THE BROOKINGS INSTITUTION

FOSTERING GROWTH THROUGH INNOVATION

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Welcome and Introduction:

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The Brookings Institution

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Vice Chair, Brookings Board of Trustees

Proven Strategies for Bolstering Advanced Industries:

Moderator:

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Panelists:

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Chairman and CEO
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P R O C E E D I N G S

MR. TALBOTT: Good morning, everybody. I'm Strobe Talbott, and it's my pleasure to welcome you here to the Brookings Institution on a soggy day. It's not too hard to come in from outside on a day like this.

This is the fifth Growth through Innovation forum that we have held here at Brookings. I'll give you a little bit of a background in a minute. It's the third one that we are conducting publicly.

The phrase "growth through innovation" is an important part of the vocabulary here at Brookings. We have what we call four institutional priorities under which we try to cluster all of the work that our more than a hundred scholars do here. Those four priorities are energy and climate, opportunity and well-being, managing global change, and growth through innovation.

This is, I think, exactly the right moment to be having today's event. We're in a period of transition in our national leadership here in the capitol of course. We have a new Treasury secretary, new chief of staff coming in. We'll be having a new Commerce secretary, a Labor secretary. And, of course, the 113th Congress is settling in on Capitol Hill.

The forum is going to address the issues of how to reinvigorate our economy, how to strengthen competitiveness, and how to create jobs. We're going to have three panels -- the first on advancing industry and manufacturing, the second on deficit reform, and the third on improving government performance. The participants here today include Brookings scholars, outside experts, and private sector representatives and leaders. Our discussions will reflect a lot of the research that goes on here at Brookings, and you will be able to find a number of examples of that research outside the Falk auditorium where you came in. I recommend, in particular, the work of our Metropolitan Program on ideas on how to revitalize manufacturing

and also the work of our Governance Studies Program on how to make an innovation-based economy.

The Growth through Innovation project is an example of what we're doing increasingly here at Brookings, and that is undertaking both research and public events and outreach that draw from multiple research programs here at the Institution, and we have three of our research programs represented here today. The Growth Through Innovation Project is led inside of Brookings by Darrell West of our Governance Studies Program, Bruce Katz of our Metropolitan Program, and Martin Baily of our Economic Studies Program. The co-chairs of GTI, as we call it, Growth through Innovation, are three Brookings trustees: Glenn Hutchins, Klaus Kleinfeld, and Dominic Barton.

And my final note before turning the program over to Glenn is to do something quite different than I did for many years, and it shows that there has been technological innovation and we live in a new era. I used to always end my remarks by saying will everybody please turn off their cell phones. I would ask you to turn them on to silent. You can keep them on, on the condition that you use them only to tweet out of this conference. And for those of you who are able to do that -- I'm not yet one of them -- the hash tag is #USinnovation.

So, Glenn -- you know all of that, so come on up here and talk to these folks.

MR. HUTCHINS: I'm sure that in an active widespread civil obedience you're going to do with your technology what you choose, and as someone in the technology business, please go ahead, because I like to make money while I'm talking.

I'd like to thank you, Strobe for having me here today, welcoming all of us to the Brookings Growth

Through Innovation forum, and welcome to all of you. We've got a stellar group of panels organized today with some fantastic panelists. I'll get through my remarks very quickly,

because I know you've come to hear them not me.

I did want to reflect that our first Growth through Innovation panel was over three years ago. At the time we were really in the depths of the great recession; the unemployment rate was 10 percent; we'd lost 8.5 million jobs worth. We were pausing to remember that. A lot of us were very -- it was a moment of great national crisis.

Brookings, I think, under Strobe's great leadership, chose to point and lead the way toward the future: How do we grapple with then today's problem in order to create a brighter future. One of things we did was what you're here to witness, to be a part of today, the Growth through Innovation forum. We decided we would examine government policies that would help to unleash private sectorization. We weren't under any illusions that government actually creates jobs or creates innovation but can create the conditions under which those can be fostered, all right, because we view the need for growth on the heels of the great recession as a vital American problem. A huge loss of economic production, we're operating at about $1 trillion below our potential, unacceptably high unemployment rate, representing vast loss of human potential.

Many people ask, why is growth so important? Why should we focus on more Washington-centric kind of problems? And it's really kind of a math problem. People don't understand the vital difference of the compounding of interest over the course of a very long time period in economic growth. One percent difference in economic growth; two to three percent represents a massive, massive outcome difference over time.

I have just a few examples for you. If, for instance, between the period from the end of the Civil War to 1990, the U.S. economy had grown one percentage point less, our economy would have been the same size in 1990 as that of Mexico, that one-percent difference over that century creating a massive outcome difference.

Looking forward 10 years from now if we grow at two percent rather than three percent potential, we will have had an additional one trillion loss of outcome, which is about $10,000 per household in this economy. That's a very, very big deal. But growth alone is also not important; it's also growth that is inclusive, that is broadly shared. And that's one of the things that Brookings is devoted to. We have a project called the Hamilton Project, which is focus-centered on that issue.

If over the course of the last 30 years, roughly 35 years, the average income in the United States household had grown at the same rate as the U.S. economy, .6 percent actual for the household growth versus two percent for the economy, the per capital GEP would be 50 percent higher than it is today, and it would be $90,000 versus $60,000. If you translate that into kind of what happens at the household American economy, that is vital, and what we do in Washington is really, really important.

I just came back recently from a trip to Brazil. I don't want to spend a lot of time on that, but Brazil essentially has gone to a potential zero percent growth rate. A lot of that has to do with the kinds of things that we've experienced from Washington that had been imposed in Brazil in an economy that is less resilient than ours. Fiscal uncertainty, slightly higher taxes, slightly more regulation, slightly more cost of labor, and all that has caused the economy in Brazil to go from an economic growth of potentially zero percent growth rate.

Now, we have an ability to withstand more of that in the United States than they do, but it's the same effect. Government can't necessarily create economic growth, but it can create the conditions under which the economy grows or create the burdens under which an economy struggles. And we need to understand that that's vitally important.

So, today you look where we are and you can see that the economy has been in recovery. Household net worth has recovered almost pre-recession levels. The economy is almost at pre-recession levels. We've added 4.5 million jobs. That still means we have four to

go to get back to pre-recession levels. Unemployment rate has dropped to 7.8 percent, but it's not enough. Households have begun to restore their balance sheets. Housing sector's finally started to recover and contribute to economic growth. We're in the process of a slow, steady recovery.

The problems is that at about two percent it's probably not enough to reduce unemployment measurably from here, and getting above two percent is absolutely vital. So, we're going to talk about that today. And we're very, very hopeful that we can do that, because we're creating conditions right now to increase economic growth in the private sector.

Today, however, the big problem is the political failure in this town associated with the inability to solve our government debt problems. And now while our government debt is not a problem today, as trajectory leads us over the course of not that long of a time period, a decade, to levels that will further imperil our economic growth, we get to levels of debt that's projected or based on today's operating of the government. History shows that those countries that have experienced that level of debt grow another one percent less than they would have otherwise.

So, you can see a way to think about it is we're on the cusp of having an economy that can contribute the above two percent growth necessary to generate reductions in unemployment. We're also on the cusp of having a debt problem that can take that growth away and get us back to the sub-two percent growth that will cause unemployment to be very sticky for a very long period of time. That is a very, very big problem. It's a problem that we need to -- and that doesn't include the damage to consumer confidence, the decisions that are taken as a result of those uncertainties in the corporate boardrooms and the spectrum of employment and capital spending and all those sorts of things that layer on top of that. So, that is a very, very big problem that we will next turn to focus on the resources of growth through innovation in coming years.

But, as we move to the panel today, one of the things that Bruce Katz, who's leading this next panel, has taught me is that while national governments can build up deficits and wallow in dysfunction, states and cities cannot and that the hope in many -- like (inaudible) the states of laboratories of the nation, the hope that we have for important parts of our future is that people at the state and local level continue to soldier on and do what's necessary where the rubber meets their roads to create the conditions for economic growth, innovation, and projects like advanced manufacturing that can generate the types of jobs that can get those per-capita median incomes up and generate the kind of growth that is shared and inclusive.

So, today we've got a great panel managed by Bruce. He'll introduce the panelists. The title of the panel is Proven Strategies for Bolstering Advanced Industries.

Bruce, it's all yours. Take it away.

MR. KATZ: Good morning, everyone, and thank you all for coming out on a rainy day, and hello to everyone watching on the Webcast and ultimately C-SPAN. I'm Bruce Katz. I'm Vice President of the Brookings Institution, Director of the Metropolitan Policy Program. I want to reiterate Strobe's reminder to Tweet under the hashtag #USInnovation, and I just want to thank Glenn for the support and the intellectual guidance for growth innovation over these years.

For those of you who have not picked up the three Metropolitan Policy Program papers on advanced manufacturing or linked to them on the Web, please do so, and we will describe those as we go forward with this panel.

Let me start just by quickly introducing the panel, then I'll set some context, and then we'll get into the conversation. To my immediate left, Klaus Kleinfeld, the CEO of Alcoa, I think well known to everyone in this room and watching the Web, also a Trustee of the Brookings Institution.

Dominic Barton, Global Managing Director of McKinsey, also a Trustee of the Brookings Institution, and someone that we've been partnering with at the Metropolitan Policy Program on moving advanced industry initiatives in Colorado, in Tennessee.

Emily DeRocco runs her own firm called E3, which is linking up economic development and skills training and workforce. Prior to that she was at the Manufacturing Institute, and prior to that she played senior roles in the Department of Labor.

And finally, the Mayor of the great city of Louisville, Greg Fischer, who actually has a background in manufacturing. But very interestingly, upon taking office, has been working with the Mayor of Lexington, Kentucky, on a dual metro effort, a regional effort, on advanced manufacturing.

Let me just set some context for the papers we put out today -- yesterday -- and for the conversation today. First, a very quick reality check: We still think about manufacturing in the United States as yesterday's economy as opposed to the vanguard of innovation in our economy: 9 percent of the jobs, 11 percent of the GDP, 35 percent of our engineers, 68 percent of private sector R&D, 90 percent of our patents -- we may be the only mature economy to somehow decouple production and innovation. Trust me, the Germans aren't doing it, the Japanese are not doing it, and the Chinese are not doing it.

Some bad news: Glenn talked about the Great Recession, a loss of 8.5 million jobs. Manufacturing led the loss -- 2.3 million manufacturing jobs lost during the recession -- more than construction, more than business and professional services, more than trade and transportation. We think about the Great Recession as a housing recession, a recession of the finance sector. Manufacturing took the brunt of it. In the last decade, we lost 6 million manufacturing jobs in the United States. And once you lose those jobs, trust me, engineering, product development, technology skills, they leave the country.

Third point is some good news, right? Since the end of the recession, manufacturing has gained back about 526,000 jobs, right? Not enough to make up the loss, but some significant change. And there are trends out there right now -- the rise of wages in China, the shale gas revolution, the beginning of reshoring of production facilities, some disruptive technology, 3D imaging, digital fabrication -- that gives us the sense that this is not a blip, but the beginning of something big.

So here's the question that we have for ourselves and for the country, and these are essentially the topics of yesterday's papers and I think will be the topic of some of our conversation today. How do we begin to drive collaboration between our major companies, our universities, a series of specialized firms, so we can crack the code on product and process innovation, right, as they do in Germany? So we've recommended a series of advanced industry innovation hubs, not very expensive, right, building on some modest beginnings of the Department of Commerce and Department of Energy.

How do we build a supply of skilled workers? Yesterday we recommended a Race to the Shop. Remember Race to the Top? Race to the Shop. I failed shop, but I know there's quite a few people out there who make things. How do we have a Race to the Shop so we can challenge states and cities to orient their skills workers to their distinctive manufacturing clusters, whether it's automotive in Louisville and Detroit, whether it's aerospace in Wichita and Seattle, whether computer and electronic products in Portland and San Jose?

And then last piece is how do we grow a supply of advanced engineers in the United States by creating a network of manufacturing universities? We've done it with land grants starting in the 1860s. This is the challenge of this generation, this century, this era. That's our final recommendation.

So we can get our act together in this country. And from our perspective at the Metro Program, because we see all this energy bubbling up from cities and metros and states,

we can realize the full potential of this advanced manufacturing moment. But we do need to make some bets. We do need to have some smart public policies whether in this town -- suspend disbelief -- or in the laboratories of democracy and centers of innovation -- our states, our cities, and metropolitan areas.

So with that context setting, let me start with Klaus. Do you think we have a manufacturing moment? I mean what's fueling it and what could hold it back?

MR. KLEINFELD: I absolutely do think, and then to the very effect that we are sitting here and debating it and the whole facts that you gave us show the debate is in full swing. And it's good that it is in full swing because there are so many factors that are changing. But let's get a lay of the land because I think you mentioned a couple of things, and I'd like to add a few.

First, job growth is back in manufacturing; 500,000 you said after basically the start of the recession. That's good, right?

Secondly, I mean basically you see the automotive industry as a large player in manufacturing. Who would have thought, I mean, after the debacle that we saw in 2008, 2009? I mean the projection for this year is it's most likely going to go back to pre-recession levels. It's a strong engine. It's a strong engine for growth.

And finally it's become innovative, and that's a second point. Why is that so? There's a big change there because of some smart government regulation. We see it directly affecting Alcoa. The thing called CAFE regulation, corporate average fuel efficiency, what basically means finally we've decided to say the cars that we have here have to obey to certain efficiency rules. That drives suddenly a whole host of innovation thoughts. Light weighting comes into the game, right? So that's a new foundation, smart, smart, legislation.

In addition to smart legislation as a new foundation, you mentioned that, but it's a big one, is the change on the energy side where the U.S. has been given some gift, I would say, that is so big and it has so many implications that we are just starting to understand what that means. Because we're suddenly seeing already happening today a decoupling between gas, natural gas, and oil happening here. What used to be very highly coupled, today it's decoupled and it's cheap. And it's going to be cheap for a very, very long time if we don't screw it up, which I don't think we will.

So this is a fantastic opportunity for many manufacturing industries, and that alone -- I'll give you three examples directly out of the Alcoa area. We are currently putting $300 million investment into Davenport to build an automotive expansion. And the interesting thing is we're already thinking about Phase 2 of the expansion because the capacity, even though it's not yet on line, is sold out.

We are building another part of the expansion also off capacity for a new alloy that we've developed for the aerospace industry, and we're putting that into Lafayette. And aerospace, by the way, another fantastic industry where the U.S. continues to have a very, very strong position, and it's a nice market and has a lot of manufacturing implications in there.

And a place that we used to treat as a swing plant, which is down in Texas, at Point Comfort, is a big refinery. The only refinery we have here in the U.S. We used to treat it as a swing plant because energy costs here in the U.S. were outrageously high. Guess what? This is now one of our lowest cost refineries. So we're bringing it back up to play a full load--play a full load role.

So that's all the good things that's happening. But then what is the risk or opportunity? I mean if you look at the numbers in the next years until 2018, 2.7 million manufacturing jobs -- of people that are in manufacturing -- will retire. So we have and you can see it, I see it as an opportunity. I mean you have a lot of people with a lot of experience that

are leaving the workforce. At the same time currently we have about 300,000 jobs open in the manufacturing space here in the U.S. alone. So the whole -- and then the question is what is the new job going to look like, and pretty much everybody projects -- and I would agree with that -- that about 40 percent and even more of those jobs in the future in manufacturing will require a postsecondary education.

So that gets us straight into the other discussion is how do we deal with the educational side, and I don't want to go into that. We'll probably do it in the second round. Then you come to the question of how do you -- how do we make it more flexible? Currently we -- I don't know how it happened, but we started with a history in the U.S. that was very flexible in education. And where we are today is everybody basically is back to the Ford model. I mean you have kindergarten to 12th, then you go to college, and if you haven't achieved that you're really worthless. So that's not working. I mean I think we have to go back to our origin and say, let's make it more flexible and let's also bring the vocational element in.

You asked early on where are the opportunities for cooperation? I think that is where the most natural opportunity is for cooperation; in fact, it's happening already. We have a number of programs underway very successfully because you suffer from the lack of getting good people if you don't take it into your own hands. There's a big challenge there, and that is the challenge that most people today that go through an education system don't even understand what a manufacturing job looks like. The image that they have of a manufacturing job is that you come in early in the morning with a white shirt, and you leave in the evening with a dirty shirt, right? That's so far from reality. And your hands are oily and your fingernails look dirty. That's so far from the reality today that we've got to make manufacturing sexy again. And I think it starts with bringing people into our plants, having them look at what's really going on there, how high tech these things are, so that young people get a feel for it. And there are a couple of things that we're doing, and I don't want to --

MR. KATZ: In the first round --

MR. BARTON: Just one quick thing. I detect a slight German accent here.

MR. KATZ: Just two seconds on the German model of apprenticeship, if you can, and then we'll move on to Dom.

MR. KLEINFELD: The German model of apprenticeship, well the model goes like this. I mean you basically -- it's societally accepted for as long as I can think that a manufacturing job has a high esteem in society. I think that's what it starts with. And the education, the vocational education, and the trainers are seen with an equally strong social respect. That's really important. So there's not a stigma. In fact, there's a counter of a stigma.

If you have a kid that decides at the age of 14 or so that instead of going to 12 to leave after 9th grade and then go into a vocational training job, the way this works is you basically start working. You work most of the time during the year and then you have courses at a vocational school. These courses all are extremely practically related to the job that you get educated in. And then you -- at the end you have a nationally recognized test. So if you pass this test, no matter where you want to go, you have a degree. This degree is I would say very, very highly regarded. The big advantage it has -- and I've seen that in families and friends, I don't know how it is with your kids. There are kids, obviously ours are excluded, that don't have that much of a temptation to learn math. And particularly when they get into the age of 13 to 15 or so because suddenly hormones creep up and they have other interests and then math kind of is not the most attractive thing to learn in the afternoon. The dynamics change tremendously -- and they regret it later in life. That's the sad thing.

The dynamics change tremendously when you tell that kid that the car that you just got from the junk yard that you gave the kid and said well, do with the car whatever you want, repair it, and you can pick up some good looking girl. But to tune that motor you need to

know how to handle a computer because these days I mean tuning a motor you have to understand how to wire certain things. To understand that you need to understand the sine function and that's where applied math suddenly comes in. I tell you, this kid is going to learn that type of applied math because that means something very different to that individual than what it would have meant if you would have taught that in a classroom environment which is just a discussion. So that's very important dynamics there.

MR. KATZ: So game changer -- shale gas, smart regulation, barriers, culture, skill -- I won't talk about the hormones. Dom, McKinsey is really sort of at the cutting edge of looking at not only global manufacturing trends, but also trends in what you're describing as advanced industry and this really interesting interplay of production innovation. How do you see the landscape?

MR. BARTON: Well, I think very much as what you said at the beginning and the context of what Klaus is saying. I think that there is a shift going on. I think maybe we should start by saying that too many of us lump manufacturing into one big category, and I think there are at least five categories. I won't bore you with our own view of it, but I think at the tip of it is this advanced manufacturing, which is more of the -- it's using big data; it's advanced materials; it's nanotechnology; it's the combination of many of the things, the innovation, the capabilities that this country is superbly good at; the cross-functional capabilities. And as you said, it only is roughly around 11 to 12 percent of GDP, but it's an extremely important flywheel. It accounts for, we think, a third of U.S. productivity growth. So that small, that 12 percent of GDP is accounting for a third of our productivity growth. And if we go back to what Glenn said at the beginning, the difference of a 1 percent shift, this is a very big deal for us to be able to get right.

The other thing I would say is that this advanced manufacturing sector has actually been doing quite well. It was doing obviously very well before the Great Recession at about 2.6 percent growth. It has continued to do that in spite of all of the challenges and

changes that's going on, and we think that there is an opportunity for it to grow at a much more significant rate.

And this is where doing actual work with Brookings, the work in Colorado, the work that's being done in Tennessee, the work that's being done in cities in Colorado with the space program. The areas where I think we could really advance advanced industries is by doing some of the things that the country does very well. If you look at the Silicon Valley, if you look at what's happening in Austin and Texas, if you look at what's happening in Cambridge; everyone else in the world tries to replicate these, but it's very difficult to do. I could reel off a lot -- Russia's trying to do it, Malaysia tries to do it, China's trying to do it. There is something that we have and it's in the -- I don't know, it's in the air, I don't know where it is, but it's a collaboration. And I think if you look at what's happening in Colorado with the space group, we've got 370 companies. They're not all in one sector; they're multiple sectors because health care companies can learn a lot from space manufacturing companies. The video technology that's being used, the interface that's done in the space program is very applicable to -- if you're a young doctor doing diagnostics and so forth and medical device companies, you want to be together.

And the role that government can play, especially state governors and mayors, I think, play a really important role in getting these clusters together. And I think that we see huge potential.

The last thing I'd just say is that where there's momentum -- you know, we lost a lot of jobs and we lost a lot of jobs in the broad sector of manufacturing overseas. We are seeing more reshoring. I mean there is -- I could bore you with quite a long list of companies that have actually been coming back to the U.S., particularly on the advanced manufacturing. Just to rattle off a few, G.E. with their geosprings water heater coming to Kentucky; Nissan for the first time is doing one of their luxury vehicles, the Infinity SUV, in Tennessee; Apple is

actually bringing some of the Mac production line back here; Emerson is bringing a lot back from Asia to Mexico and here; and part of it is also the shale gas issue.

You know, labor cost is only about 3 to 4 percent of the cost, right? When you talk about energy costs coming down the way they have, just in the last 6 years natural gas prices have dropped by about 67 percent. That is a far bigger driver -- and, by the way, wage costs have been going up -- so we've got some momentum. Emerson, BMW, Electrolux has built a -- this may seem like a strange thing to put in the advanced industries -- a cooking center. But there's a hell of a lot of technology in cooking that actually goes on, again with data, the various different materials --

MR. KATZ: You're not talking about my household.

MR. BARTON: Even Wham-O, you know, the guys that make Frisbees and hula hoops, they brought back that. So there's more technology, believe it or not, going into play items and so forth. So there's actually a lot going on. I think what we need to do is sort of take a competitive advantage we have around collaboration and scale it. And then I think that's going to create more business opportunities, and it's going to create this productivity effect, the flywheel effect, that we can get.

MR. KATZ: It strikes me, though, that what you're describing, though, is an economy that we just don't quite understand. I was looking at two statistics yesterday. Silicon Valley, San Jose, remember 9 percent of Americans are employed in manufacturing; 17 percent in San Jose. We tend to think of it as Facebook and social media, a big manufacturing power house. Then you look at Portland. I don't know what people think of Portland, Oregon, but I mean obviously it's a sustainable metropolis of the world, but about 20 percent of their gross metropolitan product is in production compared to 12 percent for the country as a whole. It sounds like we don't even understand our own economy.

MR. BARTON: We don't. The other thing I'd just say, just building a bit off what Klaus was saying about, say, making manufacturing sexy. Machinists, right? We should be celebrating the hell out of our machinists union. There's 110,000. I worry about the aging of that group. But you think about what's being done in aerospace and the capabilities and the training we need. This is a -- these are superstars, right? You think of a machinist as again, it's -- I love your white shirt, black shirt -- these people are highly skilled, the technology.

The other one I'd just say is AG food, which I happen to think is a big industry. If you go to Brazil right now and you look at the farming that's going on, the technology required. They're using drones because the farms are so big that you can't -- there's no roads -- you have -- so that's a big export source for what we do.

So every industry needs this advanced manufacturing. And, again, I think we have to somehow get it to students to see this, that this is -- it's a very prestigious role to be played and a lot of opportunity and so forth. But we have -- we're kind of in a --

MR. KLEINFELD: A lot of that requires robotics. That's the other thing where we have a leg up because let's face it. I mean we are reaching, for instance, when we go to our aerospace, we are number one when it comes to aerospace blades manufacturing, right? We are reaching levels of precision that are impossible to reach through manual work. You need the finest technology and the best computers to do it and that's what the machinists do. So the job is super clean, the person they see operates a number of numeric controlled machines.

That's a big advantage also on bringing jobs back because -- but it's fewer jobs and very, very different skills, very different skills.

MR. KATZ: Emily, how do you think about the cultural barriers, the continued stigma, and then some very big numbers that Klaus was putting out there about the kind of skilled workforce that we need to build? And we could rattle off numbers about educational

deficiency and the fact that we're not really investing sufficient in STEM. How do we overcome this?

MS. DeROCCO: Well, it just warms my heart. I do revere machinists, and I've spent most of the last part of my career helping to find things that work not only for our manufacturing employers, but for workers that, quite frankly, are very attuned to the hard skills needed in the manufacturing economy.

I would venture to say in agreement with both our prior panelists that it is manufacturing that we don't understand today, and that does require a cultural shift. But in terms of our education and workforce system approach to supporting the growth and sustainability of manufacturing in the U.S., we actually do know what works, and we're just not doing it everywhere and in all cases.

There isn't a manufacturing discussion that occurs in this country or, I think, globally where the development of talent doesn't become a huge priority issue for all of us to address, and I'm really pleased about this. Quite frankly, with the U.S. falling behind in its educational attainment and in its understanding of and promotion of what you and I might call vocational education, nowhere is reform needed more than in support of our U.S. manufacturing capacity.

So first, I do want to say kudos to Brookings for the Race to the Shop! It points to many of the shortcomings that we need to address even if there is not such a race. But the cultural and image issues that Klaus raised actually I guess I'd have to now say we probably need to change the shop title because manufacturing is so very, very different today. But thank you for that paper.

So what do we know about what works? I think in large measure, these points are represented on this panel today. Number one, we know that our focus in developing an

educated and skilled workforce for manufacturers needs to be within the regional economy, not against political jurisdictions where all of our policy systems and investments from the federal government now reside. It is in these regional economies where clusters are developing and manufacturing can become the anchor or is now the anchor where we can really stabilize and grow those current industries. And I think even more importantly, create the talent asset that in many instances is the number one asset to attract new manufacturers who are either reshoring and bringing jobs back and/or moving from new technologies and innovation to production capacity within regional economies. So remaking federalism around the policies and investment in workforce development is absolutely critical to supporting our regional economies that will be the anchors of our manufacturing growth.

Number two, and I'm just going to say these in a very different way because these two gentlemen actually touched on some really important points. We need much better defining information about the jobs, occupations, and skills in manufacturing today. It's just a travesty, quite frankly, what we work with. In our national database is related to occupations and skills, many of the jobs, careers, occupations in advanced manufacturing today aren't even in there. They're not counted. They become service jobs in national databases that drive policies and investments. And we just can't rely on -- forgive me -- Bureau of Labor Statistics' retrospective data about what kinds of jobs and careers are in manufacturing today. We need the power of that national database, but fueled by the transactional real-time data coming from organizations like Manpower, for example, coupled again with industry-driven input to the kinds of jobs and skill and competency requirements being created and needed today and into the future in manufacturing. This is a big data task that is going to impact our success in education and skill development.

MR. KATZ: This is "Moneyball" for manufacturing.

MS. DeROCCO: It is “Moneyball” -- exactly. We just had that conversation yesterday. So, as we gain better knowledge then about those jobs and careers, then we need -- I hesitate to use this word -- but we need that campaign. Young people today still look to their parents as their major influencer in what educational pathways and careers they’re going to pursue, and our parents today don’t have a clue what the opportunities in manufacturing are. Most of them will say “We don’t manufacture anything anymore,” and they will not define the very exciting fields of robotics and the high-end machining and the high-end applications joining welding as others do, the materials joining. Now, they won’t define those jobs into a young person’s future, neither will educators. So an informational campaign based on real jobs and career opportunities with real payout because manufacturing continues to be the highest paying, wage and benefit combined, industry broadly, nationally, than any other sector.

The other big ticket item, which we have successfully implemented in manufacturing, but not completely, not comprehensively in the U.S., we’re at the frontend of this, and it is applicable in our education and workforce development reform efforts, and quite frankly, in other sectors as well. It really gets to addressing your question to Klaus about the German apprenticeship model. We can’t replicate, nor should we replicate, that model exactly in the U.S. But what we do need to do is end the false dichotomy that our federal policies and investments have created between educational pathways and workforce development. That’s absolutely bizarre. We can and have built integrated educational pathways from secondary through postsecondary education that allow for alternative paths to high school graduation and the pursuit of postsecondary skills development and credentials that, in fact, relate to over 60 percent of the jobs in our economy that require postsecondary education, but not necessarily a baccalaureate or graduate degree. So in manufacturing while I was with the Institute, we developed a system of nationally portable industry-recognized credentials in machining, welding, manufacturing, and logistics processes, built on a foundation, an academic foundation, of applied math and reading, translated that to the credentials and the curriculum which could

and, in fact, were integrated into secondary and community college programs of study, leading to stackable credentials with real labor market value along the way to an associate or baccalaureate degree and as a feeder system to our engineering technology and engineering graduates. Progressive companies like Alcoa -- I hope you knew this, Klaus -- supported the integration of those certifications in the community colleges within their footprint, moving to the pipeline of workers, skilled workers, that they would need today and into the future. When I left the Institute, we were active in 36 states; that's in a four-year period. It shows you we can reform the education system by integrating from the needs of the employers.

And then very quickly the other things we know that work that we need more desperately in manufacturing is more business-driven partnerships with higher education. We need the clinical experience opportunities that you get in health care as part of your learning in manufacturing, and internships are an important part of this. Jeff Immelt and I actually illustrated this in the Right Skills Now Initiative around CNC machinists in the Minneapolis area. You can get to an integrated curriculum, workers with credentials that are valued by manufacturers, coupled with a paid internship which is so helpful, to working learners today and ultimately a direct connection to the employment opportunity. So we've done all this in the U.S., we just haven't done it broadly. And we have not changed the federal systems, the federal policies, and the federal investments that will allow us to go regionally, have the right data, integrate educational pathways to credentials that have value in our labor market, and engage business as the driver to make these things happen.

So last, but not least, I would say this has huge impact federally and in our new federalism definition because many of the entitlement or benefit programs that are going to be the subject of great debate are actually the intake operations for an integrated educational workforce system that leads to employment if we do this right. Every unemployed worker in the UI system, every TANF recipient in the welfare system, all of our disconnected youth in youth

development programs, if we can link them early with the right information to a pathway that leads to a credential and doesn't cost $60,000 a year for a baccalaureate degree, but instead is right skills now for skills that lead to employment and a good salary, we're going to be able to address in a very positive way the entitlement reform efforts as well.

MR. KATZ: Thanks, Emily, and I think that's just a great recitation of the fact that we know what to do.

MS. DeROCCO: We know what to do.

MR. KATZ: So now we get to the person who's actually in charge. He ran to be Mayor of Louisville. It's the 16th largest city in the United States. No one told him that in our new federalism the whole pyramid has been flipped. You're in charge. You're a pragmatic. You're affirmative. You're nonpartisan. You get stuff done. And then you come to Washington and --

Describe what you're doing in Louisville with Lexington, with your business community, with your university community, with your skills and education system, because I think it really is a model being built for the country.

MAYOR FISCHER: Thank you. So I happen to be a business guy and an entrepreneur that's mayor right now, so I speak more as a businessperson. I cofounded a manufacturing company in 1980, and we grew it into a nice international manufacturing firm. So I've been able to kind of see it on both sides and really see this interesting transition as well.

So we've talked a lot this morning already about what I would say the hard skills, the credentials that are involved, but universally whether it's an assembly line worker or an engineer, there's as much emphasis on the soft skills that are required to be a world-class player as well as an individual no matter where you are. And by soft skills, I mean just the ability on one side to show up regularly. Two, are you a problem solver? Three, are you a team

player? Can you lead? Can you follow? And it's these types of skills that I really see in high-performance companies that have higher productivity than their competitors because the teams know how to get together, identify the problems whether they're big innovations problems or just small lean problems they need to work through, and they can innovate more rapidly than their competitors.

So these are skills that we can teach, starting in grade school and high school, basic things like data collection and analysis and how to be members of a team. So I don't want us to forget while we go through all this technical stuff that at the end it's people working together, and it's the teams that are really getting things done.

We have two great multinationals in Louisville that kind of define our manufacturing base and that's Ford Motor Company with two plants -- one manufactures the Escape, the other is the Kentucky truck plant -- and then General Electric Appliances as well. So those are large employers. They invested over a billion dollars two years ago in the modernization of their plants; as in GE's case, reshoring business -- two product lines from Mexico, one from China -- after being out of intensely U.S.-dedicated manufacturing for 10 or 15 years. And so they realized it's better to have the whole supply chain closer together and particularly to have R&D closer together, bring back the products to America, and now they're in the process of saying what did we lose in that 10- or 15-year period?

As has been mentioned up here, a lot of the manufacturing workforce is aging. One of the rock star positions in a manufacturing plant would be an industrial maintenance technician. These guys -- and they're usually guys -- they can fix anything. Whether it's a hammer or a computer, they can fix anything. Very highly skilled and absolutely necessary to keep manufacturing plants running. This was lost a little bit when America offshored manufacturing and so those skills absolutely require the kind of meat and potatoes of keeping factories running.

So the aging workforce is a challenge as well because we've talked about how manufacturing does not have the cultural attraction that it should have, and we need to get it back so that that young hotshot in high school is saying, "I want to be an industrial technician. That's a really cool career path. I can make $80,000 to $100,000 a year, make a good living off that as well." So we're in transition of that.

So solution wise, we start with some high schools that have magnet programs around manufacturing. Our junior and technical colleges obviously have everything from a certificate to full degrees that can be focused on manufacturing as well.

And I want to emphasize -- Emily talked about these stackable credentials that are out there already, but are not being taken advantage of by manufacturing in the U.S. to the degree that they should. And I don't know if it's because people want to have "we didn't invent it in our company so we can't use it" syndrome, but these stackable credentials are a fantastic way to prescreen when you're hiring people. And there are a lot of people that want jobs. When GE was hiring 1,000 new people, 12,000 people showed up for those jobs. Now of those 12,000, probably about a quarter of them were eligible, were qualified, for the jobs, which is a whole other commentary about this lost massive wave of tens of millions of people that we have that don't have the skills in our country right now to compete in a global society. So the stackable credentials, I think, are something we really need to focus on.

That leads to another area that I think as a country we need to figure out because we're trying to figure out independently locally, and that is what is the power of a workforce intermediary in today's world that has so much more data -- we're calling it big data right now. So we can go out now in Louisville and scrape all the job databases and come back with precision and say well, there's 800 sales openings this week in the community, there's 400 coder openings, there's 600 nursing assistant openings. We didn't have that capability just a couple of years ago. So what does that mean, then, for the universities, the technical colleges?

Are they nimble enough to respond to the needs of this workforce that's changing ever faster in this rapidly changing world that we're living in?

So that's a really interesting process we're in the middle of right now. As I talked to my colleagues at the U.S. Conference of Mayors, this is a national problem. It's not like just we have this in Louisville. And so we really haven't figured out how to quite do this yet. But it does require a business partnership, and I'll be frank. As a business guy that now just happens to be mayor, businesses are busy. And if government can't respond efficiently and quickly in a way where they've got their act together, guess what? We've just got to move on and do our own things.

So we talk about how government can enable and there is absolutely a critical role there, but it has to move at the speed of business for it to be relevant. And, unfortunately, for bureaucracies, the speed of business and the speed of the world is ever faster right now. So how do we catch up and break through all of that?

And last point, we just talked about the culture. Number one is embracing the fact that if we want to compete at a manufacturing level, global levels of quality, productivity, safety, must be givens. Then how do we get that done with this global wage structure that's out there and result in good, middle-class jobs for American citizens? This is something that I'm very concerned about. When we see a kind of erosion of the middle class over the last decade or two, it parallels pretty closely with the erosion of manufacturing in the country as well. But what's changed since the offshoring is this global wage sector. So how do we bring the manufacturing jobs back that result in middle-class American wages? Because one of the reasons why manufacturing is growing back in America is a two-tiered wage system where the jobs before used to be $20 to $30 an hour jobs; now they're $15 an hour jobs and so a cut to two-income families, et cetera. So this is a big issue, I think, for our country because we have

to have a healthy middle class to have a healthy country. And we've got to figure that out while we have this manufacturing renaissance in the country.

MR. KATZ: So just trying to summarize what I'm hearing here and then we can open up for some questions. I mean if I had a ledger, on one side of the ledger this is the positive side, which I still don't think is completely understood in this town for sure, but even throughout the country. You've got some of the smart rules that are coming out of the federal government, frankly, around auto or some other sectors that are fueling innovation, so to speak. We've got the best network of advanced research institutions in the world. We still have to work on commercialization of innovation, but we can crack that code. We've got the natural gas gift and the move toward energy independence. We seem to know what works on skills that we haven't quite scaled it up yet. We do have some smart proposals, I think, coming out of the Obama Administration that would sort of move this along.

On the other side of the ledger, culture. When you look at popular media, you still basically see the repetition of the old stigma. And I would put on the other side of the ledger some of these really worrisome issues about some of the wage trends.

So in theory what you'd want is you'd want a national campaign here, right? I mean you'd really want the federal government to basically seize the moment, carpe diem, let's move ahead. If we don't have that, how do people perceive the next 3 or 5 years? Let's say we get seven states, ten states. We get dozens of mayors and county leaders to do what matters with their business leaders, with their university leaders, with the skills. Can we have a true renaissance lacking a center? I mean how do you think this plays out?

MAYOR FISCHER: I absolutely think so because look, the action is at the local level. People aren't waiting around for Washington, D.C., to figure things out. I try to sneak into town and get out of here as fast as I can.

The other thing in that plus and minus is to talk about regionalism. In our case, Louisville, the number one city in Kentucky, about a million and a half metro population, we teamed up with Lexington. So combined -- they're about an hour away from us, it's our number two city, about two and a half million people -- we said let's figure out how to make more pie together rather than steal pie from each other. Our universities are collaborating. Our big companies are collaborating with each other. So we can figure out on a regional scale how do we improve workforce readiness? What's the innovation cluster that we need? How can we increase our exports, et cetera? So there is so much to be done at the local level. There's a lot of work to be done, and I think regionalism between the cities is a big part of that.

MR. KATZ: Right. Emily?

MS. DeROCCO: Yeah, I guess I'd make three points. One, a national campaign, yeah, but I'm with the Mayor. It's not as much about what is said from Washington as what we free up the regional economic leaders to do.

So that gets to if we can't -- we don't seem to be able to positively legislate these days. Can we just get waiver authority to waive the restrictions that we have imposed on our regional economic leaders and, quite frankly, on our governors; and then give them an opportunity to respond, as they will because it is their constituents who need those jobs and that's primarily how they're elected, so they're going to want to attract businesses in.

And then the last point is what the federal government should focus on is the underlying business climate for manufacturers. I'd be remiss if I didn't say, representing manufacturers for 5 years, that the corporate tax rate and the cost, sometimes unknown the cost by the time they're passed of our regulatory structure, still need to be dealt with, again freeing up the governors and mayors to create the best business climate possible for manufacturing jobs.

And finally -- there's always one more, isn't there? I think we have a huge failing in our education system. Yes, it is world class, but the land grant colleges and universities have lost sight of their Morrill Act vision. They're still operating on the original one, and it's all about how they can change. Our K-12 system is producing graduates where one of our primary manufacturers in the U.S. told me just a year ago 54 percent of the people who walk in his door can't read the employment application to fill it out. So hard skills aside, our basic academic foundation is floundering. We've got to address those, and there's a role for the federal government. Otherwise, let's waive what we can and let the state and locals take it.

MR. KATZ: Got it. Klaus?

MR. KLEINFELD: Yeah, I'm a big fan of the American philosopher, Michael Jackson, who once said if you want to have change, look at the man in the mirror, right?

MR. KATZ: I was thinking of another song, but anyway we'll talk later.

MR. KLEINFELD: So because there's a lot of good stuff happening and if you don't put your money where your mouth is and the word's going to spread. I mean I'll give you a few examples. This summer I went over to Whitehall, Michigan, and visited. We have a big facility there. And here I run into this group of young girls. It's summertime. They are on vacation. So I'm asking what are they doing here? They're working. They're doing something. And they say oh, we have a program here with the local school where we select the best younger women and we give them an opportunity for two weeks to do kind of a guided internship. And then I say oh, that's interesting. So why are you doing that? Because they have no idea what's going on here. They only see the hall from the outside of the glass facility. They have no idea what's going on. Then the lady who runs the program tells me you know what? You wouldn't believe how many of those girls, because we track them, then decide -- I think this is 9th grade -- then they decide to learn more about math and they go into a STEM path in the college. It's those deciding moments, those deciding moments. So that's one thing.

We have programs locally here in the U.S. around in many, many places where we cooperate with the community colleges to help them build their respective curriculum in a way that it comes with the opportunity if you do that, you get a job. And we offer it to our own employees as an upgrade, and we pay for it. And we give them the time. There are thousands of things. I encourage everyone who runs our facilities to do a family day a year. And the reason why I think so, multiple reasons, because in my view it's the best way to motivate the family, bring them back in, but also to change the way people see what's going on. It's a mystery when you stand outside. There's a fence or something going on there and something comes out there. But what happens behind there people don't understand. Once it's introduced to you by your own family member, there's an emotion attached to it. You suddenly see what great things are going on there.

So I think that level is essential. You can do whatever campaign you want to do; if that level doesn't happen, nothing's going to happen. That's where the mayors come in, and I think they get it instantaneously. If we can get support also from a national level, starting to stir more of a national debate, this event, I think, is very important for that. Understanding the importance of shale gas, this is gigantic, gigantic, what we have there.

It's gigantic also when you talk about advanced manufacturing, Dominic, what you said. Because most people when they think about manufacturing, they think about labor costs. That is so old school. That's so not true anymore. You know, the labor costs in most cases are going down and down and down and down. It's much more about the level of sophistication in which you can do that, the rate of innovation, the proximity to your R&D center, the opportunity to your most advanced customers. So these factors are all much, much more critical than the labor costs per unit.

MS. DeROCCO: First, could I -- just to supplement one little point that Klaus made, the National Academy of Sciences shortly will be issuing a report on the nation's energy

workforce. And the 7 or 8 sectors across energy are experiencing much higher levels of retirement, much greater shortages in exactly the same skill sets that we found in the entry level jobs and early jobs in manufacturing. So that competition across sectors for a minimal pool is only going to increase, putting more of a burden on your efforts in the regions. But I think it's important to see how this is a growing problem.

MR. KATZ: Right, right. Dom?

MR. BARTON: I was just going to say two quick things. One is this big data idea the Mayor mentioned and you mentioned it. I think that's where we should just leverage that. That's a capability we have to talk about, where these job needs are. We talked about the machinists, right? That is an aging talent, a really vital talent pool that we need to -- so I think getting more transparency because students just don't -- we aren't aware of what these opportunities are, and we can get that quickly. I really think that's a key element.

The second is related to that. There are these sectors -- you mentioned energy. Brazil right now -- and I'm not saying this is a look in the mirror in a different place or -- Brazil -- there's a group of business people and regional government leaders who got together. They basically said look, we need -- energy's become a huge opportunity for us. We don't have the skills to do it. We cannot wait for the education system to change. We get that. So that got together. They've set up their own vocational programs, and they literally went -- there was someone who went around to every single company and said, what's your pipeline for the next 5 years of capital projects and what do you need? And they defined that then in 190 job types. And they've now trained and employed 90,000 people. And that's a pretty -- that's just a bootstrap thing.

And we've got in this country -- you talk about the shale gas; there's huge advanced manufacturing opportunities in that area. As I said, AG food, people think that's probably the -- who wants to be a farmer or whatever that is? That is -- I honestly think you

have a choice. You want to go to NASA or do you want to work in the farming industry? That's where it's going if you look at the technology that's being applied in that area. And I think if we can identify these areas and then get at the regional -- I think it's a local regional level area -- we can get a flywheel going.

MR. KATZ: Let me ask you all this question because I find going around the country there's unbelievable energy and enthusiasm around advanced manufacturing. But then there's this other parallel path around really small boutique manufacturing, which is happening. There's a group out of Brooklyn called Maker's Row. And it's like a matchmaking technology where on one side you have people designing new clothes, new apparel, and on the other side they match up to companies still in the United States that are probably at a little bit higher cost than you would find at certain big-box retail. But they match up through the Web these designers with Made in America factories.

You see a desire for this. ABC had a piece called Made in America last year. I don't know, it's like a series that they've done. A classic series where they went to two people in Grand Central Station and said please take off all the clothing that's not made in the United States, and two people agreed to do it. And then at some point they stopped because this is family television, right?

But you do see a sense around the country that it's time to make things again. It's time to rediscover a craft both with regard to advanced manufacturing, but also with other kind of manufacturing. Is that a real movement? How do we think about it compared to this?

MAYOR FISCHER: I think it's because it's sexy now, right? Think about the tools that you have now compared to 20 or 30 years ago. You've got very powerful software. You've got less expensive robots. So it's not like I've got a press break in a manufacturing shop and it's the dirty, gray T-shirted spot that Klaus talked about. It's this convergence of all these technologies, and now I just happen to be making something. So it's a lot cooler to do that.

And I think it shows you the strength of the American entrepreneur and the American economy because when you think about all the ways that Washington, D.C. has attempted to screw up the American economy over the last 5 years, and we've pulled out of it. And granted Washington did some good things. But it was the American ingenuity that says we're going to figure out how to do this. It was leveraging the power of technology and people just figuring out new companies.

So if we can get our act together with a federal industrial policy, I mean just think how America can shine right now. Now, that takes a little humility. We've got to say what can we learn from Germany? What can we learn from Japan? What can we learn from China? But we've got to have time to talk about that type of thing rather than fiscal cliffs and dysfunction.

MR. KATZ: Unfortunately, many of their companies are here. So they come here and they basically bring those practices to the United States, which has an enormous effect on the skills piece.

MR. KLEINFELD: Related to that is also the innovation part. We've got to have the innovation and ramp the innovation up because if we just do something that's already there for 5 years, that's not going to make the cut. We've got to get it to the next level, the next edge, right? And this cannot be addressed without addressing intelligent immigration reform.

MR. BARTON: Impossible, impossible.

MS. DeROCCO: Two other points. One, I think many of our manufacturers when production was in large measure moving offshore, they actually changed their mindset from mass commoditization to mass customization and that was very purposeful on their part in order to keep their market vibrant. So that was one reaction to what was happening in the broad manufacturing sector globally.

But secondly I would say this is where the critical gap we have in our innovation research infrastructure in this country I think has a huge impact. We fund a lot of basic R&D, maybe not enough, that's subject to discussion. But after the -- let's take the SPIR programs in manufacturing. After the basic research and before the traditional venture capital is available to get to beta testing and early-stage production or manufacturing, there's absolutely no financial help. And we are seeing our innovators with great new technologies not being able to figure out how to get to beta-level production capabilities. And meanwhile we're letting great assets, like Kodak Eastman's Business Park where there's equipment and talent to do that, go wanting or be sold off.

So that's part of that gap in our continuum from research to development to be able to take advantage of our great innovators and actually move to mass production again. I wonder if we can.

MR. BARTON: I don't want to broaden it up, but the other areas you were talking -- I was thinking about health care again, too, which is one of the most technically retarded industries on the planet in terms of applying what could be done.

MR. KATZ: Tweet that!

MR. BARTON: You look at how a hospital works, and this is a very micro thing, I'd say. The amount of time that's spent because tools are lost, the scalpels and medicines and where things -- this sounds like a very basic thing. And I just think that if we can, again, use the data, we make more transparency on industries and how they work for people to then innovate and say my God, there's a -- if we could take some of that Silicon Valley capability and apply it to health care, what productivity improvements would be there? And I just think there's 21 sectors out there that could use this.

MR. KATZ: But this whole conversation, I think what's so fascinating --

MAYOR FISCHER: Could I come real quickly on small- and medium-size manufacturers? We think about the big global multinational corporations out there, but there's more people that work for companies with fewer than 500 employees. Most of them are out there duking it out every day, focusing on cost reduction. One of the things that we've learned with our Blue Grass Economic Advancement Movement between Louisville and Lexington is the lack of innovation capacity with the small- and medium-size manufacturers that are feeding the big guys. So this is an area of concern for us as we look at how cities and states, maybe the federal government, can help with creating this innovation capacity with the small- and medium-size manufacturers.

MR. KATZ: The common theme here, and then we'll go to questions, is convergence integration, the mash-up of sectors. It's not manufacturing in a little corner over there. Oh, that's what we used to do. It really sort of connects to, relates to, so much of the rest of the economy question.

Right over here -- and here comes the mic.

SPEAKER: What a fabulous morning! Thank you. I'm Mitzi Wertheim with the Naval Postgraduate School, but I spent 13 years at IBM and was very much involved in their getting out of the manufacturing world, but I was playing in the manufacturing world. I'm struck by the importance of the narrative for the nation. You need to have TV shows. You need to have movies. You need to have heroes. You need to have children's books. I'm trying to get people to write children's books about process. How did that happen? And we don't build into education. How did that happen? Its structure, its process, all that's missing. And I think you need to build collaborative groups. I'm willing to help on any of this because it's a really burning issue for me about getting the narrative out. You have to make it simple to understand. I've worked for think tanks. They produce huge reports nobody reads. Nobody has time to read.

MR. KATZ: Except for the Brookings Institution.

SPEAKER: Maybe, maybe. But nobody has time to read all this stuff, and so if you don't get it out in simple narrative statements -- I kept sitting here thinking about a Website I would build with each thing that you're doing and the primary statements to make it easy for the public to understand because if they don't understand it, not much happens.

MR. KATZ: We have a communications problem here.

MS. DeROCCO: Thank you. Two real quick things, one when I was at the Department of Labor, of all the work we did and spent billions and billions of dollars when we spent virtually nothing on with McGraw Hill was a little magazine called *In Demand* that showed young people in a whole array of manufacturing jobs that went to every elementary school. And we got more positive feedback from that than anything else we've done, and I think that's absolutely critical.

I also think we have to -- in every one of these conversations, somebody stands up and says we need another Sputnik moment. I think we need to continue to quote our friend, Rob Atkinson, and recognize the mini Sputnik moments that happen every single day in this country with our innovators. So I'm with you.

MR. KLEINFELD: But on the Sputnik moments, I once did in my past life I looked around the executive room on that debate. And I said when -- and pretty much everyone was an engineer around the room -- so I said when did you decide, when was the moment that you decided you have this spark and you want to go there? Funny enough everybody mentioned a moment that was early on in their childhood, early on in their childhood, and it was a very personal thing.

Out of this came an initiative where we at that time created two boxes that we gave to kindergartens -- actually that retirees could choose and gave to kindergartens. One box, a very simple box on basically electrical experiments and another one on chemical

experiments, because what we saw is that in kindergarten the kindergarten teachers are shying away from even coming close to anything that has to do with natural science because they don't understand it. They are not trained enough.

So we use the great capabilities of retirees who really -- and their personal relations to the kids there -- and they could give those away for free. You were successful. You did the same thing, Dominic, over in Europe, where you had -- also in Germany, yeah -- where you had a big campaign very successfully.

MR. KATZ: Question, and then we've got a whole bunch lined up.

SPEAKER: Thanks very much. I'm Garrett Mitchell, and I write the Mitchell Report, and I want to say that this has really been a fascinating panel. And it occurs to me that the next time around it would be a fascinating panel to have the kinds of people that you're talking about bringing into this, talking about how they made their decision and what they're doing, and if we had some pictures, if it was visual. We know what law firms look like. We know about mad men, but we need to see the shop.

I want to ask if you could perform a sort of thought experiment, which is you have a sort of magic dollar that could have as many zeroes behind it as you want, but let's stay with a dollar. And your job is to determine which of the many priorities that are necessary to attack the set of issues that you've been talking about are the most logical places to invest. So it could be in communications. It could be in K-12. It could be in this data component that you've talked about. It could be in the linkage between universities and research. Where -- in order to deliver on the promise of this new technology, what are the priorities and where would you put the components of that dollar?

MR. KATZ: Thoughts on this? Who wants to start?

MAYOR FISCHER: Well, I think one area we haven't really talked too much about today is engineering and the importance of engineering. We're not a culture that looks at engineers predominantly and say you're a rock star, we love you. I want to grow up and be an engineer. It's part of the cultural manufacturing thing. So I don't know if we can have a PR campaign that gets people to think they want to be engineers, but it goes back a little bit to what you said, ma'am, about kind of looking at manufacturing and engineering as being careers of dignity and respect and worth. While manufacturing has been offshored, we've got to remember that's when the technology revolution was taking place, entertainment revolution, and our country's psyche kind of shifted to boy, there's a lot easier ways to make big money faster in much higher profile industries. And this blocking and tackling and making things one piece at a time just really doesn't seem to be an attractive way to do things.

So we have to regain that, but that seems awfully shallow to say it's a PR campaign. But then we have to bring back in the talent of the engineers, the innovation, the R&D that's going to fuel this growth for us as well. So I think a lot of it is communication and workforce and restoring dignity to these positions. I know Mr. Jones down the street, and he works at GE. He's one of their engineers and that's what I want to grow up and do.

MR. KATZ: Dom?

MR. BARTON: I'd put $.50 in data at the beginning just to get -- and then maybe you could -- I hope you'd give me some dollars after that or a year after that -- but I would put it in the data and just a bit, too, on the -- here are the opportunities because there's such a gap. People don't know. And I think once people know, they're entrepreneurial enough to figure it out to start moving it forward. So I just think the data of the opportunities and maybe with a bit of glitz or excitement about what these roles are would be something because I think people just don't -- are not aware of them, the talent.

MS. DeROCCO: I'm actually working with McKinsey in the hopes we can creep up on that big data issue. So he's spent his $.50. I'm going to take $.50 and say we ought to create those alternative pathways to high school graduation that are integrated. If you look at educational expenditures -- I'm going to get the high end wrong because it keeps going higher -- but over $600 billion in public education, only $1 billion that we attribute to vocational education in this country. That's bizarre. And then we have this separate workforce development system that really doesn't contribute, so my $.50 is there.

And then it is on dealing with that gap between basic research and the early stage production for which we can't get venture capital, and as a result we're losing all the new technologies to overseas producers.

MR. KLEINFELD: I would be very happy with how Dominic and Emily have just spent the dollar, really happy. I would specify the first $.50. I feel that we need the data on U.S. competitiveness, not just on U.S. jobs, because in the end I mean the jobs will go away if they are not built on a solid foundation.

And it was in the '80s when we had a similar challenge. And I still remember the first time that I read the Porter book on competitiveness of nations, which I thought was a very, very good diagnosis on where we stood and what opportunities we have, and I couldn't agree more. If we had something like that today, which was forward looking, we would have some of the elements that we could talk more educated about.

And the second $.50, I'm excited about that. And the point that you said, Emily, before to also have national standards because you want to have this portable. I mean it's great to have these kinds of initiatives on the ground, but you want it portable.

MS. DeROCCO: Very important.

MAYOR FISCHER: There's one other thing real quick. Think of how little money we spend as a country on lifelong learning. Okay, we spent all this money on pre-school, K-12, postsecondary, and the most important thing we know right now is we've got to keep learning every day after we get out of formal education, yet we spend -- we really don't understand it very much as a country, and we spend a miniscule amount on it. It's very important that we address that.

MR. KATZ: Yeah, I would just say for all of you in the room and for people on the Web, these are the questions to ask the deficit panel, right? We put out proposals yesterday. A billion dollars. We have a $3.5 trillion budget. We can find the money. We can cut to invest in what really matters. So let's not separate out the conversations, and we're going to talk about the economy over here and then we're going to be like little accountants over here to sort of cut the debt. We have to join up these conversations.

Question here and then question there.

SPEAKER: Helmut Wodrich, Siemens Industry North America, another slight German accent. And Bruce, in your introduction you mentioned before software. You mentioned real and virtual -- Greg, you shortly touched on it -- and I really believe and we talk about manufacturing renaissance, it's a software revolution. And Klaus, you mentioned it, it's your call. We don't use a drill anymore, we use a PC. It's where we send a Mini Cooper heavy rover up to Mars and the only way to do it is really to test it virtually a thousand times and then it really happens.

Now, what does that really mean? What does it mean for corporate leaders? But what does it mean for educators? How do we get this into their brains? I think if we find this answer, manufacturing is super sexy.

MR. KLEINFELD: I tell you, we're just building a gigantic complex, manufacturing complex, integrated companies in Saudi Arabia. So -- and this is the first time that they have a full bauxite mine, alumina refinery, smelter, and then a rolling mill, and they can ship it right from there. So one of my big scares was how do we find local people and how do we educate them? So on 12/12/12, the 12th of December, we had the first metal. And so we are already manufacturing there, and I saw how we ramped this up.

Now, it's highly automated also, but it's a very tough job still, right? So the interesting thing was we now had to do it all from scratch, the occupational training. The thing that was most attractive was a crane simulator, a crane simulator, which we originally thought we're going to have onsite. But when we saw how hugely motivational that was, we basically took that crane simulator and put it right into the occupational school so that it could be used basically 7 days a week, 24 hours. And the answer is right there.

I mean when you see what attracts the kids -- they are sitting in front of their PCs and playing games. You can turn that into a positive with these things, right? It's actually much easier than I thought it is to be honest.

MR. KATZ: Very interesting. Question here and then question back there, and then we may have to have other questions just set to the mysterious Website.

SPEAKER: I'm Marc Brodsky. I grew up to be a physicist and an engineer. In the last 25 years I've been struggling in various roles in industry, government, and not-for-profits to manufacturing in the United States.

One of the things that bothered me about this whole conversation and reading the report is all this emphasis just on events, manufacturing events, industries. It's all very important, but the reason the public doesn't connect with that is the public thinks of commodity manufacturing. That's what's in their minds and that's what we have lost over the last few

decades. Capital-intensive used to be labor-intensive commodity manufacturing. And that's something that just doesn't happen very easily without, I think, some sort of government help in some way, for example, by roadmaps, finding missing ingredients, the missing floor technician to fix the machines -- well, nowadays the missing machines -- in the United States. Could you address that specific area of what might be done to enhance commodity manufacturing?

MR. KATZ: Thoughts?

MR. KLEINFELD: Energy is a big part of it, energy, because many commodities -- I mean we are in a commodity business. I mentioned the refinery part. In the refinery part there's nothing special about a refinery -- my people will kill me with that sentence -- but in reality you can do it anywhere on this planet. So what is critically important? It's not the skills. I mean if you don't have the maintenance people, I can't do it, but I can educate them, right? But energy is a huge point there.

What is the reason why we are now running it as a fuel plant? (Inaudible), who was on this panel a year ago or so, is now putting huge amounts of money behind to build it I think in Texas and someplace else, in Louisiana I think it was the second place, where he's building a new refinery also. But at the same time the normal commodity business, I mean a normal no-differentiation job will not come back. It will not come back. Why would it come back? We have to have differentiation. We have to have innovation. That's why I think this debate about competitiveness is so important that we are not falling into the trap and wasting national resources.

MR. KATZ: I have a question over here, right there in the middle.

SPEAKER: Thank you. Susan Lund from the McKinsey Global Institute. I'll try to keep it short. It's been a fascinating panel. I'm surprised that I haven't heard one word all morning, which is exports. So my question to all of you is, is this manufacturing renaissance for

domestic consumption or do you envision the U.S. eventually as an export platform to the rest of the world?

And then a second related question is if you put on the hat of a multinational corporation, whether U.S.-headquartered or foreign, and you're considering where to put in your next plant, what would be the number one barrier you would point to in U.S. competitiveness? So this is a little bit different from the earlier question, which is if you were considering a corporate investment, what would be the number one thing you would point to? I've heard immigration, taxes, skills, infrastructure -- I'd love to hear from all the panelists.

MR. KATZ: So first, are we producing for a domestic or global market?

MAYOR FISCHER: Well, in our case in this Blue Grass region of Kentucky, we have a specific program on export assistance for small- and medium-size companies. The big guys know how to do it already. So part of this American renaissance is creating a culture of exports -- it's just what you do. And if you're an industry that has an international competitor and you don't export, I'd say to people you're probably going to be out of business in 5 years. So there's all types of reasons to figure it out, and the smaller companies need some assistance. But I think you'd see that's ongoing throughout the country.

MR. KATZ: Dom?

MR. BARTON: Yeah, I'd just say to sort of tease my colleague, you obviously weren't listening to what I was saying in the beginning, but I think I did make one comment that it was -- with 11 to 12 percent of GDP, but it's 45 percent of exports. So I think it already is a big driver of it. I'd just say a couple of practical examples. I think Ford now is going to be manufacturing the Lincolns and some of their SUVs globally for China will be done in the U.S.

So I think if the -- I think that there's a huge export with the space side. We learned this in Colorado. I think there's something like 30 countries that are now with space

programs, right, that are moving. Some we may want to support; others we may not. Argentina, believe it or not, has a space program that's out there. And I think these are areas where -- health care will be another one where people will do it. So I think it's a vitally connected part of exports.

MS. DeROCCO: And I think most of our research at the Manufacturing Institute for the past 3 to 5 years has shown that the lack of an educated and skilled workforce is always one of the top three pain points of manufacturers who want to stay in the U.S. and/or choose a new location in the U.S. But it vacillates with the business climate, which goes back to taxes and regulatory structures and the skilled workforce. But they're always in the top three of where they're going to choose their next siting.

MR. KATZ: Any other thoughts on barriers?

MAYOR FISCHER: All these sites come down to point out that the best place to locate a new company in the United States of America is in Louisville, Kentucky. I will save all of you a lot of work and just we're happy to have you.

MR. KATZ: No, I think you should say that again and stare into the camera.

MAYOR FISCHER: In Louisville, Kentucky.

MR. KATZ: It's clear that you were a businessman in a prior life.

First of all, I just want to thank the panel because I think what is so critical, particularly in this town, is to have an affirmative, positive, conversation about where our economy can go. Not delusional, right, based on what is actually happening on the ground because above global dynamics and because of some very, very, very, smart policies and practices being invented at the city, at the metropolitan, at the state scale. Thank you very much.

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