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TRANSCRIPT

Event

"Enhancing the Regional Impact of the CHIPS and Science Act"

Keynote Addresses

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FEATURING

Todd Young

U.S. Senator

Mark Kelly

U.S. Senator

CSIS EXPERTS

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Senator Todd Young: Well, thank you, John, for that generous introduction. It's great to be with people, actually in person, in the wake of another industrial policy, John, by the name of Operation Warp Speed. I want to thank CSIS and the Indiana University Public Policy Institute for holding this event today on enhancing the regional impact of the CHIPS And Science Act. And I can't think of a colleague who I'd rather be in attendance with today more than Senator Kelly. He is – he's a great American, and he worked very hard to help us get this bill across the line, include some important tax incentives so that we could ensure the CHIPS and Science Act was successful not just through the halls of Congress but in implementation as well.

This event, of course, does have an Indiana University connection. So I'd like to acknowledge that many of us here today are from what many disparaging call flyover country. We embrace the term. We lean into it, back in the Hoosier state. It's a term that brings pride. Regardless of why some folks may use this term, the reality is that millions of Americans live in places other than our major metropolitan areas. They live in places far away from the coasts. And yet, just five cities – Boston, San Diego, San Francisco, San Jose, and Seattle – experienced more than 90 percent of the job growth in advanced sectors like tech, computer manufacturing, biotech, and telecom between 2005 and 2017. More than 90 percent of the job growth in those sectors.

In 2019, there were only three coastal states – California, Massachusetts, and New York – which were home to more than 75 percent of all venture-backed investments in the United States. Three out of every four venture dollars go into those three states in 2019. As one example, California made up $1,600 in venture-backed investment per resident per year. I'm happy for California. That's great for our country. But Indiana averaged $57 per resident per year. Since 2000, 94 percent of the nation's job growth has been in urban areas. Just 31 counties out of more than 3,000 – 31 out of 3,000 – nationwide account for a third of the nation's gross domestic product.

Now, I understand the drivers. I've spent quite a bit of time trying to understand the economics behind all of this. But from a social and a civic standpoint, having a country where most of the new opportunities are opening up in just a few coastal, urban places can divide us. It can put us at a disadvantage in our global competition with other countries, China in particular as well. Too much of the innovation America needs is coming from too few of our citizens and too few of the great places across our country. In short, if our people must constitute a new arsenal of democracy, our stockpiles are too thinly spread, and the playing field is not level.

With its capitalist-communist economic system, the Chinese Communist Party is heavily subsidizing its own tech industry. CCP has invested $14 trillion in frontier technologies that will shape our modern economy and decide winners of future wars. Technologies like quantum computing, robotics, and artificial intelligence. They've also made advances in hypersonic missile technology, which could allow nuclear projectiles to travel at five times the speed of sound while avoiding our current defense systems.

China accounted for less than 4 percent of microchip production half a decade ago, but it's now on pace to control roughly 20 percent of the market by 2024. And if China produces more and more of our world supply of semiconductors, America's economy and security could be at the mercy of the CCP, especially in the event of another pandemic or, God forbid, a war. After all, 90 percent of the chips in our military hardware are currently made overseas.

Last year, when a bipartisan coalition in Congress passed the CHIPS and Science Act, America went on the offense against the Chinese Communist Party. And the CCP knows it. In fact, they actively lobbied against the law. They knew it was bad for China. They knew it was good for the United States. That's because the CHIPS and Science Act gives our people the tools to flourish and ensures America continues its global leadership role. It's both a national-security investment and an investment in our peoples and communities.

A major portion of the law's funding goes toward ensuring that more Americans have the requisite skills to work in these industries of the future. One area, of course, is semiconductors. But it also includes funding for areas like hypersonic systems, artificial intelligence and quantum computing.

The CHIPS and Science Act will help connect more of our citizens to, broadly speaking, this innovation economy, not just in the semiconductor field. And as most of you know, the law is already jumpstarting semiconductor production here in the United States, including in the industrial Midwest, in so-called flyover country.

Looking at Indiana, for example, development of a corridor of the semiconductor industry is already under way. Since the CHIPS and Science Act was enacted, semiconductor companies have announced manufacturing, design and R&D expansions across the United States, including many in Indiana.

An emerging domestic microchip industry will provide jobs and it will prevent future supply-chain stoppages and safeguard our military readiness. And it will, I believe, help bridge the economic-opportunity gap that divides our citizens.

I also want to mention that we are nearing the announcement by the Economic Development Administration of a funding opportunity for phase one of the Regional Technology and Innovation Hubs contest. As you may know, there are two funding opportunities. The first phase, phase one, will designate at least 20 tech hubs and award strategy development grants. The tech hubs designated in phase one can then participate in the next phase, where the remaining money designated for the program will assist five hubs with implementation, with hopefully more funding from Congress to come for tech hubs in the near future.

Because of this contest, all over Indiana we've seen a pooling of resources and collaboration on strategy across both public and private sectors and academia, as regions position themselves to win a tech-hub designation. Given that, I remain cautiously optimistic about Indiana's prospects for landing a tech hub.

Regardless of the outcome, I've been encouraged. Interest at the state and local level in the program has been tremendous. One of the reasons I'm so excited about that is it's fostered local collaborations. This collaboration creates a national ecosystem where regions compete, not where the federal government arbitrarily picks winners and losers. The law is a catalyst for coordination, collaborations and new partnerships that will be productive for years to come.

A few examples from our home state: Of course, Indiana University's Innovate Indiana; Purdue University's work with the Greater Lafayette Commerce to win $5 million to support SkyWater's semiconductor manufacturing facility in the Discovery Park district of Purdue; Rose-Hulman Institute of Technologies, Rose-Hulman Ventures. Rose-Hulman, by the way, has also partnered with the University of Illinois and Stanford to establish new semiconductor curricula for its students. And Franklin College's recently opened Center for Tech Innovation, a space for collaboration between students, faculty, and industry. On top of this, Indiana's General Assembly recently passed an ambitious budget that includes over a billion dollars for economic development efforts. This included $500 million to spur greater regional economic partnerships.

I've been in regular communication with the governor, the Indiana Economic Development Corporation – our department of commerce – and state legislative leaders. I'm encouraging continued implementation

on strategies to attract private investment while also pursuing federal opportunities including those in the CHIPS and Science Act.

This is exactly the strategy we need to connect more people in regions to the high-tech economy. One other thing I'm stressing as implementation of the law moves forward is a focus on place, on physical hubs. It's important that we up skill our workforce but it's also important that this law leaves a physical legacy in communities.

In addition to the economic benefits of skills training there's tremendous value in the proximity of innovators and creating growth centers, ecosystems where startups and incubators, academic and industry, all cluster and coexist.

Now, there's still a great deal of work to do. Still, I'm incredibly optimistic about the opportunity before us. Because of this law we have a once in a generation chance to harness our greatest assets, our people, especially those in overlooked places, to win the future and to secure another American century.

We can become more prosperous. We can position more regions to grow economically, to attract and retain talent, and to leave a legacy to our kids and grandkids, and they will be able to say with pride that when the innovation that determines global contests and brings wide prosperity emerges it will not be from a few select regions that have benefited from the weight of government investment in generations prior but instead it will be from all of America.

Thank you so much for having me and I'll look forward to visiting with my colleague in a moment. (Applause.)

Senator Mark Kelly: All right. Good morning. Good morning, everybody. Dr. Hamre, thank you.

Administrator Castillo, great to see you again. Thank you for all your trips across the country. We were just speaking about the administrator has visited 40 states including trips to, I think, Indiana, Arizona, all in furtherance of industrial policy.

First, I want to thank Senator Young for all of his hard work and leadership that went making the CHIPS and Science Act such a success, and I don't think it's an exaggeration to say that without Senator Young's initial willingness to work collaboratively on what we then called the Endless Frontiers Act we would have never been able to build this

bipartisan law that we're here to talk about today, and I have to say that endless may have been a good word to describe the process. (Laughter.)

I mean, it took nearly two years and I think we – how many, four years? And we ended up renaming the bill about a half a dozen times, and the process ran into a bunch of roadblocks and it took a lot of hard work to get this done.

But the benefits of this bipartisan law really cannot be overstated. You know, microchips are in everything that has an on/off switch, from your coffee maker to your cell phone to the most advanced fighter jets and weapon systems and spacecraft, and we invented the microchip here in the United States.

But we don't make enough of them domestically, at least we don't anymore. In fact, the share of microchips that are manufactured in the United States today is just 12 percent. It used to be 40 percent. In 1990 it was 40 percent, and this is a problem.

And we really saw the downside of this during COVID-19. During the pandemic, when lockdowns drained supply chains, we couldn't get enough microchips here in the United States and we couldn't produce the things we need to make. And it drove up the cost of everything from new cars, and then even used cars, to how much it would cost to produce the military equipment and technology that our service members rely on to keep us safe. And our reliance on supply chains across the oceans – I mean, this was a real threat to our national security and to our economy.

So right after I was sworn into the United States Senate, I got to work on this for months. I worked with Senators Young, Cornyn, Senator Warner and others to negotiate a deal to fund the CHIPS Act programs. And that's what we did. We developed this $52 billion plan, a bipartisan plan, to support the construction of the most advanced semiconductor manufacturing facilities right here in the United States. And we provided the dedicated funding for research and development programs as well, to make sure that the next generation of microchips were discovered – and this is an important part of this – discovered, meaning invented, designed, tested, and then built here in the United States.

And through the course of negotiating the CHIPS and Science Act, you know, I pushed for us to go a little bit further on this, making sure that our incentive grants were both for the actual semiconductor manufacturing, but also for the tool and equipment manufacturers. Those are often left out. Because in order to bring this manufacturing back to our country, we need to boost the entire ecosystem that goes into

creating microchips, not just the manufacturing of the chip itself. So we created new investment tax credits to supercharge semiconductor investment here in the United States. And now, we are starting to see the effects of these investments.

Just a few weeks ago when I was back in Arizona, I toured the – Intel's, their new manufacturing facility, the building that they're putting up, the fab. And their two new factories are going to create about 3,000 construction jobs, and then 3,000 manufacturing jobs. High-paying jobs that you can actually raise a family on. And not to mention the thousands of other jobs. The multiplier on a high-end manufacturing job is on the order of maybe seven to 10 additional jobs in the community to support those workers.

Now, these factories, the two Intel factories, are expected to be fully operational next year, chips coming off the production line. And then on the other side of Phoenix, the Taiwan Semiconductor Manufacturing Company is building their first manufacturing facility here in the United States. And thanks to the CHIPS Act passage, their investment in our country has now gone from $12 billion to $40 billion. It is, perhaps, one of the biggest foreign investments in manufacturing in the history of the United States. And that $40 billion number, that is likely to increase beyond that.

And that facility is going to produce some of the most advanced semiconductors ever made in our country, including the chips that go in your iPhone, or the chips that are used to drive artificial intelligence platforms and autonomous vehicles. So you might be asking, why Arizona? Like, how did this happen? Well, the foundation for this success – I mean, this isn't just with the CHIPS Act. This goes back decades. Companies like Motorola and Intel came to Arizona in the 1960s and '70s, when we were sending astronauts to the moon for the first time, you know, powered by computer chips and computing power that is much less powerful than what is on a smart watch today.

But that laid the foundation for the modern Arizona economy. And the industrial base cultivated a talented workforce. And this was bolstered by some worldclass research institutions and some really good community colleges.

And today that ecosystem supports defense companies like Raytheon. Raytheon Missile Systems is near where Gabby and I live in Tucson. Boeing manufactures the Apache helicopter in Arizona. Northrop Grumman. I just visited Honeywell, which makes some jet engines, and I mean, just aerospace technology across the sector.

And then we also have these future industries like First Solar; KORE Power; Lucid, who makes eclectic vehicles in Casa Grande. And it's why we're becoming a hub for semiconductor manufacturing. I mean, we're well positioned to take advantage of these investments that are going to be transformative for our economy, not only in Arizona but nationwide. And these investments are going to create tens of thousands of good-paying jobs that do not require a four-year degree.

Now, last year, while I was working on the CHIPS law, I met with two women over a Zoom call; one of them, she told me her story, which I thought was pretty incredible. I mean, this woman was out of work for over a year; she had three kids; she was a single mom. She could not find a job, and she's looking through her email, her spam folder – who goes in their spam folder? I don't ever go in there. She goes in her spam folder and she sees this ad for this thing called the Quick Start program at Estrella Mountain Community College. It is a 10-day program to give her a background in semiconductor manufacturing, and it promised that at the end of the 10 days, if you complete this, you would get an interview with a semiconductor manufacturing company. So she figured what the heck, and she called, and she got somebody on the phone and she got into the program; she completed it. She got an interview with Intel and now she works at Intel as a semiconductor manufacturing technician. I mean, it is a story that we will see repeated over and over again because of the CHIPS laws.

But in order to maximize these investments and see them multiply in years to come, we need to invest not just in individual companies but in the long-term competitiveness of regions, and that's why the long-term programs included in the CHIPS Act, like the establishment of the National Semiconductor Technology Center or the Microelectronics Commons or the regional technology hub that Senator Young talked about, these programs will help regions like Arizona, like Indiana. It will help us build the infrastructure to sustain the growth that we're seeing right now. And some of this is physical infrastructure, like an example – you know, we need to widen this highway that goes entirely across the country, I-10, that through a good part of Arizona goes down to two lanes and every single day gets backed up for hours. It's a public safety issue, but it's also an issue for companies that are trying to locate their facilities near that transportation network. But it's also about human capital infrastructure. In Arizona we have programs at Arizona State University and our community colleges that benefit from these regional investment programs. We need to be able to scale up their capacity to train the future engineers and technicians to do these jobs. And we have a long way to go, a long way to go until we fully realize the opportunities

provided by the CHIPS Act. But I'm confident, thanks to the leadership we've seen from the assistant secretary at EDA to Secretary Raimondo and others in the administration, and through our continued bipartisan collaboration in Congress, we can ensure that the CHIPS and Science Act is the catalyst that will jump-start a new generation of American innovation.

So we will continue – if we get this right and we do this right, we will continue to lead in the world in researching, developing, and manufacturing the technologies of the future. And thank you again.

Dr. Hamre, thank you for having me, and I look forward to our Q&A. Thank you. (Applause.)

John J. Hamre: Thank you both. (Laughs.) Really great speeches. And it shows what leadership – what a difference leadership makes. You've both been leaders, and we're grateful for that.

Let me start by just asking: You know, the CHIPS Act did appropriate funds for semiconductors, but there were an awful lot of other initiatives in the CHIPS Act that were really authorizations; they weren't appropriations. You know, I used to be an authorizer and I remember an appropriator once saying, well, you give them hunting license, I give them rabbits, OK? How are we going to get funding for the rest of the CHIPS Act?

Sen. Young: Well, it has to be a priority, bottom line. And we, of course, need our instate stakeholders. And that should be everyone, but some are closer to this effort than others, so those who work in our research universities, those who will have a direct role in training this and next generation, and hopefully beyond, in the technologies of the future.

Your legislators need to hear from you and be reminded of the value proposition of making these critical investments. We need to be making the case about the spillover benefits. And there are many that will be realized, the products and services which we have the disadvantage of not being able to predict exactly what they are, but we can look backward and learn from recent history. We've made critical investments in our space program, in our aerospace program, that, of course, led to breakthroughs in these fields. The intellectual property was used by private investors to scale up whatever findings we had.

We will need to hear from associations, those in this town and well beyond; the National Association of Manufacturers, for example. We are the most manufacturing-intensive state in the country. One argument I'm

making is, look, we make synthetic-biology investments in research through the CHIPS and Science Act. We will be increasingly drawing on that field and many others to determine the sort of things we're making in the state of Indiana. And if we are to continue to move up the value-added chain to ensure that our workers can earn better wages even in what some call flyover country, it's going to be essential that the United States has first dibs, as it were, to those findings.

So it just – it's going to take leadership. And it will take collaboration across party lines. It's no secret that we have a Democratic president, a Democrat-controlled Senate, and a Republican-controlled House. So by definition we have to play well with and work with one another if we want to accomplish anything of significance.

I guess the last thing is, in implementation of the CHIPS and Science Act, we need to take every measure. And I believe the administration is working with, you know, legislators and our partners throughout the country on the ground, as well as our allies around the world, to ensure that implementation is done with fidelity, consistent with legislative intent, and with economy, spending every dollar that's allocated in the most efficient, effective way possible.

And there are no doubt, John, some pockets of individuals who are wedded to a notion that industrial policy is always wrong, irrespective of what the lessons of history show and the many benefits we've gotten from that. So we'll have to be prepared to win these arguments. And I think we will.

But I know Mark's committed to this effort. Arizona State is going to benefit. But more importantly, he's a patriot. He knows our country will benefit. And a lot of Republicans and Democrats are committed to allocating sufficient resources to make this successful.

Sen. Kelly: It's interesting Senator Young, Todd, commented about how some feel industrial policy is, you know, not something we should be doing. That also is bipartisan, by the way. You know, I've seen – I remember, you know, just being done in, you know, some all-Senate briefings and have folks from, you know, just on both sides of the aisle not wanting to do this. And it was not easy to convince both the Republicans and Democrats as caucuses that this is the right thing to do, because there are some folks that are often – you know, for different reasons, you know, are against taking bold, dramatic steps. But as Senator Young says, you know, history has showed that this is just – it's good for our country.

Dr. Hamre: You're both defining what Americans desperately want in leadership in Congress. And thank you; really grateful for that.

This – our partner today, of course, is Indiana University, a powerhouse. You mentioned, Senator Young, the role that venture capital plays. But it's too narrowly focused.

Sen. Young: Yes.

Dr. Hamre: It's just in the hotspots, you know? There's a partner to venture capital, which is tech transfer out of universities. You know, the universities are these great engines of ideas, but it's very hard to get ideas from a scientist, who doesn't know business, into commercialization. So we have technology transfer offices in your universities. They become crucial partners, but they're kind of under – people don't appreciate what they do. Can you just share with us how you work with the universities to kind of get them – encourage them to be more innovative and to create real jobs? They can be an engine for us.

Sen. Kelly: Yeah. Before this job, a while back, I was on the board of the engineering school at the University of Arizona. And when I joined, they didn't have much of a technology transfer program at all. But NASA did. And I saw the benefit of NASA's technology transfer program, that would take innovation and invention from NASA employees, you know, patent it, and then work with industry to move these technologies to the private sector. Some universities do a fantastic job at this. I mean, the Massachusetts Institute of Technology, MIT, as an example, generates an enormous amount of revenue that they can then reinvest into the university, into more innovation, into labs that create this technology, and then transfer the next thing out to the private sector.

But I worked with U of A to encourage them that they've got to get better at this, and connected them, you know, with NASA as well. And today – I mean, this is now 15 years later – they have a – you know, a technology program. And it has helped Tucson, you know, start to grow a small – like, right now a small ecosystem of tech companies that are – that are starting to develop there, from stuff that's been created in the university. But, you know, every university doesn't do this. It needs to be something they're focused on.

Dr. Hamre: It's really something you may want to consider as you augment this policy. We need to get these engines more productive, but they need help in these tech transfer offices.

Sen. Young: Yes. Well, there's a notion that universities are sort of the locuses for discovery. And in a sense, that's absolutely accurate. Our best minds are often located within the university environment, and experts in their discipline, and focused on pushing the frontiers of science and technology. But that's an incomplete vision. Without the benefit of the crowd, as it were, the masses of people, to suggest, to inquire, and to hypothesize about how their findings might actually be used in the world, I think you're missing a big part of the mission of the university.

And Indiana University gets it. And, frankly, this sort of culture, this broader understanding of the mission of a university, to educate typically the young, but also, we're finding – (laughs) – those who are currently working – to make these fundamental discoveries but also to apply it, that has to be emphasized by the leadership. So President Whitten has really taken the reins here and she's making this a priority. And it also sustains the support for a university when you have a sense that these investments really benefit rank and file –

Dr. Hamre: Well, it attracts stronger faculty. Faculty want to go there when there's a strong tech transfer program.

Sen. Young: That's right. That's right.

Dr. Hamre: Can I just add? You know, as senator from Indiana Birch Bayh and Bob Dole 40 years ago created what's called Bayh-Dole, which is a legal framework where we get ideas started with government funding in universities, and we get them commercialized. Now there is a challenge to that. It's coming from people that want to drive down the price of pharmaceutical drugs, and the so-called march-in rights. There's just a fundamental question that's really on the table, which is, you know, who owns intellectual property that was funded by the federal government? And the Bayh-Dole Act really created a very fair, sensible balance. It said, you know, the government has some rights, but we want you to bring it to the market. But there's no challenge to that, Senator. Can you speak to this if – I know you're familiar with this challenge on march-in rights on Bayh-Dole.

Sen. Young: Yes. Well, at the highest of levels. It's not something I've spent a lot of time with. But I recently learned of sort of this challenge and I think it's confined mostly to the sort of life sciences –

Dr. Hamre: Pharmaceuticals primarily, yeah –

Sen. Young: – the pharmaceutical area.

Dr. Hamre: – because that's the political agenda. Yeah.

Sen. Young: Yes. But we're, certainly, going to – we're going to have to look at Bayh-Dole and make sure that – you know, it's a piece of legislation that I think almost universally is recognized as catalyzing universities to conduct cutting-edge research. We want to make sure it's – if we need to update it, if we need to take some measures to –

Dr. Hamre: Yeah. You know, it's been such a foundation for the way we've had idea innovation in America these last 40 years but it's now being threatened and I think it's something we should be looking at – do we understand what's at risk here.

Let me, if I could, just, you know, ask because this is a somewhat different question. You know, 90 percent of all the people that filed for patents, you know, in 2020 were white guys. OK. Very few minorities. Very few women. You know, the system is really – for some reason we just are not getting diversity inside the – all the talent pools that we have in this country isn't really manifesting itself when it gets to the world of ideas.

Part of that is how do we get innovation incentives into HBCUs, for example, and historically Black colleges and universities. How do we get a wider spectrum of encouragement in society so it's just not a narrowly focused thing and it isn't just, as you say, in the hotspots.

What are your thoughts about this?

Sen. Young: Well, I didn't know it was, you know, 90 percent because I don't believe the workforce of scientists and engineers is 90 percent –

Dr. Hamre: Right.

Sen. Young: – you know, White male. You know, I think it's a matter of at a young age encouraging – and this usually is necessary around middle school – encouraging young people, people of color, to continue to be interested in science and math and that's hard, especially with young women. At a certain age, you know, young women become less interested in math and science and it's something that's been going on for decades.

Dr. Hamre: Sadly, yes.

Sen. Young: Yeah. So in my former job as an astronaut we spent a lot of time going to schools, you know, elementary, middle schools, high schools, to

encourage and get young people excited about, you know, science and math and engineering.

It has some effect. It's, certainly, something that should be scalable and I think it's really on, you know, all of us. You know, for the folks that are successful, you know, in these careers to give back in some way, to encourage, you know, young people to do this.

And it's not just – you know, it's not just in this area either. I mean, it's – we've got, you know, issues with, you know, military recruiting right now –

Dr. Hamre: Yes.

Sen. Young: – and it's important at a young age to get folks, expose them to different opportunities.

Dr. Hamre: Yeah. If I could, and I know we have to let you out of here. We've got about five more minutes. If I could ask, what is the prospect for providing support for these tech transfer offices?

You know, a lot of it – because it isn't just, you know, what's out there. It's they have to develop an ecosystem within these tech transfer offices with venture capital firms so that they can help direct these and I think that's going to take some infrastructure support. I mean, there was a part of the CHIPS Act which did not make it was to provide some financial support for universities to strengthen their technology transfer programs.

Is that a possibility we could look at in the future?

Sen. Young: It is. And you know, fiscally sometimes austere, always responsible states like Indiana – (laughs) – are going to have to rethink some of the investments they make or don't make. I can make a very strong argument and probably will be making this argument, moving forward, that, listen, we need to make some critical investments in our people and our places. This is one area where, to the extent that Indiana picks this lock, as it were, and really figures out how to optimize some of these well-resourced tech-transfer offices, it's going to disproportionately benefit our state because your venture capitalists will descend on the university, you know, to visit with researchers, to identify findings that will have some commercial use, to start companies, to identify talent that can work at these companies, on and on. And then the flywheel effect, again.

So I – as you indicated, I'm certainly open to making these investments from the federal level, but I'm a realist. We've asked a lot of my colleagues to step up and make these critical investments.

Dr. Hamre: Yeah. Yeah. Yeah.

Sen. Young: Some of them will have to occur at the state, local, regional, what-have-you level.

I'd say one additional point – I can't resist – on the previous question. You know, this is – this is an issue of national security, which is how I've sort of addressed this whole notion of industrial policy. For me, it's an exception to the rule. I don't think we should gratuitously get in the business of industrial policies. But we have to – we have to be able to use discernment and judgment to figure out when those exceptions exist, and we've done so in this case, and we must continue to do so and not in the slightest – be the slightest bit embarrassed about making exceptions to doctrine. I think, instead, those who are mindlessly wedded to doctrine ought to be explaining themselves.

And we need to make critical workforce investments in minorities and women. That starts with K through 12 systems, which isn't in the main a federal issue. But if we – if we crack that nut, I'm not suggesting that all of the other challenges will be solved – you need mentoring, it needs to be a priority, on and on – but I do think you'll see a lot more people choosing STEM as a field if they have an adequate preparation to succeed in those areas.

Dr. Hamre: You know, just as a footnote, you know, when we had the giant tobacco settlement, you know –

Sen. Young: Yes.

Dr. Hamre: – and states got money, Michigan earmarked that money to create venture capital firm and tech-transfer hubs, and it really made a difference. It's really energized it. So I think from the bottom up there are opportunities if we can find them.

Sen. Young. Yes.

Sen. Kelly: And, John, I don't think – it's not one of these things that's incredibly expensive, I mean, for –

Dr. Hamre: No, no.

Sen. Kelly: I mean, it's rather – I mean, it's small dollars. It also requires that you have a university president that makes it a priority.

Dr. Hamre: Yeah, yeah.

Sen. Kelly: I've seen this at ASU, as an example. Michael Crow –

Dr. Hamre: Oh, they're a powerhouse. Yeah, they're a powerhouse. Yeah.

Sen. Kelly: Michael Crow has really made this a priority for the university. And if you just connect people – you connect the researchers with private equity, they see the value in some technology, they're willing to invest their own money to get this into the private sector. And then if you have, you know, a policy where the innovator/the inventor gets to own some of the intellectual property or at least benefit from it, you know, you encourage, you know, the research, and – you know, that often takes a lot of time and effort. You're encouraging scientists and engineers to continue this kind of work.

Dr. Hamre: Well, Abraham Lincoln had four planks in his platform when he ran for president, and one of – the first one was public education, and it led to the land grant system, you know, one of the great innovations – industrial policy, in a sense, because it created a foundation. You guys are doing that now in this modern era, and I want – let me just say if any final words because we're at the hour where I need to let you go. You got – (laughs) – you got work to do.

Senator Young, first, with you? Anything final that you would like to offer?

Sen. Young: Implementation is going well on the CHIPS and Science Act. If we get this right – if we get this right – you will find places and spaces across the country – and Indiana is among them – where we will have the opportunity to make things that are very valuable to mankind, to our people in particular, but also leading to handsomely-compensated jobs for this generation and beyond.

We have an opportunity to be providers of hardware in various technology spaces. We will continue, I predict, to see the coasts and conurbations be areas where you see a lot of development of software, but we have the opportunity, if we play our cards right, to remain a manufacturing-intensive part of the country in the state of Indiana to make valuable things and be a place that is a destination to work, as opposed to inheriting one's home state and choosing to stay or leave.

So I'm really excited about the possibilities. This took a lot of partnership to get here. As I've indicated, Senator Kelly played a really important role. And thanks so much for having the two of us here today.

Dr. Hamre: Senator Kelly.

Sen. Kelly: Well, this is about national security. It's about bringing down costs. It's about good-paying jobs. And we've got other national security issues we're facing. You know, right now I think one of the reasons why this could have – was such a strong bipartisan effort was because of that. There's a House select committee right now on China that's addressing some other national security issues focused on, you know, our biggest adversary. And if they can be successfully addressed – they, you know, often have to do with supply chains, but other technology that we want to make sure stays here, that doesn't get transferred to China. And I think we've got an opportunity to get this done.

Dr. Hamre: Well, it's leadership like this that makes a difference. I think we are on the cusp of a brilliant new decade because of the investments that are coming this way, and you were leaders to bring us there. Thank you.

Sen. Young: Thank you. Thank you, John. Thank you.

Dr. Hamre: Would you all please congratulate our – (applause).

Sen. Young: Thank you.

Sen. Kelly: Thank you very much.

(END)