say I had two populations and I was  
06:10:38 9 comparing population A and population B, and I had  
06:10:41 10 samples from each population, and I was going to  
06:10:43 11 calculate the average height from my samples.

06:10:46 12           Even if the true average height in both  
06:10:49 13 populations is the same, in my sample there is going to  
06:10:52 14 be a difference in the average height of the sample from  
06:10:55 15 population A and the average height from the sample of  
06:10:59 16 population B.

06:11:00 17           The test of statistical significance is did I  
06:11:02 18 get a difference in heights across those two populations  
06:11:07 19 that was too big to happen just by chance. And the way  
06:11:12 20 we quantify that is to say, did I get a difference in  
06:11:16 21 heights that would happen less than 5 percent of the  
06:11:19 22 time just by chance. That's really the idea of  
06:11:22 23 statistical significance.

06:11:24 24           Q. Okay. Do you agree that this is a  
06:11:31 25 description -- that statistical significance is a

06:11:33 1 description of how certain a statistical result is?

06:11:40 2 A. Yeah. It's not just -- it's a description of  
06:11:45 3 how precisely I can estimate something, yeah. Somewhat  
06:11:50 4 of a description. I mean, if you are just going to talk  
06:11:54 5 about significance and not talk about the components  
06:11:56 6 that go into it, then you might say it's -- it could be  
06:12:00 7 described in terms of certainty.

06:12:05 8 Q. Is there any authority for -- well, is it your  
06:12:10 9 opinion -- now, again, I don't want to invite you to  
06:12:13 10 launch into -- excuse me. I don't want to invite you to  
06:12:16 11 a discursive answer of your reviews about Dr. Leamer's  
06:12:20 12 regression. I'd really like to stick to answers to the  
06:12:22 13 question.

06:12:24 14 Is it your opinion that in order for a  
06:12:26 15 statistical analysis to be reliable, it must produce a  
06:12:30 16 statistically significant result?

06:12:32 17 A. Not necessarily. That doesn't have to be true.

06:12:36 18 Q. So --

06:12:38 19 A. But statistical significance is one thing you  
06:12:39 20 do look at. And particularly here, you can look at the  
06:12:44 21 P values, for example, that show up in the table.

06:12:49 22 Q. Okay. So where are you directing me to? Are  
06:12:55 23 you on your report or Dr. Leamer's report?

06:12:57 24 A. In my report. So you look at table, say, 22B.

06:13:11 25 Q. Is this appendix 22B or Exhibit 22B?

06:13:14 1 A. Exhibit 22B or Exhibit 22A. Either one. We  
06:13:17 2 can go with A, it's the first one.

06:13:20 3 Q. Uh-huh. Okay.

06:13:22 4 A. So these would be the P values, which is the  
06:13:25 5 probability that that you get a number at least that big  
06:13:28 6 just by chance. And you can see for lots of these,  
06:13:34 7 there -- these are from his estimates that restrict the  
06:13:37 8 coefficients across. You get a lot of these P values 50  
06:13:42 9 percent, which means it's a number -- I'm going to get a  
06:13:45 10 number that size half the time just by chance. Kind of  
06:13:49 11 what those numbers mean.

06:13:51 12 Q. You say there is a lot that are 50 percent?

06:13:53 13 A. I'm saying there is ones that are 50 percent,  
06:13:55 14 30 percent, 40 percent. There is a few that are  
06:13:58 15 smaller. But, you know, the majority of them are, you  
06:14:03 16 know, 30 percent or higher. That means a third of the  
06:14:06 17 time I'm going to get a number like that just by chance.

06:14:20 18 Q. So --

06:14:27 19 A. And remember, this is just looking for an  
06:14:29 20 average effect, let alone asking the question whether  
06:14:32 21 there is a common effect.

06:14:35 22 Q. So if I wanted to look at some authority for  
06:14:38 23 the proposition that these P values are a basis to  
06:14:44 24 reject Dr. Leamer's regression analysis, what authority  
06:14:48 25 should I look at?

06:14:51 1 A. You could look at any basic econometrics  
06:14:55 2 textbook.

06:14:56 3 Q. Should be easy for you to identify one, then,  
06:14:57 4 if I --

06:14:59 5 A. You can look at Green, you could look at the  
06:15:01 6 book that we cite in here. There is tons of econometric  
06:15:07 7 textbooks out there that would talk about these things.

06:15:11 8 Q. And they will say a regression with P values in  
06:15:13 9 that range ought to be rejected?

06:15:15 10 A. No. They would say P values in that range are  
06:15:17 11 not something that you would say provides really  
06:15:21 12 substantial evidence of the hypothesis.

06:15:25 13 Q. Why don't you just give me one textbook that  
06:15:28 14 you are certain includes this proposition.

06:15:30 15 A. You know, look, I last looked at textbooks 30  
06:15:34 16 years ago when I was in school. People -- we don't rely  
06:15:37 17 on textbooks for what we do. We -- you know, it's all  
06:15:41 18 done in research and papers and journals and all those  
06:15:45 19 things. I mean, you know, you could -- you could -- you  
06:15:51 20 could look at Green, I guess, would be a textbook that  
06:15:54 21 would have it. You could look at, you know --

06:15:56 22 Q. Is Green one that you cited in here?

06:15:58 23 A. Yeah, we cited Green and we cited one other  
06:16:02 24 one. The book we cited on clustering.

06:16:05 25 Q. So the Angrist and Pischke?



06:16:06 1 A. No, Angrist and Pischke is -- yeah, that would  
06:16:10 2 be a useful one to look at. You could just ask Ed. I  
06:16:17 3 mean, he'll tell you.

06:16:18 4 Q. Well, if you'll take his word for it, whatever  
06:16:20 5 his answer is, then I'm happy to do that.

06:16:23 6 A. I sure hope he's still the same guy I knew.  
06:16:25 7 But he should be able to tell you that a P value of .5  
06:16:30 8 isn't something that you would write home about.

06:16:32 9 But it's worse than that. It's not the P  
06:16:34 10 values here. It's really -- it's really the degree of  
06:16:38 11 precision that you have for estimating even the average  
06:16:41 12 effect. It's really problematic, and it's unfortunate.

06:16:49 13 Q. Is there a better way to estimate the effect of  
06:16:55 14 this conduct than using a regression analysis?

06:17:02 15 A. I think if you are going to do it, you would  
06:17:03 16 have to do it a different way.

06:17:06 17 Q. What are some possible ways that are feasible  
06:17:09 18 given the data?

06:17:11 19 A. First off, I think you wouldn't want -- the  
06:17:13 20 theory -- economics tells us that there is going to be  
06:17:16 21 differential effects for different people, which I think  
06:17:19 22 pushes you away from the regression analysis to begin  
06:17:21 23 with. Because the regression analysis, at most, is  
06:17:27 24 going to give you an average, and that's not going to  
06:17:29 25 tell you whether there was class-wide harm. I think you

06:17:31 1 would have to move away from that. I don't think the  
06:17:36 2 regression analysis is going to be useful for that.

06:17:39 3 If you were going to do a regression analysis  
06:17:41 4 you would have to have one that does a much better job  
06:17:44 5 of controlling for the other determinants of firm-level  
06:17:48 6 compensation over time. That's the thing that would  
06:17:53 7 solve your potential problem.

06:17:58 8 Q. What I'm asking is, is there some mechanism  
06:18:00 9 other than a regression analysis by which this can be  
06:18:03 10 accomplished?

06:18:05 11 A. There very well could be. But Professor Leamer  
06:18:09 12 hasn't done it.

06:18:09 13 Q. Can you tell us any mechanisms, other than a  
06:18:12 14 regression analysis, that would account for this --

06:18:16 15 A. Sure. You know, if I had some time to work on  
06:18:18 16 it, I could come up with something probably. That's not  
06:18:21 17 what I was asked to do. The regression -- I think the  
06:18:26 18 regression, the number of flaws it has, cannot be put  
06:18:30 19 forward as the answer to this question. It really  
06:18:33 20 can't. And I'm sorry to say that.

06:18:41 21 Q. You don't have to be sorry. It's not the first  
06:18:43 22 time I've heard it, Dr. Murphy. Believe me. It's  
06:18:46 23 really okay. I understand.

06:18:48 24 A. Anyway....

06:18:48 25 MR. GLACKIN: So, look, I have probably, I

1 I, Gina V. Carbone, Certified Shorthand  
 2 Reporter licensed in the State of California, License  
 3 No. 8249, hereby certify that the deponent was by me  
 4 first duly sworn and the foregoing testimony was  
 5 reported by me and was thereafter transcribed with  
 6 computer-aided transcription; that the foregoing is a  
 7 full, complete, and true record of said proceedings.

8 I further certify that I am not of counsel or  
 9 attorney for either of any of the parties in the  
 10 foregoing proceeding and caption named or in any way  
 11 interested in the outcome of the cause in said caption.

12 The dismantling, unsealing, or unbinding of  
 13 the original transcript will render the reporter's  
 14 certificates null and void.

15 In witness whereof, I have hereunto set my  
 16 hand this day: December 6, 2012.

17 \_\_\_\_\_ Reading and Signing was requested.

18 \_\_\_\_\_ Reading and Signing was waived.

19  X  Reading and signing was not requested.

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