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WEBINAR

CAN THE BIDEN ADMINISTRATION IMPROVE THE MANUFACTURING SECTOR?

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P R O C E E D I N G S

MR. WEST: Good morning. I'm Darrell West, Vice President of Governance Studies at the Brookings Institution and I'd like to welcome you today to our 10th Annual John Hazen White Manufacturing Forum. And we have a Twitter feed setup at hashtag #USmfg. That's #USmfg so if you'd like to post any comments or questions during the forum feel free to do so.

This forum is supported by John Hazen White. John and his wife, Liz, and sons, John and Ben, are with us. And we want to thank them for the financial support that they have provided over the years that enables the quality work that our scholars do and we are very grateful to them.

Today we are going to discuss what the Biden administration is doing to improve manufacturing. The good news is our country is coming out of the COVID pandemic so businesses have reopened, consumers are spending money and the economy is rebounding. Yet there remain a number of challenges in the manufacturing sector. These include supply chain issues, where parts are coming from and how to handle supply shortages.

The whole question over Made in America in terms of what that means and what the threshold should be. And then finally, workforce staffing and development issues. So kind of a rise in advanced manufacturing and how we retrain workers for the new economy that is starting to emerge.

To help us with these issues, we have put together a distinguished set of experts. We have two panels for today. And on our first panel, we are pleased to welcome three speakers. Monica Gorman is a Deputy Assistant Secretary for Manufacturing Industry and Analysis in the U.S. Department of Commerce. She works on global supply chain issues and Made in America questions. Prior to her public service, she worked for a number of years at New Balance.

David Cicilline is a Congressman from Rhode Island who was elected in 2006 and has risen to a top position within the House. Among his other responsibilities, he serves as Chair of the House Antitrust Subcommittee. He is a leading advocate for manufacturing in America and has several key pieces of legislation.

But perhaps most importantly today is his birthday so happy birthday, Congressman.

And we're delighted your spending this special day with us at Brookings.

I should also note that the House will likely be having some votes this morning so the Congressman may have to sign off a little early. So I just wanted the audience to know that.

And then our final speaker is John Hazen White who is the CO of Taco Comfort Solutions based in Cranston, Rhode Island. He has been at the forefront of manufacturing worker retraining and helping his employees gain new skills. He also is a Brookings' trustee.

So I want to start with Monica. So you work with President Biden on improving the manufacturing sector. I know there are a number of new initiatives underway so tell us what he and you are doing to improve manufacturing.

MS. GORMAN: Right. Well, thanks so much, Darrell. That's really a privilege to be here with such a distinguished panel.

I think I want to start by just saying that particularly for manufacturers and for supply chain professionals, these are very interesting times. COVID highlighted to all of us the importance and the fragility of the global supply chains and we now know very acutely that even small failures at one point can cause outsides to impact further up the supply chain.

And so, supply chains can feel a little esoteric if you don't spend your day job working on them, but, you know, there's an old proverb that I think really illustrates this risk well. And it goes like this, for want of a nail, the shoe is lost. For want of a shoe, the horse was lost. For want of a horse, the rider was lost. And this probably goes on and on until the entire kingdom is lost off of the want of a horse nail.

So it's because of this that the Biden-Harris administration is taking steps to ensure that the United States can meet every challenge we face in this new era as we come out of the COVID pandemic. And the critical part of this is recognizing our own proverbial horse nails.

The President has made very clear that we can never again be in a position where we have to rely on countries that don't share our interests to protect our own people during a national emergency. And to this end on February 24th, as you know, the President signed an executive order launching a comprehensive review of U.S. supply chains and also directing federal agencies to identify

ways to secure them against risks and vulnerabilities.

Specifically, this EO ordered a 100-day review of four key products. Semiconductors which we let here at the Department of Commerce, critical minerals and materials, pharmaceuticals and their key ingredients and advanced batteries like the ones used in electrical vehicles.

This EO also initiated a long-term assessment of the industrial base of six sectors over the next year. Again, the Department of Commerce is leading the one on the information and communication technology sector and that's to identify additional substantive policy recommendations that will fortify supply chains in these critical industrial bases.

So again, as I mentioned Commerce was charged with leading the 100-day report on semiconductors and my office played a central role in this effort. And to be honest, semiconductors are illustrative I think of the issue we are facing in supply chains and manufacturing at large.

So I mean semiconductors are computer chips. They power all sorts of modern devices including my phone and probably the phone that all of you in front of you as well. And a lot of you probably also know there is a shortage of semiconductors right now and this has caused delays in the production of many types of consumer goods in particular cars, which in term has often had an effect and has led to reduced hours for American autoworkers.

The semiconductor, in itself, is smaller than a postage stamp, but it has eight billion transistors each of which is 10,000 times thinner than a single human hair. They're amazing but they're tiny. And when they run short -- I mean when we don't have enough production of them, the semiconductor is essentially the epitome of a 21st century horseshoe nail.

So these reports were released in early June. They're all available on the White House website and I would really urge everyone to go read them. Certainly, at least start with the executive summary, which highlights the themes that came out both across the reports and key themes within each report.

But I think I'll close my answer to your question just by touching on three of the themes that came out of all of the reports. So first and foremost, we know that building resilience in critical supply

chains really means investing in American business specifically in small and medium sized enterprises as well as increasing production of certain types of products here at home.

So again, specifically for semiconductors, we know that Congress is on the verge of passing a bipartisan bill which will invest more than $50 billion in domestic production and R&D for the semiconductor industry and supply chain. So we're certainly watching that with keen interest.

Here at Commerce, we're also doubling down to convene not just the semiconductor industry but also the downstream users of semiconductors and other stakeholders to facilitate increased transparency along that supply chain, communication and see how we can facilitate more trust throughout that long supply chain.

And I do want to note, I mean the semiconductor was invented right here in the United States. And while these chips will continue to be made globally, we do need to ensure that the United States remains at the forefront of leadership and research and development in this space.

Investing in American manufacturing is obviously broader than semiconductors. And again, as you know, the President in his first few days in office signed a Made in America executive order and that directs federal agencies to buy U.S. made products and services and strengthens the Buy American laws. And this included establishing a Made in America office and the office management budget.

That office also relayed its initial guidance early last month. Again, I would urge everyone to read that. It looks, for example, to close existing loopholes in the current Buy American laws.

Second, I mean we know that building resilience means doubling down on our investments in education and workforce training. And that’s particular stem education at all levels. We need that pathway for Americans into these good paying jobs.

This is a theme that came out in every one of the 100-day reports. And I would say it is currently a key focus of U.S. government policy. The policy process that has resulted from that work.

Last, but not least, we know that resilient global supply chains are also going to be looking beyond our own shores and working more closely with our trusted allies. So even where products

are made in America, they may rely on some components and materials that are naturally available within our borders. To be honest, there is very few wholly domestic end-to-end supply chains.

So this means that we need to work with our allies and our partners. We need to build that geographically diverse supply base and pursue partnerships and research and development across borders also to harmonize our policies to address market imbalances and also work together to address nonmarket actors.

So I'll close there but hopefully that gives you some of the key themes that are emerging from the initial work and we'll just say that this continues to be a major focus as the one-year reports are underway at the moment and we expect more to come out of that effort in the near future.

MR. WEST: Thank you, Monica. That's a great way to kick off this conversation. And I do love the point about building resilience in America. So for example, on the computer chip issue, you know, many people don't realize that most chips are now made either in Taiwan or South Korea. Both very sensitive places these days so enhancing U.S. capabilities is really crucial because almost everything, every device and service today relies on semiconductors.

Congressman Cicilline, so I know you've been a longtime champion of American manufacturing so I'd love to get your reactions to what we've seen so far of the Biden agenda on manufacturing. And also, just what you think needs to get done?

MR. CICILLINE: Well, thank you again for including me and thank you to John Hazen White and Taco for sponsoring this forum each year.

And I really want to say that I think what's been so extraordinary is the leadership of our new president who really has distinguished himself very quickly as America's greatest manufacturing president. His executive order, his leadership on creating to Make it in America office is extraordinary.

But Congress also responded to what Monica described that we all kind of saw the pandemic. I mean Americans were wildly supportive of manufacturing and understood kind of intuitively how important it is the American economy, but I think as people saw the struggle for PPE and for other things that were necessary to beat back this virus, they began to really put pressure on their elected

officials to do something about it.

And so, in the Cares Act and in the American Rescue Plan, we included substantial support for American manufacturing. In the Cares Act, we included, of course, $350 billion in loans to small businesses to the PPP program of that -- much of that available obviously to manufacturers.

We help companies keep employees through PPE and the Employee Retention Tax Credit. We directed national academic to study the manufacturing supply chains of drug and medical devices and to provide Congress with recommendations to strengthen the U.S. manufacturing supply chain. We clarified that the strategic national stockpile can stockpile medical supplies.

We clarified that during a public health emergency, a medical device manufacturer is required to submit information on a device shortage or device component shortage upon request of the FDA. And we allowed barter to more easily partner with the private sector on research and development.

We then in the American Rescue Plan included $10 billion to enhance the Defense Production Act to boost domestic production of critical PPE to secure supply chains and to increase capacity for vaccine production and to help entrepreneur production of rapid COVID-19 tests. We provided a $5.2 billion appropriation to the Biomedical Advanced Research and Development, the BARDA, to support advanced research development, manufacturing production and purchase of vaccines. And finally, we included $7.5 billion for the Center of Disease Control to prepare, promote, distribute, administer and track COVID-19 vaccines.

So I think the pandemic caused us to include on those recovery packages critical investments in supply chain manufacturing. But I think maybe more importantly, it underscored the urgency of Congress really taking on this issue to make certain that we're doing everything we can to support American manufacturing.

We haven't seen some of the consequences of the absence of manufacturing in our country and relying on some other countries that maybe don't share our values in this really critical moment.

I think the President's executive order has been really important. I've been working a

number of years now and reintroduced legislation with Senator Murphy to close these loopholes and make America Buy American requirements and the President's commitment to that has been extraordinary. So I think this is a moment for a tremendous renaissance of American manufacturing.

Congress understands the importance of it. We have a president who is leading on it. And of course, we have a Secretary of Commerce who hails from Rhode Island, the birthplace of the American industrial revolution. So a Secretary of Commerce who will continue to be a leader on this.

So I'm very bullish about the work ahead and the progress we'll make in securing and growing American innovation.

MR. WEST: Thank you, Congressman. And certainly, you're absolutely right in terms of the pandemic reviewing all of the vulnerabilities and I'll just add to that the pharmaceutical vulnerabilities because much of our drug production as well as protective equipment for our healthcare providers was made outside the United States and clearly that was a big problem especially at the beginning of this.

Johnnie, you were on the front lines of innovation and so I would like to get your reactions either to Monica or Congressman Cicilline in terms of the current situation, what the administration is thinking about, what Congress has done and what you think needs to happen to improve manufacturing.

Johnnie, if you could unmute yourself, please?

MR. WHITE: Sorry about that. It cost $5 in my (inaudible). The comments by both Monica and Congressman Cicilline are really spot on in so many respects.

I think we have to look back at the, you know, the year and a half or so as quite a unique period of time obviously. So many things, so many problems arose from the beginning of this pandemic as we all know so many. But so many opportunities came up and I think it's important to realize that.

I think that just prior to making some comments on that. I do want to comment on this very briefly. The Congressmen, David, we spoke and I could almost in every single forum, you know, you and I have bantered about the issue of the Buy America program. And Monica has talked this too. And I think it's a very good thing.

I'm terribly concerned as I have been and mentioned this that we try to get it right

because it's becoming more and more difficult. It has become more and more difficult for manufacturers like myself to real adhere to the Buy America program in its current form. So I would caution you to be cognizant of these. I would reach out to find out what that really means from people like myself because you could, in fact, with all the right intentions box us right out of being able to do business.

So I would just pay attention. That's just a cautionary note and a thought. You know, for what it's worth. You know, I've always based that on material cost content, right, of a product. And where that was easy to build and do in the past. Not much of our components are made in America so that kind of puts us in a vulnerable position. My whole infrastructure. So anyway, it's just something for you guys to keep in mind and think about.

I think that one of the things, Darrell, that has come out of the last year and a half has been some of the vulnerabilities that have been exposed. The supply chain being the primary, you know, throughout the supply chain being the primary example.

And, Monica, you know, you talk about the microprocessors and the electronics and how that's impacting the auto industry. And let me tell you, every single circulator I make, I put one of those into. You know, and so we're running all over the place practically, you know, scratching like pigs for truffles or whatever. Looking for these, you know, little parts just to be able to keep ourselves going. So it's a real vulnerability now.

I think it's really important though to note that you're acknowledgment of the need to be able to work with our allies because not everything can be made. And so, the notion, look we boxed ourselves, kind of regulated ourselves. And I think this is a good thing in many ways, but regulated ourselves of the (inaudible) to a large extent. We can't buy steel and cast iron competitively. So we have to go to China. We have to go to Brazil. We have to go to Mexico. We have to go to different parts of the world to be able to be competitive.

And remember what I've always said, David, is that the most important thing for manufacturers to be able to do is to buy materials at worldwide competitive prices. So it's just the nature of being a global, smaller world. But acknowledging the need to be able to do that is important, Monica, I

think just moving ahead. You've got to keep that always in mind. You can't be totally focused on America only. It's not going to ever work.

I think, if I might comment briefly, having gone through a horrible, horrible period obviously in the last year and a half. The government has done really a tremendous job of doing what I always knew the government is being here for, which is to protect us, right? So military and infrastructure and whatnot. You know, I think the protection plans that have been put out starting with the Trump administration in fairness and moving right on through. I've been really productive.

We were a recipient of the PPP loan and that actually saved a whole lot of jobs here. And so, I think the government did the right things. I think in retrospect, I would probably do it all again the same way. So I commend you for what you've done. I think that the one thing I would want to acknowledge and this is just not in the United States, but this is a worldwide comment.

It's important to remember that one of the things that kept the world going, certainly kept America plowing ahead was manufacturing. I mean we made stuff. We never stopped. But we were deemed essentially in the beginning. And by the way, companies like mine were somewhere along the line deemed critically essentially because we were supplying and moving hot water in hospitals and homes and nursing homes which were keeping people alive, I guess to some -- you know, if you want to go there.

And so, I think manufacturers kept a lot of the world going. As I said, not just here but internationally. So I think it's very important. And I have said this a number of times here with my people who I have nothing but respect for and love. Deep love, you all know that from the history.

I have said many times and I will say again. The people in the manufacturing world are nothing short of heroes for what they have done in the past year and a half. To show up at work every day heroes. And for companies like Taco and the rest of the world to have supported the safety of those people together.

Coming together to work together to prosper and grow and succeed and survive. These people are nothing short of heroes. And I don't want to ever let that -- lose sight of that fact because I

hold that very dear to my heart and will be forever grateful for what these people have done.

So I commend what the government has done, Congressman. I commend and, Monica, I think what you've done and what you are doing is terrific and I thank you. And, Darrell, I will leave it at that.

MR. WEST: Okay. Thank you, Johnnie. So, Monica, a two-part question for you. One on supply chains, one on Made in America. So in the supply chain area, I've heard three different concepts, onshoring, which is basically bringing jobs back to America. Nearshoring which is bringing production back to places close to America, perhaps Canada. And then friendshoring, which is bring production to American allies even if they are halfway around the world.

So I'm just curious how the administration is doing onshoring, nearshoring and friendshoring? And then on the Made in America question, like how would you respond to someone like Johnnie or other businesses who are worried about either meeting that 51 percent domestic content threshold or, you know, there is legislation, quoting from the Congressman, to raise that percentage there.

MS. GORMAN: So let me take your second question first and I would stress the administration has been very clear that stakeholder engagement is a critical part of this discussion.

So as this policy process is happening, I would really encourage, John, your company and companies out there to engage with us. I know almost every day I'm in discussions with industry, but it's important that we have that feedback back that helps to feed the policy process so that we can get it right.

We know this is challenging. There's a lot of factors that we're trying to balance. It's complex, but we need those different perspectives and voices. So let's please have this discussion. We'll keep the dialogue going and hopefully that helps us get it right as the policy process continues.

Great question with regards to onshoring, nearshoring and friendshoring. And I would say, we're still in the earlier days of determining exactly how that is going to play out. It is also quite supply chain and product or industry specific. So supply chains for different industries can look quite

different. Some may need to all be in one general geography. Some can have more widespread geographies and that's okay. Some may need to be more regionally focused. And so, that's part of what we're focused on right now is specifically with these critical industries and critical sectors of our industrial base.

What are the areas that need to be onshored? What are the areas that need to be nearshored? And what are the areas where friendshored provides that resilience that we're looking for. So it's complex. And again, just as with Made in America, we're really seeking that feedback from the stakeholder community to help guide our process there. But again, work is ongoing and we invite perspectives to help inform that.

MR. WEST: Thank you, Monica. Congressman, actually the same questions for you both on supply chain and Made in America. I know you have legislation to close some of the loopholes. We currently do have a 51 percent domestic content requirement so that is not new that has been on the books for some time, but we would like to close some of the loopholes. And perhaps even raise that threshold higher. So how do we do that?

And then on the supply chain issue how do we navigate just all the complicated geopolitics of manufacturing in material supplies?

MR. CICILLINE: Yeah, I mean I think the effort to make the Buy America provisions work more effectively is to principle close the loopholes that have been developed over time that have just made it too easy for people to avoid buying American made goods.

And so, I think there's bipartisan support to do that. And raising the requirement to 60 percent is an effort to be sure more manufacturing happens in the United States when we're using taxpayer money to buy those products and services. And it includes as well substantial resources to help American manufacturers who might not have the products or services that are currently needed to be purchased.

So part of it is making sure we buy American goods and supporting American manufacturers to develop products and services that might not currently be available in the United States.

So it's really making a serious commitment to making sure we buy American by also helping manufacturers grow their business and develop new business lines.

And, you know, I think the onshoring versus nearshoring versus friendshoring obviously involves lots of competing considerations in terms of our relationships with our allies and that's why having someone like Secretary Blinken leading our diplomatic work matters so much and experienced and thoughtful diplomat.

Obviously, kind of just the more immediate responsibility, our interest obviously is to bring as much manufacturing back to the United States to create and support good paying American manufacturing jobs in this country. But we recognize that there is value to things that you describe as nearshoring and friendshoring. And all of them are better than having to rely on adversaries to produce things which are critical to the health and wellbeing of our economy or the American people.

But I think just as a kind of local person who advocates on this, I think congressional interest is very much focused on onshoring and thinking that kind of our chief responsibility is to respond to the economic devastation of this pandemic and helping to create good union manufacturing jobs here in the United States. And, you know, the administration obviously is going to have to balance a number of other interests and I know we'll do so well.

But all those things are better than what we saw during the pandemic and that is relying on some of our adversaries for critical components of our supply chain and manufacturing.

MR. WEST: That's a great point. Adversary shoring didn't seem to work out so well during the pandemic.

So, Johnnie, your thoughts on that? Like, you know, if we increase the domestic content requirement from 51 to 60 percent. And by the way, if you look at public opinion surveys, actually people love the concept of Buy America. You know, it's very popular with the general public.

Workers are certainly want jobs here so that they can keep their jobs and not have their jobs be exported to other countries. So your views on that, Johnnie.

MR. WHITE: I think that's an admirable, you know, goal. Certainly, we all wouldn't mind

Buy America. Look, I manufacture everything from the United States to the United States, and then to the extent I can.

But please guys, this is not a hypothetical world. Somebody has got to run these businesses. So the goals and the aspirations are terrific, but if I can't buy material at a competitive price, I can't compete so I'm out of business.

So we've got to -- David and Michael, we've got to come to some resolution on some of this beyond hypothetical. It's got to be real. And I'm glad you said this, Michael, because I would love to engage in this conversation because I'm passionate about making things in America. It's what I've done. It's what I built my life around. And by golly, I'll continue to, but I can't do it if I can't do it.

So let's all be on the same page and get together and do that. I think, you know, I want to throw in a thought I had that while we're talking about the pandemic and about America and the supply chain and everything. There's another issue at the front here for manufacturing and that is the ongoing evolution of the workforce.

And I was thinking about this because I was thinking about our training programs. David and Darrell, you're very well aware of those. And the turnover in the baby boomer generation, right? And we're now developing a whole new cast of employees that we now have to bring into the company and try to teach the culture and perpetuate the culture.

And so, there's a whole other element of moving forward as we come out of this pandemic, which is coincidentally at the same time, right? So there's -- I just throw that in before I forget it, Darrell, because I think there's more to talk about too about how we come out of this thing and move forward. And that's how we move ahead with the developing a solid workforce.

So we're actually succeeding at this here, but, you know, it's a new challenge also. That's just simply a thought that popped into my head as I was, you know, talking.

MR. WEST: And that workforce development piece --

MR. WHITE: And I do love to talk, Darrell, so a lot of thoughts happen while that's the (inaudible).

MR. CICILLINE: You know, I think Taco under the leadership of Johnnie and his dad before him. You know, has a reputation for extraordinary investments in their workforce. I mean he has one of the lowest turnover rates probably in the country because he really invests deeply in his workforce.

And, you know, I think it's a lesson to the manufacturing world that, you know, the most valuable commodity today have -- and most research they have on their employees and Monica made references in her opening remarks. This workforce development piece is really critical.

Part of that is making sure people have the skills because as you know every time I visit a manufacturing facility, you see the new kinds of equipment that folks are using. It is very different. It is very sophisticated. It requires a very high level of training and expertise.

But also, you know, we have to again remind people that manufacturing is a great career. I mean manufacturing wages are higher than nonmanufacturing wages. And sadly, I think we went through a period where, you know, people were discouraged from being manufacturers because it was sort of seen as a dead-end sort of career path.

I think that's changing in part because of great manufacturers, in part because of a renewed interest in manufacturing but also in part because young people are part of this maker movement.

And it's, you know, making things is cool again. But I think we've got to just as a country understand valuing and being respectful of people who work in manufacturing as a really treasured job and a vocation and a profession is something we need to continue to promote. And I think, you know, we talk about this every year.

There was a period in which if your kid came home and said, mom, dad, I want to go into manufacturing. They'd be like, what? I think that's finally changing and it should, but I think we just have always be mindful of it.

MR. WEST: Okay. Yeah, that is a great point from an issue about the importance of workforce development in this whole equation.

So we are starting to get a number of questions from the audience. So we're going to

move to some questions from those individuals. And just a reminder, any of the audience who would like to ask questions, you can do it via our Twitter feed at hashtag #USmfg.

So I have two questions that are kind of on the same topic. John, who is a professor at Purdue wants to know how can we envision enhancing the ability for small businesses and entrepreneurs to participate in the regional manufacturing resurgence? He's an engineering professor at Purdue. He says there are countless innovations that are potentially beneficial and technology but he says the barrier to entry is just too high and the risk tolerance is low.

And then Laurie who actually works for the Small Business Administration has a related question again on the small business front. How are you integrating small businesses into these national efforts to create a more resilient supply chain?

So Monica, Congressmen or Johnnie, any thoughts on that topic?

MS. GORMAN: And I'm happy to kick off. I should say the SBA has been at the table at a number of these discussions and it is really important and we certainly see that here at Commerce that SBA is continuing to be part of the discussions as we bring to life these investments that we're looking to see in certain supply chains.

Another program I want to highlight that Commerce has is the manufacturing extension partnership, which is public, private partnership. Really has just phenomenal success over the years and brings experts together with manufacturers to help them improve their operations, increase their profits, really sustain a business over time. And it has had such tremendous success.

I just want to get the numbers right here, but for every federal dollar invested, it generates nearly $20 of new sales growth and over $33 with new client investments. So that's one vehicle that we have that can really help manufacturers enhance and grow and expand and sustain their business over time.

There's a lot more that we can do, but those are a couple of ways that we're working today to try to enable our small businesses to grow.

MR. CICILLINE: Yeah, I would just add the manufacturing extension partnership is a

huge success. Has been really impactful. I've actually introduced two pieces of legislation to build on what I've seen in that one that I plan to reintroduce in this Congress to make it in the American Manufacturing Act which will encourage kind of regional public/private partnerships to really help support manufacturing growth.

And the New England Regional Commission which is a piece of legislation that will allow Rhode Island, Massachusetts, Connecticut. This is just an example to come together and receive federal funds specifically to help spur regional economic development because I think one of the challenges and particularly manufacturing.

I think one of the challenges we see in economic development broadly is that so much of it is designed around state boundaries. And so, there's not a lot of incentive to think about this regionally because everyone measures jobs in their own state and unemployment in their own state. And governors do that, but, you know, that's not the way that economies typically work especially manufacturing economies.

And so, the New England Regional Commission Act with create this regional commission that will allow these three states to really think about manufacturing regionally and do good planning and investments that will help spur manufacturing growth in that region which is a lot more effective and impactful. So I think, you know, those kinds of things can help spur economic growth in the manufacturing sector in a regional way.

MR. WEST: Thank you. Beth has a two-part question. One is about the U.S. manufacturing R&D innovation center. So she wants to know whether they are having positive impact on growing manufacturing innovation.

And then her second question relates to electric vehicles and transportation. And she wants to know the intersection of semiconductors, critical minerals and advanced battery supply chains and how the administration will address the geopolitical aspects of building electric vehicles?

MR. WHITE: Can I jump in, Darrell, just really quickly on the --

MR. WEST: Yep, absolutely.

MR. WHITE: -- first part of that? On the first part of that, the innovative centers which I completely (inaudible).

They are very beneficial. It ties back to the last conversation about how difficult it is to bring a new business, you know, forward and the barriers to entry are certainly there. But these make rooms or these innovative centers are so important. And they really are very local all over the place.

I think something can be reach out to for help by anybody. And to the professor's question that to aid and assist in the development from soup to nuts from R&D to marketing, through sales, through accounting and everything else. So I think those places are available and should be reached out to.

I think also the Brookings has done an extensive job over the past in the metro studies program. Was that one followed up?

MR. WEST: Yes.

MR. WHITE: And you remember you just focused on, you know, regionalizing certain manufacturing semis. So I guess, Monica, like semiconductors might be Silicone Valley, but, you know, something else might be around Pittsburgh and something else might be around Chicago where, you know, your source of supply and your complete product are all sort of local at least to some extent.

And it's an interesting comment to me because for somebody to try to get into a business, I would go, if that was available, to a local place like, you know, and that's pretty simply said but, you know, I think you get the point. And on electric cars -- by the way, Darrell, if I could just throw one thing in?

When you introduced me in this thing, you said I was a CEO. I'm the CEO. Cheryl Merchant is the CEO. I just happen to own the joint. But anyway --

MR. WEST: That's a better job, I think.

MR. WHITE: I just stepped off the plane into the shark infested waters, but anyways.

MR. WEST: Thank you for that correction. Monica or the Congressman on electric vehicles and innovation hubs?

MS. GORMAN: I mean, I'll take the -- I think the question also touched on critical minerals, semiconductors. I mean that's a better reason how those supply chains really -- and it's a really great question if you think about just the 100-day reports manded by the EO those are exactly the sectors that were mandated.

Critical minerals are interesting because it underpins so many of these other sectors. So critical minerals, critical materials go into semiconductors. They also go into advanced batteries. And so, that is one. Think about it as a foundational layer.

Coming out of the studies there were done, there are a number of different workstreams now specifically on critical minerals, but also how they connect to these other key sectors. It can be very sector specific.

But if you think about advanced batteries, we're starting to see more announcements of battery manufacturing plants being stood up because it is so critical to auto manufacturing and EB electric vehicles. So again, it really depends based on the sector but I think specifically around advanced batteries, you're going to see a desire to see more onshoring of that because having that vertical supply chain is so important to EBs.

Similarly with semiconductors, again, the chip black funding would drive a lot more manufacturing here. But we need to have that. We need to have that manufacturing here and we need to be able to make those leading-edge chips here as well which we don't currently today.

In the case of minerals, I mean minerals are in the ground where they are in the ground. So we may be able to get some here. Some will have to be in the locations where they are. And so, in that sense we have to look at the geography as where those minerals exist.

But again, it's very industry and sector specific and so we're really trying to be thoughtful as we take the work that came out of the initial research that was done and drive the policy process forward.

MR. WEST: So my Brookings colleague, Mark Murrow (phonetic) of our metro program has a question. He would like to get your thoughts on how the contemplated policies can deepen U.S.

technology innovation? And particularly regional supply chain density which he thinks is a very important factor in improving manufacturing.

MS. GORMAN: Is that to me, Darrell?

MR. WEST: Any of our panelists who would like to react. Don't be shy.

MR. CICILLINE: We're relying on Monica's expertise.

MS. GORMAN: Well, I will make one comment in that again certain industries really need that localization and vertical supply chain. And so, that by definition is going to drive more regional density. We also know that manufacturing and R&D innovation go hand in hand.

When you've got your innovation center right next to your factory that is a virtuous circle that happens. When the people on the floor are talking to the people doing the research and development. So we see building more of those centers as this gets stood up in different industries and different areas. It reportedly creates that virtuous cycle.

MR. CICILLINE: Yeah. And the only thing I would add, Darrell, is that I think that's why the two efforts I mentioned about this sort of regional economic development both in terms of planning and in terms of, you know, federal resources being devoted to regions is so critical.

And so, I think we just have to sort of get out of the political way of thinking about the way we measure all these things because that's the way the economies work. And I think Mike had made that point again.

MR. WEST: Okay. Thank you. So Sandra of an organization called Personal Cities has a question about green technologies and green initiatives, which of course is a big part of the broader manufacturing agenda as well.

She wants to know what new technologies are being used to improve manufacturing efficiency and increase green initiatives?

MR. WHITE: Green initiatives?

MR. WEST: Green initiatives?

MR. CICILLINE: So I'll just jump in and you guys can comment from that side of it. I

would say briefly that almost everything is happening in development of product. In any area that I can imagine has to do with a green focus.

In other words, so I'm in the HVAC business. I'm developing pumps and valves for heating and cooling, air conditioning and heating.

Every single thing we do is designed for, number one, comfort but really number one plus would be for the energy efficiency and green sustainability. So rest assured that everything is happening. And with some of that, by the way, some of that is regulated. A lot of it is regulated actually by the government and that's a good thing because it keeps, you know, it keeps the leaders leading and the rest of us, we're trying to keep up.

But some is just done because it's the right thing. You know, it's kind of like solar. If you're going to put solar around your house or in your building, is it necessarily economically feasible? No, not always. But you know what? It's the right thing and a lot of people do things for that reason so that would be my thought.

Every single thing that's happening that I know of in development is revolving around -- I'm going to call it the environment.

MS. GORMAN: I'm would just to add to that. I mean, we see a tremendous opportunity here in terms of our climate goals and economic development potential around clean tech and sort of clean industries.

So you think everything from things that drive energy efficiency to green steel and green cement, abatement technologies, renewables is an obvious one. But I mean the U.S. really there's no bounds for American ingenuity and we lead in so many of these technologies, particularly driving new technologies. So it's a tremendous opportunity both for more manufacturing, more exports, but also to help our manufacturers here at home as we continue to make our own industries more efficient. So we just see a tremendous opportunity as we take this forward.

MR. CICILLINE: And only I would add that that's why it is so important that the government really continue to provide robust research and development dollars because so much of our

success in this area is, you know, new innovations, new products. You know, sustainable materials that Monica mentioned. So having a very robust research and development investment is really critical to all of this.

MR. WEST: So another question from our audience. Thomas who is a policy analyst at the Duke University Center for Health policy says, I'm showing a production of essential good is critical, but he says manufacturing quality issues still can arise in the United States particularly, he notes, in pharmaceutical areas.

So he wants to know what steps can we take to ensure continued quality in production as we ship more manufacturing back to the United States?

. WHITE: That's investment in productivity. I'll go right there very simply put because I look back at the history of this company as a micro cosmos of what we're talking about.

And, you know, as we've come through the last 40 years, it's been continual investment in two things. Design -- I don't know about pharmaceuticals. I have no knowledge of that. I do know about things. And, you know, the design for manufacturing (inaudible) and the production processes for manufacturing ability and quality are critical. But you can make a product that cannot fail going out of a factory which is what we strive to do. So it's all about investment in the process.

Bringing things back is going to be about investment in the process. And by the way where we can improve over some of the -- what do you call them? Adversary sourcing?

MR. WEST: Yes.

MR. WHITE: Pending? Mending?

MR. WEST: Adversary sourcing.

MR. WHITE: I don't know what the acronyms were but the --

MR. WEST: Production in adversarial nations.

MR. WHITE: Adversarial nations, right? I mean those are very, very manual and they've got real quality issues coming from some of those places. Believe me. I have lived with them all my life. But so back here we have the opportunity to invest in them so.

MR. WEST: So you would worry more about the quality issues elsewhere as opposed to the United States?

MR. WHITE: They're harder to control because they're not at your fingertips, right? I mean, you can control them. Sure, we do. We work very hard at that but being right here and investing in what we can for production has been absolutely a no question.

MR. WEST: Buckley of the Wisconsin Center for Manufacturing has a question. He wants to know what are the most transformational ways the administration can invest in U.S. manufacturing? So obviously, there's a lot of initiatives going on across the board. I think he went to your top hits. Like what's the most important thing that actually would transform the nature of manufacturing? Monica, do you want to jump in on that?

MS. GORMAN: Yeah, I'm happy to. I would say it's two-fold. One, it is continued focus investment on research and development. The U.S. leads in so many key technologies. There is nothing that can match American ingenuity. We need to continue to invest in that in so many different industries.

The other aspect of that though is continuing to support the commercialization of that and the ongoing manufacturing of those technologies once we invent them. And so, that's where we're looking at a number of different industries to make sure we can continue to do that. Semiconductors being a key example.

So research and development but then supporting that commercialization and continued manufacturing.

MR. CICILLINE: And I just had one thing. Darrell, I think actually those are the right two first priorities. I think the third kind of immediate way to do that is a substantial big, bold infrastructure package that includes strong Buy America provisions that will help rebuild the crumbling infrastructure of America, help support American manufacturing in a very profound way. And that's just what the President has proposed.

MR. WEST: Okay. And Congressman, I think you may have a vote coming up and you may need to jump out.

MR. CICILLINE: In my committee, yes.

MR. WEST: But we appreciate your contribution and hope you enjoy your birthday today.

MR. CICILLINE: Thank you. Great to see you. Great to hear, Monica and Johnnie.

MR. WHITE: Thank you, David.

MR. WEST: So the Congressman mentioned this issue of infrastructure. So, Johnnie and Monica, we'd love to get your thoughts. Obviously, there's a lot of discussion in Washington now about infrastructure broadly defined.

But I'm just curious of the manufacturing part of that and what the government should be doing to improve infrastructure in a way that will enhance manufacturing.

MS. GORMAN: So it's critical that we see the infrastructure bill passed. The President has been very clear. It's an ambitious agenda and it does envision U.S. manufacturers providing those products. American manufacturers being able to do it.

So it is going to drive demand for products that are being made here. The need for it, I think is self-evident, but it is absolutely critical that we do this. It provides us a way to invest in our country and to do so with American labor and American products.

MR. WHITE: There's no question for the need. This is what government should be doing to some extent as I said before. You know, --

MR. WEST: Johnnie, if you could lean a little closer to your mike so we can hear you better?

MR. WHITE: No, I think this is what the key roles of government is, is to protect us and to keep our infrastructure whole and solid.

And so, this investment is really important as long as it's kept focused on infrastructure and doesn't go, you know, floating off into other areas. But I think that the investment in this -- I've had an awful lot of conversations. Because a lot of the infrastructure that's going to happen, the infrastructure investment is going to happen relates to, to frankly, to moving water.

I'm telling you. Whether it's waste water, sewage, whatever. So I've been actively --

we've been actively involved in this conversation. This is a really important step because I know, Darrell, I was talking to somebody the other day. I think you were with me when the guy was talking about the manhole covers in Washington having 1849 on them and stuff like that.

I mean this pretty old stuff that has to be fixed and replaced. But the whole nation is going to crumble right under us so. And I think the opportunity for American job creation through this investment is very real. I mean I look at the -- in any segment of the infrastructure bill, you're looking at, the addition of jobs to support that is going to be significant and substantial.

So that in and of itself is an important reason for doing this. I just hope it's pure that's all without a lot of important and stuff. But I mean, it's just the laymen speaking, but I think it's really important.

MR. WEST: Okay. I have a couple of questions that relate to the same theme of equity. Angela says manufacturing is often thought of as a man's world. So she wants to know how can more women be included as owners and managers as paid employees?

And the Zach, who works at the National Institutes of Standards and Technology has a related question about what the government can do to promote greater equity? Gender, racial and geographic equity throughout the supply chain?

MS. GORMAN: Great questions. And I would start by saying equity is an overarching theme that is driving so much of the work that we're doing.

A key way in which we will want to do this is through workforce development. Making sure that we are training a diverse workforce at the outset. So in our schools, in our community colleges, in our universities that we are making jobs that go into manufacturing something that people from all different backgrounds want to join.

So I think that's probably the underpins all of this. We can continue to encourage folks who come into these jobs to stay. I mean these are great jobs. There's a lot of opportunity to grow. John, you see that within your business. So we want to make sure that folks of all backgrounds and they really see that opportunity to grow within manufacturing.

But again, it really starts with a focus on equity in workforce development in the schools and the programs where people gain the skills to go into these jobs and then keeping them in manufacturing as they rise throughout their careers.

MR. WEST: Well, Johnnie, you have a female CEO so.

MR. WHITE: We have females all over the place. I mean, we're very diverse that way.

MR. WEST: And again, if you could lean a little bit closer to your mike.

MR. WHITE: Yeah, I'm so sorry. Maybe I'm glad you didn't hear my comment. Yes, we have lots of -- look, you know, the country has been built on opportunity. And so, one of the great opportunities for a person like me is to provide opportunity for people.

So Taco has been open. And most places that should -- I wish every place were the same. Open to anybody. Anybody. To come in and learn and grow and develop and build a life for themselves and their family. Whether they're man or woman, I don't care.

It's just about -- and so, I think the answer to the question and, Monica, I think it's important that the government have a role in that somehow. We see it developing more and more. But you know what? It's also a mindset of ownership. It really is a mindset of ownership to be willing to open up our doors and let people come in and enjoy the opportunities that are provided and take advantage. And then we'll support them.

It's just like the education, Darrell, we've had here over the year. That's something for everybody and to grow and achieve and my dream in my life has always been to provide a place where people can come and grow and prosper and their families can grow and prosper with them.

And so that's a mindset too to some extent. You can't regulate that. You can't regulate mindset.

MR. WEST: Okay. I have one last question for you and then we're going move to our second panel.

So Dollop (phonetic) has a question about China. And basically, he believes China is way ahead of the United States on manufacturing in general. So he wants to know can the U.S. even

conceive of catching up with manufacturing in China?

MR. WHITE: Can we catch up with China? Is that the question?

MR. WEST: On manufacturing in particular? Yes.

MR. WHITE: Absolutely. We're ahead, we really are ahead of them. They pick and choose certain areas for investment and they've done well. But I think we can absolutely maintain the leadership in the world in manufacturing. I have no doubt.

MS. GORMAN: I would strongly agree and I think it's less of a race and more of how are we going to out innovate.

MR. WHITE: I agree.

MS. GORMAN: That is what we do best. We will absolutely out innovate.

MR. WEST: Okay. I love your optimism on that front. So we will end the panel on that optimistic note.

But I want to thank Monica for sharing her thoughts with us and definitely good luck at the Department of Commerce in the various initiatives that you have underway.

And, John, thank you very much for sharing your perspectives from the frontlines.

MR. WEST: Monica, if I may just quickly wrap up. Monica, please involve people like me in the discussion on Buy America. It is so critical that we do it right.

MS. GORMAN: Absolutely. Let's chat after this. We'll talk on the conversation.

MR. WHITE: Thank you.

MR. WEST: Okay. Well, thanks to both of you and also with our audience. We appreciate all of your questions as well.

So we are now going to transition to a second panel which is going to continue this discussion about manufacturing in the United States. What the Biden administration is doing. How we can do a better job to promote manufacturing.

And we're very pleased to have two distinguished experts on this part of the conversation. So Ben you can already see on the screen. Ben Wang holds the Gwaltney Chair in

Manufacturing Systems at Georgia Tech University. He teaches in the Stewart School of Industrial and Systems Engineering and he is a Professor of Materials Science and Engineering at Georgia Tech. He is also the Executive Director of the Georgia Tech Manufacturing Institute. Ben, that sounds like you have several full-time jobs there.

We're also delighted to welcome Liz Reynolds with us. She is a Special Assistant to the President for Manufacturing and Economic Development at the National Economic Council of the White House. Obviously, she's in the middle of many of the things that the Biden administration is doing to promote manufacturing. So, Liz, we will start with you. So we have several interesting manufacturing initiatives emanating from the White House in terms of supply chain, Made in America and workforce development.

In our last panel, we talked a lot about supply chain and Made in America issues. So I'm just curious what you're working on in particular. Some of the perhaps workforce development initiatives that you think will be helpful. I know there's a lot of R&D investments taking place. There's going to be a new National Science Foundation director on technology if Congress agrees to this.

And just how these various things are designed to help the manufacturing sector.

MS. REYNOLDS: Well, thank you, Darrell. It's a real pleasure to be here and also to be with Ben on this panel. I fully enjoyed the previous panel as well.

And I want to make sure I'm not too repetitive of that. But I think it's worth stepping back for a moment before we talk about the entire agenda and how manufacturing fits into it for the Biden administration. And really sort of take stock to say, you know, where are we today? And what are we looking at going forward?

I think the pandemic exposed as the supply chain work has discussed. Really exposed some critical vulnerabilities that we've seen in our supply chains and our industrial base. You know, from the PPE to the semiconductors and -- but while those were exacerbated, they really have been with us for years.

And they're reflective of a lot of policies and practices that were driven a lot by concerns

that were primarily dominated by efficiency, maybe short-term goals as opposed to building resilience focused on long-term growth and innovation.

And so, the Biden administration has really laid out what I think we can consider a revised or reformed industrial strategy. Industrial strategies have been with us since Alexander Hamilton. But one in which we really see a robust role for government working in partnership with the private sector.

And I think that this is a critical part of the administration's agenda. And we can talk through what all of those are. But it's coming at a critical time. I think maybe I'm sure the audience has seen some of these recent numbers on manufacturing productivity in the country.

We have seen a decline in the last decade across the majority of industries here. We have lost, you know, thousands, tens of thousands of small and medium sized manufacturers particularly between 2000 and 2010 that challenging decade.

We've seen a decline in our entrance of so to speak workforce and the challenges we have in terms of building a talented pipeline.

And so, for all of these reasons, I think we are at a moment in time where this agenda is more important than ever. And this agenda as sort of has been touched upon in the previous panel. I think it's got four primary sort of pillars, if you will.

One is around growth and innovation. We have to improve our productivity growth in our companies and we have to lean into our innovation capabilities, which I think people have spoken about in the previous panel.

The second area in my mind is know how. It's one thing to be investing and providing capital and census and things. The other part is the know-how. We know that firms need -- you know, you learn through building. And that learning curve can take time and particularly for our small and medium sized firms. It's not just about capital, but it's about what kind of bond? What kind of assistance do we give them? What kind of guidance do we have about integration of new technology? The know how part I think is something we've lost when we've lost a lot of our manufacturing offshoring.

The third area is workforce. And when I think about workforce, we obviously are talking

about that pipeline. But we also know that the issues of Industry 4.0 are really about organizational transformation. So we need to train a new workforce, but I'd also say we also have to be thinking about management as well. And just a whole different way of thinking about how we manufacture in the country.

And then fourth, all of this has a geographic dimension. And there's -- if you're helping manufacturing, you're helping middle America in this country. We've got at least 50 percent of our machinery firms are located in plastics and metal companies. Are located in -- I think it's about -- well, maybe in about 30 percent of our counties in this country. We've got tremendous concentrations in different parts of the region. So these regional approaches are really valuable for our manufacturing agenda.

So in terms of the agenda itself, we've seen, you know, one piece very squarely placed on the R&D agenda and the innovation, and we've seen that in USICA bill particularly around this tech directorate, which I'm very excited about. I think it's really taking all of our excellent skills in basic research and trying to then bring that to an applied context. We have a lot of good experience in this in DARKA (phonetic) and ARKAE (phonetic).

Also, you've heard about the supply chain agenda and what we're doing with the supply chain resiliency program. How to invest in our supply chains where we saw a lot of vulnerabilities in this first round of research. But they exist across multiple areas. And it's got both a domestic agenda but it's also got an international agenda.

Third, I think is what I call the geographic dimension of investing in manufacturing. That is the innovation hubs which are a very exciting way of taking what we've learned to date about regional clusters and how we build coalitions and deepen our access or our ability to bring sort of growth to regions that are not necessarily, you know, our top tech areas but also going deeper geographically and also going deeper in terms of bringing in greater racial equity, agenda equity.

Then the work of the MEPs and the Manufacturing U.S.A.'s. Two of the critical institutions that spread across the country for us that touch a lot of different communities that are also

able to, again, provide that know how I think for companies, which is really important.

We mentioned I think, Monica mentioned as well, the Chips Act and what we're doing specifically around semiconductors. We then also have a huge investment and opportunity in the workforce development piece. We've talked about that I think in the previous panel. But how do we bring the next generation through that talent pipeline?

Procurement, which also was mentioned, a critical piece here. I think an opportunity for providing some demand side opportunities for our manufacturers. And then finally, indirectly I think it was really important that question from the last panel on infrastructure.

That infrastructure agenda is indirectly a manufacturing agenda in so many ways. It's both helping our manufacturers through the investment in that kind of critical infrastructure. But also, I think there's going to be opportunities for U.S. manufacturers.

So it's a very, you know, you could look through this the administration's lens. If you just look through the manufacturing lens, you just see, you know, that this is just one critical piece of the pillar of that agenda. And so, it's really -- I think it's a once in a generation moment for our manufacturing.

And I think there's consensus across the board that we can't continue in the way we have been. Again, giving the way the technology is changing, given global competition, given the needs of our national security, our economic security, our innovation agenda. This has got to be a new way and a new trajectory for our approach to manufacturing.

MR. WEST: Great points, Liz. Thank you very much. So, Ben, I want to bring you into the conversation. So Liz is emphasizing a number of different areas, but especially the importance of innovation and the importance of workforce development.

And I know you are in the middle of each of those issues. You are very much interested in extending the manufacturing innovation ecosystem. And then on the workforce side, you are a professor. So you are actually training the next generation of young people. So I'd love to hear your thoughts both on the innovation side as well as the workforce development side.

MR. WANG: Thank you very much, Darrell, for having me on the program. I'm really

honored to be part of this important dialogue with Liz and the audience because advanced manufacturing is foundational to our economic prosperity, resilience and the national security.

Well, by way of introduction. I was involved in the Obama administration's advanced manufacturing partnership, M1 and M2 from 2011 to 2013. And it is obvious that I'm extremely pleased that the current administration is taking important and the very much needed steps. And also, taking an intentional strategy and approach, okay, to expanding our technology innovation ecosystem and the manufacturing supply chains.

Darrell, if I may? Before addressing the questions, I would like to say from the get go that my comments are grounded in a few beliefs, okay? So that the audience know where I stand on the manufacturing policies.

And first, building a strong manufacturing base in the U.S. is a national imperative, okay? And we know that technology-based innovation is the dominant driver of economic growth in the 21st century. In addition to economic growth, supply chain resilience, as Liz mentioned, national security standard of living and rebuilding the middle class in our society all depends on a strong globally competitive manufacturing base.

In order to have such a competitive manufacturing base, we need a vibrant innovation value chain tightly coupled with a strong manufacturing ecosystem. Okay. So that leads to my second belief. We cannot separate innovation from manufacturing, okay.

In the past, some policymakers believe that we could continue to innovative and lead manufacturing into other nations. As it turned out not only did we lose our ability to produce high tech products, we began to lose our ability to innovate. As the former Dow Chemical chairman and CO, Andrew Liveris, and he cochaired the advanced manufacturing partnership steering committee. And he notes in his book where manufacturing goes, innovation inevitably follows.

So if we want to compete well globally, we must maintain both the technological innovation leadership and advance manufacturing leadership.

And the third one is the importance of medium size and the small manufacturers in the

U.S. They contribute to our supply chains and the GBP in a significant way, but often times they lack the resources to evaluate and adopt new manufacturing technologies. And we continue to develop many state of the art technologies.

And how do we get these new technologies in the hands of these small and medium sized manufacturers. In other words, how do we overcome the last mile challenge in technology adoption by these small, medium sized companies? I believe the national and the state MEP can play a critical role in it.

So let me comment on the regional manufacturing, the ecosystems. And I want to emphasize the importance of taking a regional approach to developing the manufacturing ecosystem. Again, connecting the existing program with the new ones and then align them with the state agencies for economic development. Either in these and two-year colleges and four-year universities, state MEPs and the many wonderful local not for profit organizations.

So the regional ecosystem stakeholders should come together and determine what they want to compete on. Is it a talent? Is it infrastructure? Is it a supply chain or is it a business climate? And I mean this regional ecosystem approach is time tested. Liz and her team at IPC at MIT did wonderful work. Michael Porter's work on innovation clusters and Pizano and Shuen work. Okay. So all of these are great examples to prove that a regional approach actually works and works well particularly for the U.S.

So the regional ecosystem actors must work together to identify common challenges and common opportunities. And then co-innovate around those common challenges and opportunities. And this regional approach actually pushes local companies to rethink how they should interact with one another to ensure that benefits are shared by all. In other words, they should grow and excel symbiotically if they have a right combination of technologies workforce infrastructure regulation standards and some other policy. For instance, the tech incentives.

Now, as you know, I'm a big fan of the regional approach, okay? But I also want to mention that the use of proper metrics to measure the health of the manufacturing ecosystem is essential.

Okay. Without the proper metrics, we don't know where we are and we don't know where we are going. Wealth is a good example of the metrics driven approach and that is called the tech fire ecosystem assessment tool developed by energetic technology center.

So the tech fire is a comprehensive tool that evaluates many indicators from investment to incubators to minority participation to workforce training.

MR. WEST: Right. Thank you. So, Liz, if I can bring you back in? In your opening remarks you emphasized geography and some of the geographical challenges we face that there are problems in middle America in the sense that the jobs are not equally spread all across the country and that fuels resentment.

And one of the things that the administration is trying to do is to promote heartland development in kind of a more equitable spread. And I know you've done work on these topics in the past as well. So tell us a little bit more about the geography angle, the regional innovation hubs and how the administration hopes to build greater equity in the system as a whole.

MS. REYNOLDS: Well, I have to say for those of us who have done regional economic development for decades. It's a very exciting time to be in this administration because I think there's a real understanding and embrace of this approach toward economic development.

Our country's economic security and growth is really built upon regional strength. That's where we find, you know, you have all of these Centers of Excellence, if you will, that drive our competitiveness globally.

So the regional model is one, as Ben said, has been, I think, well tested every state in the country. Every region has, you know, built again on this concept of clusters. The challenge often is that there are nation clusters there, but we just don't have the -- necessarily resources to take that kind of growth or the opportunity to the next level.

And the other challenge has been also making sure that we're including the broader communities, if you will, or parts of a regional economy. I think both of those things are things that this new regional tech innovation hub model is really trying to address. So it's about building on innovation-

and technology-based solutions to -- or growth opportunities. Taking them out of our traditional tech hubs, if you will, that we often find on the east and west coast. And saying, let's go find those assets that exist in other parts of the country.

Let's go build upon what already we know exists in smaller areas and rural areas. In cities that maybe smaller cities but have strengths in different areas of technology. And then let's ensure -- and this is part of the tech hub model -- let's ensure that the engagement across sort of partners, as Ben was talking about, is a broad engagement and is bringing in different or sort of not the usual suspects into our thinking.

Because I think often we -- the manufacturing agenda is one. It builds on a legacy, right? And that legacy is place-based in many places, but it's also based in particular communities, and we need to sort of expand beyond that. Whether that's a racial expansion, a gender expansion or an expansion beyond particular communities.

So the model, I think is one that is built on a strong foundation, but is trying to, I think go to the next level and push us a little further to figure out how does this work in different places around the country.

MR. WEST: Certainly, one of the silver linings of the last year via remote work has been geographic in the sense that one no longer has to live in Boston or Seattle to work in the tech sector. It may be as we are moving more generally into either a hybrid model or a fully remote model that that will actually help create greater geographic equity and help you accomplish some of the things that you would like to do.

And then on the workforce development part. So you teach at Georgia Tech. You're on the front lines of educating the next generation of young people. What are you telling them? And what do they need to do? And how can we help support them in order to help develop the manufacturing sector?

MR. WANG: Darrell, I think the EWD is perhaps the number one challenge before all manufacturers. Okay. So I in the last 35 years spoken with numerous manufacturers and EWD is the

common denominator, the common challenge for all manufacturers.

And I have a couple of comments here. So the first one is we have the best educational system in the world, but we do not have a national workforce training system, okay? Instead we have many, many training programs. By that I mean if you have a certificate and provided by one program, the certificate may not be recognized by companies.

So what we need, number one, is to have an industry recognized credentialing system in the country and it's built on standards and the proper certification certificates. And the credentials should be national stackable and affordable. Okay. So that's number one.

And the number two is to take, again, take a regional approach. Employers should collaborate with one another in the region to create statewide industry and work with the community colleges and universities to create a coordination mechanism. And they should work together on defining the knowledge skills and ability elements and the corresponding competencies. And to embed the credentials in their degree programs so that the trainees, a student can get both a degree certificate and also require the skills for industry.

And the last one is -- and now we realize the use of online education and training and the use of AR and the VR technology accelerate workforce development and the retooling of the current workforce for Industry 4.0 and the factory of the future.

MR. WEST: Well, Liz, I'd be interested in your views on how we can do a better job of coordinating on this workforce development question just in terms of the interface with higher education, the role of community colleges, the technical institutes online platforms and certificate programs. How do we bring all this together in a way that we actually have a coherent system of workforce development?

MS. REYNOLDS: Coherent workforce system is really I think one of my major goals right now. I think that is absolutely the case as Ben said.

Historically, it is very siloed and we have resources that come into regions and states, you know, across many different programs. I'd also add to Ben's list of vocational schools, which I think are really also an important piece of this story.

So I think we have a lot to build on. There's been a lot of experimentation going on here in the last several years. Whether it's by public sector entities where we see a lot of great work coming out of our community colleges. Where we see them partnering with industry. We see two-year schools working with four-year schools. We see a whole host of experimentation, and I think that's great.

And I think we also see it as an important piece of tying high school to the post-secondary education. How do we get students who are in high school, already taking classes and immediately going into additional post-secondary education?

We know today that a high school education is not sufficient for a pathway career wise in the country going forward. It's certainly not enough anymore in the manufacturing space. So how do we create that pathway that brings high school right into the post-secondary education? Whether it's -- we're very excited about registering to apprenticeships. And the administration has got significant, you know, resources putting towards trying to grow those in the country.

How do we put our community colleges also doing that? And then partnering, as Ben said, with the private sector regionally. It is critical important.

But I am very excited about this area because I think that there's an understanding that we need that kind of continuity across that particular in that kind of post-secondary area. I think we also, I would say, we need evaluation. We need to make sure we're evaluating what works for students because we've got a lot of new exciting certificates that are coming online.

We've got a lot of different products, if you will, or offerings to students in the market place. I don't think we have a very good sense yet. I don't know what Ben thinks. But about their returns for the student. And which is why we really emphasize this registered apprenticeship. It's a way for us to really measure outcomes down the road.

So I think the evaluation is critically important. I think that also the whole element of the hybrid learning that has got to be part of our future, the ARVR possibilities.

When I was out talking to firms in my previous job at MIT. You know, a number of firms in trying to introduce this technology. And the trainers would be a little bit threatened by it. You know

that, well, is this ARVR going to sort of take my job because now who is going to, you know, train the students?

And actually, it turned out to be just the opposite. That it meant that the students could learn through this new, you know, means, but it allowed the trainers to actually touch more students and to bring in more material.

And so, I think that's going to be something too. Again, investment in our educational institutions to be able to provide that kind of education is going to be important and important for attracting the next generation to manufacturing, which is going to be -- is one of our long-term needs here.

MR. WEST: Okay. In terms of online education, I have always thought there was a natural combination of the human teacher and the technology just in the sense of the technology can do a good job of communicating basic facts and assessing the students on their knowledge of basic facts which then would free teachers and professors for higher level instructions. Problem solving, critical analysis and so on. So I know people do not view those as zero sum goals.

And then I want to come back to Liz's point on evaluation because she was talking about the importance of determining where we are and what we know and where we're going. What works? And what doesn't work? And you mentioned the importance of a metric-based approach.

Tell me a little bit more about that. Like how do we think about the role of metrics in all this? What are the right metrics? How do we start to develop an evidence-based approach to these kinds of challenges?

MR. WANG: On EWD, Liz is correct. We have so many certificate programs in the U.S. And some of them are wonderful programs, okay? But the return on investment for the employers and also for the trainees has not been proven, okay? So that is something that we need to work on, okay, to validate the return on investment. That's number one.

Number two, I think it should be based on standards, okay? And also, accreditation system similar to ABET for the engineering and the technology program, okay? So those are the two things I would like to add to it.

Now the metric system for ecosystem development. I think most of audience know the TRL, technology readiness level. And most audiences know what MRL is, manufacturing readiness level, okay. And I think it is important for us to mature technology. At the same time, we want to develop our manufacturing ecosystem. So when a new technology is ready for production and we have a place to produce to it in the U.S., okay? So that's the realization of invent here, build here in the U.S.

And there are several metrics, okay? From the workforce to investment of the local business climate and even minority participation, technology, transportation, infrastructure. All these are important metrics for us to evaluate of the manufacturing ecosystem.

MR. WEST: So one last question for each of you and then we're going to move to some audience questions. So, Liz, earlier you mentioned the crucial role of infrastructure in improving manufacturing and, of course, all of D.C. is talking about infrastructure in general.

What can we do with infrastructure investment that will specifically aid manufacturers?

MS. REYNOLDS: Well, let me just say the other word that is on everybody's tongue here in Washington besides infrastructure, the other words are supply chain, which is very exciting for some of us. I think that rarely would we have thought we'd come to a point where people are talking supply chains nationally and certainly in the beltway, which is I think an important piece to this.

So I think on the infrastructure funds, you know, what we're talking about is massive and most needed investments in things like railways, courts, our train system, our roads, our bridges. All of what we think of as sort of basic piece there along with things like water treatments and the like.

There are -- for all of that we're talking about first and foremost a construction industry that is implicated by that. But also, the manufacturing of parts and pieces and aspects of upgrading. And I think that combined with a procurement emphasis here in the Biden administration provides a lot of opportunity for our manufacturing.

But for a foundation behind so many of our industries is a manufacturing base of machinery and fabrication and plastics, et cetera. There is just going to be away in which we see a sort of ripple effect, I think particularly for our SMEs in this infrastructure bill.

I think it is not a first order. We're not seeing it in the first order, but the second order behind how you actually do this. And think about when you go to other countries who have, you know, invested in their high-speed rail systems and port systems as well. We have a lot. We have a long way to go here.

And the manufacturing piece of this is going to be critical. And particularly if we can combine it with an emphasis on reshoring and rebuilding our supply chains here in the country. And also, I want to emphasize how we innovate into new supply chains.

The previous panel talked about our innovation capacity and capabilities. We see this in advanced manufacturing across a number of different industries. And so, it's not necessarily a story of bringing something back as much as it is investing in the new technology that helps us do it better here. And I think we have a real opportunity across the board to find ways in which we're going to actual invent our way into stronger supply chains.

MR. WEST: Ben, we'd love to get your thoughts on infrastructure. What we need to do in that area? And then we're going to take some questions from the audience.

MR. WANG: Well, Liz is correct in saying that the infrastructure is really part of the manufacturing. Okay, without a robust infrastructure -- and there is no way for us to expand our manufacturing particularly going forward with a digital manufacturing. So that is -- I mean these two are integral and as from the policy standpoint.

Darrell, I would like to very quickly comment on the importance of the integration of the existing innovation programs and the new programs that's the current administration is proposing by taking the whole of government approach, okay.

We have some of the best R&D programs and innovation programs in the world. So the key to success is really to connect these programs together. So from basic research to, to prove a concept, to prototyping and then production in the U.S. And I think we need to make it as a continuous innovation reality which then coupled with a local manufacturing ecosystem. If we can do that and I think the manufacturing renaissance on these are going to be around the corner.

MR. WEST: Okay. We're going to move to some questions from the audience. And I want to remind those of you who are watching. If you'd like to submit questions, we have a Twitter hashtag setup at hashtag #USmfg. That's #USmfg. Feel free to pose any questions that way.

So I have two questions that are somewhat related. So Christopher who works with the Leadership's Network organization asks how can we accelerate upscaling for currently low skilled workers?

And then Milt of Venture Nashville wants to know what is a bigger constraint on improving the manufacturing sector in the next 10 years. Technology innovation or the supply of human workers. So each of them are wanting you to address the human aspects of manufacturing.

MS. REYNOLDS: No. Those are good questions. I guess I'll start. Upscaling current workers. So critical and something that we -- you know, what are our tools for being able to do that?

Interestingly, there is some recent research that has come out of MIT, my former colleagues, Ben Armstrong, Bill Bonbilion (phonetic) and Suzanne Burger have looked at these small and medium sized firms and asked, you know, when is it that they adopt new technology? What are the conditions in which that happens? Because as Ben said earlier, one of our biggest challenges for increasing productivity is actually investing in technology.

And in some previous work we did, you know, we're looking for more -- just in our interviews with firms, we just thought there would be much more adoption than we have seen to date whether it's robotics or 3-D printing, et cetera. But what was really interesting was where there was adoption of technology? It was the upscaling of workers.

But those two things go hand in hand. So it's almost like a virtuous cycle. But if you're going to -- when are you going to upscale your workers? When are you going to invest in, you know, more training, et cetera? It's when you actually move towards greater productivity, great investment in technology.

And so, one way I think to do this is to be incentivizing firms and helping firms make that leap. These small and medium censors are understandably very risk adverse, and they do not have a lot

of capital on hand to be making these significant investments. You know, we need a kind of a poll mechanism if we can. I think the role of any Ps is critical here.

So I think that there is in my mind a way in which technology is very much tied to this upscaling question of incumbent workers. And then also, I think I have to say, I think that the online opportunities are also something that didn't exist even a decade ago where we need to have programs in ways in which we can help workers today gain new skills while they're on the job through a combination of hybrid learning. So they're also through online education but we're also finding ways for them to partner with local schools, et cetera, to have kind of hands on learning.

In terms of the second question. The constraint. What's the bigger constraint for us on technological innovation? I'm going to weigh in on humans. I think that we can create a lot of great mousetraps but unless we can figure out how we're going to translate that into new jobs and new industries and new opportunities, it doesn't translate -- you know, it doesn't lead towards the kind of outcomes we want.

So we have a shortage of workers right now. It is preventing firms from hiring, from growing, from making those investments. The reality is a lot of them are actually investing in technology, I think will be our friend here. We'll hopefully augment workers and fill in gaps where we can't find workers.

But I think we have to find a way in which we're going to really invest in that workforce that's going to help us grow and then the technology actually can get, you know, implemented and applied as those companies are growing.

MR. WEST: So, Ben, your thoughts either on the upscaling productivity question or the human versus technology one.

MR. WANG: Well, upscaling. I think the local partnership is the key to a successful upscaling the existing workforce. The current workers, they cannot move far, okay, from their home base. So I think the local vocational schools, the two-year colleges and also the companies, they can work together to identify the gaps and then bring the technology. For instance, manufacturing innovation institutes to the local MEP manufacturing extension program partnerships and then upscale the existing

workforce.

And then on the human aspect. Right now the artificial manufacturer in AI robotics and they are really new technologies. But five years from now, ten years from now almost all companies will have all this. And this will become the essential capabilities, okay.

So they're going to have to compete on business models, the innovative business models. And then business models are developed and created by human beings not by robots or by AIs. So I think the human aspect in the future of manufacturing is even more critical in order to compete well.

MR. WEST: Okay. I'm glad that each of you voted in favor of humans here. That's reassuring.

So Tracy has a question about marketing manufacturing. She says is there a marketing problem for manufacturing when it pertains to attracting workers in the future because she says people do not see manufacturing as sexy. You know, it's not like technology or mobile apps or other things like that.

And she says, we need to do a better job marketing manufacturing as the tech jobs of the future. So any thoughts or reactions to that?

MS. REYNOLDS: Well, I can just say I think Tracy is completely right and hopefully she's on the case and helping with that in whatever work she does. But I think that's true. I think also though we have to recognize that for several decades we had significant disinvestment in our manufacturing base and it hit very hard in particular communities.

And if you grew up in those communities and you saw your grandfather or your father lose their job or a lot of the waves of the industrialization and offshoring. It is very challenging to say, okay, I'm going go enter into that field. And certainly, parents are going to ask twice about that.

I think the positive piece here is to say -- and Ben said it, I think earlier, but we're really in a 21st century manufacturing is going to look extremely different than 20th century manufacturing. It is a completely different way of understanding how we're going to be doing this.

There's going to be much more technology, much more interface with computer systems.

You know, if you go into some of these facilities now, you'll just see these, you know, clean and sort of precision-oriented places or factories that I think are very much a different a vision than what people have. But the marketing part, I think the thing that we're not going to be seeing. And actually, manufacturing is going to have -- when we start to see the kind of products that are coming out of manufacturing. When you start to see the way in which it is actually embedded in so many of our new and important kind of industries around biopharma, around clean energy related technologies.

We're going to see a next generation that actually sees that there are advantages here. Where there's something interesting here and that they like to actually work with their hands. That sort of move, I think is now happening in this next generation. And even though they're sort of, you know, raised on the software and the apps, how that applies to manufacturing, I think can be quite interesting.

MR. WEST: Ben, your thoughts on this advanced manufacturing thing? And how manufacturing actually is going to become technological?

MR. WANG: Yes. I absolutely agree. I think the future of manufacturing is digital manufacturing. A lot of high-tech products, devices, machineries and tools, okay. And I recall 10 years ago when the advancement manufacturing partnership started and there were four workstreams, technology, infrastructure, policy and the fourth one is the imaging of manufacturing as a career choice, okay.

So the people recognized that the image of manufacturing may not be as good as some other sectors. But going forward digital manufacturing is going to be clean, quiet and also high pay as well. And that also requires really very good skills, okay.

MR. WEST: And so, clean, quiet and high paid that should be an attractive package for young people. Anna has a question about the design side of manufacturing. I mean often times in these discussions of manufacturing, we really focus on production. Her question is about design and basically how can we do a better job involving research and design institutions in developing manufacturing and what, if anything, is some of the proposed new administration initiatives doing to promote design in here?

MR. WANG: Liz, do you want me to take this one first?

MS. REYNOLDS: Please, Ben.

MR. WANG: The design for X, okay? Is really very important and the design actually determines 80 percent of the cost, okay, even though the real cost happens or incurred during the design stage. It's only about 15 or 20 percent. But design actually determines at least 80 percent of the cost.

So design for manufacturing going forward, the design for additive manufacturing, okay, because additive is a very different approach to production. Design for supply chain, particularly the design for resilient and robust supply chain in the past it was all lean, but going forward I think resilience and robustness are becoming more and more important.

So and design for circular economy, okay, to make it clean and reusable, recyclable. So the design is absolutely a crucial aspect in advanced manufacturing. So manufacturing is really not just to make things. It's really to design and make, distribute and reuse.

MR. WEST: Okay. We have a question from C.J. Carter who wants to know what advice would either one of you give to local Workforce Development Boards in order to get people employed in manufacturing?

And of course, just for our audience, the workforce development board are set up many communities across the country and involve kind of trying to connect businesses with educators to make sure people are having the right skills. So any advice for these local workforce development boards?

MS. REYNOLDS: I can go ahead and just say, you know, I've seen I think great work by the Workforce Development Boards in Massachusetts where I was, you know, have been for a while in which it's really again based on a regional. Looking at sort of regional economies and having the workforce boards be very connected to the demand side. Understanding both supply and demand in the manufacturing space.

I think having that kind of information that is sort of a relationship that understands where we're seeing gaps, where we see opportunities. That's the first piece to being able to solve for some of the workforce challenges.

I think the second area for the boards is very much the sense of integration across

institutions. How can they help with that seamless flow from the high school to the secondary education? What we've seen is I think that where we can catch students early on and interest them in some of this work. If we can provide a seamless pathway, we can get folks through with their certificate, with their degree and a good position for that career path.

I think it was said in the previous panel. You know, for the longest time, the emphasis and certainly in the country and perhaps some of the sort of general public discourse was that the four-year degree was the only path forward towards success. And no question, the returns for a four-year degree are higher.

But the fact is four-year degrees aren't for everyone. And a lot of people -- of course, the 40 percent start a four-year degree and do not finish within six years. So it's a lot of waste of time and money. We need to really strengthening that pathway towards the middle. Pathway to a middle. The middle wage jobs to the middle class.

And I think the workforce boards are focusing on that and focusing on that opportunity for the next generation is really where there's a tremendous amount of opportunity. I'm excited about that shift for us in sort of a general shift I think in the public discourse. I'm really excited about it in terms of the priorities for the Biden administration.

MR. WEST: Ben, any advice that you have for local workforce development boards?

MR. WANG: Just very quickly. I think first work on the demand side by identifying the Case A gaps and then work with the local two-year colleges, four-year universities and also vocational schools in developing programs to fill those gaps.

And make sure the programs are built on standards, okay? And then we want to continue to monitor the return on the investment for the employers and also for the trainees.

MR. WEST: All right. Thank you for that. I have two questions about what's called micromanufacturing. So these are firms with under 20 employees. So the tiny businesses that are out there.

So Elana of Recast City wants to know how will these programs help micro-

manufacturers scale up and become a stronger part of our domestic supply chain so basically can micro-manufacturers help solve some of these onshoring and global supply chain issues?

And then Kennedy has a related question that is basically does the Biden administration have any plans specifically for micro-manufacturers?

MS. REYNOLDS: I guess I'll go first, Ben. And again, that's fine. So the micro-manufacturers, you know, a critical part of our manufacturing base. I don't know the exact the numbers in terms of numbers, but we have a lot of micro-manufacturers who fill a niche often making commodity products or other, you know, niche products for their customers and don't necessarily have a tremendous capacity for investing in their own growth or growth trajectory.

In some previous work that we did at MIT. We used this phrase, you know, these companies are often found home alone. You know, how and when you were small firm, you're completely. You don't have a VP for human resources or for R&D or for any of these things. So how do you actually look for ways to grow and to expand and find markets, et cetera?

And so, I think that there's a challenge there and there always has been a challenge there. And the question is how can we make sure that these firms become more competitive? Part of that is investing in their equipment and their people. And it's also about figuring out new markets. And I think in terms of programs or approaches to this a couple come to mind.

And these are kind of the bread and butter programs for the country and ones that we're investing in significantly in the Biden administration. One is of course the MEPs that we talked about. That is really the niche for MEPs is to think about the small and medium sized firms and how do we help them make that next leap and provide the resources that these firms can't provide themselves.

And the second, I think are SBA and the role that SBA plays in terms of providing basic capital to affordable capital so to speak to these firms. And particularly for those who have small perhaps investment needs. But even for a small company to invest, for example, in a cobot. You know, that could make a huge difference in their productivity.

And so, how do we help those firms understand first of all that a cobot could help them?

How do we give them the know-how and the sort of technical assistance to bring in that integration because it is not necessarily obvious to these small firms? And then how do we provide the capital to allow them to make that kind of investment?

And so, I think on all fronts I think that that's something there. We have some existing programs that we are actually reinforcing and doubling down on in the administration.

And then I also want to say that I don't think it's just a role for government. I think we also want to be looking at ways that when customers and OEMs are also looking to invest and support their suppliers. And finding ways in which they can be incented to also do this. Because the OEMs are only -- their sort of technology adoption and their efficiency and their resiliency -- as Ben, you know, points out -- is only as good as their supply base.

And in a lot of research that's been done about supply chains and resiliency. Often the weak link is found in that fourth or fifth tier of suppliers. It's the small commodity making supplier that you didn't think about where you have some of your, you know, link in the chain. So I am hopeful we can find ways to, again, bring private sector investment and resiliency and that will help the small firms.

MR. WEST: That's a great point. And certainly, both government and business have some responsibilities in this area.

And just going, Liz, going back to the point made earlier about procurement. Procurement is an area where often large companies that have lots of experience selling goods and services to governments have clear advantages. And these small companies just don't have the staffing to do it. Procurement is complicated. There are a bunch of rules and regulations and it's very difficult for them. So procurement reform could be a part of that.

But, Ben, any particular advice you have in terms of micro-manufacturers?

MR. WANG: Very quickly, I think the best way to do it is really to work with local MEP. And the manufacturing extension partnership is really a national treasure, okay? It has strong presence in all 50 states and Puerto Rico. And it is the best manufacturing extension program in the world.

And I think we should continue to invest and incentivize the companies to work with MEP

and MEP work with the local companies.

MR. WEST: All right. Thank you. So Jim has an international question for you. He points to other countries, you know, such as South Korea that he says has a very dynamic and innovative 21st century manufacturing.

And basically, he wants to know why can't the United States do that? Like what are we doing wrong? You know, is public policy a factor? And I would just add to that. Like, you know, we know there are other countries like Germany is a common example that has invested heavily in manufacturing and has a very robust manufacturing sector. Are there lessons that the United States can learn from these other countries as we consider ways to help promote such?

MS. REYNOLDS: Well, I guess I'll kick off. And I couldn't agree more with that question that, you know, there are models out there that emphasize the role of a public/private partnership in which manufacturing is a high priority for the country and is their foundation for growth and for innovation.

And so, I think we can do that. I think that's what the Biden administration is trying to do with this manufacturing agenda, with this industrial strategy in which we see a real -- a focus, a role for the government to try and fill gaps and to rebuild what has been lost over the last several decades.

I think one of the things you see in both of those countries that I want to emphasize is actually a real investment in labor. And if you look at the German model in particular, there has always been a way in which labor and management are partnering. And we see higher wages and we see more support also for the SEMs whether that's through financing or other areas.

But if you're investing heavily in your workforce, you then have a very big incentive to increase your productivity because you're trying to get as much as you can out of, you know, every hour of the workday. I think that's first and foremost one of the pieces here that is part of the Biden administration is to say, let's invest in workers. Let's make sure that we're providing quality jobs.

And then the other part is to say, we have it's in our national interest to have a strong manufacturing base. I don't think we've necessarily really emphasized that in the past in the way that we're doing this now. And we're identifying through this supply chain work places where we see we have

gotten -- the system as it stands, which has been very much focused on efficiency and on short-term profits, et cetera, has become untenable when it comes to sort of issues of national security and economic security.

And so, how can we have a strategy in which we're saying, you know, it matters to us that we are able to have some biopharmaceutical capabilities in this country. You know, it matters to us that we need to have abilities to make semiconductors in this country.

We have a number of areas where I think other countries have made those decisions and we're making those decisions now. And I think that that's going to be helping us build and kind of look I think hopefully not exactly like. We have a different system than those countries. We are not -- you know, we are much more decentralized. We have a much -- I think a very strong role, an important role for the private sector to play.

But nevertheless, I think there's a way in which we can rebuild and create sort of a U.S. version of the strong manufacturing base that is going to learn. You know, we can learn from those countries and apply it in a uniquely U.S. manner.

MR. WEST: Ben, any lessons from abroad in terms of what other countries are doing that we can develop here in the United States?

MR. WANG: I think just two quick additions. Number one is the realization that, you know, innovation cannot be separated from manufacturing. These two have to come together, tightly coupled. And building on that to create a set of industrial policies to support those innovation and the manufacturing in the U.S.

MR. WEST: Okay. So I think we have time for just one question. So far, we've basically been talking about American investment in America.

Robert has a question about what's called foreign and direct investment. Basically, foreign companies investing in America. Of course, there are many foreign companies that actually already are doing this. So he wants to know what role do these foreign direct investment companies play in improving the manufacturing sector in the U.S.?

MS. REYNOLDS: That's a great question. And I think it's an obvious -- maybe it's an obvious thing to say. They're critically important. We got foreign-based companies that have significant investments in this country. Some of our major manufacturers in the country are, you know, foreign based. You can find them in autos. You can find them in electronics. You can find them in a whole host of areas.

And often they bring, you know, I think best practices from other countries particularly when it comes to introduction of new technology. I think you'd find that a lot of the foreign companies have potentially been quicker to invest in the industry 4.0 technologies. They also have often good practices vis-à-vis labor and management. Not always, but in terms of investing in their workers and understanding that the workers are kind of what drives productivity growth, I think is very important.

What we've seen in some of the companies that we've interviewed. I've interviewed certainly on my previous job is that what you can often bring to a new context is regionally based. So if you see a foreign investment in the Detroit region or in the Carolinas or something like in that area. Whatever their practices are often there's a spillover effect in which other companies learn about or they start partnerships within educational institutions like they might do in South Korea, like they might do in Japan. And that actually becomes something that becomes a positive here.

So I think they play a really important role. I hope we continue to attract that investment and it's often, you know, it's not just our market, it's our innovation capacity that often attracts the international companies. So we have to be very clear that that's kind of real asset that we want to be investing in.

MR. WEST: Ben, your thoughts about foreign investment in improving American manufacturing?

MR. WANG: Well, I agree. And I think there are several aspects. The job opportunities and also economic growth resilience by shortening the supply chain and also the national security should be a top priority as well.

MR. WEST: Okay. Thank you very much. So, Liz, I want to thank you very much for

joining our conversation. It's great that you're having a chance to apply your academic expertise from MIT in the White House. So we look forward to seeing the fruits of your activities.

And, Ben, you've been doing tremendous work in Georgia Tech so good luck in your ventures as well.

To our audience, thank you very much for tuning in. We appreciate your interest and if you would like to learn more we at Brookings write regularly about manufacturing and ways to improve the climate for manufacturing in America. And you can check out our work at Brookings.edu. So thank you very much for tuning in.

MS. REYNOLDS: Thank you, Darrell.

MR. WANG: Thank you, Darrell.

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