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## PROCEEDINGS

MR. O'HANLON: Good morning, everyone. Welcome to this Brookings event. Good morning. I'm Mike O'Hanlon from the Foreign Policy Program at Brookings. I'm joined by colleagues, Ben Bernanke and Mark Muro.

Ben is with the Economic Studies Program and the Hutchins Center. Mark is with our Metropolitan Studies Program. And we are here to talk today about defense, of the defense sector more generally, and its effects on the U.S. economy and vice versa.

So there's a lot on the table. And so we are going to talk about everything from Defense's role in short-term economic policy or effects on short-term growth, through the longer-term issues about Defense's role in potentially aiding the development of research and development technologies, the ways in which defense can help the economy and vice versa, but of course, also the way in which defense spending is a significant part of our budget and our budget deficit. So, it runs both ways, and we are trying to discuss all these different implications.

My job this morning, as Moderator, is first to frame a couple of the broad considerations here, before introducing Ben and Mark, and

then asking each of them a few questions. We'll spend about half the time doing that and then go to you for your questions.

I think you all know, beyond the broad interest in this question, the importance of the subject right now, Congress is soon to return home to Washington and to face the question of how to avert a potential sequester, or even a shutdown. And defense -- and debates over defense spending are a part of that conversation to be sure, while watching presidential candidates, and for those of you who are watching a lot of C-Span these days, this is not the Iowa State Fair, and none of us at present are running for President, or perhaps one of us should be.

But we are going to still talk about Defense's role in broader economic strategy and broader national competitiveness in an area where we all know these issues have been first and front and foremost in voters' minds, as they should be.

Let me, before I introduce Ben and Mark, and then go to some questions for each of them, let me just say a couple more words to put defense spending in perspective. And I'm going to try not to overdo the statistics; speaking here, out loud without a lot of visual props, and therefore not wanting to drown you in numbers. But I think a couple of them would be useful.

And as you probably know, some of you, defense is now representing, the defense sector, is representing a little less than 3.5 percent of our gross domestic product. So, just under 3.5 percent, that's a downward slope from about 4.5 percent at the very end of the Bush years, early Obama years, when the wars were at their peak, and we are headed downward now towards, perhaps, 3 percent of gross domestic product at the very end of the Obama presidency, and projections would have to climb further thereafter, although who knows what the world will bring, what the next President and Congress will bring.

By historical standards, this is a modest burden on the U.S. economy, certainly compared to anything in the World War II or post-World War II era. In the Clinton years we were also around 3 percent, but in the Reagan years we had been up closer to 6 percent of GDP, defense as a fraction of overall national economic activity. And in much of the 1950s and '60s, the figure was often 8 percent to 10 percent.

So that's just one way to put it in perspective, but also of course defense spending is still very big, it's still almost \$600 billion a year, still about a 15 percent of the Federal Budget, that's much reduced from earlier periods, but it's still a large fraction of the overall budget to be clear and to be sure.

And therefore, this is certainly one of the main ways in which the Federal Government interacts with the broader economy. So, if we just frame things in those terms I think you'll begin to get a sense of the importance of the sector.

A few more statistics, and then for the real show here; even though defense is only a little more than 3 percent of national GDP, it can be a lot more in certain parts of the country, and that's certainly one of the things that I know Mark is going to talk about, and I'll say why his interest in taking them in those directions in just a moment.

But we are just across the river from Virginia. Virginia has the highest defense concentration, or dependency of any state; 13 percent of Virginia's gross state output is defense spending of one sort or another. By the way, when I say defense in this context, I'm including the intelligence community, but I'm including also the nuclear weapons activities of the Department of Energy.

I'm not including Veterans' Affairs; I'm not including Homeland Security, just to be very clear on definitions, although you can certainly bring those subjects in the discussion, if you wish, a little bit later on.

Here in D.C. and in Maryland, defense is more like 6 percent

of state or local economic output, so it's substantial. Another way to look at it is in terms of defense's role in high technology, in promoting manufacturing, research and development, and again, here the defense sector is a bigger share of the national economy, and that 3 percent of GDP number would imply.

So, for example, in national manufacturing, military procurement is about 100 billion a year, national manufacturing output is around 2 trillion, so it's 5 percent of national manufacturing output, and a lot more in certain sectors, like aerospace, space launch, some others that we'll talk about today.

One last way of looking at it, research and development; research and development spending, by some metrics, defense and related activities are 20 percent of all national research and development. Now, that probably overstates things, and I'm not going to bore you with all the details right now, but it's probably fair to say, that as a fraction of overall national research and development, the defense sector can be attributed to maybe 10 percent of total activity in this domain.

And that's largely government money; it's also, to some extent, the money of defense contractors as they are looking to promote new ideas for the future.

So, as you can see there's a lot going on, the technologies that are at issue include not only aerospace as I mentioned earlier, cyber, propulsion, advance materials, nanotechnology, a number of other things that are going to be central in our future national competitiveness more broadly defined. So that's why today's subjects are important and, again, we are very grateful that you would come out on a hot August morning to join us here.

Mark Muro has been at Brookings now for about eight years. Like Ben, he is a Harvard Grad, he then went to Berkeley for his graduate work, and then spent a lot of time in Arizona. Certainly one of the up and coming states by many measures advanced industry, and that's going to be one of things we talk about today. He worked as a journalist, and also as a scholar in Arizona before joining the Metropolitan Studies Program.

One of my favorite studies that he's worked on at Brookings is called Launch! And it's about Colorado and its role in the space launch industry, and ways in which national government, local government, public sector, private sector, universities can work together to further the competitive advantage that Colorado already had, and that's just a case study of the broader dynamics that we'll be talking about today. He's also done a good deal of writing on advanced industries more generally in the

United States, and on green technology, and a few other things.

Ben Bernanke needs no introduction. We are very, very grateful to have him at Brookings where he is, as I say, a Scholar in Economic Studies and at the Hutchins Center. As you know, he was Chairman of the Federal Reserve from 2006 through 2014. He and I were both born in Augusta, Georgia. I won't claim that I knew him then, but I had known him since the 1980s when he was a Professor at Princeton when I was a graduate student.

Let me just say, he was one of the most supportive, collegial and encouraging professors back then, and his personality has not changed the slightest despite the fame that he's accumulated since that time. He was on the Council Economic Advisors prior to being Chairman of the Fed, and had other roles in the Fed as well.

He was at Princeton through the 1990s essentially, as Chairman of the Economic Studies -- or Economic Department, and also with the Woodrow Wilson School. So he was at Princeton from the mid-'80s through the early 2000s. His PhD was at MIT.

And for those of you who also haven't yet discovered it you should definitely check out Ben Bernanke's blog. It is one of the most entertaining, and sometimes even tricks you into learning some



macroeconomic along the way. So, I was reading, the other day, his views on whether Alexander Hamilton should be taken off the \$10 bill, and I learned a lot of fiscal policy and monetary policy in the process. By the way, the answer is no, but I'm sure he can say more later on if you wish.

But he also blogged about the Washington Nationals back in July, and maybe he'll have more to say on that subject as well, but maybe not. So, before we launch into questions let me -- since we have the opportunity here to thank Ben for his service to the country, let me, please, ask you to join me in doing that right now. (Applause)

And I'm going to begin with him, and let me say, this is not a sneak preview of his book, *The Courage to Act*, which will be, I think, his fourth to fifth book, he wrote economic text books at Princeton, he also wrote essays on The Great Depression when he was a Professor in earlier period and working with the Fed. And so this book will come out on October 4<sup>th</sup>, and it will be, I'm sure, much acclaimed and much watched, but there will be different events about that, but today is not one of them.

Today, Ben, I would like to begin by, first of all, thanking you again for joining us with this discussion, and asking you, initially, just how do you think about the size of the defense budget, and the appropriateness from the economics perspective?

MR. BERNANKE: Thanks, Mike. And thanks for inviting me to speak on this important topic today. We have known each other for a long time, not an investor, I was a lot older than you, but at Princeton, and I've followed Mike's work ever since then, I always found him to be one of the most thoughtful and balanced writers about national defense.

Also, full disclosure, obviously I'm not a defense expert, I'm an economist though, and I hope to be able to bring that perspective to try and help us understand through all the Military Defense in the U.S. economy.

You asked about the size of the military, and you've cited before, a whole bunch of numbers, the total spending, obviously those numbers are important for thinking about the amount of resources that are being used in the national defense. But I guess I want to start by being anti-economic and saying that those dollar figures are not necessarily a very good measure of capabilities and potentialities.

One number, just to take the opportunity, one number that bothers me a lot is the journalistic tendency to say, well, the United States spends more than rest of our potential competitors combined, therefore we are militarily secure. And I think that's obviously a mistake from a lot of ways, we have different goals, different needs, but in particular there is the

problem of making comparisons across countries using exchange rates to try to evaluate qualitative differences.

So, if I'm comparing the living standards of the United States and China, I don't want to look simply at exchange-rate-adjusted GDP per person, instead I want to do what economists call a purchasing power parity comparison, which means that I want to take into account that labor is much cheaper in China, and therefore haircuts, for example, which may be, who knows, of equal quality to those you get in Washington, in China are much cheaper, and contribute much less than the GDP.

But nevertheless, any attempt to compare the standard of living of the United States and China, needs to take into account those differences in costs. And the same thing applies to the military, and the comparison and labor costs between U.S. and China, and a good case in point. I did a little bit of work before the session to try to figure out the relevant numbers, and what best we could find, with Peter Olson and I, and my Research Assistant and I worked on this a little bit.

And the best we could find is that the U.S. military calculates that we spend about \$110,000 for each active military member, we are talking now about pay and benefits, we are not talking about training, we are not talking about equipment, we are just talking about some of the

personnel costs.

We spend about 90,000 per person for each civilian member of the defense effort, in comparison, the per worker, an urban worker in China earns about \$9,000 a year, and so I don't know exactly what the Chinese personnel costs are, but they are obviously a lot less than \$110,000.

So, this is an example of how, just looking at, you know, dollar figures, or when the new figures can be deceptive, and this is something -- by the way, this is something that the defense industry, the defense specialists I think understand, the Pentagon, and the State Department, do calculate PPP comparisons, and you find in that case, for example, that under PPP comparisons instead of being 45 percent of world military spending, U.S. military spending is more like a third of global spending.

So these comparisons are important, ultimately, you know, I think we can -- we should understand, and I'm the right person to say this, that economics can only take us so far, and then in the end, in thinking about the size of the military, and our resource expenditures, we need to think about our foreign policy goals, the threats we might face, the capacities we need to develop.

And ultimately, of course, the long-run budget constraints that we often do face, but this is just a small pitch for thinking things in purchasing power parity terms and in more utilitarian terms rather than simply dollar function; so that's, I think, an important initial point to make.

MR. O'HANLON: Thank you. And we'll come back to the defense budget relative to the broader government budget and its fiscal gain a little bit later, but let me ask you first about something that you had to deal with in the last five, six years, which is, defense spending coming down, at a time when you were trying to, along with other policymakers, figure out a way to get the United States out of recession, how were those dynamics linked? Did the defense cuts complicate your task, how much did they affect the way you looked at the problem?

MR. BERNANKE: Well, so, defense spending, and military spending is connected to growth through a number of different mechanisms, and you are thinking specifically of what you would call the Keynesian demand side mechanism. How much does spending on military functions affect the total demand in the economy?

And then particularly a situation where you have unemployment, high unemployment or recession; you know, the standard

textbook macroeconomics says that increase spending will increase activity, you know, by adding to the demand for goods and services.

Generally speaking, I think it's best to keep, you know, the military preparedness goals separate from these short-run cyclical considerations, not to say they are not sometimes important, the most obvious example was, of course, World War II, where this enormous national effort in World War II brought the U.S. economy out of The Great Depression, and had an enormous impact on total output and then lasted even beyond the war.

A more negative example would be the 1960s, when the Vietnam effort contributed to the overheating of the U.S. economy, and led to the inflation, in part, that we saw in the 1970s. So, it can be important but there's no sense necessarily in which the changes in the defense spending will be -- you know, move in the direction that you would want from a purely cyclical point of view.

Recently, you know, military spending is now a much smaller share of GDP than it was, obviously, in the '40s, or certainly in the '60s, and so the effects are much smaller but they have been -- they were mildly negative, I think in the last few years. Starting around 2010 the decline, the draw downs in military spending were a negative in U.S. GDP

growth, up to a point of three or four-tenths on growth, GDP, not enormous but noticeable.

And that was in turn, how to deal with the drawdown of the wars in Afghanistan and Iraq, but also, in part, due to the deliberate budget cutting that took place in 2010; in fact, the worst year in terms of adverse effects was 2013, which was a very negative year in terms of fiscal contraction and the effects on our economy.

So, I guess I would summarize by saying that -- first that the effects on the demand side growth the last few years have been mildly negative. Part of it was completely understandable, certainly you wouldn't want to determine the resources devoted to Iraq and Afghanistan in any way by U.S. cyclical conditions, but the other part I think was, to some extent a self-inflicted wound since all these cuts were made for, presumably, economic reasons, but in fact they went mostly in the direction in the sense that they were a mild negative in an economy that was trying to recover.

We'll come back to it I'm sure but, you know, there are many other connections between military spending and the defense establishment and economic growth, but on the particular, this particular narrow case of the effects on total demand, it's lessened the deal than it

used to be because defense spending is a smaller part of the economy, but I think, unwisely, that the cuts in military spending, which were not motivated by defense needs the last few years, were actually a negative in terms of our economic recovery.

MR. O'HANLON: So, as you mentioned about specific sectors, and getting into that in a little bit more detail, I'm looking at national research and development, I wondered if you specific thoughts on which technology sectors were most important where defense does contribute, or just generally had to think about this problem.

We were talking earlier and many people here remember of course that in previous eras, Defense had a huge role in creating advance technologies or promoting any and everything from nuclear technology in the 1940s, helicopters, advanced jet engines, a number of other technologies, the invention of the Internet, many other things, Defense was crucial, and then of course NASA contributed as well, if we thing more generally about the Federal role.

Today it's a much smaller fraction of overall research and development spending, just as defense is a smaller fraction of GDP, do you still think there are areas where it's particularly important?

MR. BERNANKE: So, broadly, we were talking about the



growth connection through demand, and I think the most important in the medium and long term, by far the most important effects of military spending are on the supply side of the economy, and that works to a number of different mechanisms, including training and other things, but by far the most important, certainly in the United States, has been the linkages between defense, military, appropriations and broader technological trends.

That's one of the major sources of U.S. growth over time, and we will remain technological leader, that's one of our national strengths, and so it's very -- first of all it's important to try and understand the relationship between what the Military is doing, and what's happening in terms of productivity and technology. So, let's just specify that that is a critical issue, and we need to understand that.

Now, from an economist point of view, there's actually a sort of a standard argument which says that the government ought to be conducting basic research, and that goes back to Ken Arrow, Nobel Prize Winner, Mary Summer's uncle, so that's another qualification he has.

The argument basically is that both basic research, scientific research, they may have tremendous economic returns, but are very hard the scientist or the engineer to capture, because this is just basic broad-

based research, and so there is a case for the government to subsidize that kind of basic research through grants, or through direct activities and so on.

So that's kind of the intellectual case for government research. The thought is that now if you look at the composition of Federally-response research, most of it is not basic, basic fundamental science, most of it is what you might call mission-related research, that is rather than studying the basic properties of items, you know, most of the Federally-funded research will be about how to incorporate our understanding of, you know, nuclear forces into a missile system or whatever it might be.

So that's a more subtle question, given that we have much more focus on mission-related research as opposed to basic research, you know, what's the connection between what the government does, and what the private sector does? As you pointed out the Federal R&D is big, it's about 40 percent of total U.S. R&D, about half of that being military.

It's been coming down over time, but it's still a very big component. Now, if you look at this area, a lot of what you get is the anecdotes, and a lot of great stories going back to the Manhattan Project, and so on, and there are many examples of Military R&D, or Defense-

related R&D which has been very productive on the private sector side.

An example that I like is laser technology which begun as a military application, but there has since been something like 55,000 patents related to laser technologies and the things that come out of that including laser surgery, and barcodes and DVD players, and a whole range of things that have come out of that.

Everyone is aware of the nuclear components, aware of the Internet that came out of DARPA and so on. So, obviously they are plenty examples of where military technology has been extremely important for private sector growth and technology.

Now, that being said, you know, economists have tried to identify the channels, and they send the work in both directions; on the one hand, the spending by the government can create capacity in the economy, you know, create more training for scientists and engineers, who can work in both military and non-military areas, can pay the fixed costs of underlying research, and there's a lot of complementarities between the things that happen in the military sector and also happen in the private sector.

On the other hand, you can think of ways in which military research is counterproductive. For example, a lot of it is secretive for

classified reasons, that it can't be shared easily with the private sector. In some cases it uses scarce resources, specific scientific resources, and obviously if they are used up by the military, they are not available for the private sector.

So it goes in both ways, but the studies, I think a fair summary would be that the studies have looked at the empirical relationship between R&D spending at the military -- on the military and R&D spending outside show a positive relationship. The complements are probably somewhat stronger, and then the substitute effect.

So, every dollar of extra military R&D, not only does not displace a dollar of private sector R&D, it probably adds 0.20 or \$0.30 of extra private sector R&D because of the things that learned in the Military application. So I think that if you are going to make a case that U.S. Military preparedness and spending have made a positive impact on U.S. growth, it would probably be through the R&D linkages and spillovers, which seem to be positive, and seemed to have been beneficial.

So, I think that's an important finding, and one that probably argues in a sense, particularly from more basic research which, again, the economic case is very strong. But finally, just to wrap up on this, I think though that whenever we talk about the effect of some new government

spending program, you always have to ask yourself, was it kind of factual?

So, instead of spending money on specifically on military purposes, if the same money was spent on basic science that would probably be a better strategy, but all our sequel, you know, the evidence does seem to be that military R&D spending has had positive spillovers on private sector spending.

MR. O'HANLON: So, a related subject, manufacturing and obviously, closely linked in with research and development, but I wanted to ask your thoughts on the Defense Secretary's role in natural manufacturing. As we all know, and please correct me if I'm summarizing incorrectly, but U.S. manufacturing output has been, and I don't know, a small upswing lately, probably due to the shale energy revolution, and improved competitiveness, but over time, certainly the number of manufacturing jobs, has gone way down, largely because of robotics and automation, but we've been concerned, you know, throughout our adult lives about declining American competitiveness in some industries and Mark writes on that too.

So to what extent does defense play into this? Does it help counter that trend? Is it only going to be helpful in certain specific areas like aerospace, and how do you think about Defense's role in showing up

at the American manufacturing base?

MR. BERNANKE: Well it's important to understand, you know, why manufacturing jobs are going down, and you touched on it with the robotics comment that you made. The amount of -- the share of U.S. output, that is manufacturing has actually not changed all that much over time. We remain a very big manufacturing economy and exporter, but the number of manufacturing jobs has gone on a lot because manufacturing productivity has, you know, grown so quickly that it essentially takes far fewer workers to build an automobile today, that it did, you know, 20 years ago, or 40 years ago.

And as a result, with a lot of implications, the number of -- particularly lower-skilled manufacturing jobs has been greatly reduced. If you think about the relationship of that to defense, other than, of course, the fact that defense isn't, indeed a major industry and one that in some sense has to be onshore, at least most of it has to be onshore.

I think that it's important to understand, again, that what's happened in the U.S. manufacturing is not, in some sense, that it's being gutted out, what's happening instead is that we are increasing productivity with the lowest number of jobs that are created, and also moving up the value-added chain. So we don't make a lot of, you know, simple

manufactured goods anymore, we make more sophisticated machine tools and specialized equipment and so on, but to a couple of consequences. One is that we are not heading back towards the manufacturing sector which can provide jobs for low-skilled people. It's much more so that in the past in industry that is going to provide jobs for higher-skilled workers and higher-paid workers.

What that means is that the relationship between defense and U.S. manufacturing is probably mostly a complementary one, but for the same reasons I was talking about in terms of R&D, that the extent that defense manufacturing leads to more sophisticated products and technological events, it's going to probably support U.S. manufacturing more broadly to some extent, but not -- it's not going to take us back to the world of the 1950s when you had, you know, assembly lines with hundreds of workers, you know, building a car.

So, it is probably a mild positive. Again, it's always a question of what the counter-factual is, you know, where is the money going otherwise, but it's not taking us back to the pre-technological evolution days of much more labor-intensive manufacturing.

MR. O'HANLON: And that leads, naturally, into the broader question about Defense's role in the labor market, and we were talking

that earlier as well, you just touched on the half concerning manufacturing and production of equipment, there's obviously also the direct employees of the Department of Defense, and again, most people in this room will know, but a quick reminder, they are in three broad categories, there are about 1.4 million active-duty fulltime uniformed personnel, a little bit less than that right now. I guess about 1.4 million.

There are almost 800,000 fulltime civilians employed by the Department of Defense, fulltime government workers but not in uniform. And then there's about 900,000-some in the broader Reserve component of the U.S. Military, part-time soldiers, sailors, airmen, airwomen and marines.

So those three categories together represent a couple percent of the U.S. workforce, and then of course there's the manufacturing side of things, how do you think about Defense's role in the labor market?

MR. BERNANKE: Well, you know, we are used to thinking of job creation as a good thing, which of course it is but, you know, you want to avoid sort of the mindset of the Congressman who wants to have a base in his district, right, because the creation of jobs through expenditure by the government, it's creating jobs, yes, but the output of



those workers is in, some sense, is not contributing to the standards of living, it's contributing to a different set of outcomes.

So, clearly the fact that we have whatever, 1.4 million active-duty soldiers is, in some sense, a cost to our economy, meaning their services are being -- obviously they are important, I'm not in any way saying there's too many or too few, but their services are, you know, being used for Defense purposes, and are not, obviously contributing to the private economy.

And so, we shouldn't be confused into saying, oh, the more people we employ in the military the better, obviously, on the one hand you are creating jobs, and on the other hand the output of that, those jobs are not contributing to private sector standards of living.

So, it is a real cost that we have to bear the fiscal and economic burden of a large military, there may be good reasons for it, but it's a cost not a benefit. But a related question though, one that I think is really important and it goes back to this issue about the linkages between defense spending and R&D is, you know, when you see the Army ads on television, it's like, come in the Army, we'll train you to be a computer scientists or something, and you go out, and you know.

And so it's an important question, one that Congress has

looked at in great detail, is to what extent does Army or Military experience add to training and skills of those workers, so that when they go back to the private sector, do they bring with them, you know, skills and earning potential that they otherwise would not have had.

And to the extent that that's the case for individuals, that's a bit of an offset for the fact that the -- you know, services were not available to the private sector while they were in the military. Now, there've been a lot of real interesting studies of this and, of course, as in economics, nothing is ever finally settled, but the evidence appears to be though that there really is not an advantage.

I mean, if you are -- if you go into the military at age 18 versus an identical person who stays in the private sector and, you know, takes a private sector job, 10 years later if you leave military your skills and wages are probably not going to be quite as high, on average, as the private sector person.

But one of the great studies of this, one of our colleagues at Princeton, Josh Angrist, who I taught in macro, Graduate Macro, he didn't do this paper in that course, but he did a great paper where he looked at people based on their draft lottery number. Mine was 335, by the way, thank God.

So, if you had a very low draft number you had a high chance of being drafted. If you had a very high number you were not going to be drafted, and so by using that as kind of an instrument, he was able to figure out, you know, how otherwise similar people fared in terms of their long-term labor market experience, and what he found was, again, as I said before is that people who, you know, went into the Army, and they came back out, that they were -- that their skills and pay were actually a little bit below their counterparts for a while.

But over time, there was some tendency to move back towards average, but there was not really a benefit. Now, people have broken this down, and it could very well be that the Vietnam era, you know, was a different thing from the all-civilian, or the all-volunteer military. And probably some difference between having, you know, being trained in combat versus being trained in electronics, and there is some difference there.

But unfortunately, there doesn't seem to be much evidence that the training implications are probably a positive from the Military. So, you know, overall the labor market, the people who go in the military have similar or maybe slightly worse outcomes. For example, if you are a veteran who left after 2001, your current unemployment rate is about 7.1,

7.2 percent, as opposed to a national 5.3 percent.

If you are a veteran of any age though, your unemployment rate is a little bit lower than that, but I think the best way to think about it is that the military takes, you know, our young people and uses them for good purposes, but it's not really adding much to the private sector, you know, through training or other experience.

The last comment is, there's a whole interesting area which has not seen as much research which I think is worth looking at, which is the relative experience of reservists versus, you know, longer term, you know, permanent station to people. Reservists on the one hand, they don't leave the private sector, so they are able to continue to accumulate experience.

On the other hand, their work experience is disrupted, you know, by being called to duty, so I think it's a really important question that probably hasn't got enough attention is, you know, what's the right combination from an economic point of view, what's the right combination of active duty versus reservist, you know, by a military, and I think that's a question we don't really know the answer to yet.

MR. O'HANLON: One last question for you, Ben, in this round. I may ask you later, or let others in the crowd get at the issue of

comparing the role of the Fed Reserve Chairman to Military, Joint Chiefs Chairman or SecDef for some of the political sensitivities and delicacy, we'll save that for later. But before going to Mark, I do want to ask you one more question to wrap the economics discussion together.

Which is, when you think about the nation's deficit, which of course, has come down, but perhaps only temporarily, and obviously our debt is fairly big compared to GDP, and Defense's role within that. What are your broad observations; first, on the size of the deficit, and trajectory of the deficit, but then also Defense's contribution to the deficit?

MR. BERNANKE: So, it's important to start with a couple of just general observations. One is that the deficit obviously soared, you know, during the recession of course, because tax revenues went down by so much, so the ratio of national debt held by the public to our GDP went from about 35 percent before the crisis and the recession to about 75 percent today.

So there's been a big increase in the amount of debt outstanding, and that has longer implications for our ability to service any kind of, you know, government-provided expenditures including, of course, military. But the other thing to understand -- a couple other facts to understand, one is that while there's a lot of talk about the long-run

problems of the deficit, they are really long run they are not that short run, so I said the debt to GDP ratio in the U.S. today is about 75 percent, the Congressional Budget Office projects that in 10 years, it will be about 77 percent.

So it's going to be pretty flat. The next few years, deficits are down now to about 2.5 percent of GDP which is pretty low, so we are not looking at a big increase in deficit over the next 10 years or so. Beyond that time, then the Congressional Budget Office has deficits and debt increasing more significantly, and the answer to that question, why that's the case, it's one of the great aphorisms about the Federal Government is, the Federal Government is basically an insurance company with army.

It's the insurance part that's the costly part for us, because the projections of big increases in deficit 10, 20 years down the road, are mostly tied to the health care costs, Medicare, Medicaid, and are based on the projection that health care cost will continue to rise at the rapid rate we see in the last 20, 30 years.

That turns out to be the key issue in terms of longer and deficit planning. If health care costs do not grow so quickly, and recently there's been a little bit of good news on that front, then deficits will not be a problem, you know, within our lifetime, anyway Mike. But if the health

care issues continue to be severe, then that's going to a constraint on long-term ability for the government to provide various services.

But I think the bottom line to draw from this is that it was -- I think it was wrong, it was a mistake that during -- with the sequestration and those things, that there were these inefficiencies, there were these steps taken to correct the deficit in a very short run, that probably had long-run cost in terms of preparedness, in terms of cancelling system that were mid-way, and that sort of thing.

So I would just conclude by saying that there's nothing in our deficit prospect that should make us distort our defense planning in the near term, and we should be making our decisions based on medium-term considerations, based on what makes the most sense in terms of efficiency, for achieving our objectives, there is no reason to be taking draconian steps right now to -- that will have long-run and costly implications for our defense posture, just for deficit reasons. The deficit is a longer-run issue and we should be thinking about it in the longer-run context.

MR. O'HANLON: Very helpful. Mark, I want to now ask you a couple of questions. You've listened to Ben, so there's a lot on the table. And I just wanted to ask you to reflect and react, but also

specifically to, again, bring back your interest and focus on advanced industry, and on some key geographic sectors in the United States where some, the kind of partnerships you've written about may involve Defense as a player. Just how would you interpret some of these questions, especially on the issues of research and development, advanced industry and manufacturing?

MR. MURO: Absolutely. And thanks, Mike, for having me. Great to be here with you, Ben; and the whole Foreign Policy and Economic Study Team.

So, right off I'll just -- really appreciate the focus on what defense actually is here rather than some of the bumper stickers. And I'll just add, to begin with, no doubt it's an important component everywhere, for the most part, but I do want to make the point that, though there are 4,000 bases out there, in hundreds and hundreds of communities across the country, defense itself there is widely -- from to place.

You know one of the metropolitan -- I work with Metropolitan Policy Program, we are very interested in sub-national variation and, you know, you touched on it, but if you look at the projected defense purchases, detailed by industry and state, DoD publication, you do get to quite wide variation of the local importance of this economy.



You know, I think you touched on this a little bit, we don't think where defense doesn't matter very much, too often, but in fact, New York, Oregon, Minnesota, Michigan, West Virginia, it's less than 1 percent of state GDP, you know. And then as you alluded to Virginia, Hawaii, Maine, Mississippi, D.C., Alabama, Kentucky, Alaska, 66.5 percent, so a significant local importance.

So we are having a conversation which needs to have multiple conversations when we talk about economic impact, and it's not a uniformed -- you know, it's not flat across space, it's spiky, it's hugely important in a short list of places, massively crucial and occurring in certain places like, you know, like Virginia for instance, or Kentucky, Colorado.

So many places, absolutely right to be thinking about, you know, very concerned about the local economic impacts, but many places not so much. But I'm less worried about these aspects of the economy, the defense economy, than the extent to which U.S. Military expenditures in the absence of systematic thinking about our economic base, remain the nation's main driver, or a significant driver has been suggested of high value industrial activity.

Especially technology innovation, I think while these -- the

effects may be declining over time, we are talking about, you know, 70, 80, 90-year history of investment and experimentation that has left us with a critical sense -- set of industries. So, what we need to think about, and what I'm going to argue here is that we need, as we think about the size of the military posture, consider the rest of our economic strategy, to ensure that we protect in DoD's industry.

So, you know, my group here at Brookings, has identified what we call the nation's advanced industry, 50 high R&D, high STEM -- in STEM-intensive industries that inordinately anchor the economy, that's not just a claim, these inordinately drive patenting, inordinately drive innovation productivity growth, exports, and so on.

So they really are -- you know, by only about 10 percent of the economy in terms of employment, but a significant driver of our global prosperity. You know, so ranging from aerospace, semi-conductors, medical device, manufacturer, but also -- so the manufacturing side, but the number of energy initiatives, renewables, stocking is critical here, and then high-tech services, and computer services design -- computer system design.

So, the point here though is, these reflect decades of productive interactions between the military and the private sector,

including those secret pieces, including inadvertent spillovers of knowledge, they've reflect decades of strategic capacity building, maybe inefficient, maybe not. And then decades of directed DoD procurements.

So here, I'm looking at the different channel of reaction. And I'll go further, in the absence of, you know, a consistent urgent, non-military industry strategy, such as many of our competitors, whether it's Germany, South Korea or China have had, the essential countries have functioned as something of a stealth industrial policy, for better or worse, are going on balance, they have been helpful.

The defense budget has turned out to be the only place that one could argue for and deliver certain kinds of useful economic industry innovation, because somewhat beyond criticisms for a long time. So, in that sense, since World War II, this has arguably been the nation's study as the most creative supporter of technology progress.

You know, while I won't bore you with a lot of the anecdotes that, I think, Ben alluded to, but World War II, key source of funding for foundational scientific research. The Manhattan Project created the National Lab Systems, arguably one of our most important distributed networks of core piece of innovation system.

DARPA, with its experiments in new formats of blue sky

incentive thinking, establishing, in many respects, the startup as an idea, promoting decentralized networking innovation, sophisticated kind of initiative that is, I think, not just in its spending, or its science, led to structural approaches, structural innovations.

And clearly, we just invest -- heavy investments in emerging fields. Whether it computer science, material science, solid state atomic movements, data analytics, robotics, the list goes on. And then it's deployed huge procurement budget, so this is a different, in this sense, not just early-stage R&D but creating markets for new technologies; and this regarding my friend, Daniel Sarewitz, Arizona State University, stresses the special attributes of military innovation.

You know, this is a focus-mission, enduring ties to the private sector that have been a distinctive feature of the military enterprise. And then this role as an early customer for advanced technologies. Whether it be nanophotonic microprocessors, artificial intelligent software, data analytics, and to some extent, the military continues to not just make the early investments, but to be a discerning, strategic early customer.

So, that's what I worry about. And the question isn't simply to maintain the military effort at its size for perhaps inefficient to maintain

in -- perhaps inefficient innovation and industry benefits; but it's, you know, it's about making sure that we look at the overall economy and consider other, maybe, civilian interventions that would parallel.

MR. O'HANLON: You make a really good point, which is, you know, in an ideal world we would have government-sponsored basic research. And many of these you talk about would be coming out of long-run considerations for technical change and the need to maintain technological leadership. Our political system is not good at investing in long-run --

MR. MURO: Right.

MR. O'HANLON: -- making long-run investments with uncertain payoffs. And the political impact of military R&D is that people can concretely see, you know, the effects that military spending has a privilege place in the political system.

It's unfortunate, in a way, that's the main reason that we are getting this, that, again, ideally we would have a much broader-based program that would look at both non-military and military uses, but this appears to be one of the main functions of military spending is to create a political basis and support for it.

MR. BERNANKE: I mean, conceivably -- I think to date, the

necessary interventions have migrated to the defense budget for delivery, and I think the request here, or the call here, I think very much in your spirit, is to have a broader discussion in which the defense budget is simply a component of a coherent national stance. Which maybe *laissez-fair* in the end, but I don't think it would be.

MR. O'HANLON: Just one more question from me too and then we can involve all of you in the discussion as well. As I hear you, Mark, and building on what Ben just asked, it sounds like you are impressed by the ways in which the defense sector has contributed to national economic growth, but also where of at least two limitations. One, defense is coming down, as a percentage of national resources, and therefore it's not going to be as adequate as is might have been.

And secondly, we just need a better civilian strategy to complement, as Ben was saying, because I read your reports on advanced industry, and you are not that happy about where we stand internationally, and competitively right now.

So, am I correct in hearing that what you'd like to see is sustained solid support, in some sense, for defense, not throw away the baby with the bathwater, keep that part but complement it with a stronger civilian strategy?

MR. MURO: I think from a defense economy point of view, I'm somewhat agnostic. The question is, are we going to maintain an economic posture, an economic stance that clearly, centrally we'll have a public, private collaborative element, and this is not an argument for heavy-handed industrial policy, but it is about, you know, a degree of public investment, public creativity and experimentation in partnership with the private sector.

MR. O'HANLON: Let me ask just one follow up, to maybe give a couple of the highlights of what you wrote about in regard to Colorado as a case study, and then maybe Ben has a follow-up, and if not, we'll go to all of you, but I would just think that to make this concrete, you could maybe tell a little bit about what's in that excellent report, from I guess now, two years ago?

MR. MURO: Yeah.

MR. O'HANLON: Please?

MR. MURO: Well, we came on the scene there at a time of consternation, late 2011, concerned about the looming discussion of sequestration, and found regional economic development officials, various military leaders, and progressive Democratic Governor, John Hickenlooper, very concerned about threats to a front range complex of

basis that harbor significant high-end data, missile preparedness, communications capabilities that have created along the front range, you know, an extremely real exemplar of the kind of side effects of economies that can grow up in regional ecosystems around these kinds of complexes, than in this case.

You know, they are built up not for economic reasons, but had yielded, you know, a major aerospace space defense complex that had been to move towards new commercial applications, and some of the cases had begun to evolve away from government contracting all of it.

So we arrived, looked at this, surveyed especially the space, aerospace piece, and recommended acceleration wherever possible of the move off the dole and into the commercial space location, where they have, you know, companies that are delivering earth observation technologies that you all have, are using on your cell phones when you use Google Maps, for instance.

Major companies, whereas services being hung off of technology and launch capability were allowing significant and commercial growth. So, a strategy emerged there, and this is a state, you know, it wants to make sure that a continuous evolution, wants to protect the base, but also move into commercial applications, a kind of diverse expectation



strategy.

But I would just hold this up as an example, I think, of another factor which is going to be the kind of response of sub-national actors around this huge Federal activity. This is a state that created industry champion to both watch the military budget, but also work to build networking among various space-related industries. Wound up creating a \$200 million accelerator program for supporting small startups in the space.

So I think this is another factor that we are going to see, a sub-national response to changing the divisions of labor. And in this sense, you know, quite productive I think, and may represent the first glimpse of a kind of new division of labor as the defense budget shrinks.

MR. BERNANKE: When you look at regional development though, there is always the question of how much of the motivation is basically, you know, there's some game type where parts of the country are looking for additional Federal funding ultimately the expense of all the taxpayers. So certainly, given the interest of local politicians, it's going to be part of what's going on.

At the same time, I'm not really trying to disagree with what you are saying because technological change and innovation are

ultimately local events, involving networking among different groups, private sector, universities, you know, defense and so on. So it has to happen somewhere. So I think I agree with you that this is just an example of the positive spillovers of defense spending R&D, but again, as we try to evaluate these types of projects, we have to take into account, sort of the regional benefits, vis-à-vis the national benefits, not always the same.

MR. MURO: I find healthiest there, in fact, you know, the desire to diversify in the movement, it's you identify commercial adjacent opportunities. I mean, clearly there's a dimension that's defending the base that is legitimate, and I think about acceptable, but I think the accent in Colorado seems to be on diversification. And we see this all across the -- in many of these places with, you know, 6 percent plus, shares of the economy, and in Defense, they are looking at it that way, I think.

MR. O'HANLON: Excellent. Well, I'll tell you, please wait for a microphone, I will -- we'll go up here, the woman in the green shirt first, and then we'll do a little bit this third row, just for a second. Please identify yourself, and please just ask one question, if you could, so we make sure you have enough time.

SPEAKER: Thank you so much. Jennifer Chan; Reporter

with Sansha Media Group One of TV Network in China; I have a question to Mr. Bernanke. So, do you think -- it's about renminbi's devaluation, so do you think that China's move to devalue its currency is going to exacerbate the U.S. trade deficit? And is there is any negative impact to you as economy, and will be related to the Fed to raise the interest rates? Also do you think the floating of the exchange rate of renminbi will do any help for it to join the SDR? Thank you so much.

MR. O'HANLON: Before I give the floor to Ben, I'm going to say one thing I should have said sooner about ground rules, which is that I'm going to try to protect my colleague, and he doesn't want to answer because it's not directly pertinent to today's, and/or it might be relevant to his book launch, we are going to give him the right to defer. But having said that, do you want to --

MR. BERNANKE: You are confusing me with the Chairman of the Fed. I think, certainly I will just say that, you know, in some sense what China is going is what we've asked them to do, which is to let more market forces play a role in determining the value of the currency, and that's -- we are seeing the Chinese currency appreciated very considerably because of it's being tied to the dollar, and that has put pressure on the Chinese economy.

So, this is a liberalization that is actually moving in the direction of more market determination of the exchange rate, which is something that the U.S. has actually asked for, for a long time.

MR. O'HANLON: Next question, here, the same row please.

SPEAKER: Bill Mann; Penn State University. Mark, in your findings what impact have universities had on the overall growth of the economies in these high tech industries, such as aerospace? And what have you found is the best way to leverage the skills and talent in universities to contribute to the National Defense and overall economic growth?

MR. MURO: Great question, and let me provide one note of pre-history, which is that to an extent in a number of circumstances, the military has actually created the university department, for instance of -- in computer science, for instance, or invested in building the high-level academic knowledge. So that has been another beneficial set of activities.

In this ongoing interaction between, I think, big government, in the form of the military and, you know, private universities, public universities, so absolutely crucial, clearly in building the skill sets and creating much of the IP that has fueled this system.

Yeah, I think it's absolutely crucial, I think that that has been a continued dynamic, and we see the interaction also between Defense early purchasing and early program development, has been also a way of employing people coming out of the universities. So I think you get these dynamic local ecosystems that it's almost as a side product, create these advanced industry ecosystems as well.

MR. BERNANKE: We routinely, when they rate the top universities in the world, the U.S. routinely gets like three-quarters of the top 25 or so. It's a huge national asset that we need to make sure we are making best use of, and we become -- by the way, we become much better at interacting between universities and the private sector and government. That's become a much more efficient process in the United States, and that's something we should, you know, take advantage of that.

MR. MURO: I think the military history has been important in --

MR. BERNANKE: Yes.

MR. MURO: -- working out those patterns, you know, and I think that's now becoming a standard way of operating.

MR. O'HANLON: Say, in the third row?

SPEAKER: Thank you so much. I'm Yasser Alfaharani, ICD

Fellow. My question is to Mr. Ben. To what extent do you think the Middle East situation, the Middle East and also Africa, you know, ISIL and the Boko Haram and these groups. To what extent do you think they have affected already the defense spending and military budget of the United States? Thank you.

MR. BERNANKE: Well, I'm going to ask you to jump in on this, Mike.

MR. O'HANLON: Yes.

MR. BERNANKE: Because Mike has done great work in trying to evaluate specific threats and specific objectives in the Military; and pointing out that you need different types of capacities for different situations. I mean one of the things, and I'm speaking totally as an amateur here, but one of obvious things about warfare in the last few decades is how little of it, is sort of between large national armies, and how much of it, is sort symmetric warfare of various kinds, dealing with lack of information and embedded gorillas, and all those sorts of things.

That obviously is -- I mean, there was a story this morning that had the U.S. beginning to use much more drone monitoring, for example, so that the set of technologies that you are using, and the set of military strategies, obviously, has to adapt to the nature of the challenge,

and we are seeing a change there. Mike?

MR. O'HANLON: On two points. One of them is economics, so they need to be corrected here in a moment, but the economic observation, is if you had told me 20 years ago, 30 years ago, you could have this much turmoil in the Middle East, and oil prices would have taken a dive, and sustain that, I would have been flummoxed. And I would have said, Professor Bernanke, what is it about your course that I didn't study; because there's something going on here that I don't know how to predict.

So that's one observation, which obviously we know some of the answers, but I'm still stunned that this could be true. But secondly, I'm also somewhat surprised, that so far, we really haven't changed our defense posture very much. So, the defense budget cuts have continued, the drawdown in force has continued, very modestly, and the size of the force, but it's still been in a downward direction.

And certainly, General Odierno, who retired last week as Army Chief of Staff lamented, to some extent, the degree to which the army is suffering the brunt of these reductions, and that hasn't changed in official planning since the rise of ISIL. I think your question was primarily about the last year to two years, and the dynamics we've seen. So that would be a second point.

My third and final point is, however, pushing somewhat in the other direction, is that I would expect Ron Paul Bernie Sanders, notwithstanding, that most of the political energy in the next year-and-a-quarter in the presidential election, is going to be the push to the right in defense terms, and that we will see major candidates of both parties advocating at least modest increases in defense spending, recognizing that threats have gone up a bit, and we haven't even talked about Russia and Ukraine.

And as Chairman Bernanke just said, we don't have to be so rushed in our concern about bringing down the deficit, as to ignore what might be needed for broader national security purposes. Now, I'm not suggesting we are going to have a 2015 or 2017 equivalent of the Reagan buildup, but I think we will see modest real growth proposed by either party's presidential candidate, once we get through it.

The next six weeks are interesting in Washington because of the looming sequester. And in fact, I'm a little surprised that there hasn't been a better effort by the two branches of government responsible for this, to make sure we don't sequester defense at this juncture. I think it will be a big, big, mistake, and so here is a plea, from a think tank guy to please find a way to avoid sequester, because we don't need it, and it



would be counterproductive for the kind of issues you are raising. Over here, in the third row?

MR. RISEN: Yes, sir. Thank you. Michael, Mark, Chairman Bernanke, thank you for your time. I'm Tom Risen, with U.S. News & World Report. I like what you said about how the government is not too good on certain investments over time. I've spoken to some people who are -- in the startup community who are unhappy with the Federal Procurement process.

How do you think that we could make the defense spending better to funds -- promising projects quicker and make sure that projects don't continue longer than they need to, because startups have a very short lifetime? They need money really fast. The Federal procurement process can take too long for them. How do you think we can improve the Federal Procurement process to be more like a startup model?

MR. BERNANKE: I think -- I don't really know the answer to the question, but I will try to answer it in the following, you asked me before about the linkage -- the parallels between Defense Department and the Federal Reserve. One of them, if I may, is one of myths that -- you know, the Fed is also engaged in a technologically -- technically complex activity, with long-run implications.

The same as the Pentagon in that respect, and the way the Fed has managed this relationship with Congress, is that, at least, ideally the Fed is what's called instrument independent, which means that it gets its -- gets to make the decisions about how its objectives are met. However, do Congress sets the objectives? Congress, ideally, does to interfere, for example, in interest rate policy directly, but it says, while we are charging you the Fed with achieving maximum employment price stability.

And so the Fed has to explain how it's going to achieve those objectives, but it uses its technical knowledge and its long-term perspective to achieve that. Now, we can't use the same model for -- I don't want to pretend that you use the same model for defense. The objectives are much more complicated, they are much harder to evaluate, there is much less short-run feedback from Defense, so you can't really say to the Pentagon; here, we want you to defend America, and you decide how to do it.

We can't do that, obviously, but I think you could move in the direction of Congress and its oversight bodies, specifying the particular objectives and goals and capacities that it wants the military to have, and giving more scope to either the military itself, or impartial -- commissions

or other groups to sort of make some of those decisions, so that you are not having politically-determined base locations, and politically-determine procurement decisions and those things.

I'm not naïve enough to think we are going it over there, but we could move in the direction, like the Base Closing Commission is a good example, of having more independent objective analysis that is then subject to a sort of up or down vote, or the single decision by the Congress. And so, in what you are describing, again, if there was more flexibility to the military planners to meet their objectives, you know, subject to fiscal constraints and so on, that there will be more opportunity for them to have that flexibility that otherwise, too much intervention in those decisions is blocking.

MR. MURO: I would just in. One, I mean, first are hints in the fact that it is our mission-oriented agencies that may provide a hint toward where this could go with much more focus on actual delivered capabilities, and I think such as Ben was talking about. I would also note that within the Defense Corpus there have been successful experiments sometimes famous ones. For instance DARPA, more recently In-Q-Tel that, you know, the CIAs, kind of venture, effort, you know, that actually do, do this.

That they have the short applications, quick grant cycles, and are built on speed, and in fact, have wound up influencing other agencies and the private sector even. So I think so much has been spent, so much has been attempted in the military history that to some extent the answers are within the military system as well.

MR. O'HANLON: And I'll add a word here as well. You know it's a complex subject and the answer is going to vary in a way from what type of technology you are talking about, one to another, we had an event on acquisition, we formed for the Department of Defense at Brookings in April, and Frank Kendall spoke, he is the Undersecretary of Defense of Acquisition, and I asked him, how well do you think we are doing in acquisition? Now he's got an incentive to say, we are doing okay.

On the other hand, he has put out three successive better buying power roadmaps for how we can improve, and he is trying to energize the case for reform. But he basically said, I think we are sort of a B-plus, because look at it this way, whenever we go to war we've got the best stuff in the world.

But then after him, we had Bill Lynn come up on stage, and I asked Bill the same question. Bill had been the Deputy Secretary of Defense, also in the Obama Administration, so they are teammates, in

some broader sense, but Bill now runs a small company, Finmeccanica, the U.S. arm of the Italian aerospace company.

And Bill said, well I think we are pretty good at the big stuff, like Secretary Kendall said, and the cost overruns and the delays are sometimes, you know, unfortunate, but you produce a great system in the end, but we are bad at anything that's touched by Moore's Law, anything concerning electronics. So the very kinds of things that are on your mind, when you are asking that question, those specific technologies is where Bill thinks we need to find better ways.

And there already is a legal code that allows you to use some commercial procurement practices, but we don't do it very often. The Military Services tend to get very conservative in these kinds of situations. So, anyway, there are a million dimensions to the problem and a million answers, but I would just begin by saying, some parts of the problem are more serious than others. The overall system is not fundamentally broken; there are parts of it that are broken, in my judgment. Way over here on the far side, please?

MS. BERNSTEIN: Leandra Bernstein, Sputnik International News; for Dr. Bernanke. It's been said that the U.S. ability to project power is very closely linked to economic power. So in your view, at what

point does the debt become such an issue that it actually impacts U.S. ability to project power abroad?

MR. BERNANKE: You said the debt, so U.S. debt?

MS. BERNSTEIN: Yes.

MR. BERNANKE: Yes. Okay. I said earlier that I didn't think that it was right to distort near-term military planning and defense planning because of the deficit, because the deficit is a longer-term issue, and debt is a longer term issue. But that being said, you know, in the long run, to a first approximation whatever -- you know, whatever additional spending we do we have to pay for somehow, and essentially with higher taxes in the end, and clearly with the higher debt to GDP ratio, our resources are more constrained than they used to be.

So, I don't have -- I can't give you a number which says, beyond a certain -- there's a very sorry history of trying to pick specific numbers where things will go wrong, it doesn't really work, but I certainly didn't mean to imply that in the end we don't have to think about our long-run national capacity and our resources, and again, I don't think we are at that point now.

I don't think that we should be distorting near-term decisions, but we do need to think about over a period of decades, you know, what

objectives we have as a country, both foreign policy and military objectives, and understand that those things are constrained by our economic power.

It's a very complicated relationship between economic growth and the Military. We've been talking about some of the positive relationships, but we also know the work on rise and fall of great powers, which is just beyond a certain point, you can become overextended, and the commitment of resources to military purposes can actually be very negative for your economy and your long-run ability to project power.

So what I'm trying to say is, short-run, I think we are fine, but over the longer term we do have to think about resource constraints in our economy and make sure that we are not undertaking commitments, globally, militarily that our economy can't sustain in the long term.

MR. O'HANLON: In fact, can I build on that by asking Ben about how you looked at things in the crunch period around, you know, 2008, '09-'10; and to what extent was this question on your mind? I mean, obviously, your main concern, I think, was to prevent The Great Recession from becoming a second great depression; and you were a firefighter in some ways, and you were trying to find creative ways to save the economy.

I don't know if you were thinking in terms of long-term American national power, but in our political science, and foreign policy worlds, a lot of people were, at that moment, writing about how China was perceived to be rising, and the perception was growing even faster perhaps than the reality, probably because of The Great Recessions. To what extent did any of those thoughts enter into your calculus back then?

MR. BERNANKE: Well, I was certainly thinking about both the short-term and the long-term, and certainly one of the reasons that we had so much doubt, and I think there still is; in the political arena a lot of doubt, and angst. It was because we didn't really know,, you know, in 2008, 2009, we didn't know exactly how things were going to come out, we didn't know whether this was just a bad recession, or something much deeper and longer.

So, obviously there was a lot of questioning about what our long-run capacity was going to be. And what we've seen is that a lot, not all, but a lot of the decline in output we saw after the financial crisis was cyclical. That is, there's been significant recovery, not complete, but significant recovery in output and employment, and so the longer-run implications are, I think, less than we were worried about in 2008.

In particular, one point I did make very consistently in actual



real time, was that notwithstanding the scary deficit numbers that we were seeing, and 10 percent of GDP is a very big deficit, which, we were close to that early on, notwithstanding those scary numbers I didn't think -- I said at the time, I didn't think that 2008, 2009 and 2010, was the right time to be going into fiscal austerity. That we needed to be thinking about long run fiscal constraints, but in the short run we needed to give the economy a chance to recover before we started cutting.

And so in the short run, my advice to Congress at the time, was, you know, let the economy recover, let's not go into austerity mode, yet, but obviously at the same time they were thinking about recovery and contribution of fiscal policy to recovery. We also need to be thinking about the long-run constraints that we are facing, and that's the right tradeoff I thought at the time.

MR. O'HANLON: Right. Well, we've got a couple more rounds here, I think we'll take two a time now, so we can make sure we get a few more questions in before we run out of time. So, why don't we do this gentleman here, and then in the black shirt in the fourth row, and then we'll respond to those together.

MR. WILK: There's been a recent push --

MR. O'HANLON: Name please?

MR. WILK: Brian Wilk. There's been a recent push in the fast-food industry to raise the minimum wage to \$15 that would give the fulltime employee a gross pay of about \$30,000 a year. In contrast, in the Military newly minted officer with a college education earns in the lower 30,000s; and the new enlisted Military personnel is about \$18,000. Would you discuss how that raise in minimum wage will impact the Military cost, especially with 1.4 million active-duty personnel?

MR. O'HANLON: And then, we'll take this question here as well, please?

MR. TIMINSKY: My name is John Timinsky. Can you talk about the consolidation in the defense industries, and whether you think that's unbalanced, good, or does that consolidation lead to mega (audio skips) that have a life of their own and just the economies of scale that would bring? And how do you actually, politically address those?

MR. O'HANLON: Do you want to take whichever fraction; and I'll try to --

MR. BERNANKE: Well, on the minimum wage, how much that minimum wage constrains the demand for labor depends a lot on the local conditions. I mean, wages are different in different parts of the country, and in some parts of the country that wouldn't be very far from

what low-pay workers do get. Other parts of the country that would be very high, it would be, probably it would squeeze some workers out of the -- out of employment.

So, obviously the military has to main competitive wages. I haven't done the study, I can't give you the exact numbers, but my impression is that the Military pay is pretty competitive, that the Military is able to attract, on average, pretty good quality recruits, and relatively skilled workers.

So, I would turn to my colleagues on this one, but it's not my impression at this point that labor market constraints are preventing the Military from meeting its needs, and don't think that some increase in minimum wage, whatever the benefits or cost of that, and I'm not going to address that broader question, I don't think that would be a major concern, and of course, if necessary, the Military can make adjustments.

MR. O'HANLON: Right, that's right. There's a quadrennial review of the Military compensation, you are probably familiar with, that comes out every four years, and the last one looked across various strata of the Defense demographic and what it basically found, is if you compare the typical person in uniform to a person of the same age and experience, education level, test proficiency, in the private sector, the military pay for

enlisted personnel, is at about the 85<sup>th</sup> percentile.

In other words, they make 85 percent more than -- or more than 85 percent of all people with similar cohort, and that includes their allowance for housing and their health care benefits. It does not include military pension into the calculation. It's not to say they make enough, there's a separate ethical and moral question as to whether we are doing enough for them when we send them off to war.

But in terms of how we are handling the labor market so far it's been okay. But you raise a good point, hypothetically, if we go to a higher minimum wage, and the economic recovery that Chairman Bernanke and others have engendered continuous, you may have some recruiting issues, that in recent years we really haven't, so we have to keep our eye on that very carefully.

Do you want to try the defense industry consolidation question, or Mark?

MR. BERNANKE: That's Mark's question.

MR. O'HANLON: Good.

MR. MURO: I can say that what -- that we've certainly seen that, again, that will be a top growth between places, and we'll see consolidation into certain places that will -- at a geographical level that will

profit from this, and others not. But I think the larger question is the structure of the economies and industry that exist to deliver, you know, mission-critical products.

And I think, you know, the question is about maintaining sufficient competitiveness, I think. And there has been a lot of consolidation already. I think Mike can talk about that. You know, the question is whether it's the right spot.

MR. O'HANLON: Yeah, I think it's sector-by-sector. You know, we've gone to five or six major shipyards, that's probably okay, but it's not five or six separate independent companies, we've got basically two companies making fighter jets, two companies making fighter jet engines. There is a single consolidated production line now, or a single effort associated with nuclear-propelled submarines and aircraft carriers. Some of the work is shared across two different shipyards in two different states.

So, sector-by-sector, we usually have a couple, but that's not true in every domain. And we've got a bid decision looming in coming weeks or months, which is about the long-range bomber. As you probably know, there are two main competitors, and Boeing and Lockheed are involved in one; and Northrop in the other. Boeing and Lockheed are the

two companies making a lot of fighter jets, still, today, and making other kinds of aircraft as well.

Northrop probably makes a lot of drones, but their fate as a future-manned space company probably hinges to a large extent in the balance of who wins this competition. How would we feel if lost Northrop, hypothetically, in that space? Well, I would be somewhat concerned.

So, I think that's the kind of place where you go from two to one, or even three to two, where you've got to ask yourself hard questions. And maybe you are willing to pay a little bit of a premium in terms of having two separate production lines to retain the independent design and production capabilities, if you can find a reasonably economical way to do it.

Now, with aircraft carriers we don't do that, because it's just too much, so it's only one place, we build them in Virginia, and that's it for the country. And we just have to hope that Newport News Shipbuilding continues to deliver well but, you know, I have to say, they do deliver well, but the new carrier costs two-and-a-half times what the old carrier does, and I'm a little troubled by that trend.

So this is where you worry about losing some competition, and I think your question is right on the money, the problem is there's no

perfect answer, and as we continue to have defense budgets stay about the same, or shrink a little, and the average cost per weapon keeps going up because of high technology, you are going to have more and more of these decisions to make. So the next one is the long-range strike bomber, and again, I'm still sorting through the economics and the national security dimensions of that.

Let's go in the back here next to the camera, please?

MR. JONES: Yes. Hi. Clayton Jones, Future Science Foundation. So my question is, getting back to this topic of bridging the relationship between the defense and the civilian economy. What do you think are the prospects of, while maintaining the inputs that we get from defense in R&D and manufacturing; bringing more of that, the final expenditure of that activity, domestically, so not just through expanding the role of the Army Corps of engineers, in terms of size and scope?

Or creating programs returning soldiers to engage in actually nation-building types of activity, such that you sort of start to close that cycle of import of -- you know, input and output, but it actually, the final product is expended here in the United States itself. You know, closing in particular the multi-trillion dollar infrastructure gap that we currently have.

MR. O'HANLON: Now let's take one more question before

we go to responses here. So, yeah, I will go in the back, gentleman in the tie, will you stand up? Here comes the microphone.

SPEAKER: I appreciate all your comments so far. I noticed the principle of draconian measures in case the budget balance gets to be a very serious issue with the GDP, which may occur. I wonder, if there's a problem with the sequester, as we heard following that, if that's a problem. Now, what to do? In 1939 FDR was faced with the problem with Britain and the situation in Europe, and they told Britain, we'll give you what you want, but the principle is cash and carry.

By January '41, they were out of money, and we moved into land lease. Currently we just merely provide a great deal of weapons to countries and don't charge them a thing. I wonder, how long can this keep up? Is this the right way to proceed?

MR. O'HANLON: Why don't we take one last question, and make it the final round, and then we'll maybe divi things up, one by one. So, right here, in the white shirt?

MR. VYSE: Yes. Graham Vyse, Inside Sources. You spoke earlier about the sort of implications of all this for labor and for workers. And you talked about, you know, the debates over how much the training actually benefits workers. And I'm just curious, as you look



sort of long-term, and you consider maybe cutbacks or maybe future increase in the defense budget, and defense spending.

What other sort of implications does that have for workers, for the sort of quality jobs for low-skilled folks, for the higher-skilled folks? And then maybe, you know, talking about different metro areas, what are the sorts of differences in different parts of the country in terms of that issue?

MR. O'HANLON: So, if you like, I can try to begin with the first two questions; and then perhaps you guys can include other comments.

MR. BERNANKE: Yeah, great. Go for it.

MR. O'HANLON: So on the first two questions, very fair points, but I would point out that in broad terms we are already doing pretty by the standards that you identified. In other words, American defense manufacturing is largely an export-oriented sector; they do export a fair number of weapons abroad. Most of the money in the defense budget is spent by and for American firms. Most of it is spent in the United States.

We've downsized overseas bases just as dramatically, actually more so than we have domestic bases. So there is always room

to look at another example, and say we could do better here, but we also have to maintain a sense of fair trade, because we are trying to continue to persuade overseas customers to buy our stuff, and if we never thing about buying theirs, you know, it's hard to maintain the culture that says, we should be open and fair.

So, overall, I'm less concerned, perhaps, about the broad picture, than you might be. And I do think defense trade is an advantage for the American economy right now, we do more exporting than we do importing. And on this issue, sir, a related question of where we are giving away weapons. You know, there are some good debates to be had, but they only concern three or four important countries, three or four big chunks of money.

So we are giving a lot of security assistance to Egypt, myself, I think it's too much, because I don't want to support President Sisi quite as categorically as we are, but it's not so much for the reason you mentioned. That's a fair debate but -- and then we have, of course, Afghanistan, where we essentially fund their army and police them, we are going to have to keep doing that for a number of years. Not so much high technology weaponry, more salaries, although a little bit of both. We give a lot of ongoing help to Israel, but Israel makes its own decisions about

where to buy weapons and often makes its own weapons.

And the Gulf States in the Middle East, they buy weapons with the money that, you know, they earn from the oil economy. The same thing for East Asian partners, the same thing for European allies, with other -- obviously they all make their own revenues in different ways, but they are all capable of paying, and they tend to pay.

So, you can have good debates about it from the foreign policy point of view, should we giving as much money to Afghanistan, to Egypt, to Israel, to some extent to Iraq, although we are not giving very much right now? But I don't think it's fundamentally a big problem about, most of our defense exports depending on the taxpayer largesse. The defense industry is competitive -- the American defense industry is competitive and it's winning a lot of contracts with paying customers; again, largely in the Middle East, East Asia and Europe, already today. I'll leave my answers at that. Ben, over to you.

MR. BERNANKE: Well, just to the last one about cutbacks. Again, going back to the question about the debt, and so on, I mean, having a large military is an economic burden ultimately, for the most part. I mean it uses up resources and tax money that could otherwise be used, but to the extent it has benefits. I mean, one of the ones I think we've

identified today, is on the technology spillovers, and the productivity spillovers, and in particular as Mark was pointing out, that it seems politically, unfortunately, seems easier to get some of those things funded and supported via in the context of defense spending, than it would be in a more general, you know, civilian context.

So I think that's an important consideration. We want to make sure they remain technically and technologically competitive, and that does affect -- it affects different workers differently of course, but it does affect the overall prosperity of our economy, and ultimately it affects, and actually most workers, the ability of our country to produce at a high level and with high productivity.

So I think that's the main thing that I'm feeling a little bit uncomfortable about, because we are, in fact, reducing our reliance on Federal and Defense oriented R&D, in the sense that that's been coming down as a share of total R&D, but there is a good economic case for government support for basic research and research with broad-based spillovers, to the extent that cutback, and military means cutbacks and that kind of research as well. I think that's something to be concerned about.

MR. MURO: I'll throw in, on a parallel basis, the Military clearly anchored the creation of the sort of baseline STEM work for this

country, and we are clearly seeing the shrinkage of that, the aging of that in many of the defense industries, and in the services. So, I think parallel to what Ben is saying, and I've been saying, there is also the transition in our training posture, both for the Military and the rest of the economy.

And again, I think we've not been arguing for a certain size of the Military, but we have been arguing for a competitiveness of the nation, both from a Military side, but also economically, so I think we see that that's a huge question as we are hearing in the innovation space, but also in skills, and then there's a manufacturing base which, I think, we are seeing there at the technology side is now, I think lifted the manufacturing base to an extent where it is now much more competitive than it was, even though it is not hiring, you know, to the same extent.

So, I think there is a real transition here that's about the trend for the defense budget, but then what about the rest of the budget? And/or are there other sources for delivering these services that are needed, that we can leverage.

MR. O'HANLON: Unless there are any final words, I think we all recognize there are a lot more topics to explore. We haven't come up with an industrial policy for solving the Washington National's decline, among other topics. Please stay tuned. We have a full agenda coming up

in the fall including, of course, Ben's book. So, thank you all very much for being here. (Applause)

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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.

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