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The Role of Leadership in 21st Century Manufacturing:

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P R O C E E D I N G S

MR. WEST: Okay. Good morning. I'm Darrell West, vice president of Government Studies and director of the Center for Technology Innovation here at the Brookings Institution, and I'd like to welcome you to our fifth annual John Hazen White manufacturing forum.

And we are webcasting this event live, so we'd like to welcome our viewers from around the country and around the world. We will be archiving the video from this conference, so people who want to view that afterwards, will have an opportunity to do so at the Brookings.edu website.

We also set up a Twitter feed at hashtag #USMFG, so if you wish to post any comments or ask questions during the forum, you're welcome to do.

And it's always interesting to go back later and kind of compare the conversation we had within the room with the virtual conversation that is taking place around this.

So we have several guest with us: Our benefactor, John Hazen White to my right, so he is here, along with his wife, Liz, and sons, John and Ben, who are over here.

So please join me in expressing our appreciation for their financial support of this forum. So, thank you.

(Applause)

So for several years, we have explored different aspects of manufacturing. We've looked at the manufacturing renaissance and what has helped to bring this sector back. We've studied the obstacles facing the industry and ways to overcome them.

One year we examined the Obama administration's initiatives on regional manufacturing hubs, and what they are doing to encourage innovation, and last year we focused on work force development as it related to manufacturing.

With the many interesting developments that are taking place around the world, this year we chose to focus on manufacturing in a global contest. What are other countries doing. What innovations in leadership or work force developments have been successful? What lessons can the United States take from what other countries are doing.

So today we have a program that will look at several aspects of global manufacturing. Our first panel will examine the of leadership, and we have people from the private sector, as well as the

public sector to offer alternative perspectives on this, and then after that, we will have panels to look at innovations in work force development, and lessons from abroad.

And will hear from people in the China and South Korea, and Australia. We have some from a German company on this panel, so we're trying to incorporate a variety of different angles on this.

So to help us think about this topic, we have several prominent experts:

Eric, Lachambre is the chief operating officer of Wilo, one of the leading manufacturing firms in Germany. Eric has been a member of that company's executive board since 2011. He's responsible for operations in mature markets, division circulators, group marketing, and group service, among other activities.

John Hazen White is the CEO Taco Comforts Systems in Cranston, Rhode Island. He is the third generation of his family to head Taco, which was founded in 1920, so soon you will be coming up on your centennial.

In recent years, he has innovated --

MR. WHITE: Not me. The company.

MR. WEST: The company. I was not implying that you are about hit 100, although you'd be a very youthful 100 if you were in that category.

In recent years, he has innovated by hiring a new president and chief operating officer Wil VenderWiel, who is actually here with us today.

The company has required Hydroflow Pumps, a Tennessee manufacturer of pump for mining and agriculture. And most recently, the company acquired an Italian pump maker, (inaudible).

Jennifer McNelly is the executive director of the Manufacturing Institute, which is the nonprofit arm of the National Association of Manufacturers. In that position, she works on the attractions, qualification, and development of world class manufacturing talent. Her goals are to support research on manufacturing excellence, focusing on innovation and talent recruitment, and then solutions that will help make American manufacturing more competitive globally.

Jay Shambaugh is a member of the White House Council of Economic Advisors. In that position, he advises President Obama on a range of issues including manufacturing policy.

He is on leave from George Washington University where he is a professor economics and international affairs.

So, Eric, I'd like to start with you. You are the COO of a very successful German manufacturing firm. And, of course, Germany is considered one of the world leaders in manufacturing, so what is German doing right in manufacturing, and what should Americans know about German manufacturing? And I ask that even though you are French.

MR. LACHAMBRE Yeah, but that, I was about to start (inaudible). In fact, I'm French. I'm working for German company for seven years, and I have the chance during my life to work in different countries, so I spent time in China, four years, but also in Canada, in Belgium, in Austria, in Italy.

Living and working in those countries gave me the chance and the opportunity to see different things. What I can tell you definitely is that describing in a few words why Germany is a successful manufacturing is a bit of a challenge, but try to make it simple because that's also one thing I learned in the U.S. We like simple things. Is to make complex things simple. And I try to summarize, in fact, (inaudible).

So successful manufacturing in German is due to the fact, point one, that it's a nationwide cause. It's a nationwide mission, manufacturing. Everyone works in the same direction to support manufacturing because everyone knows how important it is for our country: Governments, politicians, associations, workers, and so on.

So that's point number one. This is an important point number two, which is also very important is the structure of the companies. Small and medium enterprise are very strong. In Germany they are also called mitterstand companies. You have lot of them successfully, and their success is coming from the fact that they are family-owned, you know what it is, family-owned company focusing on a niche market, and being most of the time number, two, or three in their niche, actually.

Why every so successful is because it's family driven. Family are investing, invested in the future. This is very important.

Now, they are also supported, and this is the third point, by a very interesting institute called Pilofer (Phonetic 14:29:05) Institute, which is supporting those mittlestand companies with

innovation. Innovation in product, in processes, in way of doing, and this is something very important. We can talk about it for hours, but let's, I said make it short to start.

So to summarize this Polifer Institute what it does it does that small company are not (inaudible), just someone to help.

And point number four, last but not least, work force. The educational program in German is particularly well done for manufacturing. I don't say it's the best overall for all type of job probably, that is for manufacturing it helps a lot.

It's a dual training, dual program whether they are vocationals, or like of apprenticeship, or study, because this happens also for university, learning on the job, and especially for manufacturing you need people who are convinced that they are going to do a job that they would like. That it's not only being working in a noisy, dirty factor, but in a place where they can really do something and contribute.

So I believe in a nutshell those four points are really summarizing for me the reason why Germany is doing such a nice job and being able to keep a level of around 24.25 percent of the total GDP coming from manufacturing sector. This is really a success because if you look at the evolution of the last 30 years, they were at 23, 30 years ago, they are now 24. And when you look at all the other countries, developed countries, whether it's U.S., U.K., France, they were at certain time at the same level, but today they are around 10, 20 percent.

Of course, this means a lot of potential. Let me say at least this is a summary of the situation (inaudible).

MR. WEST: Well, that's 25 percent of GDP. That is a country that is taking manufacturing very seriously.

So, Johnny, you have worked in American manufacturing for a long time. What is American doing well, and what does America need to do better?

MR. WHITE: You know, this, I think, I think, we had a lot of red wine last night, right? Did we talk about this because (inaudible) absolutely.

I think a lot of what Eric has talked about is relevant here. I look at the U.S. as a huge opportunity, obviously, to recreate manufacturing. I think where we may have fallen, fallen behind as much as anything is the image of manufacturing, and you've just talked about that.

I think manufacturing has taken a role in this country of being something less than where people want their children to go. And I think if we can somehow find a way to overcome that over time, I think well position ourselves -- we talked about this I think last year. There's a small town someplace in the, you know, we're all confronted with regulatory issues, and all this, so a lot of the same things wherever we are.

And we're confronted with material costs. Right. This is I've learned is that we must purchase more (inaudible) because the rest is up to us, right? We control the productivity of the labor content and everything else.

So I think if in so doing we've created these factories which are incredibly efficient, incredibly high tech. And there's a small town, we talked about this last year, somewhere in the Midwest that has a factory which is one of the largest suppliers to the automotive industry, I think, and they're losing more jobs in this company due to retirement and whatever than they have people to fill. Okay. So the company was facing closing, and moving, and going, actually, going bankrupt.

And what they did was they came together with the town to put together a program, the city to put together a program to bring kids in from school because parents were not allowing the kids to go to work in a factory.

And so they, they were bringing in the kids first, and the kids were going home and saying I gotta work there because it's pretty cool. It's like a video game. And the parents are saying, no, it can't be.

So then the town was bringing the kid and the parents in. And then they were paying the kid $80,000 a year after highs school to come to work. I'm not sure where I go with that one mentally because I think kids ought to be able to go to college if they can, but they were immediately paying them $80,000, and that town has resurrected it's manufacturing base.

And so I think that proves a point. That if we can all collectively get a vision of what manufacturing really is, it's not the dirty old place that you have to go just to earn a living. It's something that -- and college education and manufacturing are not exclusive anymore. I think they go together.

So I think if we can overcome some of the imagery, we can move ahead pretty rapidly in this country.

MR. WEST: Okay. Jennifer, you are working on making U.S. manufacturing more competitive globally, so could you tell us a little bit about your activities and what you would like to see the United States do?

MS. McNELLY: (Off mic) service with the World Economic Forum where I chaired the Future of Manufacturing Global Agent Council. And we examined, actually, this exact topic. What is going on in the global marketplace with manufacturing, and what does it take to be successful whether you are a developed nation, or a developing nation and everywhere in between?

And the architecture we actually just released the report this past week, and it's up on the World Economic Forum website if anybody is interested, but we actually looked at, it's sort of a new social compact with manufacturing as it relates to the role of the public sector, the private sector, and ultimately civil society, and what does it mean from a jobs perspective, and what does it mean from a policy perspective, and what does it mean from a growth perspective?

And what we do through two sort of two years' worth of work and benchmarking, and I think we ended up with 22 or 23 case studies that looked at the drivers. Fundamentally, we are at the precipice of significant change in manufacturing. And that creates a new set of opportunity. It's not just the produce innovation. It's the process innovation that's driven by new technologies, and the efficiencies that that drives in manufacturing, and then what I always consider my sweet spot, the people innovation, and what that means for job creation and opportunity.

And in the context of that, we benchmarked against the role of each of those constituencies and agreed that what we really need is greater transparency. What does manufacturing look at in growing economy, or a developed when communities come together at really the job level to do exactly what we're talking about here, to create opportunity, and what does it mean when you have the ability to manufacture in environments because process has changed so much, sort of the democratization of manufacturing in growing economies, and the new market opportunities that that bring forward. So as I think about what that means for the U.S. here. And, you know, the Institute spends half of its time benchmarking both globally. What I know is the people element is the number one (inaudible) issue. That in the end, having individuals understand what modern manufacturing looks like, what the career opportunities are is really important here in the United States.

We do have a culture of college for all, yet I think there is an increasing sentiment here in the United States of what is the value cost of that opportunity? I would juxtapose that against the apprenticeship model you spoke to of both going on Germany that we benchmark constantly against where individuals have the opportunity to advance in an education environment aligned with what their economic opportunities actually are, and what their interests are.

So college and life-long learning become an element to that. So as I think about what we need to be doing here in the United States for the competitiveness of manufacturing not only do we need to change the perception of manufacturing, and we've started to make great strives through activities like National Manufacturing Day where we're asking our nation's manufacturers to open up their doors and invite in parents, and teacher, counselors, and students so we can firsthand show them how exciting it is.

I think we also need a new conversation about what the public education system looks like aligned to what the nation's economic opportunities are. And those are the kinds of things that we look at the Institute. How can we create good public policy to advance the competitiveness of manufacturing.

MR. WEST: Okay. Thank you.

So, Jay, speaking of government, you are on the front lines of (inaudible) through the Council Economic Advisors. What is the public sector doing, and what should the public sector be doing to enable manufacturing?

MR. STAMBAUGH: I think there are a lot of things that already been raised, and so I think on the one hand there are issues in work force training where I think some of the programs trying to engage more with the community college system.

MR. WEST: Right.

MR. STAMBAUGH: You know, we, different countries have different institutions, so we wouldn't follow exactly Germany's apprenticeship model, but there are a lot of things you can do with things that are unique to the U.S. system like the community colleges to try to map people better to employment opportunities.

I think that the National Network of Manufacturing Innovation is a really important development that's taken place more recently that I know you've covered in previous years where we're

now up to, I believe, nine institutes across the country, and we're building towards 15 where we can really try to do more to make sure that we are keeping the U.S. manufacturing firms at the cutting edge where we're linking them to the places where R&D is happening to make sure R&D turns into actual manufacturing process.

But I think one other thing just because it has not been mentioned yet, is we talked about both sourcing globally or being globally competitive, there's also the issue just that manufacturing is an and export oriented industry within the United States. So the U.S. a huge economy, so we can do a lot of trade with ourselves, but manufacturing is a little different relative to a lot of other industries in the United States in that a much larger share of what's manufactured here is exported.

And so I think one of the things that is really important, and we've tried to take really seriously over the last seven years, seven-and-a-half, is defending U.S. firms in global commerce. And I think it becomes really an important issue in what we often refer to as trade enforcement.

And this can be in two directions, right? On the one hand, it's because so much of manufactured content is exported, a really important thing is to make sure that exporters are getting a fair deal abroad. Right? To make sure that the trade deals that you've negotiated are actually being implemented in the right way.

And if you, you can go back and look, I think in this administration we filed 21 cases at the WTO, which is more than anyone else in that time, and we've won every case that's been adjudicated, and I think the reason is that broadly the U.S. follows its trade rules that it's supposed to, and one of the important things is just to make sure other countries are doing the same.

And that's not a knock on any other country. Not long after the U.S. and the EU had more trade going back and forth, they filed a lot of cases back and forth against each other just trying to make sure that we were all doing what we thought we should.

And as other countries kind of join the global trading regime, it just requires the same activity of pointing out, you know, that rule of yours isn't actually consistent with what you've agreed, so a lot of this has been Department of Commerce making sure that Korea is implementing the Korean Free Trade Agreement properly such that U.S. firms have the chance to hit that market the way they're

supposed to be able to whether it's making sure other countries aren't using dumping or countervailing duties in an inappropriate way that are blocking U.S. firms.

And I think it's something like 200 cases where U.S. exporters have come to the government and said we have a problem here. We can't get into this market. That over the last few years, we've been able to go around and get other countries to change those policies.

And in every case, it's not earth shattering. You say, oh, it's $5 million more of exports to that country, or it's $10 million there. Those things aren't gonna change the entire world, but they're really important to the individual firms, and to their success, and they also set precedence to try to make it easier for other firms.

And then just lastly I'd say one of the issues we do face globally in manufacturing right now is that in some core industries there is some clear evidence of overcapacity in things like steel where one of the issues you run into as an economist you want to think, well, these things will sort themselves out. If there's overcapacity, prices will move, firms will change, but if you've got a very large share of production taking place in a country that's not really responding to market forces, that requires more engagement by the government. It requires both using your own trade rules to block dumped or subsidized products, but also it really requires more than just tariffs. It requires true global engagement. And I think that's where we've seen a lot of activity in the last year especially with meeting through the OECD or through G-20 and G-7, and trying to get everyone together to say, look, where there's a problem, we need to come together globally and try to sort this out because we need to make sure the global market economy is working in a sensible way.

MR. WEST: Okay. I'd like to through a question for everybody on the panel, and give each of you a chance to answer. And there are a couple of variations on it.

What lesson should the United States learn from other countries? And are there particular countries that are doing this well? Some of their activities may be unique to that country, but are there things we can learn?

And, Eric, maybe we'll start with you.

MR. LACHAMBRE: Yeah, well, as I said, the (inaudible) is very specific. I believe it cannot be complete in a way, but PCs could be used as example, and as you said, we cannot copy the apprenticeship model, but we can learn from it, what works there. Why.

And I believe this is one of the most important elements for the future because manufacturing is going to face a new challenge. And there, again, Germany is setting an example in being prepared (inaudible). But this is what we call the revolution, the first industrial revolution. This is something which is going to be bigger than what we expect. This is the smart factory. This is the future, and this is a huge weapon for mature market, mature country to be able, to complete in the new global situation.

Germany was for the last 20 years providing (inaudible) tools, processes, to the worldwide industry to grow. How Germany is going to face the future that everyone's able to produce, policies improving everywhere, growing country innovative, you know, in product, in processes, so the way to succeed is to be (inaudible).

Being ahead, this is again relating to the nationwide mission I was mentioning before. Germany decided five years ago that to pass this force industrial revolution, they need to put everyone in the same direction, and there is this huge project also helping those old companies to be prepared for the future.

And back to the challenge of the workforce, you don't need now just people who know to work in a factory. You need those people, but they need to be digitally prepared. And I tell you, it's going to be a new challenge. And if we are not prepared for that today, we will not be ready tomorrow. And this is exactly what was started, and when we talked about Industry 4.0, you know about that because at the last (inaudible) U.S.A. was a guest country, and there were a lot of discussion around that, and I can tell you that this is one thing which is very important, and this is one thing I believe the U.S. could learn. Development of the workforce for the future not only for today, and finding a way to face the challenge of the future for manufacturing in general.

MR. WEST: Johnny, what lessons do you think the United States should learn from other countries?

MR. WHITE: Well, I'm gonna piggy back right on what Eric just said because I think we have a lot of common thoughts and in our everyday lives.

I would tell you this. As I look back at the development of Taco, we have had to stay in the front technologically for the purposes of productivity, quality, and marketing.

So the lesson I've learned from folks like you is that investment is continually the forefront of what we think about. We've invested in machinery. We've invested in productivity. We've invested in quality. These things have saved the company, and, in fact, provided a platform for it to grow and develop.

But I will tell you this. The single most important investment that I think any of us can make is in our workforce, in our people. And I look at this from different perspectives. Of course, in my company, five, six, seven, 800 people now, with a turnover rate of under a half a percent. So we retain people.

That's a good thing because were able to protect quality and all of those things, but we also now have a workforce who is committed to succeeding. They're not thinking about the next guy. They're thinking about succeeding at Taco, both for them and their families, and a community, and for the company. It's the greatest single investment we can make. Plus, I also view us as companies -- this isn't really answering your question, is it?

MR. WEST: But it's a good answer, so it's okay.

MR. WHITE: I know it's a good answer. That's why I'm giving it.

I view companies like ours, manufacturing companies, as communities with people that have real lives. They are not there to provide me a good income. I'm there to provide them an opportunity to live a better life, to grow and prosper with their families. That comes back. More than any other investment we can make.

MR. WEST: Okay.

MR. WHITE: That's my answer to your other question.

MR. WEST: Okay. No, that's fine.

Jennifer, what lessons do you see?

MR. McNELLY: So, I'm going to share a story. When I started my service as the chair of the Future Manufacturing Committee, I had the opportunity to visit a aviation composite company in the UAE. This is about two-and-a-half, three years ago. And when I think about sort of the growth of manufacturing, there is sort of this pattern that is historical, and the new rule do not apply in today's marketplace.

And that was you sort of started to hear at the low skills rules based (inaudible) manufacturing economy as you became more sophisticated with the processes, and you entered new markets, and you moved up the value chain.

And two-and-a-half years ago, I had the opportunity to tour Strada in the UAE. And they entered at the top of the value chain in aviation. So one of the highest contributing manufacturing sectors at the top of that value chain within five years are now a tier one supplier to our nation's airplane builders. Five years. That's what manufacturing looks like today.

And the other unique element associated with Strada, and part of why I was invited to visit it, was 80 percent of their domestic workforce was female. And it was built at the community level around family contributions and wanting to contribute to the growth of the community that they lived in.

And it was 120 women that had all been through very structured training programs, and two years later and 20 of them team leads. So they're seeing a career pathway. It's built at the community level. It's around that schedule, and, again, at the top of the value chain. They're gonna compete in the global marketplace.

And that's the way we need to be looking at what manufacturing is. These are not just incremental steps we need to be thinking about. It's sort of the uberization of what manufacturing is gonna look like.

Where the disruptions from technology from the fourth industrial revolution that are gonna rock the foundation and reinvent that opportunity. And I think those, that that can be really scary, or that can be really, really exciting. The innovations.

And that's the way we need to be looking at the horizon in a global marketplace. It's a very different horizon, and we need to adjust to that.

MR. WEST: Okay. I want to get Jay's perspective, then we'll open the floor to any questions from the audience.

MR. STAMBAUGH: So, actually, some of the things that are lessons that we've already been trying for, and as I mentioned, the manufacturing institutes, and things like that where we literally did just go around the world and see what other countries were doing that we weren't, and tried to take those lessons home, or whether it's trying to work more with the community colleges in an apprenticeship like way.

But I do think there's one thing that if you look, and it's not just manufacturing. It's a bit broader than that, but it, really, I think, relates to manufacturing. in the United States, different from many other advanced economies is we lose more prime age people out of the labor force than other countries do. And when shocks hit, and shocks will hit for a while variety of reasons. They can be trade shocks. They can be technology shots. It could be that a firm in a given town just didn't innovate. It didn't take the steps John's talking about, and it lost out in competition.

We don't catch those workers well enough. They fall out of the labor force too easily. And you look at our prime age in particular because you can strip out kind of the cultural differences, prime age male labor force (inaudible) in the United States is on a 50-year trend where it's been declining. This is not a new thing.

But you look at it compared to other countries and it's moving in a different way, and we're losing people, and when we hear over and over, you hear people talk about firms that are worried about do they have the right workers, and do they have the human capital they're going to need is that I think one of the things other countries do better is when a shock hits, retrain. When a shock hits, do lifelong hearing. When a shock hits, support workers so that we don't lose them out of the labor force. They're back in a different career in a different job faster.

And I think whether it's, whether it is bulking up community colleges to free community colleges where people later in life can get back into them whether it's wage insurance so people will hop back into a job quicker and not get disconnected, reforming unemployment insurance, a whole bunch of steps we can take I think would be crucial to try to make sure that the labor force people up here are talking about is there when they need it.

MR. WEST: Okay. Let's open the floor to questions from the audience. Right here, and if you can give us your name and organization.

MS. PESORIS: My name is Andrea Pesoris (14:54:_), and I'm with PLLC from New York.

Perhaps, in order to influence agency, you know, management because they are such an important factor here, if that's the theme of the panel, we need to revisit policy that comes at the level of the president and the White House. So, perhaps, we need to revisit repealing the G-9 agreement that George H.W. Bush went into while he was president. So with the Germans he agreed to deindustrialize America, going to (inaudible) job growth, and the Germans in time were able to cover for their reunification an EU free trade zone where the national champions could export into that without tariffs and things like that on the Euro in time.

So we need to, don't we, shouldn't we look at policy, what's going to, I mean, we need to stop planned obsolescence, and we're not just doing that in our manufacturing as a management profit strategy. You know, and it's kind of a pathetic insipid profit strategy.

The German's aren't doing that. We need, don't we need to have the right respect at the level of where policy can influence agency decisions, and management has to be properly incentivized and not just with the ability to while deindustrializing they aren't having a heavy balance sheet anymore.

They run all kinds of saves and costs through the income statement to play income statement games, and so they make themselves look like they're more profitable, but we've been self-immolating for the last, since George H.W. Bush's G-8 Agreement.

And you see it in the rise in the equity markets. Management has just been able to plow the money back into the turn of (inaudible), rather than putting it back in a product footprint.

And many of the producers are government contractors. So what's remaining of America's industrial footprint are government contractors in one way or another. So we have shrunk 15 percent of our GDP from production down to only being 9 percent of our employment workforce. And, whereas, it's not quite an exact correlation with regard to when you're looking a data analysis, don't we need to reflect on the things that, so we don't need to do trade liberalization we don't need to do, and we need to stop doing free trade agreements? Don't we need to reflect on these?

I'm not agreeing George H., I mean, with Donald Trump, but don't we need to -

MR. WEST: Okay. I think we have the question. Jay, you want to respond to that?

MR. STAMBAUGH: Yeah. I guess the first thing I would say is just there is no plan to deindustrialize the United States at government level. Like that is not the goal. I think I can say that in the economics sphere there is almost no issue that animate this current president more the notion that we can make things in the United States whether it's having like a maker's fair, whether it's having these national manufacturing institutes, there is a strong belief that we can make things.

I also though do think it's important, and this goes a little bit to something John said earlier, we are good at manufacturing. Right? I mean, I think there often gets, one gets this idea that because other sectors have grown faster, well, we just can't make anything.

And I will say as an academic I get frustrated when I hear other academic says, well, of course, we just don't make things in the U.S. anymore. We're a service economy.

And I think well that's just not true. Right? I mean, we're one of the largest manufacturers in the world by output. Now, partly, we're the biggest economy so that's that easy.

But we're also one of the top three exporters of manufactured goods in the world, which means that those goods that we're making here are competitive on global markets, and so I don't, I honestly just don't think it is the case that there's a deindustrialization plan.

I think a lot of the steps we've been talking about up here are important, and I think there was a period over the previous decade where manufacturing really did take a big hit in the United States. But I think over the last five years, you do see a rebound, and I think a lot of the policies that people have talked about have been important in that.

MR. WEST: Yes. A question right there, and there's a microphone coming up from behind you.

MS. SEGARRO: Good morning, ladies and gentleman. My name is Rosemary Segarro. I'm the president of Segarro International Group.

We focus on small businesses in Africa. And looking at your discussion, Africa, the U.S. government has an initiative with Africa, and we work with small and medium companies in Africa looking at the German model.

African small and medium companies are not like U.S. small and medium companies. So what would you advise the best way for manufacturing in Africa and the exporting to other countries. Yes, international like here we are talking about global Africa, and maybe it's not there, or what the manufacturer is not good, or maybe good, but how do we make it happen for (inaudible) development looking at manufacturing in Africa? Thank you.

MR. WEST: Okay. Great question. Anyone of our panel?

MS. McNELLY: So outside we've talked a little bit about this on the global stage, and I think that we all need Africa to succeed and grow. And part of that is the development of innovative technologies, I think, having the opportunity to create place based manufacturing first on the front end, and that's going to require a skilled and trained workforce, and the utilization of work-based learning models like apprenticeship. It's gonna begin to create that opportunity.

I think there's a huge opportunity in the global supply chain and the value chain to help grow. I would say if I were looking at sector, I probably wouldn't start with something like automotive. It tends to be place based, and you've got to start to build the middle class to make that production happen there.

But I see that there's huge opportunity in some of the stuff that we looked at from a case study perspective would validate that.

MR. WEST: Jay.

MR. STAMBAUGH: Add just one thing just quickly. I think one of the things that the United States has an opportunity to improve, and it pertains to your question, actually, and that is to deeper understand one of the things that our European counterparts, and, in fact, any other people around the world, have the advantage of is the different language skills, and different cultural experiences.

Most of us grown up in this country which, you know, whether we have a different culture in different parts of the country or not, we live under one sort of flag, you know, and one language, and one currency.

So I think there is no question, I don't think anybody could debate. Every single company in the world is probably looking at Africa as a greatest opportunity.

The question is for a small company, the need to know the culture, to understand what to go about this, it's a bit scary. But I think we all are looking at this as a huge opportunity. I know my company is.

MR. WEST: Other questions? Yeah. And you back on the aisle right there. Yep.

MR. JARBLE: Thank you. Ken Jarble at the National Academy of Engineering.

My question is how do we deal with companies that are lagging? We did a study last year that came out called, "Making Value" that point out that the frontier companies are doing very fine. They're innovative. They're productive. They employ a lot of people. Same finding from OECD recently on their look at productivity.

The problem is that the good companies, the frontier companies, it's everybody else in a sector. How do we help those laggered manufacturing companies? The ones that think they're doing okay, but really aren't, how do we bring them up to where the frontier companies are in terms of productivity and innovation?

MR. WEST: Panels. Don't be shy. Eric, you want to jump in?

MR. LACHAMBRE: Right. I can, let's say, share my experience again. I believe this what I was saying before. As long as we are not all convinced that manufacturing is important for the country over all, because this is job that not only manufacturing, in services around, in everything, as long as we don't get it right in our mind at all level in the society, we will not succeed. And when this is the case, I tell you those companies will work together. I was

I was very impressed also in Germany the fact that companies are working together to succeed. So German company will go abroad together to fight for new market, or even inside the county. Until the end, they work together.

And the smaller company not, let's say is the biggest one, or the strongest one, but even the one which are in the middle are teaming up together in order to become better. And this is a mindset. This is something we should, we should all fight for.

So I know it's difficult. I know each country has a different way of working, but this is also solidarity, and this is something that some country understood well, and do, and I believe there is a huge potential in that field, actually.

MS McNELLY: So if I can add onto that, I would say the other thing is the frontier companies are only as strong as their weakest supplier. And this really is an ecosystem, which, again, I think is one of those, there was a time period where it was about squeezing costs out, and that's not really the environment anymore. It's about the partnerships that get built.

I also do think that this is where government here in the United States does try to help through things like a manufacturing extension partnership trying to help companies think about their repositioning on that front. But I really do think it's the ecosystem here in the United States that's part of bringing those manufacturers to the table. And I will say I realize that's incredibly difficult in the context of they are just busy trying to survive, and, you know, keep things growing, and think about the next marketplace while worrying about the person that's getting ready to retire that could walk out the door tomorrow, so it's incredibly complex.

But I do think we overcome that through the ecosystem that happens with benchmarking the leading companies, and pulling good strategy and tactics down through the supply chain, and I do see those actions happening more and more, and then through networks like the innovation hubs, or the manufacturing extension partnerships, we do create a support mechanism to make it cost effective to get to the changes that need to happen.

MR. WEST: Antoine has a question. And I should point out, Antoine has a terrific new book on brainiac cities, and innovations that take place, which I'd recommend to all of you. Antoine.

SPEAKER: Thank you for the plug. I had a question that when I was writing this book really intrigued me. In this country, and I'm originally from Europe, in this country we're very good at promoting startups. We are terrible at helping midsize companies.

Germany is not so good at promoting startups. It's very good at, as you say, at helping, supporting in all the ways that you mentioned midsize companies.

What could we do at a policy level, this is really addressed to you, better to kind of get away from this, just as we have a college fixation, we have a startup fixation, to get away from that a bit, and do a bit more for midsized companies, particular as one of the people just said, the laggered. How can we help the laggered because I think that's really a critical question.

MR. STAMBAUGH: Well, I guess, I'd separate it a little bit between the laggereds and the midsize companies, because I think the real question is how to get the midsize that aren't laggered and how to help them grow.

I do think one of the things that we've tried to recognize a lot in the last few years is that as much as I've talked a bunch about how U.S. manufacturing is globally competitive, and a large share of output is exported, exporting's hard. You know, it's annoying.

You know, we've got this big market where we all share on currency, and one tax system, and that makes life easier. And then all of a sudden, you have to deal with currency risks, and you have to deal tariff laws, and you have to deal with a bunch of stuff.

And so there are a lot of firms who don't, as you say, they're busy. They've got a lot of other things going on. They don't want to make that leap because the fixed cost of entering a new market is high.

And I think there's been better recognition, you know, economists often will talk about countries trading, but countries don't trade, companies do. And so trying to get past that idea that we need to make it easier for these midsize companies to enter the global marketplace and that will help them grow faster, and help them move from that kind of stuck-in-the-middle (inaudible).

So I think that has been one thing, that there has been more policy aimed at trying to make sure that trade agreements that are negotiated really focus on how will these affect small and midsize enterprises, and will they be able to enter these new markets that are being opened, and try to make sure that whether it's commerce or, in particular, through commerce and the International Trade Administration, making sure there are people around the country who can make it easier for a firm to export. They can go somewhere and be told, look, these are the rules you have to follow. These are the things we can help you with. These are the consulates that are oversees that can help you. If you want to travel. This is how you do it. So I do think that's one piece of it.

I do think the manufacturing hubs, I think, some of the networks we've talked about are another piece of that trying to make sure these firms, they have an idea, they start to grow. The startup works. They're surviving, and then they get stuck with making sure they get integrated into the supply chains, into global supply chains, into national supply chains so that they can keep growing.

MR. WEST: John.

MR. WHITE: Yeah. Antoine, just to kind of take that in a different, in a nutshell, kind of for myself, and this may not sound very nice, but I think it's honest.

There's a lot of resources to draw from. XM Bank, or National Association of Manufacturers, I mean, I could go on and on, right? I think at some point, if we're lagging, it's our responsibility to figure it out.

When I began running Taco, it was not in good shape, and I didn't around for anybody to help me. I had to go at it. And we did. With our people by the way. That was why we won.

But at some point, we have to look, we're grownups, right, and so I think we have to go find those resources at some point. I mean, sure it's nice to have somebody come in with a handout, or whatever that is.

But I think we need to go find that handout.

MR. WEST: In the very back. The woman in the very back. Yeah, if we can give her --

SPEAKER: Hi. My name is Cristabal and I'm from the University of Waterloo, and I just had a question when it comes to the environment, specifically. Often, companies associates with manufacturing when you alter technology, or you alter investment and technology in order to accommodate environmental assisting ability, the argument is made that it reduces efficiency.

So I just had a question about what you think finding, or how you think companies can find a balance, or what you think the balance is, if there is one between environmental sustainability and efficiency.

MR. WEST: Well, you would be great for this one.

MR. LACHAMBRE: It's a good question. I guess this is again what the company (inaudible) at the end, and whether you are short-term, or (inaudible), if you just focus on short-term profits, then you have to make a choice. If you have a long-term view, you can do both.

And this is also something which is key for the future. It's finding the right balance, and not have the pressure of the time. And again, I refer to my experience with Wilo, the German company growing nicely for the last decades 145 years ago, and still growing, and still able to balance short-term interest, or let's say, putting that a bit aside, but keeping division long-term. How to make sure that you

reach your goal. And this is, you have a social responsibility. You have an environmental responsibility. And you need to survive.

And as Johnny was saying, you need to fight. You need to find a resource. It's not that someone will do it for you, but you will have a surrounding that will be more or less available, and then you have to find your way.

But the beauty, actually, and this is a luxury, being into a foundation-owned company, family-owned company, you can really take all those elements and not let aside because of short-term results orientation, actually.

MR. WEST: Okay, there's a gentleman in the very back so --

Ms. McNELLY: Can I make one, just one addition to that?

MR. WEST: Sure.

MS. McNELLY: You know, the NAM just launched a blog series on sustainability highlighting company actions. And I will say, and some of this, I think gets lost when people paint a broad brush as to manufacturing.

Fundamental to the DNA of any manufacturer I've ever met is how do you do more with less? It's fundamentally about reducing impact across every business element. It is in their DNA to be thinking about that every single day. And I think that's a piece of the manufacturing story that gets lost in this discussion. It's what the wake up every single day and start to think about.

So there are some of those best practices that are now in the NAM website as well.

MR. WEST: Okay. Question in the back.

MS. RADCLIFF: Yes, sir. Adele Radcliff, Department of the Defense. We've been spearheading many of the manufacturing innovation institutes that you disbursed.

In our conversation with industry, we've kind of gotten a mixed message lately, and I'd like you thoughts on this. It's one thing to have manufacturing exist and talk about workforce development going into that existing manufacturing.

A lot of the conversation we're having with industry right now indicates that the next generation is not really, they're receiving mixed messages on whether the next generation is entrepreneurial focused.

I'd like your thoughts on whether or not you think this next generation that has a willingness to go into business much less whether it's related to manufacturing, which is the next harder challenge.

MS. McNELLY: I find myself speaking about the millennia generation quite a bit. We do a lot with youth engagement across the country, and I would say I do consider them entrepreneurial and a tremendous asset.

And the other thing that I think is a great opportunity for our nation's manufacturers is the want to contribute today. They want to show up, be engaged, to be active, be a part of the solution.

And when I talk to a lot of young people, and I think about sort of the global challenges we face in the world, those solutions are actually manufacturing solutions. So talking to young people about the ability to be engaged in solving the global health challenges, and solving the global environmental challenges.

There are some huge opportunity, and I see that from an entrepreneurial perspective, but I also see that from an engagement and leadership perspective, and I do think we culturally need to be read in manufacturing to take advantage of the asset the next generation is bringing towards us, because they are our front line managers today.

MR. STAMBAUGH: The only thing I'd add to that is I think there has been over the last few years an increasing emphasis on STEM education in a lot of places where you're trying to make sure that you've got people who are engineers, who think about making things, and think about how do we do more with this, or thinking about these challenges.

And when you have that background, it's, you know, lots of people who do that wind up then saying, well, I have an idea I want to run with. And so I think you do have that background.

Sure, there are, lots of people are interested in the tech field, and in software or in finance, but even on the finance side, I think there has been a bit of a shift in the last seven years where fewer people are heading in that direction, and they are thinking about engineering and make things as more of a career path.

MR. WEST: Absolutely. I agree with that. Okay, there's a gentleman right here, and I think we have to make this last question on this panel, and then we're head straight into our 10 o'clock panel.

MR. KOBER: Stanley Kober. I'm looking at an article, "Euro Edges Lower on Soft German Manufacturing." German manufacturing today number came in well below expectations, the third decline in four months.

And it's not because the Germans are not competitive. It's weak global conditions. And this begs a question. We've been talking about supply. What if consumer preferences have changed?

If people buy a new car every 10 years instead of very three years, that's gonna affect manufacturing, won't it?

MS. STAMBAUGH: If I could just jump one quick thing. I don't know that you want to make the leap to -- I think you (inaudible) demand is really important, and it's actually something I had hoped to talk about quickly at one point, but I don't know that it's a preferences issue. I think we have had periods where there's been inadequate global demand ever since the global financial crisis.

I think that probably if I had to guess what was going on with concerns over Germany right now, it would be that post-Brexis there some uncertainty. There's worry that some firms will be investing less within the EU, and that that will be bad for the capital machinery exporters from Germany. And I think it is one reason why the U.S., I think, frankly, more than many other countries has put an emphasis in its macro policy on making sure there's adequate demand in the economy. It's why we've gotten the G-7 and the G-20 to start making statements along those lines a lot more that we need to use our policy tools to make sure there's adequate demand because, as you say, people up here can come up with as many good products as they want. If no one's buying that's a problem.

But I don't think that's a preferences issue as much as just an overall amount of demand issue.

MR. WEST: Okay, we are out of time on this panel, but I want to thank Johnny, Eric, Jay, and Jennifer. We really appreciate you sharing your insights. Terrific job.

And then we will invite the next panel to come up right away, but please join me in thanking this -- thank you.

(Applause)

MS. SMITH: All right, good morning, everyone. I'll give you all a second to grab a seat. So my name is Ashley Smith, I'm a reporter with Inside Higher Ed, and I am joined this morning by these three wonderful people who are doing very unique things when it comes to building student skills and employee skills in the workplace.

I'm joined by Mary Ann Pacelli -- did I say that correct?

MS. PACELLI: Yes.

MS. SMITH: She's the workforce development manager with the National Institute of Standards and Technology. Walter Siegenthaler.

MR. SIEGENTHALER: Yeah.

MS. SMITH: He's executive vice president of the Daetwyler Corporation. And Leah Gilliam, she is vice president of strategy, innovation, and education with Girls Who Code.

So I will start with Mary Ann, if you don't mind, just sort of giving us an idea of what you do. And I understand that you help small companies with this type of issue. Do you want to start there?

MS. PACELLI: Right. I'm with the Manufacturing and Extension Partnership, which is part of NIST. The MEP system has been around about 28 years and our focus is working with small to midsized manufacturers across the country. So we, at the national level, fund cooperative agreements -- one center, at least, in every state -- who is out there to reach out to small to midsized manufacturers.

And I help them identify what their challenges might be, not specifically workforce, but across all of their business challenges, and then help them find resources, whether it's connecting them as an intermediary to the universities or the educational system or doing some hands-on consulting with helping them look at their business. What are their growth issues? What are their technology issues? What are their process and innovation challenges? And how can the MEP network, through the networks of the institutes and labs -- the national and federal labs across the country -- help these companies innovate and grow?

So, from a workforce perspective, our centers, as highlighted in our panel previously, all of our manufacturers are challenged with growth, access, and technology, new product development, exporting, all of those wonderful things. But one of the number one challenges that they're all facing right

now is developing the future workforce, the current and future workforce, in order to help them grow.

And our small to midsized manufacturers are the ones who are going to grow the most, and it's a challenge for them because they are resource constrained. So our centers are out there trying to figure out how do we help these companies with that workforce challenge?

MS. SMITH: And, Walter, why don't you tell us about some of the partnerships that you've built?

MR. SIEGENTHALER: We're a small manufacturer with 75 people, so obviously we have a challenge to form something big. So 20 years ago, we actually formed a partnership called Apprenticeship 2000 with other companies in our area to really promote apprenticeships and get an apprenticeship program going. Over the 20 years of the partnership, we have graduated 128 apprentices and have, I think, something like 54 of them in the program right now.

Really the main reason we did it as a partnership was because we alone could not have done it. And especially with the academic part of it, we worked together with Central Piedmont Community College in Charlotte and they would not do anything because at Daetwyler we have one or two apprentices per year and, obviously, they couldn't do anything special. So, as a partnership, we get enough mass going so we can actually fill a whole class.

Typically, a community college needs at least 10 or 12 students in a class to be able to do something special. Central Piedmont does some special classes. They've done classes specifically just for us, so there's a lot of communication, a lot of coordination which has to go on.

When we started CPCC already offered a lot of the classes we needed, but one of them on Monday, another one on Tuesday, two on Thursday, whatever. So we had to teach them. We had to say, hey, our apprentices need to have all their classes in one day because we only want to send them to school one day because we need to train them hands-on the other days. So that takes a lot of work, but in a larger group this is possible.

Our program, we start our apprentices as seniors in high school. So the first year they have to go to high school. Of course, they have to finish high school, so they go to high school half a day and work at the company the other half of the day. And then, after they graduate from high school, it's three more years where they go to school at the community college for one day a week, and work at the

shop for four days a week.

They end up with an associate's degree in mechatronics and, of course, a journeyman certificate from the state. So it works very well for us and it's kind of a copy of the European program. We are a Swiss company, another partner company is based in Austria, and other one's in Germany, so we really pulled things together from the different parts to create the program that is very similar to what has been very successful over in Germany, Switzerland, and Austria.

So it works for us and we have, in the meantime, in North Carolina expanded. We have helped to get other programs started, so we have in North Carolina seven programs like that in different areas, which we have supported to get going.

MS. SMITH: And, Leah, why don't you tell us about Girls Who Code?

MS. GILLIAM: Sure, thanks. It's a pleasure to be here today.

Girls Who Code is a four-year-old national organization. Our focus is really on closing the achievement and gender gap in technology and computing fields. We have two free programs that we run nationally.

And I think what's most relevant for the discussion today is the work that we do through our Summer Emersion Program. And through that program we create classrooms of 20 young women with two teaching assistants, two teachers, and we bend (phonetic) those classrooms in technology companies and in institutions of higher education. And our focus there is to do a seven-week intensive computer science course, really to try and create this intervention that helps girls to really understand the essential fundamental ideas of computer science, also of computational thinking, problem solving, loops, algorithms, all the technical stuff.

And then also, by having these classrooms embedded in technology companies, we work with the corporate partners to really help them see and develop the young talent that's so important to really widen and change the pipeline issue that we have in terms of technology fields. And then we will work with the corporate partners to bring in mentors, to have field trips, to really think about what it means to embed a classroom of young women, and to begin to understand what their needs are, what their ideas are, and to really begin to see the real difference that a more diverse and inclusive workforce can make in their workplace.

We really see these corporate partners as key to the work that we do. And they subsequently see us as a big part of that work, as well. So the classrooms that we have at Twitter, they'll talk about how are our girls doing at Twitter? So we really see that when you have girls who are coming into companies for seven weeks in the summer, that the two cultures begin to get a sense of how one and the other works. And for the young women it becomes really essential for them to get a sense of what it looks like actually apply the kinds of skills that they're learning into technology companies, and in the computing field.

We don't imagine that every young woman is going to go into a technology field, but just in terms of the way we see computer science and computational thinking. It's essentially the new liberal arts, something that underlies so many of the different aspects of our culture and our business economy. So we see this as a really kind of essential piece of our work.

We have a national afterschool program that is much more akin to a club structure. That's a little bit more community-based and community-grown, but the Summer Emersion Program is just launching. The D.C. area program has just launched last Monday, so we're super excited. We'll be working with over 1,500 girls this summer.

MS. SMITH: Wow. So what are some of the skills gaps or some of the issues that the partners that you're working with, what are they looking for when they come to you?

MS. GILLIAM: Well, from the MEP perspective, our centers are working with small to midsized companies on a regular basis. And the skills gap, there's a lot written up out there right now trying to define it, but the struggle -- and it was brought up in our last panel, too -- is the numbers of young people that are our best and our brightest are not necessarily choosing manufacturing and technical fields as their choice of work.

So part of it is trying to encourage, and re-advertise and re-publicize and create the great community. What are the jobs? What are the careers that are available to you after high school, whether you move on to a one- or two-year certificate at a community college and/or want to move on to a four-year degree? We are seeing how do we help build that future pipeline?

Many of the young people that are moving out of high school are right away moving into college or moving into the service sector, and aren't even aware of what is available. Our manufacturers

today at the frontline level are looking for people who want to work there and can train and can learn the job. And so technical skills today in a frontline manufacturing job, whether it's entry level or moving up into what we call the middle skills level, such as mechatronics, you need a real strong high school STEM education, liberal arts core, being able to read, write, communicate; being able to do basic problem-solving, understanding math; being able to learn higher order thinking and learn some of the computer skills that you need after high school.

Those are skills that we want. Many of those young people are not necessarily knocking on the doors of our small manufacturers, so our challenge first is trying to figure out how to get some of those students to strongly consider those jobs.

MR. SIEGENTHALER: Well, just loading right onto that, obviously we have a problem. Awareness in high schools is not there, what manufacturing has to offer. We are putting in a lot of effort. It's basically a full-year cycle where we do some recruiting.

We invite career counselors to come in, offer them a luncheon to keep them happy, and, of course, introduce them to the program. Also give them a plant tour. It's very, very important that they see what's going on, what today's manufacturing is, because there's still a lot of misconceptions about manufacturing, the three Ds: dirty, dangerous, and dark. They're still out there and that's not what today's manufacturing is anymore.

But then, really, with the counselors we inform them and tell them what we are looking for. We are looking for really smart young people, but the ones who like to work with their hands. They're out there, but we have to find them.

So the career counselors then, in some schools it works better than in other ones. They go back and select some of their potential students. We then go to the high school, give a presentation to show them what is going on, and usually we take one of our apprentices with us because if an old guy like me stands in front of 15- and 16-year-old kids, that just doesn't work very well, so we bring the juniors with us.

We show them what's happening and if they're interested, then they can come to an open house. One condition that we have with the open house is that they have to bring a parent or a legal guardian with them because we want to get them right involved because a lot of the parents have

misconceptions about apprenticeships, about manufacturing, and so on. So it's important.

Again, part of the open house, of course, is the presentation of the program, as well as a plant tour so they can see what that is. Out of that, whoever is still interested, we have what we call orientation. That's four evenings after school; that's typically in February.

After school they come in, we work a project with them for about three or four hours, so they get some hands-on work done so they can see, okay, is this really what I like? And, of course, we see is this student really capable of doing things like that?

And then what we have ongoing right now is the last step. That's a six-week internship, it's paid, during the summer between their junior year and senior year. And out of that group we pick who is getting into the apprenticeship program. So it's very selective, but I don't have any qualms being selective because we're investing a lot of money into those young people, so any scholarship of $150,000 is also selective, so I don't have a problem doing that.

MS. GILLIAM: Yeah, that's very interesting. I think certainly it is definitely an issue of awareness. I really agree. And then, as I said before, it's really also this issue of this real gap in achievement. We really know from the research that there are certain groups -- because of historical and institutional barriers -- really have had a hard time understanding what the possibilities are when it comes to working with technology, whether that's manufacturing or whether that's more computational computer science fields, the way Girls Who Code has thought about initially.

What we're really finding, though, is that through our Clubs Program, there are a range of different companies and local efforts that really help our young women begin to understand the range of roles and professions that they can explore. So we're really finding that although initially our organization focused on 11 specific cities -- Austin, Atlanta, New York, the Bay Area -- sort of 11 key markets that as we continue to expand and really see what opportunities are available for the young women that we've worked with, many of whom are in junior high or in high school, we're really increasingly looking to smaller businesses, to local manufacturing, as well, to really help think about who can actually see the kinds of skills and the kinds of opportunities that are available to a wide range of people across the United States.

So we are really thinking specifically about what are those ways that we can build awareness so that young women have a sense of the kinds of opportunities that are available in their

neighborhood or in their area? So we're working very concretely with our Clubs Program this year to really think about how we begin to help young women see what those opportunities are.

So our Clubs Program is in 42 states right now, and we have over 460 clubs across 42 states. So that, to us, opens up a really interesting kind of opportunity to begin to think, okay, if you're not at Facebook, if you're not at Lockheed Martin, what are the other ways that you can use the kinds of skills that you're learning through Girls Who Code? And what are those future opportunities?

MS. SMITH: Leah, you're talking about expansion. I'm just wondering, for Mary Ann and Walter, are you all looking at broadening to other companies, to expand your apprenticeship programs at all to raise awareness in that way?

MS. PACELLI: Through the MEP, each center, each state works in their own region, and some things that were mentioned in the previous panel about really needing to be a community. What our centers are trying to encourage is getting programs like an Apprenticeship 2,000. Whether it's an apprenticeship-focused or just skills- and certification-focused, how do we get companies that have like needs together in a small region where -- just like a small company, as you mentioned -- you don't have the horsepower to go knock on a school's door and say, hey, customize an entire program for me, I have three people that I need to be trained? I'll close the door.

So how do we get four or five of those companies together to do some very specific skills training, whether it's for new employees working with the workforce system, finding some of those employees that we need to hire, or even up-scaling the existing workforce that I have? I've hired some entry level people; I've changed my technology. I now have to move this level of people into a new technology, a new operations system, or I have to grow my own maintenance people because they're not on the street.

So how do we combine a few companies together, work with the educational system, create boot camps, long-term certificate programs that are working in that particular community, and perhaps find some national funding or some local funding to help offset that where possible?

But companies have to put some of their own investment into it, also, and really develop their local, regional workforce themselves. So our centers are working as intermediaries in most cases, working with the educational system, groups of small companies, and, on a regular basis, customizing the

programs that they need and then working to continue to fill that pipeline.

How do we get more small companies to open their doors to student tours? MEP was one of the founding partners of Manufacturing Day, October 7th this year coming up. But we look at every day should be Manufacturing Day.

But how do we get more and more companies to think about how they market themselves to the community as we are a viable entity in your community and we want the individuals in that community to consider working for us? The networking of community of small manufacturers in each area is really something that has to grow much stronger.

MR. SIEGENTHALER: On our end, besides what I have mentioned before about recruiting, we also do a lot of just shop tours or the Charlotte-Mecklenburg School District has a really interesting program that we have participated in over the last three years, it's called STEMersion. They take teachers who teach in the STEM curricula during the summer for two weeks, and they move them every day to another company. So they spend a day at different companies to see what's going on.

And it's amazing to hear the comments when we get them out in the shop and we bring them out to the machines, and we let them operate some of the machines and we work a project with them. At the end, they get a box of parts and they have to assemble a little pen holder and so on, but some of the comments were, I had no idea that math is needed on a milling machine. Because where would they know that from if they don't have that opportunity? So I think it's very important that we as manufacturers really open our door and educate the people.

I'm spending a lot of time going around and -- well, that's probably why I'm sitting here, I guess. Especially in North Carolina, as of a few days ago, I'm not anymore the chairman, but I was for the last 10 years the chairman of the North Carolina Apprenticeship Council. I'm still a member of the council and that's where we helped, part of it through the council and part through just connections with friends or whatever. If we know of somebody who is interested, we help and support and hope to set up a program, and I'm doing quite a bit of that over the phone. I'll have a phone conversation with a company in Connecticut tomorrow because they're interested and they'd like to know how we do it, just to learn.

I feel our program is really working. I'm not saying that's the only way of doing it, but

that's one way of doing it, and so we are very supportive. Yeah, we could say, hey, we've got a lot of programs. We are happy. So why should I tell anybody? But we believe that apprenticeships are very, very important for the future of manufacturing, and that's why we put so much effort into it.

MS. GILLIAM: I think there's an interesting call to action that's developing here. I'm really thinking about what are the ways that you market your companies, market your opportunities in unique ways, so that people actually get a real sense of what the work looks like?

And we think about that a lot and we think about that a lot at Girls Who Code because when you talk about computer science, when you talk about technology fields, everyone sort of imagines the Mark Zuckerbergs: someone in a basement in a hoodie who hasn't seen the light of day in five years, who's just coding night and day. And people really don't have a sense that actually coding is really collaborative work, and working computationally can call on a number of different skills. And I think it's really a very similar thing when you think about the manufacturing skill set and the manufacturing industry, as well.

So I love these examples where you're really thinking about what are ways that you create hands-on, real-time experiences for young people, for underskilled workers to really begin to understand what does this work look like?

So, yeah, find a Girls Who Code club in your region and see if you can create some kind of experience with them. Field trips, hackathons, boot camps, all those things are really great ways to bring in new audiences and have them just experiment and understand what these things look like because I think there's a way in which, obviously, in such a digitally focused culture we really forget that you can work with your hands, that it draws on math and STEM and all of these other kind of areas of specialty.

So I'm really excited by these ideas and it's a great call to action to all of us to really think about, how do you give real hands-on experiences so people begin to understand what this work looks like?

MS. SMITH: The interesting thing is that you all have talked about how unprepared students are when they come to you or when they enter the apprenticeships or when they come to Girls Who Code, and I wondered if maybe you all can just talk about the role that outside companies are

playing by basically stepping into where the education space may have failed. It seems as if you all have answered a call here to go in and fill in the gaps where maybe a high school education didn't really help or didn't really prepare.

MS. GILLIAM: Yeah, I'm happy to jump in. I think that one thing that we've really found with Girls Who Code is, increasingly, that although we are working with companies, it's really the individuals in the companies that are really stepping forward. So right now we see that there are individual engineers that will come into a classroom or devote time and mentor. There are individual people who will come in and talk about their experience, but to me the real warriors in our story are the local volunteers who are running Girls Who Code clubs.

So for four to eight hours a week, running an afterschool club, coming from their day-to-day jobs, some of them are teachers, some of them work in industry, some of them work in technology fields. This is unpaid labor. They're volunteering to really mentor and help a group of young women to really understand the computing field and to understand technology.

Increasingly, we're really finding that you don't have to have a specialized computer science background to really facilitate this kind of work. And so we're increasingly really thinking about what are those kinds of relationships? What is the volunteer mechanism? And which are able to invite more individuals into this larger community and to see themselves as someone who can, if you have four to six hours, if you have eight hours or if you have two hours, that you can offer your time and your experience in your workplace and give someone else a sense of what that work looks like? So I think it's been a very interesting kind of relationship.

MS. SMITH: I don't like to use the words "failure of the educational system." I come from a long line of teachers, I have to be careful. But I think some of the deficiencies are -- and we've talked about this -- the access, the students' awareness of why am I learning what I'm learning? If I knew why I needed to learn trig back in high school -- I mean, I learned it because somebody said you have to pass this course and get a good score on your SAT. Then I go out into the real world and I'm working in a community college and I'm learning how to run a CNC machine, because I'm starting to do workforce development. Well, wow, look there, there's cosines and everything on the prints that they're trying to teach me to read.

So we have to look at how do we start building that application? Not just for manufacturing, but as we're teaching our students the basics, the math, the reading, the English, why am I leaning this? And where am I really going to apply this basic algebra and basic geometry?

There's some examples of that. One of the national networks of manufacturing institutes in Detroit, the one called LIFT, which is focused on lightweight materials, they've really started funding in the five states that are part of the partnership some workforce development activities to just figure out how do we, again, continue to get more students open and aware of what are some of the new things going on in manufacturing?

And a couple of the major things, projects that they're funding -- I think Kentucky is one of the leads for this -- is in teacher education. And we're helping teachers develop lesson plans in math, science, and even English and reading, where possible, where they work with a manufacturer and they can develop in sixth, seventh, and eighth grade math and science classes, okay, I'm going to teach you the basics of geometry. And now we're going to do a couple exercises where we're going to show you where this is applied.

We piloted this when I was in Ohio. We had an Alcoa engineer work with a teacher in the Cleveland public schools and they just decided, okay, we're going to create a few lesson plans. And the engineer comes into the classroom one day and brings out -- the Alcoa plant in Cleveland is making the wheel hubs for airplanes. He rolls one into the classroom. Everyone just went, wooo. And very easily, in a sixth- and seventh-grade math environment, he was able to explain what they're learning and how it applies to the role that he has as an engineer, along with the technicians that are on the floor.

So that's where we need to build that and teachers can't do it by themselves. So we're trying to figure out how to get more industry involved in helping those teachers create better lesson plans. Do the plant tours and very clearly show that link with what you're leaning and here's how it's applied. And whether you go into manufacturing or not, you'd better hope that somebody else is learning it because you're going to ride on that airplane someday.

But those are the kinds of things that our schools have to get better at and we as the industry have to help them do that because they can't do it alone.

MR. SIEGENTHALER: I mentioned the STEMersion before. I'm convinced every

teacher that goes through that STEMersion program in Charlotte, they're teaching different afterwards because they know why they're teaching what they're teaching, where it is applied. And if they can get that across to the students, I think they will learn a lot better.

So there is a lot we need to do and I think it goes back to, well, over I don't know how long, everybody said, everybody has to get a four-year degree. Everybody has to get a four-year degree. Well, if your plan is to go to college, you don't necessarily at that point have to know what's going on afterwards. Unfortunately, you get a really bad awakening after college, or at least a lot of them do, when they figure out, oh, and now I've got a degree and what am I going to do with this?

There has to be a plan and that's one of the things I always tell people. There's nothing wrong with college, but don't just go to college just to get a degree. You have to know what you want to do with it. And that's the same thing when we start apprentices, they have to be sure that's really what they want to do.

And it doesn't mean that an apprentice is going to stay in that field or on the machine. I made an apprenticeship as a machinist and, obviously, I'm not out in the shop on the milling machine and the lathe anymore. There are plenty of opportunities out of it, but it gives a good base and it's just that awareness, again, that they know.

The students we are taking into the program; I'm convinced that each one of them could go to a four-year college. There's no question about it. They have the smarts, there's no doubt in my mind, but they don't necessarily want to sit on a school bench for four years. They like to work with their hands and part of the evaluation is we try to find out what they do on their own time.

And since we spend so much time during the recruiting with them, we learn a lot about them. And if they fix their cars at home, well, that's a good sign. That's just the first thing.

And one of the things which is missing in a lot of the schools is those hands-on classes. Woodworking or whatever was there, a lot of them disappeared. And so we have to slowly try to get them back. We need people that work with their hands, we can't just cut each other's hair. That's not going to get us anywhere. So we need to produce something.

MS. SMITH: But I want to open it up to questions now, if you all have anything to ask.

Yes? Someone's coming with a microphone.

MS. COPRAGINN: Hi, my name is Sheeran Copraginn (phonetic). I'm a global skills trainer and market entry consultant.

From my understanding from the first panel, as well as from your discussions, I understand that culture, actually, is a very important element in being motivated for the manufacturing industry, as well as developing productive development options, such as the apprenticeship program, for instance. So I was wondering if you have encountered cultural differences as you were introducing apprenticeship programs in your company, as well as a community leader, and what the reactions of other panelists would be with regards to that. That's one question.

And the second question is where you found points of connection with the American community, especially with American youth? I hope they are not too complex questions. Thank you.

MR. SIEGENTHALER: Well, I may start out with the first one. We clearly see differences. Where our company is located, the closest high school is North Mecklenburg High School. It's a huge high school, I think 2,000 students or more. We basically get nobody out of there. And I think that's just the difference there because, okay, Charlotte is the second largest banking center and we are very close to Norman, so a lot of the higher influence people are living in that area and they don't necessarily want to send their kids into manufacturing. So it's very difficult for us to find them.

I'm convinced there are enough of them there that we could fill our program, but finding them is very, very difficult. We are more successful recruiting out in the more rural areas because -- we have one apprentice right now, he's going to graduate in August. I was at his home about a year ago and he's out in the boonies, let's say, and he fixes his car. Every weekend he works on his car, or he just actually bought himself a house next to his parent's house and he is adding an addition to it. He is constantly working on it. And, obviously, in an urban area you can't do that, so there are clearly differences. And kids don't get exposed to it because there is no possibility, so we see a lot of a difference there.

And, yes, it has got a lot to do also with how it is promoted. If the school doesn't promote it or -- in some cases we see differences, some of our partner companies actually recruit out of South Carolina. And for whatever reason, South Carolina is also more of a rural area, in general, anyway, but they get a lot more support from the schools than we get in Mecklenburg County.

So we go outside of Mecklenburg County and I would say, in our case, more than half of the students are not from Mecklenburg County where we are located.

MS. SMITH: Anyone else want to answer?

MS. PACELLI: Well, "culture" is a big word. And in the manufacturing sector, especially small to midsized manufacturing companies -- and a lot of my hands-on experience has been in the Midwest, Ohio, Pennsylvania, Michigan, doing consulting for those companies. It is changing, finally, as ownership changes over, because some of the culture comes from the top and it was a struggle getting today's younger people, the Gen Y and the millennials, to feel comfortable in the traditional manufacturing environment because many times the leadership in these small companies, let's face it, they're still living in 1950. And they are starting to change as the generations of ownerships are changing.

And now we have to re-advertise back into the culture that there is a different work opportunity and millennials and young people today can feel comfortable in what looked like a traditional workplace. Top down, top driven, but as we become more productive and we look to engage our employees, which we have to do in a flattened organization, leadership that is changing and accepting of the fact that just because somebody comes to me without a college degree doesn't mean that they can't think and that they can't be as engaging and as supporting and really helpful to solving the problems of my workplace.

As that's happening, the culture in these organizations is changing and becoming more welcoming to the younger worker of today who wants to come in and hit the ground running and isn't into that I need to pay my dues and shut up for the next five years and take lots of orders until somebody asks me a question. We want our young people today to learn very quickly and become engaged in the organization.

But it's a slow change as companies' leadership changes over, cultures are changing. But there's still the perception that manufacturing is a little bit more heavy-handed than other organizations.

MS. SMITH: I saw a question over here. Yes?

MR. ENOGOROTTI: Hi, my name is Chris Enogorotti (phonetic) from the Embassy of Italy. I have a question especially for Mr. Siegenthaler.

I wanted to ask if you have an experience of this kind of system which you used for apprenticeship in high school and this very young segment of students? Also in the higher education? I mean, have you ever tried to implement a system combining, in a systematic way, work and theory for positioning management, high engineering, and so on?

MR. SIEGENTHALER: Well, obviously manufacturing is not the only place for apprenticeships. This is a manufacturing forum, that's why I'm mainly talking about manufacturing. But we are, not just in North Carolina, but all over the United States, there is a push to get apprenticeships also into nontraditional areas.

There is an insurance company in Illinois that just started an apprenticeship program, and I'm working with some banks to try to get something going there. There are other possibilities. It doesn't have to be hands-on.

If you look at what's done in Europe, everybody basically goes through an apprenticeship program. In Switzerland, 64 percent of the young adults who are finishing mandatory school are going into an apprenticeship program. But that can be as an executive assistant, it can be as a dentist assistant, it can be as a salesperson in a store. We have apprenticeship programs for everything. We have a long, long way to go until we get anywhere near that.

But I really feel that if we can expand it into some of those nontraditional areas, that's going to help overall because then people get a better understanding of what an apprenticeship program is and that's going to make it easier, also, to find the ones who really want to get into manufacturing. But there is definitely a lot of work to be done in that field, but it's starting to happen.

There is a lot of effort and I think it's a big push since President Obama declared that he wanted to double the number of apprentices in five years. So there's a lot of activity from the Department of Labor, and so on, to get into those nontraditional areas because I think the number of potential students is much greater there.

MS. SMITH: There's a question in the back?

MR. SHABAKKA: Thank you. My name is Kareem Shabakka (phonetic). I'm with Browne Solutions International. I really don't know where to start, so I wish you would help me out.

The school systems have failed, are failing. How much do you plan to engage local

governance or state governance on the projects that you are doing to get more people involved or engaged -- I'm talking about the students -- in your operation?

Number one, I see a lot of people going towards the NBA. If you can sing and dance and flip a burger, yeah, you got attraction, but I don't see too much in apprenticeship programs. How engaged are you? What kind of resources are necessary to improve your engagement and how can I as a business person see the positiveness coming from your participation or engagement? Thank you.

MS. PACELLI: It's a good question and there's probably -- we're a big country and we behave fairly regionally and state-based in the way our businesses combine in our little communities. An example of starting to bring together resources is actually something that was written up in Brookings just last year.

In Delaware, the Delaware MEP -- which is the Manufacturing Extension Partnership -- worked with the Delaware Department of Education, along with the Delaware Workforce System, which is our WIB, the workforce investment system, and created with the Delaware Manufacturers Association, brought companies together and said, we need to really look at a frontline manufacturing career certificate to get people started. So they defined, with industry's input first, before the educators are walked in the room, what is it that we really want students to learn? What do we need them to have? What does this look like from high school to perhaps the first year of community college? And they designed that career pathway.

Then they brought the educators in the room and said, okay, what do you have and what can we do to help you augment it, enhance it, customize it, and add to it? The educators said, okay, through our CTE program, Career and Technical Education vocational system, we have a lot of this, but let's figure out how do we tweak it? Because industry was sitting there saying, you need to do this. The Department of Education's said, we will support what changes you have to make. And the Workforce System was saying, we'll figure out how to fund some of this, too.

So through all of that we now have a state group of manufacturers who have agreed to a one- or two-year certificate from the last two years -- junior and senior year of vocational school, perhaps one year of community college -- and students and parents can see where the break-off points are. So I finish my last two years of vocational school, at the end I graduate as a senior, but I have a certificate

that's recognized in the state, perhaps a national certificate, and the manufacturers in that state have said, we will look at you and give you, perhaps, give you more preference because you have that certificate as we look to hire.

But then the community college system said, we're going to recognize what work you've done so that when you come to us, if you want to enroll in the community college, we're going to give you some credit for what you did in high school, which is happening in most states right now. There's dual enrollment, there's credit for experience, everybody's looking at it differently. I wish we could have one system that looked at it the same, but we're all recognizing that we all have to work together.

And that's just an example of -- now, Delaware is a small state. How do you do that in Ohio and California? You almost have to do it county by county. But in a state, in a region, in a county, in an urban area, you need to bring everybody together and they need to listen and you need to have a strong facilitator, whether it's the MEP or the Manufacturing Association.

But everybody has to be able to, in a sense, compromise, too, and say, I'm willing to do something a little bit different. And let's see if it works.

MR. SIEGENTHALER: I think there are several other areas, too, like Colorado is another area where they really have a program starting. They've got everybody involved. Government is involved, industry is involved. But I think no matter where you are, it needs to be industry driven. That's the main thing because we -- us manufacturers have to tell the educators what we need, and it needs to be driven.

We can't just complain that we don't have the skilled labor and just sit there and wait for somebody to provide them. It's not going to happen. We need to get involved, and that's why we got involved 20 years ago. We said we couldn't find the people and that is why we said that we need to do something.

And I think that industry has to realize that they have to put some effort into it. The schools are not going to give us the skilled labor we need totally prepared, that's just not going to happen. That does not work, especially not in manufacturing.

Yes, a school can help us to provide and then prepare them for what we have to teach them. And that's where we have to work together with the schools and everybody to really improve that.

MS. SMITH: Yes?

SPEAKER: I have two questions. First, if you look at it on a national scale, these individual state efforts, but if you look at it on a national scale, how much is this taking hold in the U.S.? Could you give us some sense of that and could you point us to some studies on this?

Second point is, what seems to be commonplace -- Switzerland, Germany, Holland, Austria, Denmark, all over with impressive numbers, as you cite -- somehow isn't working here. Although 50 years ago, it existed. What are the key -- there must be some resistance somewhere? And what is this resistance and where does it come from?

MR. SIEGENTHALER: Well, where does it come from? That's a good question. On why it went there, I think that was way too long. As I said, it was just that everybody needs to get a four-year degree. If you want to get anywhere, you have to have a four-year degree. and that is not the case. I also feel that manufacturing made some mistakes.

Looking at North Carolina, a big part of manufacturing was textile. That was really the manufacturing that we had and it's all gone. I'm not saying we could have avoided everything, but I think if textile at that time would have done more about educating young people and invest into their business, get more modernized and so on, I think we would have a different picture today. But that's what we are struggling with in North Carolina right now because a lot of the parents lost their jobs in textile.

So they say, I don't want to send my kid into manufacturing. Look what happened to me. That's just going to disappear somewhere again. So it is difficult to say, okay, where did it come from? That's a trend which built. On the other hand, I have to say, looking at nationwide, I think we have a really over -- we have activities all over the place.

The USDOL generated that program, Apprenticeship USA Leaders, and we at Daetwyler are one of them and we have a commitment to promote apprenticeships. That's our commitment. And after a year, they check and say, hey, what have you done? So then we had a meeting here in Washington last year where there were over 100 of those apprenticeship leaders here.

So, yes, there is activity and being involved for 20 years in apprenticeships here in the U.S., I have never seen as much activity as over the last 2 or 3 years. It's definitely taking on, but we have a long way to go. This is a big ship to turn around. We can't do that in one or two years. It's going

to take a lot of time.

MS. SMITH: Yes?

MR. HUNG: Thank you. I'm Xi Hung (phonetic) from Tsinghua News Agency. I would follow that last questioner, you said in the last two or three years the apprenticeship is kind of booming in the U.S., so why it becomes popular in the last two or three years?

And my second question is related to that. Now, in the media, we usually talk about the recovery of the U.S. manufacturing, or the return of U.S. manufacturers, but some would argue that because of the technology improvement, although the U.S. manufacturer has recovered a lot, it employed less people. So is this one of the reasons that apprenticeships have become more popular? Because the manufacturer is booming, but the requirement for its employees has also been raised? Thank you very much.

MR. SIEGENTHALER: To the first question, I wouldn't say that apprenticeships are booming yet. It's being talked about a lot more, but that doesn't mean that really apprenticeships are booming. There's a lot of talk, now we have to also turn the talk into action.

And then, of course, on the manufacturing end of it, today's manufacturing is different than what we had 20 or 30 years ago. Everything is a lot more automated. Even if you get the same amount of manufacturing output, we are never going to be needing as many people anymore as we used to. But the people we need have to have higher skills and that's where the difference is. It's that the employment number is not going to go back to where it was, but there is higher skills needed, so, therefore, education is more important. You can't just take the people from the street and put them on a CNC milling machine. That just doesn't work.

MR. BARAKAT: Yeah, the manufacturing workforce has, in numbers, gone down as productivity has increased tremendously. Some of that has just been higher skilled workers than a lot of this, through the opportunity of new technologies. But some of the words out there about the still big need for the manufacturing workforces, we all probably know that there was some periods over the last 20 years of decreasing. And when companies were not hiring as many people, the people that they had stayed on. And so now you have an aging workforce.

So the big need, when you hear the big numbers of manufacturers across the country

who are expecting that there's going to be millions of jobs that could potentially go unfilled, it's not an increase in headcount, it's replacement headcount. I would say probably 60 or 70 percent of that number is replacement headcount and most plant managers today are losing a lot of sleep about what are they going to do?

Some of that was augmented, or pushed back, back in 2008, 2009, the recession. People who may have retired at 55, 60 stayed on because their retirement funds crashed. So now we're back up to good productivity, everybody's 401(k)s are back up to speed, and those 65-year-olds are now saying, okay, I'm out of here. I'm getting ready to leave.

And boo on a lot of small companies. They didn't plan for this right, so they're struggling with finding that skilled workforce. Those are the people that are leaving and taking lots of talent with them. And we don't have a whole lot of people in the middle, so now we have to bring in a lot of young people.

So the value of an apprenticeship or some very strong structured on-the-job training program is becoming much more aware in the minds of manufacturers today because they don't have anybody in middle. They really have to rely on Joe, who's going to retire, and hope that he's going to stick around long enough to train Susie, who's coming in off the street and has never worked in a manufacturing plant.

So it's a challenge. And apprenticeship is one of the potential answers, a good, structured apprenticeship.

MS. SMITH: Yes, sir?

MR. CHUTLEY: Thank you. My name's Pete Chutley (phonetic). I'm retired from Brookings. My question is workforce development.

When a major globally known manufacturing company moves to some of the southern, more rural states -- I'm thinking of Mercedes going to Alabama, or BMW going to South Carolina, and Boeing going to South Carolina -- so my question is, what do they do with the state to get that trained workforce? Do they say to the state, we will move there if you train this many people and have them available? Or the schools should train this many people and once you have them we'll move there? Or what's the secret behind them getting a manufacturing skilled workforce out of a formally rural area?

MS. PACELLI: Sometimes it's a meeting of the minds. Many of those states are saying that before the company says it. The Southern states, I will say -- and I grew up in the manufacturing states of the Midwest -- have more centralized systems. So when the state says, come here, we're going to figure it out, they can figure it out a lot faster because they have more -- I don't want to use the word "control," but the centralization of the education in the workforce system is there, so that one person at the state level really can say, we're going to make this work, no matter where you move in our state because we can create some more seamless and similar programs across the state. And that is what it is.

Let's face it, that's why companies move from one state to another because there's some incentive on the table. Was there a bigger workforce already trained in South Carolina or Alabama? No, but the states were more interested in trying to make sure that that happened. Are they struggling? It's still a struggle.

MR. SIEGENTHALER: For example, Volkswagen in Chattanooga, Tennessee, they have the Volkswagen Academy, so they really train -- they have a big apprenticeship program. They're training their people because the state is not going to provide them. The state probably invests some money into it, but it's always teamwork. They have to work together.

And, yes, in Alabama, I don't think that they just found a workforce which is totally ready for it. On the other hand, all I have to say is, a lot of the job in automotive manufacturing can be trained because they're repetitive. We are a very small manufacturer. We are manufacturing custom-designed equipment. Well, what we build today, we may never build again, and what we did yesterday doesn't help us today, so we need a lot more skills.

And, yes, there is a lot of support companies around an automotive manufacturer, which, also, they need skills, but I don't think there is a state out there that just has all the skills available which are needed. I think it's more of, is the workforce even there? That's the first point, because you have to have enough people. If you put up a Mercedes plant, you have to have a lot of people, but then you have to do training. And they start training way before they start production, otherwise they're not going to be ready.

MS. SMITH: I think we have time for one last question, in the back?

MR. JARVA: Ken Jarva (phonetic) from NEA, again. You know, all this discussion about getting students hands-on experience? Nobody has mentioned the words “maker movement.” How does the maker movement fit into getting young people, A, excited about manufacturing and, B, get them the skills they need to then go into manufacturing?

MS. GILLIAM: I mean; I think you said it. The maker movement is a huge impetus for manufacturing and it’s been a great, in many ways, grassroots effort to have -- whether it’s a DIY home tinkerer or whether it’s the high school shop teacher who suddenly has a new way of talking about or seeing their work, the maker movement becomes a huge component of this work, so I’m so glad you brought it up.

When we think about things like alternative educational models, like a hackathon or a boot camp, something like the maker movement -- particularly the kind of research that’s coming out of someplace like Indiana University, where they’re particularly sort of supporting and talking about what those skills are, textbooks, all of those ways that the maker movement is also really being codified has, I think, made it a huge effort.

And then, also, that you have something like a national magazine, like Make, that’s coming out and gives people hands-on activities and a point of entry into this work is huge. And if people aren’t familiar with the maker movement, if you haven’t been to a Maker Fair, that’s my homework assignment to you is to create one in your town or to go to a Maker Fair.

They’re fascinating. They’re really inspiring and also interesting. There’s a lot of research about how inclusive some of the maker communities are, but I still think it’s a great and really interesting and hopefully kind of homegrown effort that you’re really seeing a lot of small companies, whether it’s Little Bits or Eat A Fruit or other small companies that are also building and taking the maker movement into interesting online spaces, as well.

MS. SMITH: So I think that’s all the time we have. I want to thank our panelists for joining us today. Thank you. (Applause)

MR. PALMER: Good morning, everyone. I think we will go ahead and get started so that we can get out of here on time.

I'm Doug Palmer. I cover international trade for Politico, and have been doing that for a number of years. I'd like to thank Brookings first of all for asking me to moderate this event. I've actually covered a number of discussions in this room, but I've never seen it from up here. It's kind of a novel experience for me.

As everyone knows, there has been a lot of focus on manufacturing in the U.S. presidential election in terms of concerns over lost jobs and the U.S.'s ability to compete. Back in 1969 when I was 10 years-old, there were about 18.4 million people who were employed in manufacturing in the United States, and in 1999 when I turned 40, there were still about 17.4 million.

After the turn of the century, there was a steep drop in U.S. manufacturing jobs to about 12.3 million currently. There was a decline and there has been a bit of a bounce lately.

The U.S. share of world manufacturing has also fallen as China has taken over as the world's largest manufacturer. Still, there was just a recent report by Deloitte for the U.S. Council on Competitiveness which ranked the United States as the world's second most competitive manufacturing country just behind China, and that same report also projects the United States to be the most competitive manufacturing country by 2020.

We are honored today to have four distinguished speakers to discuss the role of governments in supporting manufacturing.

Representative David Cicilline is a fourth term congressman from Rhode Island, and his district, I found from doing a little reading, includes Slater Mill, which is known as the birthplace of the American industrial revolution. I don't think they make many textiles in Rhode Island any more, but I'm hoping --

MR. CICILLINE: Some.

MR. PALMER: Okay. Anyway, the congressman will inform us on the opportunities and challenges facing manufacturers in his district.

Anthony Murfett is Minister Counsellor for Industry, Science, and Education at the Australian Embassy here in Washington. Like the United States, Australia's manufacturing sector has experienced a number of changes over the past three decades, but still is an important element of the country's economy.

Next down the line we have Dongsoo Kim. He is a research fellow at the Korean Institute for Industrial Economics and Trade, and he is here to give us a South Korean perspective on the issue. South Korea was ranked fifth in that Deloitte study I mentioned on global manufacturing competitiveness. It's the world's largest ship builder and the fifth's largest automobile producer.

Finally, we have Li Bin who is Counselor for Economic Affairs at the Chinese Embassy. China is the largest manufacturer of motor vehicles as well as toy products, and has a rapidly expanding middle class that makes it a growing market for many American goods. As we all know, China's rise as a manufacturer has made it a frequent target in U.S. political campaigns, so we are eager to hear Counselor Li's views on where Chinese manufacturing is headed in the next decade.

Congressman, would you mind starting us off with a few thoughts about manufacturing?

MR. CICILLINE: Sure. Thank you for including me. I'm delighted to be here with the White family. You know, Rhode Island has a very long history of manufacturing, as you mentioned, the birthplace of the American industrial revolution, and really had an economy that was really built around manufacturing.

So, I've focused a lot of my efforts since I have been elected to Congress to what can we do to help support and grow American manufacturing, recognizing that in my view in order for us to really have an economy that works, we have to make things in this country. In fact, if we have policies that create a level playing field, American manufacturers can compete like no one else.

We make the best products in the world. We have the best workforce in the world, but what we have to do is have a level playing field so we can actually compete in a global economy.

I think we have a number of policies in place that actually undermine our ability to promote American manufacturing. I think one of the things I want to mention is I think this is a real opportunity for American manufacturing because this growth of the Maker movement and the role of 3D printing and all the new technologies making things cool again, I think gives us an opportunity.

I think for the last 10 or 15 years, if a child came home and said mom, dad, you know, I want to be a manufacturer. Parents are like really. This idea that manufacturing is dirty and someone else is going to do it, it's a dying industry. I think the Maker movement has helped to change that, people recognize that manufacturing jobs pay better on average than non-manufacturing jobs, that making things

is cool again, so it is informing the way we think about education, job training, career and voc-tech education.

I think people want to make things, and everyone can now be a manufacturer. So, part of kind of removing the stigma of manufacturing, which I think we labored under for a long time, which was bad for our country and bad for our economy, has finally changed. I think this is a very exciting time.

As you look at kind of new and more advanced manufacturing, the real focus is on the intersection of making things and design. America is a real leader in this. This is where I think we have a huge opportunity, my home state in particular, but America in general, because of the kind of innovation and design in the new and more advanced manufacturing where I think we have a real leg up.

I think this next century is going to be a century of great excitement and growth in our manufacturing.

MR. PALMER: Thanks for those comments. Mr. Murfett, would you mind going next?

MR. MURFETT: I thought I'd give just a little bit of context to the Australian manufacturing sector and the Australian economy. It does show some similarities with the U.S.

First, I'm going to be a little bit bureaucratic in that if you're watching Australian elections, we just had an election. The outcomes are unknown. We are still operating with what is called "caretaker." As part of my role, I have to make sure I am delivering factual information, I can't do any commentary on government policy or what may come.

That aside, I'm make it to a little bit of history about the Australian economy and manufacturing. In October, barring any catastrophe, and I say that probably with a word of caution in the environment we are living in at the moment, our Australian Bureau of Statistics will release a report highlighting Australia's GDP or its gross domestic product will be having its 25th year of consecutive growth.

Now there is only one other country that has had a similar track and that is the Netherlands, and that has been for 27 years, and the economy that is behind is actually Korea, who has had 18 years of consecutive growth.

A little bit about the size of our economy. It's not as big as the U.S. economy which is just under $18 trillion in GDP for 2015. Australia has its economy in 2015 in U.S. dollars as $1.22 trillion.

That being said, it's still a significant global player, and I think we are around the 12th largest economy around the world.

In the Australian system as well we have a large proportion of small to medium enterprises, and importantly if we compare it to the U.S., they are probably considered micro businesses. We have a count usually from 1 to 200, which is in the micro area in the U.S. sense.

Turning to manufacturing itself, 30 years ago, I can confess I was born, and there were 1 in 6 jobs in manufacturing, and if we turn to today, there is now 1 in 13. Until 2005 and 2006, manufacturing was the single largest sector in the Australian economy. Today, it is now the fifth largest industry, and it is behind things such as mining, financial services, construction, and health. Again, that is a story not dissimilar to what is happening here in the U.S.

To reinforce, it is the fifth largest, and it is still quite a very significant part of the Australian economy. It contributes $100 billion to gross value add. It has over 7 percent of employment. It contributes 6.2 percent to our GDP. Importantly, it undertakes around 25 percent of business research and development.

So, a little bit of the back story of how has that sort of come about. We live in a global economy and there have been a lot of changes. We have disruptive technologies. We have seen this shift in the global economic sense, we have seen increased globalization and urbanization in the rise of the Asian middle class, and that has created a greater demand on Australian resources/goods, and there has also been a greater request or demand on energy, food, and water.

Australia being an open economy, it is also exposed to many of these conditions and things that are also impacting on us is the technology is lowering the cost of entry, competitive advantage is much more easily gained, and also eroded, and businesses are starting up and filing much quicker.

Interestingly, the composition of businesses themselves is changing, and there is now a different business capability if we compare it back to traditional industries probably before I was born.

Turning now to manufacturing, because that is the general sort of economic environment. Those that have followed Australia have probably seen we have had some closures in our automotive industry and in our steel sector. Some of the reasons that have attributed to this have been around

increasing labor costs and production costs until recently, and a vastly appreciating dollar, and also things around increasing global competitors, particularly from low cost countries.

It is not all doom and gloom. Through that period as well there were parts of the manufacturing sector that were quite successful and showed resilience, and one of those was in the food and beverage sector, which contributed to 20,000 jobs in Australia in the 10 years up to 2015.

What does manufacturing mean in Australia? I'm sure we will explore that in the panel. I think touching on some of the earlier comments, manufacturing is transitioning from making a thing or a widget to the full suite of activities. It really is now this design, the R&D, the development of the product, creation of the product, but it is also the delivery, the logistics, and also the after-market service. It is a full spectrum of which there are opportunities.

One thing Australia is also having a look at doing is we are looking at things through the lens of competitiveness. How can we be competitive? Where are our competitive advantages, and where are our comparative advantages?

What we are seeing is particularly in areas of advanced manufacturing, these high skilled and medium skilled advanced manufacturers are really forging new markets. That is recognized in some of our export figures that are showing exports in manufacturing has grown recently.

I thought I'd just conclude thinking around the world what are we seeing and what does the future bring. If I had a crystal ball, I probably wouldn't be sitting here, I'd be doing other things. I think some of the themes that have sort of come out when we have looked at these particular issues, it is where are we competitive and how can we compete. It is embracing change, embracing the technology that is coming about. It is looking at things like the Maker Movement and how do we make manufacturing really exciting, collaboration and innovation are really an important part, I think, as we come across multiple issues. No one country can do one thing, and no one manufacturer can do one thing. It is important to engage with R&D. Of course, we need to keep an eye on and embrace trade.

MR. PALMER: Thanks very much. Mr. Kim, what is the view from South Korea?

MR. KIM: South Korea is pretty well known for manufacturing these days, and many people from the developing countries are benchmarking Korean manufacturing rapid development history.

Sometimes I was very confused because Korean manufacturing industry isn't really mature to share with the developing countries. It was pretty fantastic for the outsiders, but insiders, like Korean experts, like me, we see kind of waves, even though past performance in the IT industry, still our traditional main manufacturing industries like shipbuilding, automobile and steel, and petrochemicals, petro refineries, et cetera.

In the very short term, we have a really strong pressure to restructure those traditional industry sectors because of the overcapacity problem. More mid-term or longer term view actually maybe ICT sectors or semiconductor, convergence of those two, even sometimes convergence with the service sector, et cetera.

We caught up very fast, but now we are not following any more in some specific sectors, we don't know where to go and how to go further sometimes. That is a big problem in the more longer term.

It is an opportunity to me to join in this forum this morning, because I could remind myself about the more fundamental issues in the manufacturing industry, which is like a misconception for the manufacturing industry in Korea, how can we correct. The best college student doesn't go to the manufacturing area at all, they go to the medical school, they go to law school rather than engineering school.

In the first discussion session, I think Jennifer talk about STEM education, that is pretty important for the manufacturing economy, but unfortunately, Korean young people are very risk adverse at this time. There is a more fundamental longer term problem in Korea, and we need to figure it out, how to get people to engage and participate in the manufacturing industry. Those are the current issues in Korea.

MR. PALMER: Thanks very much. Counselor Li?

MR. LI: I think the Chinese manufacturing, of course, is really a very large sector, not only in China but also in the world because it not only employs a lot of people, but also contributes a lot of GDP and also a lot of exports to the rest of the world.

The manufacturing in China, I think, can be divided into domestic and international, which means when foreign enterprises invest in China, that is one sector, foreign sector, manufacturing sector,

mostly joint ventures, so there is a special feature for that because mostly we want to learn from foreign countries' technologies, other ways of doing things and practices, and also many of the products are really targeted to export markets.

The other sector is really our pure domestic manufacturing, which has nothing to do with foreign investment. That has its own special characteristics, which means we have to rely on ourselves, right, because we do the R&D by ourselves, and we don't have to export. That differs from one case to another.

Mostly I think the foreign invested manufacturing sector is really very advanced because we have introduced foreign technologies, and also the orders are from foreign countries also, sometimes, and because they must fill the needs of the foreign users or consumers. Usually, the quality is very good and also the price is pretty competitive.

I think several features of China's manufacturing can be summarized. First of all, the scale is very large, as I said. Secondly, the quality of the products mostly is pretty good, especially if they are foreign.

The problem is the value added is not very high. Mostly the Chinese manufacturers only get small share of money or income. The foreign users or the foreign consumers or foreign dealers will get more than what the Chinese manufacturers have got. For example, maybe for one product they can get only $1 or $5 or $10, but if it is resold in foreign markets, it can be resold for $50 or $100, whatever, right.

For example, the most obvious case is the iPhone, manufactured in China with a capacity, usually factories like Foxconn can be 300,000 or 400,000 workers, which is the largest factory in the world, just for this single factory, not to mention the total capacity of manufacturing for China, something that you seldom see in other parts of the world, but actually really the Chinese manufacturers, they don't get so much, and that is a very important characteristic.

The second one is the R&D content or design content is very small because mostly it's foreign technologies. Mostly we just manufacture, we just produce, we just do the manufacture. It is not designed by China; it is not designed by us. It is not an innovation or invention by the Chinese manufacturers.

A very famous article in Time Magazine, why not China innovate or invent, something like that, right. That is a very obvious problem for the Chinese manufacturers.

Thirdly, of course, I think the quality of the people in this sector still not very high, needs to be improved. Workers, of course, they need to be improved because they are not college educated or even Master degree. Mostly they are workers, right. Not very high standard of education which means they need to be improved. The government needs to provide more money to those enterprises, especially small and medium ones because a lot of enterprises are pretty powerful in terms of money for training, this is concerning human resources.

Also, I think the fourth problem of Chinese manufacturing is sometimes the products are still not meeting the demand because they still follow suit, what others have done, and they just copy, rather than really figure out what the customers really need, no matter if the customer is in China or in other countries.

Today, the biggest task or challenge for our manufacturing is still to provide the best services or products, but if you don't sit down and spend many years in doing R&D and thinking or studying rather than just want to get quick results or quick profits or just relying on foreign technologies, manufacturing will go nowhere.

I think there are still some other features or disadvantages or shortcomings for our manufacturing, but those are just a few examples.

Concerning the future plan for our manufacturing in China, I think our country has already announced a plan for 2025, which is only nine years away, which is very short. I think the plan is very clear, that by 2025, China will reach a certain level, and then by 2035, another level, and by 2049, when the People's Republic is 100 years old, another level, which means at the final stage China will become a developed, important manufacturing state, but in 2035, only something in between, which means we can manufacture and we can increase our own R&D capability, we can do some designs and innovation, but still not enough.

Those are the three stages for 2025 which is really to learn the experience of industry 4.0 and also similar things in the United States and Japan. We think the ambition in that document, of course, is very grand, but the issue is how to implement it, especially I think the most important thing for

successful realization of that plan is really education and also innovation and invention, especially to rely on ourselves for R&D activities rather than just solely have something coming in and then manufacture it in China. That period and era has passed. If we still rely on that during the next 10 years or 25 years, manufacturing cannot be improved. That needs some thinking especially for enterprises because enterprises are the backbone and engine of manufacturing growth in China. The government can only provide some services and good policies and strategies, but the backbone, the major players, are still enterprises because the government can only provide a platform, like this one, right, and then the players, we are the enterprises, and we should do the R&D, invention, innovation, labs, experiments, things like that, and that is the most important thing.

The other point is the international competitiveness of the Chinese products that I didn't mention. The Chinese enterprise is going international, still it needs to be improved because maybe they are pretty competitive domestically but once they go to international, there are few enterprises which can provide very good brands which are as famous as other brands like international brands, American brands, Japanese brands, Italian brands.

We have so few international brands that many people only know that we are the largest manufacturing country in the world but they don't know which are those famous brands. Maybe the issue is there are no brands, or maybe there are few brands or small brands, or at least publicity is not doing enough, so people don't know what your famous brands are.

Without those brands, how can you be a strong refined famous international reputation manufacturing country? You can only be a manufacturing country, maybe large, big, but not good enough because it needs to be very detailed, very refined, everything. You must do a good job, not just the big one, small things, very important.

That is the very area I think Chinese manufacturing needs to be improved. We are far from yet to be satisfied with our manufacturing, but rather we should use a mirror and see ourselves in this mirror and say there are many areas that we need to improve, and we must have a sense of crisis, not 10 years or 20 years, which will come very quickly, if we are going to succeed in this sector.

Enterprises, government, universities, institutions must have a sense of urgency and also we should do a good job in respecting IPRs of foreign countries because without IPRs, without the

respect for IPRs, nobody will manufacture because if you do manufacture, it will be copied by someone else, and then people will have no incentive to manufacture, and that is also very important for successful manufacturing.

Thanks very much.

MR. PALMER: Thank you. Those are very interesting comments. Everybody does sort of think that China is the manufacturing heavyweight, but you are sort of describing it as a work in progress, there are still areas that China needs to work on as it goes forward.

Congressman, one of the things I noticed you saying was you thought some of the policies that the U.S. has actually undermines our efforts to promote manufacturing in the United States. Could you talk a little bit more about that, where you see the deficiencies, and maybe where you see stuff that the government is doing well?

MR. CICILLINE: I think the principal place our policies undermine American manufacturing is in our Tax Code. We tend to provide better treatment very often in terms of the revenue or income to companies that have manufacturing operations outside the United States, so you incentivize American companies to actually produce products outside the United States because under the tax code they can assign the profits to that company outside the United States, so companies that do all their manufacturing in the United States that don't have that same external operation can't do that, so you have created an economic disincentive to keep jobs in America, and an economic incentive to create manufacturing jobs outside the United States, which is counterintuitive.

I think there are things within the tax code, the research and development tax credit, to make those more generous and permanent so that we can encourage the kind of R&D that the counselor just spoke about that is so critical to 21st century manufacturing.

I think our tax code principally is a place where we could enact a set of new policies that really understand this new economy.

I think the area that we have done okay on but is probably the biggest challenge for American manufacturers is workforce training and workforce development. I know one of the panelists mentioned the Deloitte study which said there will be about 3.5 million manufacturing jobs over the next

decade, 2 million of them may go unfilled, and that is in large part because of not having people with the skills necessary to fill the jobs.

Every time I visit a manufacturing facility in my state, every time, I am told by the owners of the company we have jobs today which we just can't fill because we can't find people with the skills necessary to fill those jobs.

It used to be the case, of course, that you could graduate from high school and go to the manufacturer where your mother and father worked and get a job, a good paying job. Unfortunately, that is not the case anymore. It doesn't require a college education, but it almost always requires some advanced training, some postsecondary education.

Having really good alignment between what manufacturers need, what the private sector is demanding in terms of skills, and for a long time these workforce training programs were just sort of independently deciding what they wanted to train people for.

People are going to hire them and find out what skills they actually need and then aligning that training, I think that is happening much more now, but we really have to continue this STEAM education -- we changed it from STEM to STEAM because that art piece is really important, art and design component of the STEAM education is a big part of it.

Just anticipate the problem the Counselor mentioned, we have to be very focused on understanding the value of art and design and innovation in this new kind of manufacturing.

I think we should stay focused very much on workforce development. We should reform our Tax Code and at least create a level playing field, and finally, I know we will talk about this later, we have to have trade agreements that don't create a real disadvantage for American manufacturers.

MR. PALMER: Thanks very much. Just from the comments made up here and some of the previous comments from the other panels, I am sort of struck by this idea of the hard time manufacturers have recruiting young workers to come in and work in their factories.

I just wondered, is that a problem that is common throughout all countries? Do you see that in China? Is it difficult to attract young workers into manufacturing jobs? What are they doing in China?

MR. LI: Of course. One issue that I failed to mention just now is the rising cost of the Chinese workers. That is one issue. Many of the workers have gone back to their countryside. As we know, there are about 250 million so-called "farm laborers" working in the urban area. They were not necessarily all working in manufacturing, but I can say many of them were working in manufacturing.

The labor issue, as I mentioned, is on the one hand, and the rising cost, but also sometimes it is very hard to acquire or get workers because maybe there is not enough, not to mention about some of the quality of some of the workers is not high enough because they are not meeting the demands of the employers. The employers need better employees, but they just cannot get.

As you mentioned, in many of the factories in the coastal area, the employers feel very bad because they just cannot get enough good and better qualified workers.

The other day I went to a ceremony where a factory, a company from China, in robotics and artificial intelligence, they gave a speech. One thing that surprised me is that sometimes the employers use robots, not just for consideration of robotics can save some money or salary, if they have a salary, it is not as high as the people's salary, but they cannot get the workers, so they have to utilize the robotics. That really surprised me. I thought oh, they use machines in order to replace people because the machines can be more effective, more efficient, so they can earn money and save costs, but actually I was wrong.

Maybe there was also some circumstances, but at least that was one circumstance. That is why I think the other scenario which excites me is maybe by the end of the year, babies born in China will be increased, because the policy was to allow the second baby to be born, although in the previous year or previous year, only one baby, because the government has realized that babies are the future. We should see the figure by the end of the year as to how many babies will be born.

Each year, 8 million Chinese people die. The net increase of the new population is about another 8 million.

Some people say that maybe in 2030 or 2040, the Chinese population will be something like 600 million, which I don't believe, which I also don't want to admit because that is too far away. You cannot predict for that period of time. At least at the current stage, maybe given that policy, the population will increase. By how much? Nobody knows. We should look at it by the end of the year.

MR. PALMER: That is interesting. Mr. Kim, my topics have been trade, that is what I have written about for too long. I know South Korea has a number of free trade agreements with the United States, with the European Union, a long list of others.

Do you think that has been beneficial? Has that helped boost the manufacturing sector in South Korea?

MR. KIM: I think absolutely that is true, but free trade agreements, in a short time period, that is beneficial to us, to our manufacturing industry. I think theoretically if all countries make an agreement, then our benefit will disappear, right.

In that sense, the free trade agreement, we can just take some kind of advantage in the short term, but instead we must focus more on the political side, for example, TPP, which might be better, we cannot decide only on economic free trade. We have to think about political relationship between Korea and China, Korea and the United States. We are just in the middle of two big giant G-2 countries.

That is another issue. I think that is much more important than simply economic free trade agreement.

MR. PALMER: Is it just the geopolitical alliances or --

MR. KIM: How can I say, political, we are close to the United States, absolutely, market economy, but economically, the total trade volume with China is about 25 percent of entire trade of Korea. Absolutely, China is the number one, the largest market to the Korean manufacturing industry, so we need to pay attention absolutely.

Sometimes there might be some kind of conflict, not economic conflict, but political conflict. It is really difficult balancing in between. That is sort of the current problem.

MR. LI: One thing I found interesting is the comparison between Korea's manufacturing and the Chinese one. I recently found Samsung's competitiveness has been reduced in China and the world compared with Apple and maybe some other companies. I think especially their manufacturing or performance in China has decreased. I think maybe given the change in leaders in the company or whatever reason, which is something we only speak in this room, not outside.

There are other reasons, because we see more and more people utilizing Apple, fewer and fewer utilizing Samsung, which is something that worries me because Samsung in my mind was a good company. My friend worked there and we used to deal with the company.

For a good company to become a bad company is very quick. I think all famous international top companies face this challenge. If you don't R&D, if you don't stabilize, if you don't do a good job, you will go back to maybe second tier, third tier. If one unit is second tier, they sell it.

In this world, there is no meaning to maintain second tier companies, they sell it, because you only maintain the first tier.

MR. PALMER: Mr. Murfett, thoughts on the role of trade agreements and advancing manufacturing? Has that had an impact one way or another in Australia?

MR. MURFETT: I think if you look at our history, we have embraced the approach and we started with New Zealand, our closest neighbor, went to Singapore, and we have a trade agreement with the U.S. and a large part of the TPP. I think the benefits are there. It is a common rule of law. There is a consistent and level playing field.

Some of the things we are finding also with our manufacturers, it is increasing competition, which means they are finding new solutions and new products and new competitive advantages, and as a result of some of the tariff reductions that have come in, it means there are lower cost imports, which means we can focus on the quality of our products.

I think it has been quite positive for our manufacturers.

MR. PALMER: I see we are kind of getting close to the end of time. I'd like to turn to the audience. This gentleman right here in the blue cap has his hand up.

MR. HURWITZ: Thank you very much, great presentation. I'm Elliott Hurwitz, former State Department official, former World Bank contractor, intelligence community member.

Mr. Li, you mentioned the enterprise as the core of the Chinese manufacturing sector, I think. I think the government plays a larger role in the manufacturing sector in China than the enterprises do. I would appreciate your answer on this.

MR. LI: Yes, you are right. The government in China plays a very important part in every sphere, not only economic development but also in supporting China's manufacturing. I think that can be

done through many ways, traditional ways and new ways. For example, rebate, tax reduction, tax exemption, giving very cheap land to foreigners or whatever, maybe domestic manufacturers.

It is that land, and in some alternative way, that can be very expensive, for example, building dormitories or apartments for people. If it is used for joint ventures, advanced manufacturing or whatever -- you can see a comparative cost of land for different purposes, which is another interesting topic that you can write a dissertation about.

What I said is enterprises should play a very important role in the future innovation or invention, which means they are not doing that enough because mostly they get support from the government, either fiscal or financial.

That is not enough. That will not create or lead to very good enterprises and famous international brands. My point is in the future, we should do more on R&D, on design in China, not just manufacturing in China, and government should do what is deemed as appropriate rather than doing so many things.

If you are replacing enterprises or acting as enterprises to do things, that is not correct. That is not the government, something else. Government should try to find its own position for supporting enterprises, and also enterprises of different natures, private, foreign, and state, should be treated equally, which is not enough done at the current stage. That is also another challenge for the Chinese manufacturers.

I think what I said is really the same as you have mentioned, which is to say in the past government really did a lot of things to support manufacturers but enterprises did not do enough, which means in the future, enterprises should do more and government should make what they do more reasonable than before.

MR. PALMER: Okay. Congressman?

MR. CICILLINE: I think this is one of the fundamental differences between in general American manufacturing and Chinese manufacturing. The notion of the government would be more active in the design work is not how I think our economy works.

We want to promote the development of entrepreneurship and design and innovation obviously in the private sector, and we need to fund research and development, but I think the real

strength that the American manufacturing economy has and I think is frankly the big challenge in China is a sophisticated level of a legal system that protects intellectual property.

You are not going to create an environment in which entrepreneurs and designers and innovators are going to create products without some confidence that they can retain it and someone can't walk over the next day, steal it, and use it. There is no incentive.

Not only culturally do you have to create an environment where people feel excited about inventing and designing new things because they have ownership of it, but to protect it from being stolen by others.

I think the role of the Chinese government could be much more productive if it played a real role in helping to create a much stronger system for protecting intellectual property because I think it would make it a more attractive trading partner and it would be more beneficial to long term growth of manufacturing in China.

This is something I think the United States has a tremendous advantage. We have a real system here designed to protect intellectual property. It's not perfect. We have lots of work to do. It is a real value.

You mentioned earlier in your comments kind of the role of the government. I think this notion of the protection of intellectual property has very serious long term consequences if it is not addressed.

MR. LI: The congressman's view has me think about one more thing which is the U.S. enterprises going back to the United States. Of course, the president has the policy to attract them to go back to the United States because in the past, the energy cost was low, right, so it was an incentive, but if that is the issue, that's okay.

If there are some other factors in that coming back of enterprises of U.S. back to the United States' soil, I think it is because they don't think the policies are transparent, they don't think the investment climate is satisfactory, they think the costs in China is also going higher. They think sometimes the policies or strategies are not that clear. That is something else.

These two must be clarified, if it is because of the former, which is going back because of the energy cheap price so that the final price will be cheaper, that is understandable, right. If it is because

of the other things, which is the latter, that means certain governments need to improve their worth so that the investment climate should be improved and then maybe even if you have policies to attract them to go back, they will not go back, they will still stay there.

Otherwise, they can go to some other countries, like Vietnam or even Bangladesh, if the policy is good, or the services are good.

Maybe you don't think what I said is related to your concern, but I don't know why this suddenly came into my mind. The subject is not this but it is related.

MR. PALMER: It is an interesting point. There is a young lady in the very back of the room who wanted to ask a question.

MS. LELAND: Hi, I'm Crystal Leland. I'm a student from Vanderbilt University. Thank you, Counselor Li, for sharing the information about China. For the past decade, we have seen great improvements in China in terms of development and manufacturing. You have encouraged the millennials to do entrepreneurial work and also we have seen big electronic companies successfully premiered on the world stage, but as Counselor Li mentioned, in order for China to reach its 2025 manufacturing goal, there is still a long way, especially in terms of how to encourage young people to do more innovative work.

I was just wondering for the last panel, and also Congressman Cicilline also mentioned, there are a lot of initiatives that are taking place in the United States. I'm just curious, is there any specific initiatives sponsored by the government that are taking place in China.

My second question is I was going to ask something about intellectual property rights, but since you just covered that, I'm just thinking, two weeks ago I went to the Wilson Center and there was a lecture on is China's door closing, and we heard a substantial amount of concern from U.S. business in terms of the ambiguities of Chinese policies.

Do you think the Chinese government is going to make any changes to attract more foreign companies or do you think this is not something that is on the agenda of the Chinese government?

MR. LI: The second question, I will answer first because otherwise, I will forget. (Laughter) I really don't know the specific case you mentioned, but basically I don't think there is any

change in policy for Chinese leaders to attract foreign investment, right, but certainly, if the policies, as I said, are not clear, are not transparent, and can give you a lot of ambiguity, of course, owners of foreign companies will hesitate from investing more or increasing their investment in China.

I think this is something that the government, of course, should pay attention to and should try to make every enterprise happier, not only foreign ones, but also domestic, not only state owned but also private enterprises.

For the first question, otherwise I will forget, about young people and innovation, very interesting topic. I see hope in you, because you are the future. You are the hope of the world's future and maybe China's future. I think China has attached great importance to so-called double innovation, right, to have all people or many people start an enterprise and to innovate. Only the elites can innovate, where the majority can start an enterprise. I can start an enterprise, but I'm not an elite. I cannot innovate.

I think the government has policies. Of course, if you read them on the Internet and also some internal documents, of course, they are policies, but the innovation is not only to attract young people to innovate but also some other age groups, although the young people are the very dominant because we know that physically young people are very suited for innovation because if they are in their 20s, 25, 30s, but if you are too old, like me, 70s or 60s, you cannot innovate so much.

I think there are many policies, strategies, incentives, in terms of taxes and banking, loans. Also, I heard when I was in Beijing at a previous time many people, if they have an idea and if somebody will give them money, they think you have the potential, that you are capable of doing the innovation, they will give you the money.

Now, I think in China the atmosphere is very good, and the money is available, the policy is there, and the issue is how can those young people improve themselves so that they can have some good ideas, so they can change those ideas into productive forces, which is a good product or a good service.

I'm really hopeful that not only people in China but also people elsewhere in the world can innovate and also can design or manufacture some good products like the iPhones.

MR. MURFETT: If I could add, particularly around skills, and this was touched on earlier, it is really important to inspire the next generation to come through and engage in manufacturing and see how cool it is, which is why the Maker movement is important.

I think the other part is you also need to make sure the skills match your future need, which is why looping back with who is providing training meets the industry needs and where it is going.

MR. PALMER: Thanks very much. I think we could probably go another half hour or so, but unfortunately, it is 12:00, and we have come to the end of our time.

I'd like to thank all of our panelists for participating today. (Applause)

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