FEDERAL TRADE COMMISSION

I N D E X

FEDERAL TRADE COMMISSION

COMPETITION AND INTELLECTUAL PROPERTY LAW AND POLICY IN THE KNOWLEDGE-BASED ECONOMY	)

FEBRUARY 25, 2002

Wells Fargo Room
Haas School of Business
University of California
Berkeley, California

The workshop in the above-entitled matter commenced at 1:00 p.m.

For The Record, Inc.
Waldorf, Maryland
(301)870-8025

P R O C E E D I N G S

- - - - -

COMMISSIONER THOMPSON: Thank you. I am glad you were all able to find your way here. Our Court Reporter did not. And it goes to show that even the best plans -- but thank you very much.

On behalf of the Commission and my colleagues at DOJ, it is a pleasure to welcome you here to the West Coast Session of our hearings on Intellectual Property. It is a great honor to be here amongst such distinguished company discussing really important topics. But I hope we will also have some fun in this process trading ideas and learning from each other.

I would like to start out by extending special thanks to Susan DeSanti, our Deputy General Counsel for policy studies and her dedicated staff, and our colleagues at the Department of Justice who all have worked so hard to put this ground breaking forum together. Thank you very much.

I would also like to thank our administrative host, Bob Barde, and the folks here at Berkeley for extending their hospitality and allowing us to invade their space.

Now being here at Berkeley reminds me of a very

important conclusion that was reached by the students that I had in a Graduate Public Policy Workshop at Princeton several years ago. That class was examining the important issues surrounding the next generation Internet that is expected to operate at speeds multiples faster than current Internet speeds.

And that class was surprised to conclude that almost all of the important Public Policy decisions that we will confront in looking at NGI and the future of Information Technology will not be decided at some later date, but instead are being decided right now. And I think the same holds true for the many policy issues surrounding Intellectual Property generally -- patent, copyright, and licensing issues that will drive the future in areas such as Communications, Publishing, Music, Entertainment and Biotechnology and I could go on.

So it is no exaggeration that, in many senses, the people in this room have the ability to make a tremendous impact on the direction of our economy, whether we call it the "Old Economy," the "New Economy," or the "New New Economy." I would be thankful to have an economy right now.

Most of you here know a little bit about the FTC. It is a small little agency in Washington of about 1,000 lawyers and economists and other staff people. We

have a dual mandate because we act as the country's primary Consumer Protection Agency. But at the same time we are also charged with promoting competition through the enforcement of American Antitrust laws.

While the Commission's direct mission is to protect competition and consumers, this mission also provides a platform opportunity because a truly competitive marketplace values and promotes opportunities for the skilled, creative and innovative, to be rewarded for their talent. In that sense, the worlds of Intellectual Property and Antitrust are not very different.

Let me underscore that point and explain just a little further. In the case of the New Economy, whether Internet-related, E-Commerce, or other technology or biotechnology-based markets, the impact of consumer protection and antitrust laws may be particularly significant as open competition and consumer trust are both essential to realize short term market growth and long term market potential.

So what does competition and intellectual property mean for the future of the New Economy, separating apart the legal sector? That was a joke. Reflecting on where we have been in the past several months, we have seen a dot.com shake-out and an economic

recession, and these events have had a particularly significant impact here in the Bay Area.

But what we have also seen is an increase in collective wisdom, I will say, with a renewed focus on value, a more consumer-based orientation, with an increased attention to evolution, as well as revolution, and these changes not only affect high technology industries, but also the off-line world.

For these reasons, Intellectual Property and how we treat it has never been more important, how we handle these issue especially in the context of rapidly changing technologies, presents a tremendous challenge for both Antitrust and Intellectual Property disciplines. Now, although I say that Antitrust and Intellectual Property laws are largely symbiotic, I recognize that, in the past, proponents of the respective documents have sometimes regarded each other with a little bit of suspicion. And it may be tempting to regarding the area of Intellectual Property as a zero sum game with clear winners and losers.

For example, some have argued that in the past, the pendulum has swung too far in favor of limiting the scope of Intellectual Property, resulting in reduced incentives to innovate, rather than enhancing those incentives. And others have now claimed that the

pendulum has swung too far the other way and that the recent proliferation of patents and restrictive licensing schemes has created a patent thicket that stifles innovation.

Now part of reconciling the topical tension between Antitrust and Intellectual Property may be recognizing that the doctrines are indeed harmonious because they both enhance public welfare by encouraging competition. The challenge, then, is striking the right balance, which in most controversies, as in this one, is probably some place in the middle. So what will be instructive here in striking that middle balance is applying what we have all learned from our experiences at the outer edges of the curve, and how we apply those learnings going forward.

In addition, economics has increasingly been recognized as a potential bridge between I.P. and Antitrust and may provide one means to help illuminate the middle road. We are hoping that our esteemed guests here today might share their own light on that subject, as well as identify additional issues for us to explore.

So to conclude, I think that we have to recognize that all of us in Antitrust have recently had significant and extensive histories in complex cases involving the competitive use of intellectual property.

I mean, I can think of just looking back at recent times of the things that we looked at in mergers such as AOL/Time Warner, or in investigations like Intel or Dell. So it is not so distant that we considered those issues.

So we at the Commission remain alert to Antitrust issues involving intellectual property, but we also have to recognize that in a fast moving marketplace we have much to learn. While we have been generally cautious in our approach to New Economy and Intellectual Property questions, we attempt to apply an appropriate degree of circumspection and balance because I strongly believe that in achieving benefits to consumers and industry alike, we have to have a balanced and transparent and forward-looking approach to policy problems by using interactive forums like this one, as well as working groups, industry self regulation, and from time to time, a little strong law enforcement.

For these reasons, I look forward to hearing what all of our generous and distinguished panels have to tell us. And I am also interested in hearing your questions. So let the games begin.

MS. DeSANTI: Thank you very much, Commissioner Thompson. I am Susan DeSanti and I also want to thank the Competition Policy Center and the Berkeley Center for

Law and Technology, very gracious and helpful hosts, and generous hosts. Many people have made this possible and we appreciate it.

Basically we thought that we should not be doing hearings on intellectual property and competition policy without coming to what has been a center for much of the innovation that has gone on, as well as a lot of the thinking about innovation and how best to understand it.

This week, we hope to get two important perspectives, perspectives from economists, perspectives from business. The basic questions for today's panel involve does competition spur innovation? And if so, how? What are the policy implications? You all know this is not a simple question. In addition, it leads to questions about the role of patents in encouraging or hindering competition that may foster innovation.

So from the very start, we meet ourselves coming and going as we start to look into these issues. We are here to listen and learn, and you will see that we are asking questions rather than making definitive statements. We are hoping we will learn a lot from these hearings. In structuring today's panel, I had two problems, 1) everybody here is a headliner. These are all people who should be the centerpiece of any panel

that you have. So that was my first problem.

And, in addition, each one of their presentations, I believe, compliments and builds on the other. So we are going to have a somewhat arbitrary order. We will have four presentations and then we will have a discussion for 45 minutes, and we will then have a break for 15 minutes, probably around 3:00 to 3:15, and then we will have another three presentations and finish up with a discussion through to 4:30.

Before I go any farther, I do want to introduce the other people who are on this panel from the Government. There is Hillary Greene from the FTC Staff, Sue Majewski from DOJ, Ray Chen from the Patent and Trademark Office, and I also want to give the opportunity to Frances Marshall to speak. Frances is the person at the DOJ Antitrust Division who is leading up their effort. Frances?

MS. MARSHALL: Thanks, Susan. I just want to take a couple minutes to say good afternoon to everyone. We also thank the Competition and Policy Center and Berkeley Center for Law and Technology for making these sessions possible and for providing this beautiful venue. It is really wonderful to be here. I am delighted to be here and do look forward to the series of interesting presentations and discussions through Thursday. In the

afternoon as we continue to examine the effects of how tradition in patent law and policy on innovations and other aspects of continued welfare. But thank you, Susan.

MS. DeSANTI: Thank you, Frances. All right, and now let the games begin. Our first presenter will be Professor Richard Gilbert. Rich is Professor of Economics at the University of California at Berkeley. From 1993 until May of '95, he was the Deputy Assistant Attorney General for Economics in the Antitrust Division of the U.S. Department of Justice, where he basically became the father of the Intellectual Property Guidelines that were jointly adopted by DOJ and FTC. He has extensive research in this area, far too numerous to mention all of his articles, but it basically focuses among other things on Antitrust Economics, Intellectual Property, and Research and Development.

Rich?

MR. GILBERT: Thank you, Susan. First, I am delighted to welcome our friends and colleagues from Washington to our little town of Berkeley. Here you can be both inside and outside the beltway because we do not have a beltway, but we are very delighted that we can have an opportunity to debate these very important issues here on Berkeley soil. I would like to discuss a

question that we have heard a great deal, particularly as intellectual policy and R&D policy developed in the former administration and that is whether innovation should continue to have a role in merger policy.

And that is a question that we are all likely to ask with the new Administration. And arguments for the importance of innovation from market performance, there are many analyses that relate economic growth to investments in Research and Development and human capital. This is all about the analysis of the residual and total factor productivity measurements.

For example, showing that once you subtract out that contributions of capital labor and ordinary inputs, a whole lot is leftover, much of which appears to correlate with the research and development and human capital. There is also a great deal of anecdotal evidence that competition promotes innovation. You can find it in almost any industry from the software industry. There is the competition that occurred between digital researches, DR Dos and Microsoft's MS-DOS, and new upgrades while DR DOS was a potent competitor. There is the competition between Netscape and Internet Explorer.

You can look at the races that have occurred and the timing of new product upgrades for Intel and AMD

in the microprocessor area, and other semiconductor components races. Looking at how foreign competition affected labor productivity and other measures of productivity in the automobile industry, also some evidence in Telecom as well. These sorts of stories can be interpreted different ways, of course.

There has generally been a shift towards more development and less basic research in response to competition, but nonetheless a delivery of more product to the consumer.

Now some arguments against that we have heard, I would just like to review them for this session. There is the historical Shumpeterian -- Joseph Shumpeter's argument that monopoly promotes innovation, arguing based on appropriation, scale economies, cash flow, all factors that could at least theoretically contribute to more innovation.

But, of course, looking at the other side of that, the incremental benefit from innovation can be low, a point that Kenneth Arrow made, I think, in 1962 it was, a very perceptive article. And then the difficulty of identifying sources of innovation -- R&D is typically secret, so it is very hard to see who is doing it and therefore very hard to assess the state of competition. And innovations can come from unexpected sources.

Another argument against innovation having a role in merger policy is that the link between Research and Development expenditures and innovation can be weak. And what we tend to focus on in merger analysis is accounting the inputs, the research and development, but what we would really like to know is what happens to the outputs, innovation, and they are not the same thing. There is little empirical evidence supporting a link between competition and innovation.

Most of the statistical analysis in this area tends to fall apart, as we look across industries and account for industry characteristics. But on the other hand, there are also really few natural experiments that can be used to assess this relationship between competition and innovation. And it is not at all clear that the kind of cross-sectional statistical analysis that we have looked at can really shed much light on this subject. And therefore, I am not sure it is proper to include it as an argument against.

Now just to review merger enforcement in the first half of the 90's, innovation challenges were few and far between. Of all the merger challenges out of a total of 135, four of those challenges were based on innovation effects, a total of 3 percent lost in the noise.

Then, in the second half of the 90's, that number changed dramatically. The number of merger cases challenges about doubled. That was in line with the pace of merger activity over this period. And the total number of challenges went up to about 18 percent of the total, that is an increase of six times. A total number of challenges that were baseline innovation effects -- alleged innovation effects.

So there was a dramatic shift in the role that innovation played in this latter half of the 90's, but I would argue that much of this was more rhetoric than it was an actual decisive role played by innovation in these cases. And if you take apart the cases and look at them closely, of the 49 challenges, alleging innovation effects in the latter half of the 90's, 35 of them were really add-on effects in industries that almost certainly would have been challenged based on effects in markets for existing goods and services. That is, these were fairly traditional merger cases in which innovation effects were included as another concern from the merger.

Another five of these could have been challenged based on a theory of one-sided potential competition, that is, a market in which one firm is a potential competitor into a market in which the other

firm is a significant player. And by our count, about six to eight cases that we would call real innovation cases, which I would also say you can look at as two-sided potential competition cases; that is, Firm A is a potential competitor into a market where Firm B may also be a potential competitor.

So the market does not yet exist and the two of them are potential entrants into that market. One way to look at that is as a very complicated potential competition case. Another way to look at it is as a case on an R&D.

Now I would like to just say where I come out in all of this. I think the evidence is very clear that innovation plays such an important role to the economy that it should be considered in merger analysis. Despite a lot of rhetoric on this subject, the agencies historically have actually been, I would say, quite discrete in their analysis and their use of innovation concerns in merger cases. It has really been limited to only a very few cases in which it has played a central role.

And if you look at these cases in detail, I think most of them are based on quite sound reasoning where the evidence may have to be more anecdotal as to innovation's effect than statistical, but clearly there

is need for further study in this area and maybe some follow-up study on the effects of divestitures and remedies in these cases. I have got ten minutes and I think I came under.

MS. DeSANTI: Our next speaker is Professor Dan Rubinfeld. Dan teaches both Law and Economics at the University of California at Berkeley. He also served in June of 1997 through December 1998 as Deputy Assistant Attorney General for Economics in the U.S. Department of Justice Antitrust Division. He also is the author of a variety of numerous articles relating to antitrust and competition policy law and economics, public economics, and two economics textbooks. Dan.

MR. RUBINFELD: Thanks very much, Susan. It is a pleasure to be here. And the organization is just perfect because Rich Gilbert has covered the first nine minutes of my talk. So I could be very quick. And just to vary things, I am going to go low tech and talk from some hand-outs, and I have not enough copies to go around, and it is not crucial you get one, but we will have an auction for the copies that we are distributing.

What I have done in my hand-out is borrow some materials from an article that John Hoven and I have published recently in a book on Dynamic Competition. John is an economist with the economic analysis group of

the Department of Justice. And what we have done is to first highlight all the areas of the various guidelines that the agencies have promulgated that talk about innovation. And I will skip almost all of that because you all know about it.

But I do want to point out that if we look, say, at the horizontal merger guidelines and look at the discussion of anti-competitive effects, it will tell you something about the issue I want to follow-up on, which is the relationship between competition and innovation. If you are going to try to look for the empirical work that supports whether there is such relationship or not, you obviously have to figure out what the theory is you are trying to support.

And the guidelines suggest, at least to me, that with respect to innovation, coordinated effects are probably less likely to be important than unilateral effects because, really, for some of the reasons Rich Gilbert pointed out, with R&D being so secret and monitoring being difficult, it is not likely that you are going to have a coordination in most situations unless it is through an explicit joint venture, and that is treated separately by the guidelines. But I think there are significant unilateral effects that are of two characters.

One is perhaps a traditional argument that says that when emerging firms compete more directly with each other than with other firms with respect to innovation, it can be then shown using standard unilateral effects theory that innovation could be reduced by a loss of competition. There is a second effects theory that builds on the idea that innovation is more likely to be random due to unusual unpredictable events. And it just says that if you have fewer innovators, if you have less diversity, you are likely to have less innovation or higher prices or lower quality products.

Now if you go back and sort of ask yourself what is the empirical basis to support building a unilateral effects theory, as I think Rick suggested, most of the evidence is anecdotal, there is not really solid econometric evidence, but there are a lot of interesting case studies that I think are enlightening, and I will just highlight a few of the issues.

First of all, there is the usual tension that Rich described, that says perhaps monopoly makes sense for innovation because monopolists will recoup all the rewards from innovation; on the other hand, there is a concern that with monopoly, either explicit monopoly or a vertical relationship that results from vertical integration, that there might be the possibility of what

amounts to vertical foreclosure, that is, the vertically integrated company may have an incentive to keep its innovative research in-house and not to support competitors external to the firm that might actually be innovating in competition with part of the vertical operation. And that is what I am going to call in-house bias.

When you look at the empirical data on rewards from innovation, I think you may get a misleading view because we all know that there is a very skewed distribution of rewards from innovation. The really successful companies are very profitable and most R&D is not terribly successful. You do not want to make either of two mistakes. You do not want to necessarily assume that the successful firm has earned its monopoly rents inappropriately, but you also do not want to necessarily assume that the big companies are the best innovators.

The fact is that the empirical evidence shows it is very hard ex ante to know who is going to be successful and innovating and the results vary a lot depending on the structure and nature of the industry. The work I have seen suggests that smaller firms are as research intensive as larger firms, and often more productive.

Small firms with substantial innovation

typically arise in capital intensive industries, or as you would expect, industries where innovation costs are relatively low. And in those industries that are high tech or highly innovative, we tend to see smaller firms playing a big role in innovating.

And finally, there is a study I find compelling that suggests that in the computer and semi-conductor industries, innovations interestingly typically occur both from the large established firms and the small start-up's, but not so much by the smaller firms that are already well on their way. So there is kind of an extreme conclusion either way.

There is evidence, both theoretical and empirical, that suggests that the nature of innovation will depend on whether you are in an industry where the innovation is cumulative, or whether it is likely to be discrete and independent, and with cumulative innovation, there are a lot of issues that will come up here and in the hearings because you typically need some form of collaboration in the form of standard setting or cross licensing agreements, and that may raise coordination issues.

And similarly, if you are looking empirically in innovation in network markets and comparing it to non-network markets, there may be some important differences.

Network markets, the concern I have, which I think is supported by some of the literature, is that incumbents are likely to innovate, but innovate in ways that reinforce their position as incumbents, whereas new smaller players are likely not to be affected by that incentive.

And I find myself in agreement with the view of Scherer and Ross (phonetic) who say that technological progress thrives best in an environment that nurtures diversity of sizes and perhaps especially that keeps barriers to entry by technologically innovative newcomers low.

Now I was looking around just based on my experience during the second half of Rich's experiment where there were a lot of innovation cases, and it may surprise you to find that it is not the Microsoft case which I was very involved in, which brings up the most interesting innovative issues, it was actually, in my mind, the proposed merger between Lockheed and Northrop, which is a large defense merger. Since there seem to be a few other defense mergers coming down the pike, it might be useful to take a minute and just sort of highlight a few issues and the details are described in the article that I referred to earlier.

The reason Lockheed Northrop is interesting to

me is that the Division staff actually developed some of these theories of innovation and actually got some interesting empirical support for those theories. I will not go through the details. It would probably take more than the two or three minutes I have left, but in Lockheed Northrop, there are horizontal issues because there was the proposed merger which did not go through eventually, it was blocked.

The merger would be a merger to monopoly in Airborne early warning radar, electro-optical missile warnings, fibre-optic toe decoys, and directed infrared counter measures. I am sure you all wanted to get all that down. And then it would be three to two in high fixed wing military airplanes and stealth technology and a few other areas. But interestingly, there are also significant vertical issues because Lockheed was dominant in air frames in Northrop in radar.

And the question was would Lockheed and Northrop as a combined firm handle that vertical relationship differently. And the division in developing its case emphasized the advantages of diversity and innovation and empirical evidence to support the view that you need at least a reasonably large number of firms to innovate where the strategy of innovation is highly unpredictable. And they supported the view that often

path breaking innovations in the defense area, at least, are made by niche players and not by the leading incumbents.

And in developing the vertical case, they were very concerned that Northrop Lockheed would have an incentive to deny rivals' access to key technologies and that it would not be willing appropriately to share know-how and trade secrets when in fact certain cooperation with outsiders would be pro-innovation. And the division was concerned that this anticompetitive effects with respect to in-house bias would hurt competition and innovation in air frames and radar.

And in the end, interestingly enough, in Northrop Lockheed, it was the innovation arguments that really led, in my view, led the division to decide to block the merger. There were some traditional arguments, but it was the innovation arguments that dominated.

So just to sum up, while the evidence is far from being very clear, it is my view that in many areas, particularly in areas which are dynamic and innovating generally, that competition is good for innovation and we have to be very careful about losing that important social benefit. Thank you.

MS. DeSANTI: Thank you very much, Dan. Our next presenter is Professor Howard Shelanski, who teaches

Antitrust Law and Regulation at the University of California at Berkeley. In 1999 through 2000, Professor Shelanski served as Chief Economist of the Federal Communications Commission. In 1998 through '99, he was Senior Economist to the President's Council of Economic Advisors. And prior to his appointment at Berkeley and his government service, Professor Shelanski practiced law in Washington, D.C. and also served as a law clerk to Justice Scalia of the Supreme Court.

Howard?

MR. SHELANSKI: Thanks, Susan. Well, if Rich gave nine minutes of Dan's talk, Rich and Dan together have given all of my talk, but I would like to go back and talk in a little bit more detail about why the question of how and to what extent to bring innovation into antitrust policy is such a difficult question.

We have seen starting probably about 15 years ago, a body of scholarship that loudly made the point that innovation was extremely relevant to antitrust policy, and even more strongly making the point that it was relevant to a retreat in antitrust policy. And yet some of the very people who gave us that scholarship now look at what has happened as antitrust listened to them to the extent of embracing innovation, but then in the view of some, took it in precisely the wrong direction,

in the direction of more enforcement.

Now, I think as Rich has made very clear, innovation has come in so far in the cases as an additional set of arguments to be made to enforce or to not enforce. Innovation has not become a completely freestanding and independent objective of antitrust policy; rather, in the course of merger analyses, what the agencies seem to have done is to be on the look-out for protecting innovation, just as they protect competition where a transaction might give rise to harm. Going forward, there is a question of whether that has been a wise policy course, whether it should be continued, or whether the original arguments for retreat in antitrust policy because of its possible negative consequences on innovation should again come to the fore and reverse the course that we have been on.

There is some economic learning that I think is relevant to this and it tells us why it is so hard to, as a general policy prescription, come out with general rules for enforcement with regard to innovation, just like we have some general rules or guidelines for enforcement with regard to market performance along more convention variables like price and output. And I want to talk a little bit about some of this data.

The idea that innovation and static

efficiencies -- static economic efficiency -- might differ in their respective responses to market concentration was suggested long ago by Shumpeter (phonetic), among others, as Dan mentioned. Shumpeter wrote in 1942 that perfect competition is not only impossible, but inferior, and has no title to being set up as a model of ideal efficiency when the goal is economic welfare over time, rather than static economic performance. Fairly strong statement that goes right to the heart of much of the policy premise of modern antitrust law.

And Shumpeter really had the view that large firms, and presumably firms of market power, would be superior innovators. There was of course countervailing theoretical arguments, early work by John Kenneth Galbraith, important work by Kenneth Arrow, but some of the most interesting work that flowed from this were efforts empirically to test -- what is called the Shumpeterian hypothesis, and more broadly to test the relationship between market structure and innovation.

I am not going to go deep into the econometrics of these tests in the time that I have here. They are subject to a lot of methodological critique, and I will just refer you to the work of Wesley Cohen at Carnegie Mellon for excellent discussions of those methodological

issues.

One thing that is interesting about the background of empirical information is that with regard to innovation, there has long been a view that not just market share, the conventional focus of antitrust, but firm size, is relevant to innovation. And that is something that comes in in merger policy. When firms merge, an entity that is larger than either of the previous two individual entities generally results -- generally.

Usually in antitrust policy, we do not think about firm size, but because there has been a large body of literature arguing or suggesting that firm size in innovation is relevant, it would seem that the firm size literature at least has some relevance to antitrust policy for mergers.

Following Shumpeter, large enterprises have been praised for their superior ability to attract financial and human capital, bear risks, recoup investment required to sustain R&D activities, etc., small firms, on the other hand, have been touted as being more creative and more nimble in adapting to changes and opportunities than their larger more bureaucratic counterparts. So what do we want for sustained R&D?

Numerous early studies found that investment in

R&D did increase steadily with firm size, and whether the data was compared across industries or within a particular industry, the evidence generally was accepted to show that R&D investment measured in dollars -- inputs, input dollars into R&D -- were higher proportionally in large enterprises.

Other studies found that very small firms were in fact more innovation intensive than middle size firms and that the steady link between a firm size and innovation actually occurred over a very limited range. And so the data really did not give us any clear sense of whether it was true the larger firms invested more in innovation.

General consensus nonetheless did emerge on two basic points, that large enterprises were more likely than small ones to have ongoing R&D programs, and that among firms that do undertake R&D, bigger firms, tend to make larger R&D investments proportionally. But neither of these conclusions imply that merger policy should begin to attach positive weight to firm size on innovation grounds.

First, the probability that a firm engages in at least some innovative effort approaches 100 percent at even a modest level of firm size, so you do not get a lot of differentiation in the investment above that level of

firm size.

Moreover, empirical studies relying on formal data such as reported R&D expenditures or patent output do not capture informal or sporadic innovation, which may be quite characteristic of small firms. And the presumption that a large enterprise is more likely to undertake some technological development than a small one is supported only weakly. So the presumed benefit of firm size is questionable.

Second, although R&D expenditure is higher in large firms, beyond a threshold level of size, there is little evidence that larger firms' R&D investments are proportionately greater than those made by smaller firms. So there is some proportional increase up to a point, but with very large firms the data is quite unclear. And moreover, these patterns, these consensus patterns vary enormously across industries. I do not have time to go through the various industry specific studies, but the results vary substantially depending on the kind of industry.

A third reason we do not want to take the firm size evidence as a reason not to enforce on R&D grounds or innovation grounds is it is very unclear when you pull apart the econometrics of the studies whether the weight that is being put on firm size when you control for other

variables really is statistically significant. There has been a lot of debate over the significance.

And finally, when the focus is shifted away from innovation inputs such as R&D expenditures to outputs such as patents, large firms show no advantage at all. Small firms actually tend to have slightly higher patent rates. Of course, one can wonder how valuable that measure is given that many patents are indeed not worth terribly much.

Okay, switching to the main focus of antitrust, if the firm size literatures were ambiguous and does not give us a reason to retreat from merger enforcement because large firms are good for innovation, what about the market concentration and innovation link?

For the most part, economic theory and antitrust policy favor more competition over less for the purpose of lowering prices, expanding out puts, but the presumption that increased benefits come from increased competition may become less universal when one focuses on innovation activity over time. The presumption at least that competition is good is a less strong one.

Early theoretical explorations of Shumpeter's claim found that when the polar cases of monopoly and perfect competition were compared, it was in fact perfect competition that provided stronger incentive for cost

reducing innovations and that Shumpeter's argument that the large firms would be better over time for innovation was quite questionable. The empirical data do not resolve any of the ambiguity in the relationship between competition and innovation, the Shumpeter argument that large firms and accumulated market power would be beneficial, the more competition-oriented argument that cost-reducing incentives were stronger in a competitive market.

The empirical evidence is really quite ambivalent. Many analyses supported the Shumpeterian view by finding a positive concentration and R&D investment. Others found data that show concentrations have a negative effect on innovation, and when you pull these apart, it depends what other variables the authors of the studies decided to control for and what industries they were studying.

A study by Mike Scherer indicated that both could be correct, that competition was good and that market power was good, over a sufficiently large range of market structures because the relationship between innovation and concentration is non-linear. And what he came up with was an idea that showed an inverted U with innovation increasing up to a certain degree of market concentration and decreasing thereafter. And if you go

ahead and do the analysis of all the studies testing the inverted U pattern, it comes out at about exactly where the horizontal merger guidelines are.

So if you believe that worked, the horizontal merger guidelines are not just good for output and price, but they are great for innovation also.

The evidence supporting the idea that accumulations of market power over some range will be beneficial for innovation is not, however, terribly robust. And I will just say that when industry-specific factors start to get factored into these studies, when you look across different industries, and then when you start to factor in the anecdotal evidence of the kind that Rich factored in with the case-specific studies that do not lend themselves terribly well to statistical data, you tend to find that the empirical data is exactly what it seems to be -- terribly ambiguous. This is important for antitrust policy.

What it tells us is there is less consensus and less systematic relationship between market structure and innovation than there is between market structure and more conventional measures of market performance, price and output.

When you take a body of policy that is designed to do one thing, protect competition in the interest of

keeping output high and prices lower for consumers, and where there is a body of economic learning, though not etched in stone and, certainly as we have seen in the past 50 year of antitrust policy subject to change and learning, but when there is a body of learning that supports a presumption in favor of competition to get those consumer benefits, it becomes very hard to expand up out of this policy in a systematic way to factor in a goal like innovation that does not lend itself to such systematic presumptions.

That is what is so hard about bringing innovation into antitrust, and that is why I think the results that Rich showed about very careful case by case analysis is the way the policy will proceed in the future and the way that it should proceed.

MS. DeSANTI: Thank you very much, Howard. And we will now turn to Professor Mark Lemley, who is Professor of Law at the Boalt Hall School of Law and Director at the Berkeley Center for Law and Technology. He teaches Intellectual Property, Computer Law, Patent Law, Electronic Commerce, and he is also of counsel to the law firm of Pepper and Bennass (phonetic).

MR. LEMLEY: Thanks, Susan. First I have to comment. I cannot help but notice that this panel is composed of five Berkeley Professors, one Stanford

Professor, and one professor from the rest of the world. And that ratio strikes me at about right. It is consistent with the DOJ's ratio of Chief Economists in recent years. And keep up the good work. All right, what we have talked about so far are the relationship between innovation and market structure and the relationship between innovation and antitrust.

I want to drill down a little bit into some more detail in two respects. One is I want to focus on patents in particular, rather than innovation at large, and the second is I want to focus on industry-specific rather than sort of broad cross-industry measures. And the measure I really bring is one of heterogeneity. There was a tremendous heterogeneity among industries in patent practice and the importance of patents by industry, and I think any antitrust enforcement has got to reflect that.

So let me say a little bit about the various kinds of heterogeneity that exists between different industries and in terms of patents. First off, it is easier to get patents in some industries than others. The empirical evidence suggests that patents in the semiconductor and the electronics industry are obtained more quickly.

They cite many fewer prior art references.

They are much less likely to involve abandonment and refiling practice. They have fewer claims. They are shorter. By any measure of sort of complexity, those patents are less complex -- the prosecution process is less difficult for the patentee than the patentee in areas like biotechnology, for example, pharmaceuticals, or chemistry.

So the first thing to understand about dealing with patents from an antitrust perspective is that not all patents are created equal and that there are very serious systemic differences between industries in how much effort it takes to get a patent.

Second, it seems to me that there is pretty good evidence that there are rather serious differences between industries in how important the incentives of a patent are to encouraging research and development. And here, to take just a stylized example, you can imagine the difference between an industry like a software which has a relatively low R&D cost to duplication ratio, and compare it to an industry like pharmaceuticals which has an enormous R&D cost, and while a relatively higher absolute duplication cost, still a much higher ratio of R&D costs to duplication costs.

What that means is that the exclusivity requirement is much more important if you are a

pharmaceutical company than it is even if you were a software company. You can get by on other factors like first mover advantages, trademark and branding, and so forth, much more easily in some industries with a lower ratio than you can in an industry like pharmaceuticals.

Third, it seems to me that industries are heterogeneous with respect to the role of improvement and cumulative innovation, that some industries again one might point to Pharmaceuticals as an example, or many mechanical inventions are really sort of self-contained inventions. And the power or the value of a particular patent captures most of the value of that product.

By contrast, if you take an industry like software or the Internet, or an industry like semiconductors, the role of cumulative innovation is much greater. That plays into, I think, something that our other commentators have raised, which is the importance of broad vs. narrow patents.

If you give broad patent protection in an industry in which cumulative innovation is important, you are in effect gambling that one initial innovator will be able to effectively coordinate improvement, will be able to effectively act as a central planner for all subsequent innovation. That gamble strikes me for reasons that Ken Arrow, among others, have written about

as an unwise one where innovation is particularly likely to be cumulative. The more it is that people have to build on each other, the more problematic strong initial grants of rights are because they rely on an assumption of efficient licensing, which turns out in practice not to be particularly robust.

And to give just one example, it seems to me that we are much better off with respect to the Internet by virtue of having had competition to create new types of technologies than we would have if we had given AT&T in the 1970's sort of broad patent rights that gave it control over networks and said, "Okay, let AT&T coordinate the development of computer networks."

Fourth, and perhaps most significantly, patents are heterogeneous with respect to what I call the patent to product ratio. In Pharmaceuticals, for the most part, and with some notable exceptions, a patent covers a product. What I patent is a chemical, which I actually deliver as a drug, similarly in many chemistry type inventions, what I patent is a product.

The ratio of the number of patents to the number of products is about 1:1. The ratio gets a little higher in industries like Biotechnology where you have patents on upstream research and development tools, or in software where you might have a number of different

inventions that are put together into a computer program. It gets astonishingly high, something on the order of 1,000-1 when you get to semiconductors. You cannot produce a new microprocessor without infringing hundreds if not thousands of patents because the inventions are not semiconductors. Nobody gets a patent on a semiconductor chip.

They are small changes in process, they are small changes in product, they are circuit design innovations, they are little pieces of the innovation. What this means is that in those industries with a high ratio like semiconductors, blocking patent problems and hold-up problems are much greater than they are in other industries. Now, there is more of course to heterogeneity, but I wanted to say a little bit about the implications of it.

First off, you are going to hear from a lot of people over the course of the week who represent various industries. And you will hear, I predict, very different things about the patent system. You will have people from the computer networking field come here and tell you that patents do their firms no good at all, and if you could get rid of them, life would be good. You will have people who come in from the Pharmaceutical and the Biotech industries who will tell you that patents are the

lifeblood of their industry and that if you do anything to restrict the power of patents, you are going to shut down R&D.

Both of these statements can be true because each of these industries is looking at one part of the elephant. And I think it is important for the agencies to focus on the fact that you cannot have a policy with respect to patents. You have got to have an industry-specific approach.

Now, patent law has some difficulty itself having an industry-specific approach. We have at least nominally a unitary set of patent laws. We have got a set of non-obviousness rules or enablement rules which, while it does in practice differ a little bit from industry to industry, it is supposed to be legally neutral.

But the antitrust agencies, it seems to me, can and should take this industry specificity into account in determining whether or not they ought to be enforcing the antitrust laws vigorously where patents are at issue. Now one way which they might take it into account, you might say, "Well, gosh, if patents are really important in the pharmaceutical industry, but they are really problematic in software, we ought to enforce antitrust heavily in software and leave them alone in the

pharmaceutical industry." I am not sure it is that simple, right?

You might for example take patents more seriously in an industry like pharmaceuticals within their scope. Give them greater deference, not try to push on them, but still be more worried about effects to leverage those patents outside their effective scope, or to use them to promote cartels as happened in a number of recent cases involving patents owning pharmaceutical companies agreeing with generics effectively to extend the life of their patent. Right?

So the fact that patents are more important does not mean that the Antitrust Division should necessarily stay away, but it may mean that we want to change the focus of the inquiry to focus in particular on efforts to extend patents there, while we might think more about other market clearing mechanisms in areas like semi-conductors and computer software.

And that takes me to the final point I want to make which is I do not think the antitrust agencies can or should ignore the fact that a patent is not a guarantee. The empirical evidence suggests that patents issue all the time with very little examination at the PTO, that there is no opportunity effectively for competitors to object to a patent or submit prior art,

there is no requirement that even patent applicants search for prior art and disclose it to the Patent and Trademark Office and, not surprisingly, as a result, about 45 or 46 percent of all patents ultimately litigated turn out to be invalid.

Now it seems to me that the agencies ought not ignore this fact. It is not enough as a sort of defense to an antitrust claim for a company to assert, "Look, we have a patent," and therefore that is the end of it. I think the antitrust agencies ought properly to inquire into whether patents are likely to be held valid and into what the effective scope of that patent is likely to be.

And it is often a scope that is narrower than is asserted by intellectual property owners, not for the purpose of attacking the ownership of the patent itself, but for purposes like determining whether a licensing transaction between two competitors, in which two patents are cross licensed, is in fact really a sham transaction or really a cross license of blocking patents. If the standard is merely do we own patents, virtually any company is going to be able to come up with a patent that they can assert as an immunity from any inquiry into their cross licensing activity.

At the same time, it seems to me that you do have to respect valid patents within their scope, that

the antitrust laws ought not be going after unilateral refusals to license patents, but instead ought to be focusing attention on plus factors or plus conduct -- agreements involving the use of patents that might extend their scope, or conditions that are placed on a license so that it is not truly unilateral and unconditioned, right?

So that the effect of this, it seems to me -- I guess what I would suggest is both with respect to different industries and with respect to different patents even within an industry -- it is not enough to treat patents as a unitary phenomenon, you have got to drill down and you have got to focus on the actual characteristics of the industry and the actual characteristics of the patent to try to decide how important it is to innovation and how antitrust law ought to treat it.

MS. DeSANTI: Thank you very much. We have a wealth of material all ready on the table for discussion and where I would like to go from here is to ask some questions, but also get discussion going among our panelists.

Please, Professor Varian, Professor Arrow, Professor Arora, join us.

I know that there are many points that you have

that are overlapping with the issues that we have already raised, and just turn your name tag on its side, and then we will be sure to know when people have things that they want to contribute. I would like to for starters go back and explore a little of the notion that anecdotal evidence is what we have got at this point, that the firmest of it in support of a role for competition in terms of promoting innovation.

I guess one question is, does that mean we should be looking for case studies? Or does it mean that the same kind of careful fact by fact analysis that we typically do in merger analysis and in non-merger analysis, for that matter, is the right way to go. Professor Arrow?

MR. ARROW: I would like to ask one question of each of two of the speakers, just for clarification. One is Professor Rubinfeld, Dan, you referred to the difficulties of collaboration in R&D, suggesting in a competitive situation of an independent R&D, that it is not likely to lead to problems of collaboration. You say that. Am I quoting you correctly? Why do we have such a high frequency of strategic alliances?

We seem to have a lot of collaboration on the research side, there are already many examples, I do not know statistically what a large fraction it is -- how do

strategic alliances on -- to what extent are they compatible with competition? Why send out a cloak core conspiracy and Smith Alliance or whatever? He talked about merriment and diversion, but maybe --

MR. RUBINFELD: You know, I think that is a good question and others may want to comment. My overall sense is that there are many areas where, in the end, because of compatibility issues, or whatever, there is going to be a need for a strategic alliances, but that it best evolves if a lot of the core innovative work is done independently and the strategic alliance may resolve standard setting problems, or marketing, or other problems.

But if the strategic alliance is doing R&D, it may work in some cases, but it strikes me as risky to at least have it broad industry-wise for strategic alliance at that stage. Joint R&D ought to be done on a smaller scale by one or two or three firms, but not on at a broad industry level. The problem --

MR. ARROW: You mean for competition?

MR. RUBINFELD: Right.

MR. ARROW: You used the word "risky." It creates a risk of a monopolistic --

MR. RUBINFELD: Yes, yes, a risk of anti-competitive effect. And the problem is, once you start

to deal with the standard setting compatibility issues, you have created a real tension because obviously the standard setting body, if it is, say, a patent pool that is going to achieve some real benefits of achieving compatibility, but there is a risk that it will control blocking patents and deter others who are not part of the pool. And that is a standard tension that the guidelines are worried about. But I think that comes at a later stage than the innovation.

MR. ARROW: I have a question for Professor Shelanski. This point struck me a long time -- you referred again to Shumpeter as saying, you know, monopolies are oversized with innovation, but it struck me that you reached simply to Camfrey (phonetic). He's close on a lot of things. One of them seems to be that the monopoly that is encouraged with innovation works the other way. It is the prospect of monopoly that encourages innovation -- existing monopoly. I do not think he ever says -- maybe he says -- but it does seem to follow from his logic.

(Tape blank for these portions. Transcript not available.)

MR. SHELANSKI: Entry barriers are going to be an extremely important part of the analysis. For any point that you are thinking about, let us say having an

unusual remedy, or making innovation part of the enforcement decision, I think that -- in some ways, this goes back to the very first question you asked -- the inquiry is going to be very case-by-case and very industry-by-industry.

In Aerospace where there are huge entry barriers, you are obviously not going to be able to presume fringe firms and unpredictable sources of innovation. In Biotech it may be a very very different story depending on the level of innovation you are looking at, you know, basic science vs. final product.

But that is going to factor in there the same way any of the other considerations are going to factor in, the likelihood of licensing, the likelihood of multiple sources being foreclosed and consolidated. You are going to look at a firm-specific analysis in the first place just like you do for efficiencies. What is uniquely tied to this merger? What is going to result here? And an industry-specific analysis.

And I think when it comes to entry barriers, it is going to be the same kind of thing. Are we worried about innovation as between these two firms when there are low entry barriers? No, we are not. There is nothing merger-specific that is going to create new entry barriers that we are not going to follow through with the

innovation concern. If it is an industry in which there are high entry barriers, you will have a very different analysis for that particular case.

So I think it does matter. The cross-licensing issue does tie in, though, to the entry barrier question because if you are presuming that innovation that requires complimentary assets is going to occur from fringe firms, you are obviously going to make some presumptions about what the merging firms are going to do with their combined intellectual property and whether they are more or less likely to cross-license separate firms or as a combined entity. But it all comes back to the case-by-case analysis.

And just the other point that I wanted to make very quickly in responding to Hal's point about what kind of innovation. I think that is also very important. Cost-cutting innovation is perhaps less of a concern in the entry barriers context and may raise less concerns overall. It seems non-controversial to say it is a theoretical matter, that even monopolists have an incentive to reduce costs.

The problem empirically is that any true monopolist -- most true monopolists we have had in this century have been regulated and have had rate regulatory regimes that deter them or make it uninteresting for them

to cut costs. That is less so now. We may start to see evidence, but we do not have to worry about cost cutting innovation. But when you are talking about product improvement in an innovation or product or production, that is a different and more complicated story.

MS. DeSANTI: Rich?

MR. GILBERT: Well, Susan, I know that you know the answer to this question about innovation and entry barriers and all because I remember working on the IP Guidelines and you were sitting there and talking about asset specificity.

And one of the key characteristics identified in the Guidelines is that a necessary condition to worry about innovation in a merger case is the ability to identify assets that are specific for the R&D that the merging companies are performing because, otherwise, you do not know where the innovation is going to come from and there are all kinds of stories of innovations coming from very unexpected places. And the cases that are brought, that have been brought, are ones where the R&D is extremely asset specific like pharmaceutical R&D where you just know there is a pipeline and the issue is who is in the pipeline to innovate with respect to some therapeutic class of drugs.

But I want to also add another point to this,

which is if you observe competition or lack of competition in R&D, you should be very careful about making inferences about entry barriers from that. For example, you could have situations where the dynamics of R&D result in only two firms engaged in R&D even though anybody can do it because there could be lots of learning economies or experienced economies that lead to drop-out behavior if you are not far enough along the experience curve.

You can have preemption where some firm preempts the R&D that others do -- it might lead to a lot of R&D being done, but it still leads to the observation of high concentration, even if perhaps you had a very low entry barrier, so you have to be real careful about inferring entry barriers from observing R&D competition. That is true for price competition as well, but particularly true for R&D competition.

MS. DeSANTI: Thanks, Rich. And Dan, I see you are ready to follow-up, but let me ask you to talk about core competencies as to some of the specific assets that may be at issue in looking at entry barriers and innovation, in addition to whatever else it is that you are going to talk about.

MR. RUBINFELD: Okay, well, I was going to say one thing in that regard. In areas like the defense

merger that I was talking about earlier, there is not much stuff. There were significant barriers to entry in almost all areas.

But one area where core competency became important was looking at prime contractors. And those are the folks that really have to contract with DOD to produce weapon systems. They are having to put together sort of a whole set of subsystems, so they have to be sort of knowledgeable in a number of different areas. And one of the problems in looking at a merger was to make sure that post-merger there would be enough folks around who could fill this role of being prime contractors.

And the barrier to entry there is not a patent or anything, or a license, it is really just the know-how that comes with having that core competency. And so the agency worried a lot about the possibility that, if they did not maintain enough firms that had that core competency that there would be created a significant barrier to entry and that would have very harmful effects on innovation.

The other view about the markets was very difficult for the agencies because all of the effects I am talking about occur over a long period of time. And it has always troubled me that the guidelines typically

sort of take about, say, a two-year perspective. And when we worry about entry, we worry about entry that might be viable within two years. The kind of entry we are talking about here is, if it is going to arise, will probably take place over a longer period of time. And if it is lost, if you create a barrier because you lose know-how, it is going to be lost for a long period of time.

So these decisions about whether to support or not a merger are going to have huge long term effects that are going to be difficult to out-do. It is just not easy to go out there and certainly in an area like Defense and say, "We have decided to have a new firm in the industry, so DOD is going to issue a contract to a new firm." It just does not work that way. These competencies have to be developed over very long periods of time.

MS. DeSANTI: Ray, you are patiently awaiting to raise your question.

MR. CHEN: Thanks. I just have one short question. I am just interested in learning more about the heterogenous effect of patents in various industries that Professor Lemley commented on. And while there is no doubt that, in the past, say, 20 years, the pace of technological change in various industries like software,

hardware, or semi-conductor processing has been fast and furious, it sounds like later on this week we will be hearing a variety of anecdotal stories.

But I guess what I was wondering about is, is there any empirical evidence or studies that have been conducted so far for a particular industry on whether patents have had a deleterious effect on innovation or somehow have exceedingly high transaction costs for that particular industry? Or maybe a different way to put it is, maybe any studies for a particular industry that patents do not have as beneficial of an effect as in other industries?

MR. LEMLEY: Well, I mean, let me take the questions in reverse. I mean, there is certainly evidence suggesting that intellectual property owners value their intellectual property differently by industry. The classic work is Levin, Clavorick, Nelson & Winter in the 80's and updated by Wesley Cohen (phonetic), et al. at Carnegie Mellon in the late 1990's. And that evidence strongly suggests that, if you ask licensing managers and technology managers how important are patents to you as an appropriability mechanism relative to other appropriability mechanisms -- trade secrecy, first mover advantages, whatever else there may be -- you get very different answers by industry.

So, I mean, that strongly suggests, I think, that industry owners, even companies who are acquiring intellectual property rights -- right? -- or acquiring them even in industries in which they may not think they are particularly important as appropriability mechanisms. Now, evidence going the other way I am going to defer to anybody else on the antitrust side who knows the answer to that question.

I mean, I do not know of empirical studies that suggest that the costs of patents are particularly greater in one industry than another. I know of anecdotal evidence, right, that suggests particular problems with hold-up in some industries and so forth, but if others want to jump in on that?

MS. DeSANTI: Ashish, I am sure you have things to say on this, and then we will take our break.

MR. ARORA: Sure. I want to report on a study with Wesley Cohen (phonetic) and other colleagues at Carnegie Mellon where we tried to ask exactly this question, which is could we quantify the impact of patents on R&D. Specifically, we were interested in investments in R&D. And what we measured is what we call the patent premium, which is what is the incremental pay-off to being able to file a patent for an invention vs. not being able to file it. And, as Mark pointed out, and

consistent with our studies, there is a great deal of variation across industries.

Here is some of what we find. The average pay-off for all inventions, whether patented or not, is less than -- is negative. So, in other words, for the typical invention filing a patent, you would actually lose money, not even counting the direct costs of filing, the filing fees and so on.

For patented invention, the incremental pay-off varies between 120 percent incremental pay-off to about 180 percent, depending on how exactly you do the analysis. If you are interested in cross industries, for the unpatented invention, there is tremendous variation across industries. Semiconductors is on the order of, you know, negative 50 percent. So you would lose for the typical invention 50 percent.

But conditional on filing a patent, in other words, for patented inventions, it is about 180 percent for semiconductors, about 200 percent on average for biotech, so that gives you a sense of what the impact, what the patent premium is. Probably a more direct way to answer your question is to say, "Well, what would happen if we increased this premium by ten percent? What impact would there be?"

And our preliminary estimates suggest that a

ten percent increase in premium would increase R&D by three and a half percent, patenting by nine and a half percent, and so patent per R&D would increase by six percent. And that is roughly consistent with what we have seen over the last 20 years. There has been a steady increase in patent per R&D dollar. Once again, this varies greatly across industries.

So for semiconductors, the impact on patenting would be much greater, and the impact on R&D is relatively small, it is 2.5 percent. If you look at Biotech, a ten percent in premium would increase R&D by five percent, and would increase patenting by eight percent.

So patents per R&D would grow by much less in Biotech than they would in semiconductors which is, again, consistent with what I think we see: in the aggregate, patent per R&D dollar has increased far more rapidly in the IP sector than in the health care sector. And I would be happy to sort of talk more about this if folks are interested.

MS. DeSANTI: Thanks. Okay, let us take a ten-minute break and come back at 3:10.

(Whereupon, a brief recess was taken.)

MS. DeSANTI: Thank you very much for your patience as we work through our technical issues. We are

going to start once again, this time with Professor Kenneth Arrow, who is a Nobel Prize winning Economist, now a Professor Emeritus at Stanford, author of 22 books, 230 papers, served in numerous academic societies. Professor Arrow.

MR. ARROW: Thank you. First off, a remark, one thing that every analysis of patent for the discussions here, in other words, any model of patents whatever I know of, leads to one conclusion -- that the optimal patent provisions -- the length, breadth, whatever you want, depends on circumstances and are different from industry to industry and even within industry they differ according to the nature of the thing and so forth in time.

So we have a problem, on the other hand, I suppose, is a demand for adjudicability and so forth creates the problem that you are likely to have a kind of procrustean bed into which you have to fit the bright line, I guess, in order to fit these things. So there is a tremendous amount of heterogeneity.

I have been thinking about -- this discussion arose from a case -- some thoughts about the nature of what everybody calls "Dynamic Competition." It suggests ways of modeling, some theorists I am going to -- I am not going to try to present the details here, these are

still in process, but the general idea. This work has been going on with Andrew Rosenfeld, the lawyer and economist.

Now this is going to apply only to a certain set of circumstances and is not by any means a universal -- I mean, it is universal in a sense, but not universal in any sense, let me put it that way. The real question is how important they are and maybe at the end of class we will come to the end fitting into some of the discussion earlier, and there may be some questions as to the relevance of this concept in the patents field.

Now one of the things I do like to assume is that diversity is good. Now if you have differing sources of R&D -- I am using the word "sources," but they might be "firms," "Laboratories," and whatever that measurement is -- if there is a problem to be solved at the next stage of the quality ladder of products that different groups will come at it differently, somewhat differently.

I mean, obviously there is a correlation in them because one of the things is there is kind of a basic knowledge that everybody in the industry possesses, and this knowledge is changing over time. It is changing endogenously in part because the solving of the previous problems isn't out; it is also changing exogenously, at

least exogenous to the industry because basic R&D and basic research has changed the perimeters and so forth. And there are many interactions between these two causal connections in any one way.

But at any one moment, there are a big number of firms tackling this and some will have a better chance of getting anything at all. If one goes to get it, they will get somewhat different things, and maybe better solutions. I am going to be more or less assuming these solutions are arrayed on the single quality dimension. Actually, that is over-simplifying because we may have several dimensions of quality and may have different issues in the market, but let me just assume they are single-quality things.

Now, I am going to assume -- and this is confining myself to industries in which at any one moment of time there is no competition, or the competition is very limited. There are increasing returns in production, increasing returns in innovation themselves, the network effects -- so there is a variety of industries in which we expect at any one moment to have a dominant firm or a few dominant -- or at least very very limited competition for classically understood reasons, but essentially in one form or another you have got increasing returns.

But the idea of dynamic competitions, while there is monopoly all the time, there can be new monopolists and the existing monopoly is not necessarily a persistent one, and the entry is by innovation. However, we do want to add one more thing and this is where, in particular, patents are a possibility, but it is not only patents, and that is the idea that there is an entry barrier. Whatever firm is in existence has an advantage. It could be, you know, installed base, or it could be patents which block further innovation.

Now the question whether that is a real obstacle or not has been discussed earlier and I do not know that it is true. The case which stimulated me was one in which there were very elaborate discussions and there was a blocking patent, and in the middle of the case it was settled. I do not know what the agreement was. It was a licensing agreement. So in fact, it did not block. It threatened to block.

Obviously the blocking was used as a basis for the settlement, the disagreement point in a national bargaining situation, but it nevertheless -- I said national -- you can be sure it was under the joint game, I am not saying to society as a whole, although in this case it probably was. But joint game certainly to the two participants.

So the question where the blocking -- there has certainly has been a lot in the literature and it is not purely an empirical question -- to what extent blocking patents are real. Do we really get the anti-commons, tragedy in the anti-commons that people have talked about.

Certainly I have seen a number of articles alleging this occurs in Biotechnology, particularly with what is thought of as being an overly generous patent policy in that field. Others say -- there seemed to be some consensus this morning that this is not true, that you will eventually get into licensing agreements, some kind of joint ventures which overcome. I do not know if it is true. There are other entry barriers and the analysis will be valid in general for entry barriers, but the question whether it is relevant to patents, I am afraid, is something I will have to leave open.

The model is that essentially at any one moment there is a monopoly, it is incumbent. The firms try to essentially invest in R&D and try to develop any equipment. The investment yields a random return. Nobody knows what quality of product they will come across.

Now if the best entrant -- now there are a number of entrants, this is why what is relevant is the

best entrant -- so essentially the model is one of what is called "order statistics" in statistical theory. You take the maximum of some random variables. If the best entrant's quality exceeds the incumbent's quality by more than the entry barrier, then it wins monopoly for the next period which of course includes return that is now the incumbent, which gives it some advantage in the future.

Now it seems to me this sort of captures a lot of things. And I think it captures a big class of cases where entry barriers are relevant. One can think of antitrust cases. It is clear to me that this model fits a lot of cases. Whether it fits patents, I am not so sure. And that is an empirical question. In principle, blocking patents as though they should do this, but there are some issues which seem to be in dispute, but perhaps there is a consensus that it is not big.

As the best entrant -- and the best entrant wins the monopoly, of course, if it is sufficiently good. If it is not sufficiently good, if it does not exceed the quality of the incumbent who is also doing some research possibly -- may or may not be -- the incumbent raises the quality.

Now, I will be very brief here since the implications, I think, are fairly clear. In the first

place, proposing that some firms do try to enter, well, the probability that the incumbent will change -- it would be a new incumbent -- increases with the number of entrants, and decreases with the size of the entry barrier. The higher the entry barrier, the less probable it is that the incumbent will be displaced.

Now this member -- this probability, of course, is known to the potential entrants. I am assuming everybody understands the situation. And of course, well, the best entrant is -- the incumbent loses and the best entrant wins, which means that the firms -- conditional on the incumbent being ousted, there probably is only one over N that will succeed. So presumably the firm takes that into account in deciding whether there will be incentive to enter.

So if the number of firms is large enough, no additional firms will enter. It also gives a measure of the incentives on the existing firm to do research. The more firms try to enter, the less the incentive on the existing firm because the probability of winning is less. So there could be an excessive competition.

Now I said something clear enough under C, but I didn't realize I left out a point which I thought about that somehow did not get in here, which is the role of the entry barrier. Suppose the entry barrier increases?

Well, this will decrease -- it would appear, in the first place, that this will decrease potential competition. That, unfortunately, needs a little more analysis, as I realized, and is a point I had thought of and somehow did not incorporate it into this.

Namely, the potential competitor is buying -- with some probability -- is buying incumbency; therefore, if you win, part of the reward is that you are the incumbent for the next period. So there is a delicate balancing act here in terms of which of the improvements -- because you are buying, that of course is the logic behind patents in the first place, that if you win, you get a monopoly. The difficulty here is if you have blocking patents.

In other words, the problem of that here is you have patents where you have many patents so that the next stage, even though you win the competition, so to speak, you need to have access to the patents. So the patent -- let us say -- I am going period-by-period, so I will assume the patent period is more than one period, so it just does not expire each time. So the patent period is let's say two periods.

Then, if the innovation has new elements, it also needs something from the old patent -- this is the thing that I think Suzanne Scotchmer and Jerry Green have

worked on -- is that there is a blocking or a payment, which is a little bit of a blocking, by the way, even if it gets unscrambled, it is something of a blocking too, now that I think of it -- I mean, it is a partial blocking. So the existing patents will just scourge out.

On the other hand, the counterpart is that, if you do win, you have acquired that monopoly power, so there is an offsetting figure here which I must say -- I am sure you could work out the answer. Once you set up the model, you can do these things by simulation, if nothing else, you could work out the answer. The trouble is, it is going to be a very very circumstance- dependent answer.

The only general observation I thought I would make is the following. We have set up certain rules on patents, saying, "We have agreed -- somehow we have come to a social decision, a joint social judgment, that a monopoly for 17 years is the appropriate reward."

Now if it turns out that the existing patent gives you an advantage in keeping your incumbency, and therefore it in effect means the effect of a patent is longer than the planned period, and therefore, although it might seem to say that we should take action to prevent patents from being used to extend themselves beyond the period originally entitled. Thank you.

MS. DeSANTI: Thank you very much, Professor Arrow. Next we will hear from Professor Ashish Arora. He is an Associate Professor of Economics and Public Policy at Carnegie Mellon University in Pittsburgh, a representative of another university, but he is also currently a visiting Associate Professor of Economics at Stanford University. He is also the Research Director of the Software Industry Center at Carnegie Mellon. His research focuses on many things, including the economics of technological change.

MR. ARORA: Thank you, Susan. I bring you greetings. When Mark Lemley skipped out, I greeted him for the rest of the world. I appreciate the chance to participate in these hearings. Let me begin by sort of picking up on what I thought were sort of the expressed theme of this hearing, which is sort of IP in the Knowledge Economy and this phrase, the Knowledge Economy, has always troubled me because it sort of suggests that we were earlier living in the Ignorance Economy.

And so, if you sort of think about the process of modern economic growth, the systematic application of science, as Kuznets portrayed, to economic ends is the hallmark of modern economic growth. So by that reckoning, we have been in the Knowledge Economy for at least 200 years.

So what sense, then, remains of the not calling the present decade the Knowledge Economy? Let me offer one and see if you agree, which is the increasingly independent identity of knowledge as an economic commodity, in other words, as a tradeable economic commodity. And if you will indulge me with that, what it leads to is thinking about the possibilities of markets for such knowledge, which I am going to call "Market for Technology" as a shorthand. And as an important implication of having such markets is the possibility of specialization and knowledge production.

And as you will readily appreciate, intellectual property then is an important institutional counterpart of thinking about knowledge as a tradeable economic commodity.

What I want to do in this presentation is make two points. I am going to try and sort of give you some sense of what we know about the existence and size of markets for technology, and the second thing is I am going to try and convince you that where there exists, such markets have very important consequences for the themes that have interest in competition and welfare. And let me skip through that.

Here is a simple typology, if you like, from Markets for Technology. The two columns, I think,

correspond well with the existing FTC DOJ Guidelines. The first column, you could think of as markets for technology, and the second column of what the Guidelines call the "Markets for Innovation," or the "Innovation Markets." And within each of those, you could think about horizontal transactions, which is licensing or transactions with potential rivals and vertical transactions which . And it sometimes is we tend to think about either the top left or the bottom left boxes as the most interesting, but it may well be that we should think about these other boxes as well.

And I suspect each of these transactions and each of these raise somewhat different sets of concerns if you are thinking from the point of view of antitrust, and some of these have already been raised. Let me skip to the second bullet. The first task, if I am going to talk to you about Markets for Technology, is to give you some sense of how big they are. And you can measure them a couple of different ways.

You can look at the royalty flows from the stock of existing deals, or you could look at the value of deals in any particular year. And whichever way you look at them, you get slightly different numbers and, as you will readily appreciate, you should expect to get different numbers if you are counting the value of

royalty flows or the value of the deals. But take it on faith that these numbers are sort of consistent.

And if you want to think about how big these numbers are, it is somewhere between ten and 15 percent of civilian R&D. And by the way, these are estimates for all the rich countries taken together, so not just the U.S., so ten to 15 percent of civilian R&D in the OECD countries, which is not huge, but not trivial either. Moving to Consequences, this is a very interesting slide.

If you look at the last row and the bottom right number, that tells you what fraction of the world exports of chemicals are accounted for by countries other than the rich countries. And according to this table, it is 33 percent. I have looked at some other sources and the numbers are somewhat smaller, but regardless of how you choose to measure chemicals or exports and so on, or how you count multinationals, there is no disguising the fact that there has been a tremendous increase in entry into the world market for chemicals by what you might call developing countries.

And these are -- well, you can think about China, Korea, Taiwan and India. Those are the four prominent ones that account for a lot of this number. The question is, how did this happen? Obviously there are lots of explanations and the one that I am going to

focus on is by no means the only one, but what I would like you to look at -- the one that I am concerned about is where do these entrants get their technology from.

And what is interesting, if you look at the second column, that says the share of licenses from SEF's -- SEF's are Specialized Engineering Firms. These are firms that specialize in the business of plant construction design and providing technology and know-how, and frequently act as agents for other chemical firms that want to license their intellectual property. Actually, if you go to the third column, you can see almost none of the technology is internal to the third-world countries. Almost all of it comes from the outside. And a very significant chunk comes from other chemical producers and a little bit less comes from these specialists -- technology producers.

Let me go back to the theme that I mentioned, which is that the vertical structure of the industry, the fact that there is this group of firms that are specializing in plant construction and in supplying process technologies, these are almost all chemical process technologies, is very significant. And I would submit to you that they have played a very important role in hastening technology diffusion from the rich countries to the poor countries.

What is also interesting if you just look at the rich countries alone and you divide the producers there between large -- the top 100 chemical producers and the rest -- the small first-world firms look a lot like third-world firms in terms of their reliance on outside sources of technology and in the reliance on the specialized technology suppliers for technology.

The bottom line from that chart is, where you have functioning markets for technology and where you have these firms that specialize to some extent in technology generation, but to a much greater extent in selling technology and providing the complimentary know-how and services that need to go with it, that you get tremendous social gains in terms of rapid technology diffusion and entry.

As some of you know, the chemical industry is highly competitive and the competitive pressures that force a far-reaching restructuring in the industry and the U.S. and other European countries. More broadly, if you think about markets for technology, what they do is -- we talked about whether small companies are more innovative than large companies -- one way to think about markets for technology is they find you a way out of this dilemma.

You know, you can do -- and Professor Arrow has

written on this as well -- is that you can get a kind of division of labor where firms can specialize in those aspects of innovation where they have a competitive advantage and, in particular, small companies do not need to acquire the extensive downstream complimentary assets. For R&D intensive companies, having such a market provides an additional option -- they can always choose to license. And from a social point of view, having such markets has additional benefits in terms of awarding duplicate of R&D.

So, to conclude, having markets for technology is, I think, a very important component for having this kind of vertical specialization and division of labor in innovation. And when you have such a division of labor, in particular that tends to lower entry barriers even in the downstream product markets. The other part that -- Susan, am I over my time limit?

MS. DeSANTI: No.

MR. ARORA: Okay. So let me come back to then the other theme, which is what role do patents play in such markets for typology. And I will submit to you that patents play an important role. They enhance the efficiency of knowledge transfer and they help structure the kinds of licensing contracts that I have talked about.

And let me conclude by saying that -- I do not want to sound as if there are no downsides -- I think there are a number of issues that have to do with the role of intellectual property rights and the market for technology. These have already been raised.

This question of blocking patents that Professor Arrow talked about and Mark Lemley talked about, and others did, and semiconductors and biotech, what kinds of social costs are involved in coming to terms or making these kinds of arrangements to get access to the technology through this market, and in particular what are the social costs involved when these transactions break down?

And moreover, there is some evidence that suggests that legal costs -- litigation costs -- may be especially burdensome for small innovative firms. There are specific concerns about whether the patents are playing the roles that they are supposed to play and, in particular, whether they are sort of adequately disclosing what they are supposed to disclose.

And the last bullet, I think, is perhaps not relevant for the immediate topic, but is relevant for where we are, which is what impact markets for technology in general will have on academic norms and academic research. Thank you.

MS. DeSANTI: Thank you very much. For our final speaker, we move to Professor Hal Varian, who is the Dean of the School of Information Management and Systems at the University of California at Berkeley. He also holds joint appointments in the Haas School of Business and the Department of Economics and occupies the Class of 1944 University Professorship. He has written numerous papers and books on Economic Theory, Econometrics, Industrial Organization, and the Economics of Information Technology.

MR. VARIAN: Thank you. Let us see if I can operate this. You know, I am a believer in this principle that power corrupts and Powerpoint corrupts, absolutely! But nevertheless, I decided to use that technology for this demonstration. I knew that I was coming at the end of the talks this afternoon, so I decided that, rather than being repetitive, I would try to be provocative.

So what I have put together are some PBI's, Partially Baked Ideas, about the subject matter and maybe a little bit orthogonal to some of the ideas that have come so far but, as you will see, there are also several overlaps.

So I want to go back to the basics, really, and sketch out the typical analysis. And if you look at the

text books, I could recommend a few, but if you look at the text books, they start generally with monopoly and then they say, "Well, what are the losses? Prices are too high, output is too low." And then they might say, "Well, where did the monopoly come from?" And it might come from government regulation or it might come from returns to scale, or it might come from bad behavior.

And then they say, "Well, how do you remedy it?" Well, you might deregulate if it is a government and you might regulate if it is returns to scale. I always thought it was kind of amusing that you could both deregulate and regulate as a cure to monopoly. And then you might adjudicate if it comes from bad behavior. So that is pretty much a summary of what we see in the textbook analysis.

But the problem with this, I think, is in many cases -- and you might even say most cases these days -- firms compete to acquire the monopoly. So there is the discussion we have had today about patents where you are competing and in many cases there are patent races to acquire monopoly, there is lock-in, where you could acquire a position where you have some monopoly power, but of course there is a competitive stage to acquire that power because there are switching costs.

Their network effects or demand-side of

economies of scale, supply-side of economies of scale, competing for proprietary standards, and what the textbooks tend to leave out is this competitive stage, the prior stage of monopoly. And I think this is what professor Arrow is addressing a little bit earlier. And of course, if competition is very intense in all these cases, the profits are completely competed away. Of course, we still have the dead-weight loss, even though the profits could be competed away.

But even with dead-weight loss, I think there is a big problem with the standard analysis because the concept is pretty clear -- it is the value of the lost output that results from price being greater than marginal costs, but of course, in a lot of industries that we are concerned with today, if you have a flat price, it has got to be greater than marginal cost because of the returns to scale component. And additionally, it is very very common to see firms engaging in various kinds of price discrimination.

In fact, here is a pet peeve of mine, that if you look at a lot of this efficiency condition, people say price equals marginal cost, price equals marginal cost, but that is not really true. It should be marginal price equals marginal cost. Right? That is what you want for efficiency, that the willingness to pay by

marginal consumer for the marginal unit should equal the marginal cost of production.

And in many cases, the real efficiency loss does not end up being so much an output loss, but rather the quality distortions that you get from attempts to satisfy the soft selection constraints.

So take my favorite example of looking at movies and videos and so on, it might cost you $30 to take your family out to see the movies, but if you wait for six months, you can see it at home for $3.00 or $4.00. And so the marginal cost which is something that I think pretty much approximates the marginal cost of providing that particular product, so the marginal cost is really the six months that you have to wait rather than the output distortions.

Now that is the kind of thing that I think is more and more present and, of course, there are many many other cost monopolies besides just the output distortion. I am going to talk about that a little bit later on. And of course, those factors have always been around, but they are of growing importance because of the ease and the incentive to engage in this kind of price quality discrimination.

So it has certainly been facilitated by improved monitoring technologies, more and more

transactions are computer mediated, more and more merchants have records of purchase history, loyalty clubs that trend towards licensing for both information goods and physical goods, and I think more and more cases where price is going to depend on conditions of use.

So, for example, if you go to the supermarket and you are in the loyalty club, you get coupons, and those coupons depend not only on what you have bought in the past, but even on what you are buying now. If you go on-line, of course, there are all sorts of price discrimination. I will give you all a good reason to be here this afternoon, despite the beautiful day outside, by giving you a tip on how to buy on-line.

So whenever you want to buy anything, what you should do is go to your search engine and type in Amazon coupon, or Buy.com coupon, and nine times out of ten, you come up with a coupon for $10 or $25 off, so you immediately save $10 or $25 right there just by using that coupon. I also discovered another kind of cute thing.

A while ago I was at Amazon and I put a product in my wish list -- they have got a wish list there -- and the next thing you know, a day later, I got an e-mail saying, "Hey, we will give you $10 off anything on your wish list." And if you think about it, it's kind of cute

because, to say that it is on your wish list says, "Well, I want to buy it, but I am not quite ready to pay that price." So, of course, in that case, they like to make you another offer.

So you are doing a kind of iterated negotiation in that case. And, of course, it is not a secret that Microsoft and other software companies would like to sell software by the services or by subscriptions, it depends on conditions of use, they have recognized that durable goods monopoly problem is a real issue and there are even more exotic technologies on the horizon like RF bar codes which I think will dramatically affect the way goods are sold.

RF bar codes are little bar codes that generate radio frequencies so you can walk by something and see how much stuff is, what the prices are. And you could also potentially price products by the products that are consumed with, so you can extract some of the value of the complimentarities. So in any event, there are lots of different technologies that are going to allow very dramatic forms of price discrimination.

Of course, when you are in an industry with high fixed cost and low marginal cost, you are extremely interested in price and product differentiation to avoid kind of head to head competition that would benefit or

cost both of you. And here are a few diagrams from Econ 1. I mean, that is the ideal perfect competition.

The color code here is "Green is Good" and Blue is Bad," at least for non-economists. And black is real bad. We all agree black is bad. So you have got the consumer surplus, the producer surplus, and the dead-weight loss. That is the picture you usually see.

But then, if you compete for the monopoly, well, at least sometimes the competition -- maybe that all gets passed along to the consumers and so you will have the dead-weight loss, but the consumers get a great deal. And then, if you have a perfectly discriminating monopolist, well, everything is producer-surplus, but if you have firms that compete to become perfectly discriminating monopolists, which I think is a very real case, well, then, it is great because all the benefits go back to the consumers.

So, in fact, I think you might want to call this the -- maybe this is apologies to Ken Arrow -- this is the third theorem of Welfare Economics -- that if firms that compete to become a price discriminating monopolist, then you should get an efficient outcome and, in fact, consumers get the bulk of the gains. Now that is obviously an extreme case, but so is perfect competition and perfect monopoly.

In fact, somebody told me this was just too perfect because it has got to be perfect competition for a perfectly price discriminating, perfect monopoly. So it is three orders of perfection here.

But I think you ought to take it seriously, particularly when you try to look at an analysis of what happens in increasing returns industries, or industries with a lock-in or network effects, and it is important to look at the entire history of competition in the industry and also, of course, to evaluate the impact of price discrimination appropriately.

And in that last factor, I think, there is a real conflict between the way the Law views price discrimination and the way Economics views price discrimination. And so instead of Law and Economics, you know, see there I wrote "Law vs. Economics" in that particular case. But then it is also important to recognize that, being a really extreme case of that sort, there are lots of problems with that analysis.

And I think seeing what is wrong, I mean, taking that as your baseline case and then critiquing it I think leads to some of the same insights that we have heard generated today in the other discussion. One is that just the output effect is really small potatoes compared to a lot of the other social costs of monopoly.

But the trouble is, the output effect is clear-cut -- if monopolists, at least the non-price discriminating monopolists, produces too little output, whereas if you look at quality and choice of innovation it can go either way. Maybe you can have too high a quality.

I mean, people have argued that AT&T, for example, maybe due to regulation incentives, or maybe due to quality as an entry barrier, had too high a quality of their product. Or it can have too low. Maybe your favorite example is some other telecommunication companies might go in there. And innovation? Well, we have heard a lot about that.

And I think what we have heard is, on the one hand, on the other hand, the monopoly has the money, so they have got the money to invent to put into R&D, they have got an incentive to save cost, and they have perhaps an incentive to do something to quality. But they certainly do not have an incentive to destroy revenue to do really disruptive innovations.

I thought about this a few weeks ago. I went to a conference on Moore's law and Intel demonstrated a Terahertz transistor -- 1,000-gigahertz. So now we have gigahertz chips. And just this morning there was an announcement where IBM says that it is going to have a 100-gigahertz chip, but this was ten times that, so this

is a Terahertz transistor.

And they are putting huge amounts of money into innovating in that particular approach to semiconductors, but then we have people over in the EECS that are printing integrated circuits on potato chip bags with ink-jet printers, which is really a rather dramatically different technology, especially if you look at the difference between fixed cost and variable costs for how those technologies play out.

And Intel just is not a player in that particular industry, even though I think it has got quite dramatic possibilities for changing not so much the traditional semiconductor market, but in fact opening up all sorts of new markets to semi-conductors that are currently not available.

So the other thing is that competition to acquire the monopoly does not always benefit consumers. You might have rent dissipation. And it is kind of funny when you look at the literature, if you look at rent seeking literature, it says all the expenditures to acquire the monopoly are a social cost, but if you look, say, at lock-in literature, all the expenditures to acquire monopoly benefit consumers because it is all modeled as first-period consumption.

And if you cut your prices in order to get

those consumers locked-in second period, but of course there could be lots of other ways to compete that do not necessarily benefit consumers, by lobbying and regulation, and doing all sorts of things of that sort. Of course, there is also path dependence, luck, strategy, mistakes. You can look at a lot of situations where little changes made a big impact in the Operating Systems -- Steve Balmer.

In the race between OS-2 and Microsoft Windows, there was apparently a bug in OS-2 where if you hit certain keys at the same time, the whole Operating System would crash. And Steve Balmer went around Comdex showing every booth what keys to hit to crash OS-2, which I think was a particularly interesting pivotal event in the war between those two operating systems.

And of course there is also the preemption races of duplication of effort issues that go on when you look at competition to acquire monopoly. So this is the kind of patent race stuff.

Finally, there is path time consistency and I think that is a very interesting point because when the monopoly phase goes away, will the consumer still be willing to pay? And there is a big difference between a one-year cell phone contract where you say, "I will give you a phone if you sign up for a year," and pay high

prices for that year.

A three-year ink jet printer life where you pay a high price up front, you get locked into using a proprietary cartridge, or the last example were you should pay a higher price for Excel because it only cost $50 back in 1985 where we were at a price war with Lotus 1-2-3.

Or you look at another kind of nice example which is what is going to happen with those 3-G licenses in Europe where companies that pay huge amounts of money to acquire these third-generation wireless licenses and maybe in ten years, after slugging down the marketplace, you will get a monopoly or maybe a duopoly where there is a lot of pricing power going forward and are the antitrust authorities really going to stand by while the companies say, "Well, we bid for this back in 1998 and now you are saying you want to take away the profit flow that comes from that particular highly competitive phase of the monopoly." And maybe, again, we might say, "Well, if they are really good at price discriminating, maybe there is not a lot of social cost to that either."

So I think it is an issue we really have to think about going forward in these cases. But the most important issue, I think, is the tactics to acquire,

maintain, and extend the monopoly where, of course, the problem is not even in these partial-equilibrium examples I gave with a single market. It is not so much the cost in that market that is the problem as the attempts to extend or protect that monopoly using socially detrimental tactics. So the best player wins, not always the incumbent.

So maybe we want to look at that model a little differently where we could have full efficiency and even dramatic consumer benefits in a particular market because of this dynamic monopoly or competing for a monopoly story that I have been telling. But it still could be bad because of the spill-over effects into adjacent markets. So I think that is also a fairly critical issue to look at.

So in summary, I think the textbook case is less and less relevant to the real world for many of these examples because price is inevitably going to be greater than marginal cost in lots of industries of interest. Appropriate analysis of price discrimination is critically important.

We have to keep this in the back of our mind, I think, or maybe in the front of our mind that you want the marginal price to equal marginal cost. And I like to see a more systematic treatment of competition to acquire

monopoly because right now when you look at the literature it is really very divided. There are many many different cases you could look at and nobody has really pulled those cases together in a systematic way. And finally it is the impact on innovation quality and, I think, future competition and leverage issues that are really the critical issues in looking at monopoly and antitrust going forward.

MS. DeSANTI: Thank you very much. Well, we have even more issues on the table now for discussion. Rich, do you want to start off?

MR. GILBERT: Yeah. I have a question for Ashish. You referenced -- you made a statement earlier about how it was hard to find a licensing situation that was not working by some definition. But now, we have had consent decrees. We have had consent decrees with AT&T, IBM, and Xerox. And most observers of these consent decrees say that they have had profound impacts on the evolution of those markets -- of the software markets of the telecommunications market, of the development for xerography. It seems that these statements are in contradiction, or these observations are in contradiction.

MR. ARORA: I do not -- I mean, I agree with your observation and I do not think they are in

contradiction, but let me clarify.

My statement was simply that transaction costs, while they are important, they do not appear to be large enough to block most of the sort of licensing arrangements that people want. I did not mean to imply that owners of intellectual property would always license that intellectual property. And what you are saying is that when certain firms were forced to license their intellectual property -- I assume those are the consent decrees you are talking about -- that they can have very profound impact.

And I would agree that what they would essentially do would be to allow a great deal of entry into those and related markets. And I also agree with Professor Rubinfeld's observation on the importance of diversity. I think that can be a really important social benefit.

MR. GILBERT: So is this the dog that does not bark? I mean, maybe we are not finding a lot of problems because the ones who have problems do not exist.

MR. ARORA: So to some extent, the idea of intellectual property does include the right to do what you want to do with it, including not license it to somebody else. You might imagine situations where the ownership of the intellectual property, in order to

derive value from that, it has to be commercialized. You know, the knowledge is of a kind where it is best used by a large number of users.

Research tools is a classic example of that. And that is where we were looking for breakdown failures. So we did come across a number of cases of the following kind: somebody had developed a new therapeutic protein, you know, that they were going to do for something. And they refused to license to anybody else.

I do not consider that to be a breakdown in the market for technology because, by its nature you would expect this to be very tightly controlled in terms of exclusivity. And refusal to license that protein to somebody else where you would imagine that the uses will be rivaled -- privately rivaled -- seems perfectly consistent with the idea of intellectual property. That is what a patent is supposed to allow you to do.

When the IPO owner has a lot of market power, then the antitrust considerations come in and you might get a different outcome.

MS. DeSANTI: I would like to put a couple of questions on the table and see if people could comment on these in the remaining few minutes that we have. One is this question of short run vs. long run competition and what should be the focus, Hal, this is one of the points

you were bringing up at the end. Implicit in your competition for the monopoly point, I think some people have said:

What the antitrust enforcers should pay attention to is competition to acquire the monopoly; once the monopoly occurs, then you simply leave it alone and then pay attention to the next phase of the competition for the monopoly.

But is it not correct that 1) that is not a lot difference in the sense that antitrust law generally says, you know, "If you acquire a monopoly because of your talent and all of that, then you are allowed to do that. What we look for is bad conduct...," which is always hard to identify, "...in connection with acquiring the monopoly or maintaining the monopoly." But at any rate, my question goes to do you presume that, in some long-range basis, antitrust would forego further enforcement?

And I want to contrast that with Dan. I took some of your points -- and tell me if I am misreading you, but I took some of your points as saying, "When it is innovation, we need to look far into the future." And I am wondering, is there a tension here in terms of the time frame in which antitrust should be looking at, "What is the conduct with which we are concerned?" Anybody?

MR. ARROW: Implicit in my presentation that I was thinking that, as a recurring event, that you do not have a once and for all monopoly. And the forces of -- for the reasons that Hal mentioned -- the forces of competition may lead to a monopoly under increasing returns and all these other things. But we do not want that to be permanent in any situation because of the demand for diversity -- or conditions change. And particular technological conditions change, maybe demand conditions too.

And you certainly do not want -- a permanent existing monopoly is always sure to create situations in which there is gross inefficiency and it would have been better to prevent it in the first place. I mean, I realize that the nature of the law is such that you look for offenses rather than policy, but if you are asking what the economic aspects of the matter are, I would say that anything which leads to a permanent monopoly or a long-lasting monopoly, is a bad thing. That has bad effects on innovation and so forth.

So I think there is a very strong feeling that all things be equal, some weight should be given to the idea preventing a monopoly from perpetuating itself, or at least making it more costly to perpetuate itself.

MR. RUBINFELD: Can I jump in? In the spirit

of Hal Varian, I want to try to be provocative to the end of the day, so I will just make a few comments. First of all, with a lot of innovation, I think the stakes for the antitrust enforcement are increased on both sides. The benefit of encouraging the right kind of innovation is that you move along a very different dynamic path. And that can generate huge benefits.

The cost, if it is the wrong path, can be huge, particularly because typically innovations, at least in high tech, are not reversible. We cannot go back and, if we find a problem five years down the road, and say, "Let's just break up a company and put them back where they were." So the stakes are really huge and I would say generally vastly larger than in many of the static kinds of mergers we look at.

So the bottom line is, for the reasons Ken suggested in his comments, we really have to have a longer time horizon because if we have an industry where we are encouraging innovation which leads to a monopoly, and that monopoly will then have an incentive to engage in innovations which protect its monopoly position, the benefits and costs of that are just going to be phenomenal.

We just cannot -- whether one should intervene is a difficult question, but I do not think we should

just put it off by saying it is too far in the future to worry about. And I want to also say that the framework and model that Ken was describing, all those issues which I think are on the table are just compounded if we are talking about a standard-setting world where we want to encourage standard-setting because of all the benefits it can bring about -- innovation and otherwise.

On the other hand, we have to understand that when we help to support these standard-setting bodies, we also create incentives which could deter entry for parties that are playing in the game.

So everything Ken said in his story, I think, is just compounded and made much more significant if we are talking about competition for the market where we are talking about standard-setting, which is why I am going to be very interested to see what happens with the look at the Music-net and Press-Play joint ventures in the audio-streaming area. I think those are really interesting issues and they are going to sort of put the test to the division in this case, Sue, to sort of sort out all these issues.

MS. DeSANTI: Hal?

MR. VARIAN: Yes, I was going to say on this diversity point, it is also important to look at incentives to invent around because if we take the Xerox

case that you brought up -- or I guess Rich brought it up, sorry -- I mean, one could argue that there was a great patent, there was a huge amount of effort that went into invent around that patent, looking at various technologies.

One technology was ink-jet technology which never quite did it in the copier market, but ended up being the right solution and a cost-effective solution in the printer market. And of course it dominates xerography in the color-printing market because it is much easier to color print with ink-jet than with black and white. And we might never have gone down that road if Xerox had licensed its patent more liberally in the early days.

So there was something you said for exploring the design space and it is not so clear that, if you believe in diversity, it is not so clear that licensing helps you have more diversity, it helps you have less diversity. But it may give you more cost-effectiveness. So it is a trade-off here as well.

And, oh yes, I wanted to say a point about the point Dan just made about what should we do in these industries where you have got a monopolist who maybe acquired the monopoly fair and square, or competed for the monopoly and ended up with it because of scale

returns. I think you want to think about merger policy very differently for those cases because, even if the monopolist acquired that monopoly fair and square, the danger then is extending that monopoly to other industries and having undue leverage.

And I think you would want to analyze that situation very very differently than you would other kinds of mergers.

MS. DeSANTI: Rich, would you like to make our final comment?

MR. GILBERT: Oh, gosh, if you put it that way.

MS. DeSANTI: You began, we'll let you conclude.

MR. GILBERT: I am not sure I want to do that.

MS. DeSANTI: It better have great import, yes.

MR. GILBERT: I was just thinking about in the context of this quality letter, or quality letter competition and the acquisition to obtain a monopoly as being part of the analysis of the subsequent monopoly -- I hate to bring these things too close to home -- but the question I come to think of is would we want to change our policies with respect to Microsoft under the basis that, well, Microsoft had to compete to get this position

and therefore the consumers got some of the benefits.

I think one of the difficulties here is that we rarely see an industry where it has a very regular pattern of competing for a market and then experiencing the benefits, and then something happening and competing again. And I think when that does happen, it is a fairly mature market.

So you have to separate that from these events which often look pretty exogenous events or random events that create a market in the first place, or create dominance in the first place.

MR. VARIAN: Absolutely. I mean, I mean I would say the Microsoft example is exactly what I was thinking of when I raised some of those questions. And it is interesting, I think, that Microsoft is running into a problem of a maturing market in its core market and a durable goods monopoly problem, in my opinion.

And then the question is how do you extend that power they have to other areas? And that seems to me to be the most critical issue. It is not so much the monopoly in the Operating Systems market that is the problem as it is the extension of monopoly. I think I am one of the few people that can speak freely since I am not involved in this case, but that is my analysis, at least.

MS. DeSANTI: Yes, well, I was not going to say anything about Microsoft, but this has provoked me to think of one more question for all of you. As I think about everything that you are saying, for the most part, I believe that it fits within what I understand to be current antitrust theory and application at the Federal Antitrust Enforcement Agencies.

I am not aware of huge differences and I am wondering if any of you have any areas in which you think that there needs to be a radical change, or whether you perceive it differently than I do.

MR. RUBINFELD: I just think as long as we lock-in the Berkeley position at the Antitrust Division, we will do fine. But beyond that, no, I actually think seriously that we basically have -- the set-up is fine. We have the tools we need. I do not think anything is radically different myself.

MS. DeSANTI: Yes, Rich?

MR. GILBERT: This question of whether intellectual property or, indeed, demands a different framework for analysis is one that has been around for a long time. And I think it is clear that the framework of the analysis is the same, but I think there are lots of issues -- and I imagine you will hear lots of issues throughout the rest of the week and the rest of your

hearings -- where there will be arguments for looking at things significantly differently.

I think these issues are unsettled and still may require some different thinking.

MS. DeSANTI: Well, on the unsettled note, then, will you please all join me in thanking our panel of very distinguished speakers. We will start tomorrow at 9:00 a.m. with a panel that will explore innovation and patents. Thank you very much.

(Whereupon, the workshop was adjourned.)

- - - - -

C E R T I F I C A T I O N O F R E P O R T E R

CASE TITLE: HEARINGS ON COMPETITION AND INTELLECTUAL PROPERTY LAW AND POLICY IN THE KNOWLEDGE-BASED ECONOMY
HEARING DATE: FEBRUARY 25, 2002

I HEREBY CERTIFY that the transcript contained herein is a full and accurate transcript of the notes taken by me at the hearing on the above cause before the FEDERAL TRADE COMMISSION to the best of my knowledge and belief.

DATED: MARCH 8, 2002

KENT ANDREWS

C E R T I F I C A T I O N O F P R O O F R E A D E R

I HEREBY CERTIFY that I proofread the transcript for accuracy in spelling, hyphenation, punctuation and format.

DIANE QUADE