

September 9, 2016

The productivity puzzle: How can we speed up the growth of the economy?

Jonathan B. Baker

Louise Sheiner, *The Hutchins Center on Fiscal and Monetary Policy*

Martin Neil Baily

David Wessel, *The Hutchins Center on Fiscal and Monetary Policy*

Robert J. Barro, *Harvard University*, et al.

THE BROOKINGS INSTITUTION

THE PRODUCTIVITY PUZZLE:
HOW CAN WE SPEED UP THE GROWTH OF THE ECONOMY?

Washington, D.C.

Friday, September 9, 2016

Welcome:

LOUISE SHEINER
Senior Fellow and Policy Director, The Hutchins
Center on Fiscal and Monetary Policy
The Brookings Institution

Paper Presentation:

MARTIN BAILY
Senior Fellow and Director, Initiative on Business and Public Policy
The Brookings Institution

Panel Discussion:

DAVID WESSEL
Director, Hutchins Center on Fiscal and Monetary Policy
Senior Fellow, Economic Studies
The Brookings Institution

ROBERT BARRO
Paul M. Warburg Professor of Economics, Harvard University

J. BRADFORD DeLONG
Professor of Economics, University of California at Berkeley

BRONWYN HALL
Emerita Professor, University of California at Berkeley

JONATHAN BAKER
Professor of Law, American University

P R O C E E D I N G S

MS. SHEINER: Welcome to this morning's event on productivity growth. I'm Louise Sheiner, Policy Director of the Hutchins Center on Fiscal and Monetary Policy here at Brookings, where our mission is to improve the quality and public understanding of fiscal and monetary policy.

Productivity growth is an issue that cuts across many areas of economics and public policy, affecting and potentially being affected by monetary policy, fiscal policy, and business and labor market regulation. And it has deep and important implications for the growth of living standards over time. Together with Martin Baily of the Brookings Initiative on Business and Public Policy, we've put together an event that's looking at both the potential causes of the recent slowdown in measured productivity growth, and the public policy responses that have the greatest likelihood of helping to boost productivity going forward.

Yesterday we hosted a smaller conference of academics where a lot of new research on the causes of the productivity slowdown were discussed, and Martin will summarize some of those findings for you this morning, but if you're interested those papers are also available on our website. Today Martin's discussion will be followed by a panel discussion moderated by David Wessel that will highlight the many different ways that public policy can approach the question of the productivity slowdown and hope to mitigate it.

Just as a reminder for everybody today's event is being webcast and everything is on the record.

So welcome again and I'll give you Martin Baily. (Applause)

MR. BAILY: Thank you, Louise. A pleasure to be here and have the opportunity to talk about an issue that I've been studying more years than I care to remember.

So this chart essentially -- Louise summarized this, productivity growth is

very important. There are obviously distributional issues, who gets which slice of the pie, but the growth of the pie itself, the most important determinant in the long run, is productivity growth. There are sort of two common measures that we use of productivity growth. Labor is just output per hour worked, it's simpler, sort of a little easier to understand. The economists tend to favor multi-factor productivity growth which adjusts for the impact of labor and material, inputs, and also changes in labor quality. And what's left behind, the MFP, picks up really technological change broadly defined to include all kinds of improvements in the way goods and services are produced.

So my first chart is the sort of depressing one. I recently was asked to debate in Zurich and the other side of the debate was someone who was very optimistic about growth, and so I had to take the position of -- Bob Gordon position if you like -- that growth is very slow. And so I put up this chart and someone in the audience said, oh, you just won the debate. (Laughter) This is the trend, the OECD smooths the trends of productivity of the whole set of countries. We have the G-7 countries here, but the smaller countries, most of the smaller countries -- Australia is an exception -- but most of the smaller countries have had declining productivity growth that seems to have started declining in the early 1970s. So this is not just a very recent thing, however you will see that things have gotten worse. There have been some ups and downs obviously, and you can see there that the U.S. had a surge of productivity in the '90s and early years of this century. So it's not completely smooth, but pretty much everybody is in the same boat of slow growth as we look at the last few years. Things may be getting worse as opposed to getting better.

So now I'm going to focus on the U.S. This is the aggregate picture for the United States. So the blue bars are multifactor productivity, so reflecting technological change broadly defined. And you can see having grown at over 2 percent for the years after World War II that dropped back to .5 percent after 1973, but then it accelerated again after 1995 and now it's dropped back to .5. So the biggest driver of

what you might say, the ups and downs and the overall growth of productivity has been multifactor productivity or technological change. But the contribution of capital deepening is certainly not trivial and the two sort of go together, for better or worse. When we have good MFP growth we've also tended to have more capital accumulation, increases in capital per hour worked, a greater contribution from capital.

So now in this last period from 2004 to 2015 you can see that the contribution of capital is extremely low from a historical perspective, about the lowest it's been. If you look at the last five years or so it's even lower. There's essentially no contribution from capital deepening. So the lack of capital accumulation is playing a role, although we have to be careful there what's sort of causing what. Whether it's the lack of MFP itself that's resulting in less capital accumulation because there are few opportunities, or whether it's something else that's providing a drag on investment.

You'll see that the small green bars at the end, they are a measure that the Bureau of Labor Statistics creates that sort of picks up the level of experience, education; they look at various characteristics of the work force and they come up with a sort of index of the composition of these -- you know, as the labor force becomes more experienced or has more education it contributes to growth. As you can see they haven't been much of the story of the ups and downs, it's been pretty constant pretty much over the whole time period.

Now, that may be a bit deceptive. I think there's some concern now that the workforce itself is not necessarily equipped with the skills that they need for the future economy going forward, or even the current economy that we have. But that may be something that would show up more in the future than has done in the past so far.

Now I'm now going to turn, and I'm going to go fairly quickly. This is a little bit wonky here, but this chart shows you can estimate the contributions of each industry. So that depends on how fast or slow an industry is growing and also how large or small it is. It's basically its share of output, but it's something called a domar weight,

that we don't need to go into, but it allows you to measure the contribution of each industry to overall multifactor productivity growth. And it's very striking that the biggest contribution to that surge that we saw from 1995 to 2004 actually occurred in services, which is really a hodgepodge of big hard to measure industries, including healthcare and education. So it's a bit frustrating that one of the biggest drivers, if you like, of this surge is one we actually don't have a terribly good handle on. The manufacturing sector was the other large contributor. It's contributed a big part of productivity growth over the long run and a big part here to the surge in productivity that took place after 1995. If you look within manufacturing the contribution is somewhat broad based, but by far the largest part is coming from semi conductors and computers where the pace of productivity growth links to the very rapid decline in the prices of information and communications technology boosted up measured productivity.

Wholesale and retail trade actually play a little bit bigger role than is apparent in this chart because they had strong productivity growth starting before 1995. So they're acceleration was not that great, but as we'll see in a second they are playing a big role in the story of productivity over the 1990s as a whole.

So this is the chart that shows the contributions to the slowdown. So we saw which industries accelerated productivity growth and which ones -- now we're seeing which ones slowed down. And again manufacturing is very big, this time by far the largest. So really the slowdown within manufacturing, and this too was broad based, so it occurred in industries that maybe you think were hit by trade, like apparel, that sort of largely disappeared, and some of the others. But the biggest driver again was that you had the slowdown in the rate of decline of computer prices. And this was reflected in a slowdown of manufacturing productivity. You can see there were a few bright spots, mining, finance or insurance and real estate actually accelerated a little bit after 2004, but overall the picture is one of a fairly broad slowdown in productivity growth in that period.

So what's the sort of summary bottom line on why productivity surged

and why did that surge end? Well, it's obviously related to the accelerated decline in ICT prices, which was temporary. There was at the same time strong demand growth and high investment, which I think was linked to just the overall growth and a kind of accelerator effect on investment, but was also linked to the decline in ICT prices, which encouraged companies to invest in that equipment. We also had what McKinsey called the "Walmart Effect", which was christened the "Walmart Effect" from a McKinsey study which found that the big box stores, not just Walmart, but others as well -- had driven out the mom and pop stores and that had increased productivity in both wholesale and retail. But again that phenomenon was sort of played out by the early 2000s. In fact, in the most recent years we know that traditional retailers have been in more trouble because of the rise of Amazon. So at some point we may get more productivity growth measured in wholesale and retail trade, but at least at the moment that's a slow growing sector.

And then the other part I'm going to say I think there was some measurement issue here. Remember that services was the sector that really contributed the biggest acceleration, and if you actually look within that you find that it's not that the service industry suddenly started growing like gangbusters, it's that they had actually negative productivity growth before 1995 and that switched to being mild positive growth after 1995. And I think that's suspicious. I think that maybe that there were some adjustments to deal with the fact that Alan Greenspan and others were out there saying these negative numbers don't make any sense, we need to look at them. And I think it's appropriate that the statistical agencies took a look and I suspect that they were not any - - nobody was cooking the books, but there was an effort to see if these negative numbers actually made sense. So I think there may have been some measurement problem there driving that switch in services.

So there are three sort of real effects, real economy effects and one potential measurement issue that I think help you explain that sort of surge in U.S. productivity for that 10-year period from '95 to 2004. And also, remember that that surge

was pretty unique to the U.S. There were other ups and downs in other economies, but no one else saw that surge of rapid growth from '95 to 2004. So it is something that was peculiar to the U.S. economy.

So now I want to -- and I'm not going to go into any detail, the papers are available for anybody who wants to go into the details, but I think there was work that was presented yesterday that is coming up with really important new findings about the distribution of productivity within an industry. And so what they're finding -- the chart on the left comes from a group at the OECD led by Dan Andrews; on the right is the work of John Haltiwanger and also his colleagues. They're not the same, they're not set up the same, but basically they have a similar message, which is if you look within an industry, sort of controlling for that particular industry and the time period and all the controls these guys have done to make sure they're isolating the effect they're looking for, you find that the industries at the top in the OECD work, they identify frontier firms, the top few firms, top five percent firms in an industry, and they are looking primarily at Europe. So that's a European event that they're seeing on the left end side chart. On the right end side chart, it's the U.S. And they look at the so-called 90/10 split, that's to say the gap between the firms in the 90th percent of productivity and those in the 10 percent. And in both cases you're finding this dispersion widening. Well, is that good news or bad news? Well, it could be bad news if what's happening is that the firms at the frontier are growing rather slowly and then everyone else is just kind of falling behind. But it also is sort of good news because it says well maybe we have some other policies or maybe as the market economy evolves that we will actually get faster growth from the middle and the bottom because there will be a diffusion of the innovations that are driving the firms at the top.

So I think, again, to be a bit repetitive here, I think these new micro studies are showing us something important, which is that there is a potential for the firms in the middle and at the bottom to start to catch up, there's a potential for innovations that

are being made to diffuse into the mainstream, and therefore to raise average productivity.

Okay. So if the temporary surge is sort of understood then I think the issue for productivity growth is we've had fairly chronic slow growth as you saw in the very first chart I put up. It's true across countries that productivity growth has been slowing with that temporary interruption. And so the question is, what can we do now to explain why growth is chronically slow and doesn't tell us something about the policy measures we could take.

So I've argued here that there are sort of three ways of looking at it. Either there's a chronic measurement problem, and so we've got slow growth because we're not measuring the growth in important parts of the economy; the second is that the frontier is not moving out, so this is sort of the Robert Gordon, maybe Tyler Cowen view of the world, so we just have exhausted most of the best innovations. And there may be innovation going on, you know, cute new applications on your iPhone, but the best of the innovations are past and we have to accept the fact that we're going to have slow growth now indefinitely. And then the third point, which of course was pointed to by the previous chart that I showed, is that the frontier may be moving out, there may be innovations taking place, but many or most firms are not keeping pace with that frontier.

So the mis-measurement issue. We had an excellent paper given here at Brookings which reached the conclusion that that surge in productivity was not primarily mis-measurement, but at the same time there is a serious mis-measurement -- or I should say lack of measurement -- problem in big parts of the economy, so that healthcare, 18 percent of the economy, we don't really capture the innovations that are taking place. I hasten to say I don't think healthcare is the most efficient it could be, but it certainly is doing a lot of innovation and the care that's being provided is changing. We have many more advances that are really not being captured at all. We take that 18 percent of GDP and we deflate it by a deflator that's really based on the price of imports,

mostly the price of the labor in that industry rather than allowing for any possibility of productivity growth.

Education is the same. I'm less confident that we're getting a lot of technology there. I think there's a lot of potential technology but, you know, for the moment classes in schools and even universities are still taught much the same way they've been. But again I think there's potential growth in that industry and we need to be in a position to measure it if it comes along and we get real changes.

Similarly, financial services, legal services, professional services, none of those are really measured. And if you add up all these parts of the economy it's a big part of the economy, it's an important part of the economy, and it's growing and I think it's one where we need to do more. Even the story that the prices of computers and semi conductors have slowed down is a story that can be questioned. The statistical agencies have developed a method of capturing these declines in semi conductor and computer prices, but they're not really as good at capturing what's going on now in other parts, the decline in the price of cloud storage and other things that I'm not an expert on. But there's a great article by David Byrne and Carol Corrado that really identifies places where the price decline is really much greater than anything that's in official statistics.

Now it says here the solution to this may be to give the statistical agencies more money and I think that's an easy thing for me to say up here, not so easy to get through Congress. Karen Dynan, who was here yesterday, I think made a very helpful comment, which is we need to think about what the statistical agencies can do even if they don't get more money, are there some improvements that they could make to cover these parts of the economy. If we look at the resources that are devoted to measuring agriculture, for example, and we compare that to what's used to measure service sector, I think it's very disproportionate. Again, whether we can shift those resources around or not, that could be a struggle too, but potentially there are things that could be done even under the current sort of budget constraints.

So Robert Gordon -- and I commend his book. It's long but it's well worth reading. And he paints a very interesting picture of U.S. economic history and the important innovations that have changed the way we live, he contrasts the importance of indoor plumbing with the importance of cell phones and says these were the big ones then, and cell phones is less, and I tend to agree with him. I think some young people don't necessarily agree with him, they may prefer their cell phones (laughter), but I think he's right. You know, it doesn't surprise me in economics terms we get diminishing marginal utilities. So it's not surprising that the innovations coming now are not as big or important as the innovations 50 or 100 years ago, but it doesn't mean we don't have productivity enhancing innovations.

But he makes the case and it's worth reading. I don't think it's definitive. He's a little bit breezy in the way he dismisses innovations that are sort of in the pipeline, some of which are I think quite exciting, both from a scientific viewpoint and in terms of what they will do to change our lives. Joe Immochia is sort of Bob Gordon's foil. He points out that even though the low hanging fruit has been plucked and we've got to go to higher branches on the tree to get the innovations. That actually the new technologies, the information technology has provided us with new tools to do that and so that will help us actually pluck the fruit from the higher branches.

I mentioned the firm level data. Having settled that I want to agree with Gordon that the chances of going back to long run growth rates and productivity three percent I would say is probably not very high. So I agree with him to the extent that the period after World War II was one of tremendous opportunities. There had been the depression, there had been the war, but there had been a lot of innovation taking place and after the war these could be exploited. We had a lot of industries where returns to scale were important, whether it was from grocery stores to supermarkets or building larger electric generating plants, a lot of ways to raise productivity. And it indeed may not be as easy now, but that's not to say that we are necessarily condemned to very slow

growth. So a sort of partial agreement, if you like, with Gordon.

Now, what are some of the barriers that maybe preventing perhaps the most productive -- the diffusion of innovations or the encouraging of the moving up of the firms that are in the lower part of the distribution so that they do better? Well, the thing that should work in market economy is competition. And the U.S. has a pretty good track record of that. There's empirical evidence that the most productive firms expand, the least productive firms contract or go out of business. New firms start with low productivity, but as they expand and move up they become more productive that process of reallocation, of dynamism and in the work of Haltiwanger and his co-authors there are a number of signs that that's not happening the way it used to happen. And so maybe we're not getting as much competition. I struggled in the paper to find some good policy remedies for that. I go out on a limb talking about the possibility of limiting or getting rid of patents. I think I'm walking back a little bit from that. I don't think we want to eliminate the patents system; it does have significant benefits. But at the moment I think it's being used really as one of the restrictive practices as much as it's being used to protect, to encourage innovation. So there are some industries -- Brad DeLong was just pointing to his wife who works in the fashion industry, huge amount of innovation going on there, always new products but there's no patenting. So you're forced to innovate because you have to say one step ahead of the competition. So we need more of that and less of people having innovation, locking it in with a patent and then fighting a big legal battle to stop anyone else from taking advantage of that.

Colleagues here at Brookings have pointed out that 30 percent of jobs in the U.S. now require licenses, so you need a license to be a florist, you need a license to do all kinds of things. We certainly know in healthcare there are a lot of restrictive practices that make it difficult for nurses to do some of the things that they probably should be able to do, technical stuff. You can't read X-rays in India. There are a lot of restrictive practices. It's hard for the Mayo Clinic to enter the Texas medical market

because the doctors don't want the competition. So there are a lot of these restrictive practices that are around that maybe we need to get rid of. And I'll put a plug in in these political times to say global competition is also important and expanding trade.

The next thing, and I think several of the paper yesterday pointed to, the difficulties of adopting some of these innovations. So the fact that the best practice companies are able to adopt some of the new information technology driven methods, but companies in the middle or at the bottom just don't have any idea, they don't have the people, they don't have the expertise. And so there is I think a capability. Some of that is natural, you would expect that to happen, but some of it does seem to be limiting the growth of productivity because of lack of access or lack of ability to use the latest innovations. So this may be a matter of time, it may be a matter of education, certainly for production workers, for non college educated workers that may not have the skills they need, but even managerial capability. A lot of managers don't themselves understand what some of the new technologies can do for their companies and therefore find it difficult to adopt them.

So, finally, I'll mention a couple of other policies. This of course is -- the first one is the favorite of Paul Krugman or Larry Summers -- so stimulating aggregate demand is I think is something that you could do. We certainly think that, you know, performance has been very weak since the great recession and if we could really get back to the kind of high pressure full employment economy that we had in the late '60s, that we had in the late '90s, that this would be helpful. Even if that did not boost productivity a lot I think it's good to fix the roads, I think they need to be fixed. So I think that's a sort of no brainer policy.

Now the last one that I'll mention is enhancing manufacturing. And I mention it because I was surprised given how small manufacturing is now that it's still a big part of productivity growth. Obviously it's getting smaller, so its contribution is going down, but it's been a big part of this story historically. If there are ways in which one

could actually make regulation or tax reform to sort of level the playing field, to encourage companies to invest in the United States after we do have a very large trade deficit, I think that we would also help productivity as well as being something that would be a good policy more broadly.

So I think that's the end. I've covered this ground. So thank you. I'm going to stop there. (Applause)

MR. WESSEL: So Martin has set a very good example by ending precisely on the time he promised to end, so I'm good for that.

I'm David Wessel, I'm Director of the Hutchins Center here at Brookings and I'll introduce my panelists in a minute. What we're going to do is pick up where Martin left off, which is to say after listening to a lot of conversation yesterday about measurement and reasons for productivity slowdown, one of my colleagues said it's okay to listen to a conversation and come to the conclusion that the answer might be, we don't know. But I think that there is a consensus that we measure productivity poorly, but that that doesn't fully explain the slowdown in productivity growth that Martin described, that there are probably more than one cause of the slowdown, and particularly may differ from country or region, from one region to another of the world, and that we may not be able to go back to the golden era of productivity growth that followed the quarter century after World War II. However, we would be better off as a society if productivity were growing more rapidly and it's hard to believe that productivity growth is somehow immune to the policies we adapt. While I don't think anybody can say definitively that I have the policy that will increase productivity growth by .3 of a percentage point over the term of the next president, I think what we're going to try to do today is say, okay, if we want to increase productivity growth, that's our premise, what policies stand a reasonably good chance of doing that, and let's not get trapped in any one arena. There are things that have to do, as Martin said, with patent law and competition, there are things that have to do with aggregate demand and public investment. Let's have a kind of take a broad view of the

question.

So we've invited four people who have very different perspectives on this. At the far end is Bronwyn Hall, who is an Emeritus Professor at the University of California at Berkeley. Next to her is Brad DeLong, who is a Professor at the University of California at Berkeley as well. And just to correct a little bit, Martin, what you said, Brad's wife, who I've met, is definitely in the fashion industry. She's a lawyer and she teaches intellectual property and one of the issues that she dealt with intellectual property is fashion. (Laughter) I had this vision that his wife would burst through the door with an umbrella, beating Martin over the head. Robert Barro is a Professor of Economics at Harvard and visiting, at least part of this year, our new neighbors at the American Enterprise Institute. And Jonathan Baker, who kindly agreed to join us, is a Law Professor at American University's Washington College of Law.

Why don't I go in the order in which you're sitting? Bronwyn, if you could start?

MS. HALL: Oh, sure.

MR. WESSEL: I've asked each of the panelists to speak for five to seven minutes, which as you know means seven minutes. (Laughter) We have a timer in the front. One of the reasons people ask former journalists to moderate is that they are rude enough to interrupt people -- so that's a warning -- because I want to have time to have a little conversation among us and then with the audience.

So, Bronwyn, what would you do that might stand a chance of increasing productivity growth?

MS. HALL: Well, first of all I do actually agree with most of what Martin said. And in particular on the patent system, it's very difficult to know how to fix things. The Supreme Court has been making a series of decisions which have improved the situation there. But most of who look closely at it who are not actually practicing lawyers think that the requirement for novelty is a little too low. And also that it's extremely

difficult in software to know whether the invention is truly an invention. And so we do think there's room for reform in the patent area. In efforts to restrict the number of patents we don't -- most of us think it would be too extreme -- and this goes way back to the '50s -- too extreme to eliminate it, that there are cases in which the patent system provides important incentives, but that we have kind of gone overboard.

On the fashion side I can't resist pointing out that there are design patents, they are heavily used in the fashion area, and there have been some high profile disputes. For example, whether the color red on the bottom of a shoe is something which you can trademark or design patent on. I won't say anymore than that, but --

MR. WESSEL: Thank you.

MS. HALL: -- that is an industry in which people are using intellectual property. That's one of the worldwide changes that we've seen in the last 20 years, which is increasing attention to the notion that intellectual property is valuable to the firm in all fields. I look forward to seeing a situation -- chefs currently don't use intellectual property, but I fully expect that at some point they'll discover it, you know, new dishes and so forth.

The main thing I wanted to talk about was R & D policy, but I do think that the full benefits of a lot of the ICT revolutions we've seen in the last 20 years are not diffused yet. One reason in the United States, and this is an infrastructure question, is that broadband in the U.S. lags some of the rest of -- some of the other countries, particularly Korea, which is to say there are many things like using the cloud which are really not fully available to every firm or every individual because they don't have adequate broadband. It's not that they don't have something labeled broadband, but it doesn't actually run at the speed at which it's supposed to and so forth. And most of that is the last mile problem.

Also on this frontier versus non frontier, my own experience suggests that reorganizing the work flow in a firm, and even in small firms, takes time and involves

a lot of employee resistance because the employees just don't have long-term view. And so all they see is in the short-term they can't produce for you as fast as they used to and it really slows down -- so it makes it very difficult sometimes to reorganize your work. And that may be part of the problem for the smaller -- especially the small to medium-sized firms in the graphs that Martin showed.

So with respect to R & D, R & D intensity in the United States is now below that in Japan, Korea, and Germany. And China is on a track, you know, a trend which will cross ours in about 2020. Predicting that far ahead is difficult, but we don't have the lead in R & D intensity that we had 20-25 years ago. Most of us think that R & D and innovation investment is a contributor to productivity growth in spite of the fact that the actual -- quantifying that is really, really difficult. The area where I've learned a lot from Steve Merrill, who used to be at the National Academies and is now running an innovation center at Duke University on this subject -- one of the things that's happened over the last 25 years is that the allocation of federal research and development spending has skewed enormously toward life sciences. Life sciences are now more than half of the total spending in the basic science area, not in the entire R & D budget of the federal government, but in the -- where you can allocate things to broad field of science, life science is more than half and the others, engineering, physical sciences, environmental, computer sciences, are miniscule compared to that. And the shares going to the engineering and mathematical and computer science fields -- sorry, with the exception of computer science, which has increased slightly -- the shares going there have been falling over time.

And the problem here is that nobody knows how we should allocate funds towards basic research. I mean it's -- the reason nobody knows is because we can't tell now what field of science will be useful in the future. I don't think that 30 years ago or 40 years ago it was obvious to anybody that the computer science and mathematics were very important for biological sciences, but that turned out to be true.

And because we can't predict that, and therefore people like me are reluctant to tell you what the return to federal spending on, you know, geological sciences is, we just can't tell you that because we know that even if we told you something that had happened in the past, that's no prediction of future results. It's just like the stock market, it's the same thing. And so all we can do is have a portfolio that is more balanced in the basic science spending. And so I guess many of us in this field feel that things have shifted slightly too much toward life sciences and we should be spending more in a number of the other physical sciences in the future.

So I see my time running out, so let me say one more thing, which is that the R & D tax and targeted subsidy programs of the federal government, the R & D tax credit, have been very subject to political whims. And R & D is not done well when you're changing all the time how you're planning it because it's a long-term activity. It would be helpful if we, for example, adopted a permanent R & D tax credit instead of threatening to cut it off every year. There are some reasons why we do it that way, but it's mostly related to R & D.

MR. WESSEL: I think they've done it. I believe that they've made the R & D tax credit. They've already taken your advice. (Laughter)

MS. HALL: Now they made it permanent? Yeah, yeah, well I've been saying it for 20 years.

MR. WESSEL: They learn slowly.

MS. HALL: I confess I've been in Europe for the last few years and so I am a little out of touch.

MR. WESSEL: So your list then, to summarize, is that we should make patents a little harder to get.

MS. HALL: Yes.

MR. WESSEL: That we should make true broadband more widely available so that ideas and innovations can diffuse more widely, that we should think

about the allocation of federal R & D spending a little less on life sciences and a more balanced portfolio, and that Congress should make the R & D tax credit permanent, which as I said they already did.

MS. HALL: Yes. Good. Okay.

MR. WESSEL: Brad, you're up.

MR. DeLONG: Well, I need to stop flashing to a dystopian future in which drones overfly my house with chemical sensors to see if I am cooking kung pao pastrami without a (inaudible) license from Mission Chinese right now. (Laughter)

I guess three big things going on in productivity over the past half century, and if you'd ask an appallingly young Martin Baily back in 1972, say how prosperous the U.S. would be in 2025, he would have bet that you would have had about \$125,000 of 2009 dollar GDP per capita. And what happened after 1973 pushed that down to \$80,000, would be the forecast Martin would have made -- did make in the late 1980s, start of the 1990s. Then we have 1995 to 2004. What we hope is a permanent shift, but is instead a one-time blip, up and down. And then afterwards we have 2008. And after 2008 we're no longer expecting \$80,000 of 2025 per capita GDP at 2009 prices, we're expecting \$63,000. A second big jump down, one very closely tied to what happened in 2008. The reason we have this bounce down is that we should have had substantial bounce back to trend after the 2008-2009 crisis. We didn't. Bob's going to talk about that a bunch I think. But I want to stress it's not because our economy has become too sclerotic and is incapable of reallocating resources. The economy reallocated resources fine from 2005 to 2008 away from housing and into exports and into investment and other things as financial markets changed their prices and businesses responded to incentives on a truly remarkable and massive and smooth level.

But it's what happened after 2008 that's caused the second of our big problems, what happened after 1973 causing the first. And here I'm very impressed with Davis and Von Wachter, with Chodorow-Reich and Wieland, with others saying that the

process of creative destruction and reallocation, it really matters whether it takes place in a high or a low pressure economy. And after 2008 we hit the zero lower bound on interest rates. Optimism about how effective Federal Reserve quantitative easing and forward guidance policies could be turned to be wrong. And then we hit the economy on the head with the fiscal austerity brick, mostly at the state and local level, but at the federal level again, to when we hit it on the head over and over and over again, plus not doing anything to restructure housing finance to assist people who were scared and panicked after the housing crash from moving out of their sister's basements and forming households of their own. And with interest rates at zero the Federal Reserve finds no way to signal exports and business investment that they really should be doing more, should be taking up the slack from fiscal austerity caused by hitting the economy on the head with a brick over and over and over again.

Can we still recover from this post 2008 disaster? Well, first I think we need to stop calling it the great recession and start calling it the longer depression, certainly in Europe and soon here too. Back in 2009 I would have said yes, we'll recover easily. In 2012 Larry Summers and I in this room said we could recover straight forwardly. Now, there are still people like Jerry Friedman who are very optimistic and say yes, we could, and it would be easy. And I'm not arguing with Jerry Friedman until November 15, but I'll argue with him then.

Aside from striving for a high pressure economy and hoping, which Martin recommended, what can we do, where is there low hanging fruit? Well, I would focus on what are our value subtracting industries. In finance we now seem to be pay the financial industry eight percent of GDP, two percent of asset value per year for assets at four times annual GDP, when we used to pay the financial industry one percent of asset value a year for assets equal to two and a half times a year GDP, used to pay a third. And it doesn't seem to me our corporate control is any better, or our capital allocation is any better. And certainly people are exerting a lot more price pressure

against themselves and making the princes of Wall Street rich. There is healthcare administration. Our doctors, nurses, and pharmacists do wonderful things, but as Uwe Reinhart likes to say, you do the national income accounting and our healthcare administrators are about one-eight as productive as our German because they're all working against each other either trying to get things covered or trying not to get things covered. And if you understand your health insurance explanation of benefits I congratulate you. I think there is something wrong psychologically wrong with you if you understand them. (Laughter) Mass incarceration. You know, add up the effects on human capital and so forth, that's another two percent of GDP that other countries do not pay in addition to the excess of five percent for healthcare administration and the other five percent for excess finance, which is very difficult to figure out how to get at, because it's all fees people voluntarily pay. People love to churn their stocks and love to pay high fees to mutual funds and love to not follow the natural thing with respect to where they put their pensions.

And then there's NIMBY-ism in all its forms. We've talked a little bit about occupational NIMBY-ism, which may be a big factor. I'm not convinced, I'm not unconvinced. And as Bronwyn said yesterday anyone who lives in San Francisco or D.C. or Boston has got to be very impressed with residential and land use NIMBY-ism as a major factor, but again that just may be where we happen to sit, in and near Silicon Valley, as we wander around and muse at the environment (inaudible) built.

Other things. I should probably echo what Bronwyn was saying and say more attention to the government's regulation and management of research and development is desperately needed. That is, we have a world that is increasingly non-Smithian in terms of what we make and where value comes from, and yet our government sees to confined increasingly to military, to being an insurance company, to property rights and contract enforcement and auto pilot with respect to other things. And that cannot be healthy, cannot be healthy at all.

MR. WESSEL: So you didn't use the words "public investment" once.

MR. DeLONG: I thought you would. (Laughter)

MR. WESSEL: Okay. We'll get back to that.

MR. DeLONG: There's this illusion, to refer to Larry and me in 2012, the entire paper which hereby incorporate by reference in my revised (inaudible) remarks.

(Laughter)

SPEAKER: That's very good. I'll do that too. (Laughter)

MR. WESSEL: Professor Barro.

MR. BARRO: Well, there's been no recovery for real GDP in the U.S. since the end of the recession 2009. Also true of other countries. Per capita GDP growth rates since 2009, U.S. has been about 1.3 percent per year compared to an average of a little over 2 percent. And of course to recover you have to grow faster than average for some period in order to undo what you lost during the recession.

Empirically I think it is true that a bigger recession implies or predicts a bigger recovery. And the best estimate for that kind of effect I think comes from the really large economic contractions in the world. So I've looked at the long history of major economic disasters for 40 countries going back over a century, and from that you have 185 cases of declines in per capital GDP by at least 10 percent. And I've studied what the recoveries look like subsequent to those major contractions. To summarize the main result from that is that on average the recovery is about half of the cumulative loss during the downturn. And once the disaster is over the recovery is actually pretty rapid. But there is also a large degree of variability in terms of the extent of recovery that applies after a disaster event.

Many of these historical disasters feature large financial crises. So it's certainly not true that you don't have a recovery because you have a financial crisis, as has been asserted sometimes recently. An example is the U.S. great depression, 1929-33. It's a decline by about 29 percent in per capita GDP. It's followed by per capital GDP

growth, 1933-40 at an average 6 1/2 percent per year, which is actually the strongest growth of that kind of interval in the whole peacetime history. So that's an example of a strong recovery following a major financial disaster.

Going back to the recent U.S. period the surprise is that the non recovery with respect to real GDP also features very strong employment growth. So since 2010 employment growth has been on average 1.7 percent per year. So I think the right way to describe this recent event is that it's a job filled non recovery, it's not at all a jobless recovery, which was a term that seemed to get a lot of currency around 2010 or so.

As an aside, there's a question given the behavior of per capital GDP and consumption, is it better or worse to have more employment growth? Because that's the kind of situation we've had, not too good growth in GDP and consumption, but we've had a lot more work. Standard economic reasoning would say that the growth and employment was actually bad if you're holding fixed per capital GDP and consumption because you have less leisure. That view is probably wrong and there I think are some good reasons why you might prefer to have more employment growth. One thing I particularly learned from Ben Bernanke, who was speaking when Mervyn King had a retirement party a couple of years ago, he said that the most important thing he learned from the U.S. Congress was it was better to have more job growth rather than less even if you're holding fixed per capital GDP pattern.

The patterns you see in terms of weak GDP growth, strong employment growth corresponds to the weak growth of labor productivity that of course Martin Bailey highlighted. 0.5 percent per year in growth in output per worker since 2010, little worse for output per worker hour compared to averages on 1.5, 1.7 percent per year over the longer period before that. So if you want to think about policies to promote growth that might have promoted a better recovery or a better performance going forward, I think you have to think about what enhances productivity. And specifically that means you don't want to think about traditional stabilization policies that focus on aggregate demand. And

even monetary policy is not going to be a centerpiece of this kind of discussion. You want to think more about the policies that show up in the determinants of economic growth literature. So that includes favorable things that look like property rights, rule of law, free trade, lack of market distortions, and inefficient regulations, some kinds of infrastructure investments, good systems for education and health, fiscal discipline, efficient tax systems. I think those are the areas that you want to think about.

Now, in fact the main policies that were implemented by the U.S. government since the end of the recession were a substantial increase in transfer payments to persons and a very aggressive monetary policy. Those are the two main policies that have been followed. I don't think anybody would suggest that increased transfer payments would be a good way to enhance productivity. And if that's the key then this is not the right thing to focus on. I think monetary policy is mostly endogenous and symptomatic of an environment with poor investment and growth opportunities, and I don't think it's really been central in terms of the outcomes. And in any case it doesn't relate particularly to productivity growth.

So it's quite sad in this context that if you think about the ongoing political campaign, the policies that have been given a lot of attention include things like restrictions on trade and immigration, higher minimum wage rates. These are not the kinds of policies you want to think about if you're going to think about enhancing productivity.

Another way to look at this, there are places in the world where I think discussion of policy is more serious. And surprisingly Latin America is an example of that. For example, I was recently on a panel for Peru, which has done very well in terms of liberalizations in economic growth for a couple of decades, but their focus now is on micro policies that enhance productivity. And I was also just at a conference in Columbia and they were having a discussion about what kind of tax reform to implement. And this was a perfectly serious discussion about what tax policies are favorable to economic

growth and which are not. And it's hard to imagine these days having a policy discussion of that sort in the United States. You don't get that sort of serious interchange it seems.

MR. WESSEL: So you gave a long list of policies, trade regulation, infrastructure, education, fiscal discipline, efficient tax system. If you had to start -- given that the next president is not going to be able to do -- well, who knows if the next president will be able to do anything, but if you were starting with a wish list which one of those do you think would be the most important one to tackle first?

MR. BARRO: I've spent a lot of time trying to tease that out of the international data on economic growth. So it's the same as asking, you know, which of these things do you think is most important as a determinant of economic growth. I think that's a very hard question and I'm not sure I'm confident of the answer of that. I think I can come up with a list of things that I think are most likely to be favorable to growth, and I could make a list of suggestions for a new president, but I would find it very hard to say well here's the key, this is what you've got to do.

MR. WESSEL: Okay. All right. Jonathan, you're kindly walking into a sea of economists here as a lawyer. We've already had the economists opining on the law, so it's now your turn to return the favor.

MR. BAKER: I should tell you that I'm also an economist.

MR. WESSEL: Oh, you're an economist too?

MR. BAKER: Yes.

MR. WESSEL: Oh, okay. I apologize. Go ahead.

MR. BAKER: Yeah, I've been in --

MR. WESSEL: So you bat both ways.

MR. BAKER: There you go.

MR. BAILY: Are you in the fashion industry? (Laughter)

MR. BAKER: Well, so I'm delighted to be here and I've been asked to talk about the role of competition policy in spurring productivity growth. And I want to

make four points, which I'll be happy to elaborate on later.

The first is that market power is a problem in the U.S. economy. It's not all deterred by antitrust enforcement. The Justice Department files something like 60 criminal cartel cases every year and collects perhaps \$1 billion in fines, and that's probably the tip of the market power iceberg. Because it's likely easier to deter express price fixing, which is what those criminal cases are about, than to deter tacit coordination which leads to higher prices. And there are studies that find in general mergers that were close calls at the antitrust enforcement agencies actually harm competition. So we probably under deter anti competitive mergers too. And the cartel experience shows that market power is durable as well as common.

So my second point is that market power appears to have been growing for decades. And I have five possible reasons to suggest. One is that the Supreme Court relaxed antitrust rules during the 1980s. Another is that the substantial increase in equity ownership by diversified financial investors, like BlackRock and Fidelity, when competing airlines or banks have the same large shareholders the rival firms may refrain from competing aggressively against each other.

And the third reason is that many large information technology firms have benefitted from substantial network effects or intellectual property protection. And that probably insulates them from competition in some of their major markets. Now their success has undoubtedly contributed to the economy's productivity growth, but productivity growth would likely be greater if dominant information technology platforms faced more competition.

The fourth reason that market power may be growing is increased market concentration. Now we don't actually know whether concentration is growing in the economy overall, we don't have good information about that. But in a number of major industries, like airlines and brewing and perhaps hospitals, we've seen substantial - they've grown substantially more concentrated over time.

And the fifth reason market power may be growing is that governmental restraints on competition may be on the rise. And I have in mind here what appears to be an increase in occupational licensing by states, a greater scope of intellectual property, and an increase in the lobbying and other political rent seeking activity. So, for example, Mylan's lobbying of the FDA could have helped create a regulatory environment that limited competition for the EpiPen and so contributed to the substantial increase in EpiPen prices that's been in the news recently.

Well, so far I've argued that market power is likely substantial and increasing. And my third point is that growing market power means productivity is growing less rapidly than it should be, which is what we're here to talk about. The economic and business literatures consistently find that enhanced competition in an industry leads to greater productivity. And that includes, for example, work by Martin Baily and his former colleagues at the McKinsey Global Institute.

Competition enhances productivity through both incentives and selection. So it gives firms incentives to cut costs and improve products and production processes and business models. And competition also selects for the most productive firms, firms that can't keep up will exit. So if you lop off the least productive firms from an industry that increases average industry productivity. Now there's an argument about the incentive mechanism. Everyone agrees that firms want to innovate to escape competitive pressure, but if a firm expects that its rivals will quickly copy its new products and then compete aggressively it might decide it won't earn a sufficient profit to justify its research and development investments. And in thinking about that possibility some economists have argued that firms with market power before they innovate are more likely to profit from their R & D investments. And so market power could be good for innovation. But firms that are making major R & D investments usually have many other ways to appropriate sufficient returns, even with some imitation. And that's probably why, as I understand the modern empirical economics literature on this, it suggests that

greater competition not greater market power enhances the prospects for innovation.

So my fourth and my final point is that growing market power, and particularly increased anti competitive exclusion, could help explain why productivity has been slowing since the 1970s, except for the surge in the late 1990s, and why the economy has been becoming less dynamic, which was on Martin's slides as well. The timing of the productivity slowdown and the growth of market power aren't perfectly consistent, but we don't measure either of them very well, so the timing isn't decisive. Growing anti competitive exclusion could help explain the decline in dynamism, and in particular why the most productive firms are expanding less than before and the least productive firms are not exiting as quickly as before, and why the rate of startups has been declining since 1980.

When antitrust cases address the suppression of new technologies or products or business models the cases almost always involve exclusionary conduct. The exclusion case everyone knows is Microsoft which protected its market power by impeding Netscape's browser, but there are many other examples. Anti competitive exclusion is likely on the rise because the Courts have relaxed the rules governing exclusionary conduct the most. When dominant firms adopt exclusionary practices new firms are less likely to enter or expand rapidly, and at the same time successful firms are more insulated from competition so they have less incentive to innovate and expand.

So my four points explain why it's plausible that growing market power has contributed to the productivity slowdown, and there are other plausible causes too, which we've heard about, and we haven't been able to quantify their relative contribution. But even so it's reasonable to conclude that enhancing competition by filling gaps in antitrust enforcement and removing governmental restraints on competition and some of the other things I've talked about would help address the productivity slowdown.

MR. WESSEL: Thank you. And I thank all the panelists for sticking to the time. (Applause)

Brad, I wonder if you could speak to something that Robert Barro mentioned. So Robert Barro made the point, suggested that for fixed per capital income we have to choose between -- we could have more employment or more output per worker. But is that the right way to think about that? Are we asking Americans to make that choice, or is that too gloomy a way of framing the issue?

MR. DeLONG: Well, I'd say it's much too gloomy a way of framing the issue. It's completely correct that if you're going to hold total production constant you would in some sense rather have more leisure, lower work -- shorter work days rather than longer work days, although there are complications about risk and social status involved in actually having a whole bunch of extra people without jobs. So they didn't mess that up. But I don't think that's the world we're in or the world that we should think that we're in. The question is what's the current productive potential of the economy, are we below it, can we get back there, and how is getting back there going to aid us in all the various kinds of long-term investments that we ought to be making that we need to make in order to boost productivity.

One way to look at it -- look, I mean all growth comes from investment of some kind. You know, it doesn't just drop out of the air that all of the sudden this year we're two percent better at making all the stuff we made last year that we made, you know. And net private investment is something like seven percent of net domestic product. And other net investment like activities are perhaps of equal magnitude. So figure 15 percent of net economic product in total is devoted to growth and maybe 10 percent of that to arming per capital growth. And we used to get two percent per year growth out of that, which means the average net rate of return on our expenditures on making the future better, whether those are stealing intellectual property from someone else who already knows about it, that's learning how to kung pao Chinese, copying the red on the bottom of the shoes, building physical capital, creating genuinely new ideas, diffusing new ideas, figuring out how to better run an organization or how, now that you

have an electric motor, you can reorganize the factory because everything no longer needs to be connected by belts and wheels to the steam engine. That's 10 percent of net product in total and somewhere in there there are expenditures that are extremely high return because we know the average of them is 20 percent per year. And we look at the stock market and it kind of tells us that the average return on a physical investment of corporations is on the order of five percent per year. So the question is what is it exactly out there that boosts that average up to 20 and how can we figure out how to do more of it as quickly as possible.

MR. WESSEL: So we could have more employment and more output if we picked the right things to invest in.

MR. DeLONG: Picked the right to invest in

MR. WESSEL: we don't know how to do that, but the sense of the panel is that right now we're not getting an optimal allocation and there are things the government does that prevent us from getting to those places.

Bronwyn, were you simply -- did you want to?

MR. BARRO: The point I was trying to raise was about forgiven per capita, output, and consumption. Of course it's better to have better productivity and more stuff. So then the puzzle is why is it that people seem to like the idea of more jobs, forgiven consumption income per person. And there are some possible good reasons for that. I think some of it has to do with inequality, like the unemployment rate is itself a measure of inequality of jobs and there is some idea that people like to have a job separated from how much consumption they have. And there's a thought that well maybe the labor market is predicting future economic activity, but I think that one is actually false.

So I think there are a number of interesting questions about why this is true and Bernanke was saying in 2014 in his talk that while this is clearly true and we need to understand why it's true.

MR. WESSEL: Right. Bronwyn, do you -- I want to ask you two questions. One is, were you making the case that there's no question we should spend more government money on R & D or were you making the case that well maybe we shouldn't spend more, but whatever we spend we ought to allocate it differently?

MS. HALL: Okay. I'm much more confident about the second, that we should allocate it differently. But this is part of the real puzzle in the area. I'm constantly asked what are the returns to R & D, you know, what are the returns to R & D in the firms, what are the returns to R & D in the federal government, at the national level, et cetera. That's not a question you can answer because returns are -- ex ante returns and then there are ex post returns, ex post returns are all over the map as a function of ex ante returns. So you do the best you can to try to predict, but knowing what level is the right level for R & D spending is not feasible, but the only things both firms do and then countries do is benchmark against similar competitors. And so that's why looking at what other people are spending is in some sense an indicator of what you ought to be spending.

Most of us who are in the field would say that the past returns to federal R & D have been quite high and that's a reason why continuing what we're doing and possibly increasing it is a good idea, but making that -- putting hard numbers on that is really, really, really difficult.

MR. DeLONG: But what is the case for saying that our innovation system is anywhere close to optimal? There are lots of things that look very much like public goods that are being created by private companies now. And you can say there are superior advantages to avoiding bureaucracy, but then you have contests, then you set up prizes, then you say the first company to actually create an index, the on line integrated library of humanity, also known as Google Books, gets a big prize for the government because this is something that has a great many characteristics of the public goods nature. And to have it run by a private company that faces enormous amounts of

legal obstacles akin to eminent domain and getting it done, plus attempting to finance it not based on its benefits to consumers, but instead on the hope that if you give it away for free then it can somehow be financed by selling the ancillary service of locking the eyeballs of users to their screens so you can sell ads. That's simply insane. (Laughter) No one says that public goods should be funded by having a private company provide them and then selling the ancillary service of eyeballs to advertisements. That doesn't meet any first order condition written down by any economist anywhere ever.

MS. HALL: I guess I might disagree. I'm not --

MR. DeLONG: No?

MS. HALL: I mean I have probably less faith in the government than you do. (Laughter)

MR. DeLONG: Less faith in the government's ability to even run an honest contest (inaudible).

MS. HALL: Well, now the contest -- the prize and contest method of securing innovation, I'm not sure this is the innovation I would have conducted a prize for, is very useful in limited environments where you can identify what innovation you want, as in malaria vaccines and things of that kind. But there are many innovations, including the internet, which were not identified ex ante as something we wanted.

MR. DeLONG: So that it would have been a disaster to offer a prize to invent Twitter.

MS. HALL: To offer a prize.

MR. WESSEL: Yes. Okay. (Laughter) Briefly, go ahead; I want to give Jonathan a chance.

MR. BARRO: I think one thing that's true in the data across countries about economic growth is that you can't show that R & D investment as a ratio to GDP is a positive contributor to growth.

SPEAKER: But we do it, we do it all.

MS. HALL: And you can't show that it's not, that's the problem.

MR. BARRO: I think the likely reason for that is that there's tremendous spillover of the R & D success so. Google Search, for example, didn't particularly benefit the U.S.

MS. WESSEL: I don't know, it benefitted me.

MR. BARRO: I'm talking about relative to other places.

MR. WESSEL: But that raises a question. So as you mentioned, Professor Barro, there is a sense in the campaign that globalization hurts Americans and people have different spins on that, but that seems to be where the campaign has ended up. Do you all think that globalization, trade in goods and services and immigration, is basically a way to get more productivity growth in the U.S. or do you think that's just a myth perpetrated by people who like to seek the rents that come from that?

It's a yes or no question. (Laughter)

SPEAKER: It's a question for whom?

MR. WESSEL: Anybody who wants to take it.

MR. DeLONG: All right, I'll say yes. I'll admit to being a cosmopolitan neoliberal squish, a card carrying one. (Laughter) That the United States has benefitted enormously from immigration and from international trade. You might find some countries that haven't benefitted so much from say international capital mobility. Indeed, I think my second biggest analytical whiff of my career was not recognizing the vulnerabilities that the international investment and financial parts of NAFTA would expose the Mexican economy to, which ended in 1995 which was not a pleasant time at all. But the United States is an enormous beneficiary from the fact that people immigrate and emigrate and the fact that we trade an enormous amount of stuff. There are distributional consequences within the United States, but those are by and large second order and could be relatively easily, if not solved, at least mitigated by relatively minor policy adjustments given the scale of all the social insurance we do.

MR. WESSEL: I don't think I can let you go without saying if that was your second biggest, what was your first biggest whiff?

MR. DeLONG: My confidence at the end of 2008 that the Federal Reserve's job number one was to stabilize nominal GDP around the growth path that had occurred before 2008 and that they do whatever was necessary to get there relatively quickly.

MR. WESSEL: Okay. We're not --

MR. BARRO: On the trade question. So I think you want to look at enhanced trade and immigration would be an aspect of that as being akin to better technology. You're basically expanding the total that you can produce in an overall scene in the world for given inputs. Now as Brad said, there can be losers in certain circumstances and that's just as true for enhanced technology as it is for your trade. I think it's also true that the losers often tend to be more apparent and transparent than the winners, which are more diffused. And I think there's been a recognition in this political campaign that that's a real opening for political appeal and a form of populism that I think is quite dangerous.

MR. WESSEL: Jonathan, you respond and then I want to ask you another question.

MR. BAKER: All right. So trade policy and competition policy have something in common, which is that they're both ways potentially of enhancing competition among firms in the U.S., and that would potentially help in productivity. And they also have something in common too, which is that they both have distributional consequences. People lose in competition, firms lose, people lose jobs, firms shrink and exit. And that's why it's important to marry the trade and competition with a robust social safety net, which is what I guess Brad said before.

MR. WESSEL: Right. Now, you made the case basically, if I got it right, was we've had increasing market power, increasing concentration. That means that new

ideas and new innovations are not spread as widely through the economy as we would like, that the benefits of them accrue more to the people who have this market power. Right? Close enough?

MR. BAKER: That's -- yes.

MR. WESSEL: Okay. Is this a matter of we have to have different laws or is this a matter that we need to have different people as the head of the FTC and the Assistant Attorney General for antitrust?

MR. BAKER: So the antitrust laws are very broad and general in the way the statutes are written. It's a statutory area. And the way the rules and procedures that the Courts use evolve is through judicial decisions, much the way Constitutional law changes, even though it's a statutory field. And the antitrust enforcement agencies have an important role in picking areas to focus on and also in raising the profile of competition concerns when other government agencies are taking actions that impede competition. And so the Federal Trade Commission, for example, has had a long interest in questioning state regulatory boards that are captured by the doctors or whatever and impeding competition there.

And so these things are all a matter of judicial and agency changes more than statutory changes. This is much more for the Courts and the agency heads than for Congress, although Congress could play a role if it chose to.

MR. WESSEL: Okay. We have time for some questions and I think we should -- I want to take as many as possible in the short time we have. There are a couple of people with microphones. Please tell us who you are and try and keep it short so I can get as many people as possible.

I want to start here with Alan Blinder, who I've already told you who he is.

MR. BLINDER: The hard part of (audio skip) -- why we're getting so little business investment in the last pick the number years you want to pick.

MR. WESSEL: Good question. Anybody got an answer? Don't all

speaking at once.

MR. DeLONG: Well, I take refuge in Olivier Blanchard, who taught me when I was 21 that the investment accelerator is really, really powerful in the data even though it shouldn't be in the theory.

MR. WESSEL: Explain that to people who didn't take Olivier's course.

MR. DeLONG: That Investments 2410B was an excellent course.

(Laughter) That out theories say businesses ought to respond primarily to the cost of capital and to the long run benefits from actually increasing their capital stocks, but instead they seem to much more run to a just in time investment strategy, that they tend to invest only when they can see immediately in the near future that they won't be able to meet the demand that there will be for their products unless they start investing now, and that that's there in the data, that's reasonably strong.

At least when I've done the standard regressions on business equipment and non residential structures investment, you know, it's about where you'd expect it to be in the United States and in Europe given the trajectory of real GDP growth since 2005. And you can hear more about this at the Boston Fed in a month or so at their fall conference on I think October 15 where I'll be talking about this.

For residential investment there seems to be something else really going on as well that we had --

MR. WESSEL: Bronwyn?

MS. HALL: I was only going to say I don't have all the facts at my fingertips, but my understanding is that intangible investment is now higher than tangible investment. I'm not sure why we focus on tangible investment, giving so much --

MR. WESSEL: Intangible being R & D and software?

MS. HALL: R & D and other -- yes, software and other investments of that type. A lot of what we're producing is intangible.

MR. WESSEL: But when you look at the business investment as in the

GDP accounts a lot of that's there, right? And it's still --

MS. HALL: Well, that was my question. It was whether you were referring to only tangible capital or whether you included ones --

MR. DeLONG: Anyone who trusts the deflator of the software part of the (inaudible) investments, I have a bridge to sell. In fact, I have several bridges to sell them, virtual bridges.

MS. HALL: Well, the R & D deflator is pretty close to the GDP deflator.

MR. WESSEL: So Brad argues basically if we had more demand we'd have more business investment, but you argue that that's not the right way to think about it, right?

MR. BARRO: You know, I think it's pervasive that there's a weak perspective expected return on real investment. I think that's related to the view that prospects for economic growth are weak and I think that explains at the same time why the quantity of investment is not so high relative to GDP say, and also why the real rates have returned that you see, particularly on relatively safe assets, are very low.

I think that one-fourth is central and also relates to what the monetary policy has been able to be in the sense of extremely low, nominal, and even lower real interest rates.

Now, what is the underlying source of the view that the perspective return on private investment is poor is the important question and there are a list of things that you can think of, but I don't know that we can isolate one or two particular things.

MR. WESSEL: But in that circumstance isn't that the case for large scale public investment.

MR. BARRO: I think public investment would be warranted only if you focused on things that enhance productivity. And then the question is what is that. And I'm not saying there isn't anything and I certainly wouldn't rule out certain types of infrastructure projects, but I think you wouldn't want to be doing it from an aggregate

demand perspective, and you'd want to think about sort of like highways in place and providing services. You wouldn't want to think so much about the flow of expenditure related to building stuff.

MR. WESSEL: Right, right.

MR. DeLONG: Now I do think there is a residential investment point to be made that we built maybe a million houses above trend from 2002 to 2006 or so here in the United States. Many of them, you know, five bedroom houses in the desert between Los Angeles and Albuquerque where people really don't want to live and now a great many of them are standing empty and West Nile virus and Zika breed in the swimming pools and so forth. And so we actually don't have an extra million houses overhang from the housing bubble, but since then we've been running a million houses below trend, any form of trend, any form of reasonable trend household formation for seven years now. Now the housing deficit is six --

MR. WESSEL: But Alan was talking about non residential business investment. Okay, well, that was a lot of answers. (Laughter) Why don't you go to Bel and then gentleman sitting next to him and we'll take two questions and then we'll go to this side.

MS. SAWHILL: I've been surprised that --

MR. WESSEL: Bel Sawhill from Brookings.

MS. SAWHILL: Sorry. I've been surprised that there wasn't more discussion of human capital, either in the paper or on the panel. I mean obviously labor is a bigger factor production than capital. And Martin talked about the fact that there's been some adjustment for experience and maybe years of schooling, but we haven't really focused on what years of schooling buy, what they translate into in terms of achievement. And just to be provocative for you all to respond to, saw some data recently that shows that something like 70 percent of young people entering the labor force would not be eligible for the military because they can't pass the test because of

obesity, because of drugs, because of incarceration, because of a couple of other things of that sort. So if the problem or the issue here is change and not just levels I'm not sure we've been improving human capital properly measured, and that's related to the foregoing discussion that Martin talked about, about the fact that education as a sector is a low productivity sector, but I think we also have to talk about what they're turning out and that there hasn't been nearly enough discussion of that and what we could do to improve that.

MR. WESSEL: Okay, I'm going to change my -- okay, fine, great.

MR. DANNINGER: Hi, Stephan Danninger from the IMF. I had also a question and it's related to human capital. Worth mentioning that there hasn't been this high pressure economy generated that would facilitate the reallocation of factors in labor is that one factor that clearly needs to be reallocating. Now what we know from the data is that the churning, the job changes, has declined and it has declined beyond the number of creations and destructions of jobs. It has also declined for about two decades. So the number of jobs that you would have had in the first 10 years of your career were maybe 3 or 4, now they're maybe 2 or 3 on average.

If you look more specifically at these declines -- and this is the work by Davis related to market fluidity -- it seems to be it's not just the millennials, it's not just people with lower skills, it's a decline in churning and turnover that you see across all ages and skill levels. Surprisingly also you see a decline among older workers.

So the question is not only of those that we turn out in terms of the education system, whether they have the skills, but what is changing or different that's happening that the skills don't seem to transfer as well or the people don't find positions? So I'd like to hear a view on that.

MR. WESSEL: Okay. So I think there are two questions, both about human capital. But let's think about what policies could serve us well to increase the quality of labor to improve the education system, the human capital.

And then the second question is how do we make it easier for people to move from one lower productive to higher productive place, career, occupation, so that we get the benefits of that improved human capital?

MR. BARRO: One of Martin's results was in terms of the productivity slowdown, changing quality of labor did not seem to be central. So in terms of comparing different time periods, that didn't seem to be one of the key elements.

I think in terms of thinking about longer-term economic growth, I think the quality of human capital is a central factor. And if you look at long-term economic performance across countries the quality of schooling is a central aspect of economic growth, though not something like years of education, which is a more readily available kind of statistic.

MR. WESSEL: Brad?

MR. DeLONG: I guess I have two thoughts. One is that it was 20 years ago I think I was in this room listening to a paper about how in a low pressure economy when a new job is created on average 3 people changed their jobs. As the new person is hired maybe not from non employment, maybe from employment, and then if an employment vacancy is created someone else is hired and so forth. And so there was a three-person chain of opportunity here. But in a high pressure economy it was as long as eight job reallocations happening as a result of one new job being created. And I wonder what Professor Yellen would say if she were up here now sitting here right now.

(Laughter)

Second is I know Bob is right, Martin is right, it's not there in the data. Nevertheless, I've always been very impressed by reading Larry Katz and Claudia -- I should put Claudia first, she's first author (laughter) -- Claudia Goldin and Larry Katz, on, you know, the race between education and technology and how the end of free college in America is immediately followed by a plateauing of at least white male college attendance, which then is quite rapidly followed by the big post 1973 productivity

slowdown.

MR. WESSEL: College or high school, Claudia and Larry?

MR. DeLONG: College, college.

MR. WESSEL: Okay.

MR. DeLONG: But I dare not contract Martin N. Baily about productivity, especially not in this room. It's a hazardous thing to do.

MR. WESSEL: Well, but there's no reason you couldn't have more productivity growth from better human capital even though it isn't responsible for the slowdown. Do you think that there's something regulatory in -- Bronwyn?

MS. HALL: On that point, that fact that there is little from human capital in Martin's figure, maybe because there's little change in human capital.

MR. WESSEL: By the way, Bel's point is why should we accept that as given, we could --

MS. HALL: No, no, that's my point. But the point is you can't draw from that that it doesn't make a contribution. My suspicion is that those numbers, like all numbers of that kind, are based on counting the average years of schooling, which is just uninformative on this topic.

MR. WESSEL: So if we wanted to have some policy solutions, if we believe that there's something that the government is doing or not doing that's an obstacle to the people moving from low productivity to high productivity jobs are getting the education, what would be those things that you would look at?

MR. BAKER: Well, two ideas come to mind. One is there's been tremendous growth in this country in occupational licensing requirements. And it's in the states. And if you went back to, I don't know, 1950 almost no occupations required licenses and now -- I can't recall the number, but it's something huge, like a third of workers need some kind of license to perform their job. And that's got to harm entry barriers and make it hard for people to move in and out of occupations. And it's not just,

you know, doctors, it's things like cosmetologists, different -- a whole range of jobs.

Healthcare is a big area for review of occupational licensing.

MR. WESSEL: There's a tension between consumer protection and having standards and making the system fluid enough so that we can get the benefit of it.

MR. BAKER: Yes. And the other regulatory issue is the more the safety net is frayed the less people are willing to move across the country to take a job, and away from their care networks for their elderly parents and kids and things like that. And so the robust section that is also a regulatory area --

MR. WESSEL: And in fact there's some interesting work recently on zoning --

SPEAKER: But aren't you supposed to mention North Carolina Board of Dental Examiners here?

MR. BAKER: Well, that's a recent Supreme Court decision where the Supreme Court endorsed and expanded FTC role and antitrust role in scrutinizing the composition of regulatory boards that were captured by the doctors. But the states still have the power to create boards that insulate the doctors from competition if they want to.

MR. WESSEL: We had a recent paper at a municipal finance conference we had by Dan Shoag and Peter Ganong which argued that zoning is part of the problem because it's made housing more expensive in popular high productivity regions. So it's harder for people to move from a low wage job to a higher wage more productive job because the housing has become so expensive. And it's mostly Brad's fault I think.

SPEAKER: A clear need more licensing requirements for economists, right?

MR. WESSEL: So I'm going to take two questions and then we have to end. There's one here. Anna, could you go to the gentleman standing in the back in the

blue shirt? Go ahead, tell us who you are.

MR. CARR: Doug Carr from Carr Capital. And I thought Professor Blinder's point about investment is so critical because we might be able to do more with investment in a short to medium timeframe than we can do with something like education, which has a much longer cycle. And we talked about the low expected returns on investment, but doesn't it all come from the ultra low interest rates which really set the cost of capital? They're supposed to stimulate investment, that's their intent, but your basic supply and demand is if you suppress the market clearing price of capital you're going to have a lower quantity. That's what happened in Japan, 20 years of ultra low rates, 20 years of declining investment. That's what's happened in the U.S. where net savings and net investment are at historical lows when you adjust for the business cycle.

MR. WESSEL: Thank you. And the question in the back.

QUESTIONER: My name is Andrew, a student at the University of Edinburgh School of Economics. I know it's a little bit abstract but I was hoping you guys could touch on the potential impact of artificial intelligence on productivity, which could I think change the fundamentals of the economy.

MR. WESSEL: Okay. So who wants to take the first question, is this all the Fed's fault for holding rates too low?

MR. BARRO: I think I suggested before I think the low rates are a symptom of what the equilibrium real interest rate is and I think about the driver there as being prospective low returns on investment. So it's not that it was constrained to be low, but rather that's the equilibrium, that's how I was thinking about it.

SPEAKER: Instinctive reaction, taught in part by Bob, is that you know if interest rates are too low because inflation is ahead of what expectations were when they were formed. And as long as inflation stays below two percent I have a very hard time thinking in what sense interest rates are too low, not that there might be such a sense, but I'm just not intellectually equipped to think of it.

MR. WESSEL: And, Bronwyn, when people talk about artificial intelligence how should we think about this in this context of productivity? (Laughter)

MS. HALL: Absolutely no idea. (Laughter)

MR. WESSEL: Okay. I appreciate your candor. Most people at Brookings don't let that be a barrier to answering questions. (Laughter)

MS. HALL: Yes. I suspect that what's meant is a broader set of questions. You know, the impacts of not just artificial intelligence, but driverless cars. I mean, you know, there's a lot of stuff going on that you might think would affect employment, you know, going forward. And it's kind of unknowable in the sense --

MR. WESSEL: But I thought your basic point earlier was that be careful about being gloomy about what R & D can produce because if you look back in time the things that have had massive effects on our productivity and our standard of living weren't necessarily seen at the time, so that we ought not to be too depressed that we can't see them all on the horizon now.

MS. HALL: In that sense I'm an anti Gordon. Yes, I definitely don't think it's the end of history or whatever at this point. (Laughter)

MR. WESSEL: Carrie, if I go for another question will I be shot by the conference services people?

SPEAKER: It's possible.

MR. WESSEL: Possible? All right, I'm going to take my chances. Let me take one more question. The gentleman on the aisle there, Anna, and then we'll cut. And to reciprocate for my stretching my thing everybody has to take the papers and cups at their seats when they leave. That will buy me some good will with conference services.

QUESTIONER: So one thing that hasn't been --

MR. WESSEL: Tell us who you are please.

QUESTIONER: I'm sorry?

MR. WESSEL: Tell us who you are.

QUESTIONER: Lance Henricks. And one thing that you guys haven't mentioned in context of the period since 2005 is that the U.S. has been at war since 9/11 and, you know, how does that fit into the larger picture here?

MR. WESSEL: Anybody want to take that one? Has the productivity slowdown -- could it possibly be affected by the war we've had since 9/11?

MR. BARRO: The wars that mattered in terms of spending for the U.S. go way back in terms of the World Wars. The Korean War was quite big; Viet Nam was much less than Korea. Over the period you're talking about in terms of spending it's pretty trivial in terms of macroeconomic impact as you would anticipate. \$400 billion a year for a decade or so in an \$18 trillion economy.

MR. WESSEL: So the answer is not very much.

So with that I want to thank the participants here and I want to especially thank for the questions. Every question was something that I wished I had thought of in my thing, so I'm glad we had the chance to do that.

This is a continuing conversation. I suspect we'll be talking about this well after the election, so we hope that you will join us as we continue that.

Thank you very much. (Applause)

* * * * *

CERTIFICATE OF NOTARY PUBLIC

I, Carleton J. Anderson, III do hereby certify that the forgoing electronic file when originally transmitted was reduced to text at my direction; that said transcript is a true record of the proceedings therein referenced; that I am neither counsel for, related to, nor employed by any of the parties to the action in which these proceedings were taken; and, furthermore, that I am neither a relative or employee of any attorney or counsel employed by the parties hereto, nor financially or otherwise interested in the outcome of this action.

Carleton J. Anderson, III

(Signature and Seal on File)

Notary Public in and for the Commonwealth of Virginia

Commission No. 351998

Expires: November 30, 2016