U.S. Senator Maria Cantwell

Senate Floor Speech on the *Endless Frontier Act*

May 20, 2021

CANTWELL: Mr. President, I come to the floor today to continue our discussion about the Endless Frontier Act and why America needs to make more investment in the areas of research and development for our nation. This is critically important as we have gone through this debate with some of our colleagues, to talk about why this is important for the United States. I spent my time yesterday--maybe somebody from the staff can come over and help me with the charts but, thank you—the biggest reason we're doing this is because we believe in American know-how. That is we believe in American ingenuity, and we believe in American know-how and we've discussed already how that has helped to build our country over and over and over again. That we are a nation of if you will, explorers, of pioneers, and by necessity, inventors, and that has continued throughout the history of our country.

So we are so proud to continue to make these investments in all areas of science, certainly in the areas of healthcare, but we're more specifically talking about the engineers of the physical science and engineering. And we're talking about why we should make an increase in both basic research with this underlying bill that continues to drive dollars into curiosity driven early stage research, so that we can continue to grow jobs and help our economy, and it also continues the effort by saying we should make more investments in STEM education. So the workforce that it will take for us to meet the job challenges of the future. So we're excited that we're there with American know-how, but we're also cognizant of this international debate that's going on, the debate about other countries and what they're investing in research and development. And one of the reasons why I like where we are in the United States is because our research and development ecosystem is really an ecosystem of many different agencies doing research and development.

And not only are those research and development investments by these various agencies helping in particular areas, because it's really distributed as this chart shows, the United States works with the private sector, it works with our public universities, and it works with various agencies. Instead of a centralized approach that you might find in other countries, the fact that we have this distributed ecosystem with, you know, the Department of Energy may collaborate with the Department of Agriculture, they may collaborate with the Department of Defense, NSF may collaborate with universities, universities may collaborate with the private sector--it's an ecosystem, and that ecosystem is what's unique about research and development in the United States. It’s not hierarchical, it's not the majority driven by the private sector, or by government, it’s an ecosystem, and the fact that it's so distributed. That means, almost like the competition in various places, and the collaboration is helping us grow the innovation economy.

So the one thing that we need to be cognizant of in this debate is that we want to preserve that. We want to preserve the uniqueness of our ecosystem. And that's why we're really talking today about this NSF, the National Science Foundation, principally, and you can see from this big pie we just had this debate, right, we had this debate, well let's increase the defense R&D--well, we're already doing a lot in defense R&D, of course our colleagues are talking about the budget overall as it related to defense, but you can see that NSF, the numbers that they're at today at 6.8 are not really at the--you know, you might think this whole debate we're spending, you know, billions of dollars to change the focus. This agency is a powerhouse, and it's a powerhouse mostly connection with universities, and the R&D that's done there has been in the basic research area, but now this bill by our colleagues Senators Schumer and Young is about taking the basic research, continuing that, making a little bit of investment in that basic research, but then also now trying to accelerate all the research that we now have at our hands, our fingertips, at our

minds, and saying, what other user-based research we take, that basic and applied research, and actually put it into use in commercialization in the United States?

So if you will, capitalizing on a faster tech transfer and a faster deployment of these technologies. Why is this so important? Well it's important because in the information age, a lot of people can read our published research and development, they can read what we're doing and they can continue their research and development. Other nations are figuring out that research and development in an information age economy really does matter. They're figuring out that the United States has come a long way as a nation in building job growth, maintaining competitiveness, national security issues, all because we at the federal government level have said we believe in research and development with the public taxpayer dollars and it has benefitted, whether it's the Internet, or the bio sciences and healthcare, or on national security, the American public gets that that research has made us competitive of the nation.

So we've had two previous attempts to make investments in this issue in America Competes, first started in the Bush Administration in 2006 when President Bush published a report about America's competitiveness and proposed this concept of that small NSF budget that I was referring to, and articulated that we needed to double that budget within a five-year or seven-year window of time. They felt that with the level of change and transformation and innovation that we wouldn't be keeping pace on a global basis unless we made that investment. So in 2007 we passed America Competes Act which gave money both to NSF and to DOE, and literally the first three years we thought we were going to double this DOE budget, and an investment in DOE within seven years. So, there was a little good news, a lot of euphoria in R&D, a lot of hope for STEM education, science, technology, engineering and math. And then, in America Competes, the same request basically of a 60/40 split between NSF and energy, people thought we would end up, well we're not on pace, where we want to be, but oh, we'll get there within 11 years. Well, we'll put enough money into this innovation effort that we will double our research and innovation budget as it relates to NSF and our energy innovation efforts in 11 years.

Well, this is what really happened. We didn't do either of those things. We're really on a track to have taken those 2007 numbers and double them in 22 years. So, when you look back at the history and you say well how did we--what happened? If we're so enthusiastic about this, if we identify this—both a Republican President identified this and then a Democratic administration followed up, why didn't we execute on this? Why didn't we execute on this doubling of this number and making this investment? Well we all know what happened, we basically hit a recession. And in a recession of 2009 and '10, we just didn't live up to this obligation of funding the research and development that was in America Competes to the aggressiveness that we had all hoped for. I'm not sure everybody even realizes that this effort fell short, that we didn't make quite the level of investment that we wanted, that we were falling behind. I don't think anybody really on understood it until now, when people see the incredible level of international competition. All of a sudden, as we see this incredible investment from the international community, people are starting to say well wait, what have we done on this effort?

So our next chart shows the fact that the United States has been a leader in global research and development and as I said, I mentioned on the floor a report that was done by the Pew Charitable Trust, I mean the Pew Research Center that basically said, Americans, 7 in 10 Americans believe in public investment in research and development. We have a higher regard for this than other nations, and we just do I think because people get it here, I think they get that we've invented a lot of things, they believe in that innovation, they know it creates jobs. And so we have a higher regard for that, and consequently we've been the leader in world R&D for a very, very long time. But as this Information Age has come along, other nations get that R&D leads to job creation, transformation, and certainly to security. So just since 199, we have seen China who was 9th in R&D, now they are number two, and I'm pretty sure at current trajectories will end up being number one sometime very, very soon.

And so it's, you know, not everything about China, although many of my colleagues here are going to discuss this as is China bill, I view it as a bill about the future and making the investments in the future to capture the economic opportunities. There are security issues here, clearly national security issues here. There's clearly issues about a supply chain and whether you can depend on a supply chain, and whether if you have a concentration of an industry in one region of the world, then are you really dependent on that one region of the world for that particular product? What happened to all of us in the last year and a half, and I'm saying now on a global basis, is the world community realized with COVID, well, wait, supply chains really matter, product really matters, where we get product in an emergency really matters, whether it does what it says it does in an emergency really matters. And so all of these issues about supply chains, and who's building what, and the intricacies of it, really got ripped open in the COVID debate and now we're really, as the world community starts to look at this too, where do we get our product, who's making it, is it made to the standard that we want, is it secure? And obviously, you know, people have made lots of decisions about supply chain based on just pure cost and effectiveness of a product, but now people are starting to realize that it's way more complex, and it's led us to this current debate.

So again, why do we do this, why does America want to make an investment in an innovation economy? Well, we don't have to go too far to understand that from our past history. It enables competitiveness, and if you just think about, you know these sectors--I'll never forget years ago we had somebody--this was in the ‘80s, visit Seattle and they said well what's everybody going to do, make car phones and computers? And in reality, there was a big decade or so of making what then was supposed to be great technology of ar phone, and obviously we all know where we've now been with computers and operating systems and how much it drives the economy of the future, but at the time when we were seeing a transformation to that, people just thought well what are we all going to do? Is that what we're going to do? Well, telecommunication, semiconductors, advanced materials, all were huge things that enabled this competitiveness of our nation. In automobiles, in aviation, in the tech sector, in healthcare, in a whole variety of things. And it drives our economy with this level of innovation.

The Internet, just one example, is something we started working on in the ‘60s, became a reality in the ‘90s, and today, its $2.3 trillion part of our national economy, and 12% of US GDP. That's what we got out of previous research. That's what we got out of saying we're going to let scientists do basic research and figure out what they think are the most important advances moving forward. The job growth, millions of jobs, and national security today, we can see just from this past week in a pipeline that was affected by a cyber-attack, we cannot afford to take our foot off of national security research and development in the purposes of things like cyber security. We have to continue to be a leader in this area of technology. It's not as if you're not going to have intimidation of our nation by somebody maybe sticking the nose of a foreign sub in US waters or applying a spy plane over the United States, it's going to come in the form of intimidation of our banking system, or pipelines, or other senses of security and hacking.

And so, there's no doubt, no doubt, we need to stay on top of the level of investment in national security. I would say the underlying bill that we will be talking about next week in detail relates to a very important aspect of national security, and that is the area of semiconductors. We need to make an investment in our competitiveness in semiconductors, and we need to make that investment because it's going to be critical to our national security.

So let me talk about a few things that are in the bill just so people understand some of the priorities that Majority Leader Schumer and Senator Young came up with as it relates to this legislation. As I mentioned, it creates a new tech Directorate in the office of NSF, the National Science Foundation, so that it will be like a DARPA system, that is, that they work with the private sector, they create technology centers, they build partnerships between government and academia, they support rapid technology demonstration, they advance the competitiveness of the United States in important fields like artificial

intelligence quantum computing, biotechnology, and they focus on these ideas, similar to how DARPA has done, where the individuals involved are critical to the effort. That is to say, to get the best and brightest minds who are working in these areas to be part of this effort and concentration.

We also looked at and improved in this legislation the fact that universities and academia provide a lot of research and development, but oftentimes don't even--in the academia world, people are focused on publishing. Publishing their research, that's kind of how they get known, that's what they get basically almost rewarded for at the university system, and you'll be surprised how little time they take to actually take that research, turn it into a patent, and then turn it into a commercialized product. So one thing we heard in our hearings is that we needed to give more help to universities on tech transfer and patenting of information. Why patenting? Because patenting helps us protect the science that we already have developed.

It helps us, say that somebody can't just take that published science report, and then go off in another country and develop it because it is now protected under our U.S. law. So we feel this is a very important effort, and we think that it also helps lead a lot of research at universities to then be supported, developed, exposed to the venture capital markets, and thus actually helped turn into commercialization.
So efforts at the University of Washington that specifically focused on this, specifically hired somebody to come into the university and kind of, if you will, shake the tree of the level of R&D that was being done and say, what are we doing to actually patent this content, what are we doing to actually transfer it into commercialization, had outstanding results. Yes, it was a transformation of what our universities do, but in the end, they came up with something like, just in a few years, 20 companies that ended up becoming been, you know, supported by venture capitalists, and making it on to the markets. So we're very excited that we will now, with this provision, be trying to get more out of the research we do, by patenting it and doing tech transfer.

Our colleagues Senators Young and Schumer also believe that university research should continue to get investments and that's the major aspect of the provision here is to have the tech directorate work on these 10 areas of expertise, work with selected universities around the United States on those critical focus of technology. I mentioned some of them: artificial intelligence, quantum computing, biotechnology, and many others. So the fact that the bill really is depending on our university system, I think, is something that our colleagues should applaud and be excited about. That chart that I showed at the beginning where everybody's working together, this is just research dollars going to the best universities in our nation to continue to focus on this, but now focus on it in partnership with experts in these sectors, and with industry so that we can actually get to a faster adoption rate and a faster implementation into commercial markets. So I think we're leaning in to our university system. That's a good idea.

That's a good idea. What we're giving the university system, though, is the tools, the tools to help accelerate that development. And then, as I mentioned, we are also making a huge investment in STEM, $10 billion into STEM education. The chart I showed before talked about how we were going to do all these great things under America Competes in STEM. We didn't quite get there. We didn't really do that. I think this is like broadband. Everybody talks about it all the time, we think we've solved it five times, and you still think wait, I thought we solved broadband?

STEM is the same thing. You think we have funded STEM. We haven't funded STEM. This represents a huge increase in our STEM education budget, but I will just tell you, this is so that we can get the researchers, the scientists, the fellows, if you will, at the higher education level for STEM. We still need to go and build the pipeline at our k-12 system so that we are putting more people into the pipeline. But hopefully with the stem dollars here, we will be, if you will, creating a new workforce for the innovation that we are trying to chase with the investments of these dollars.

And we felt so strongly about this that we looked at the numbers, and we were just astonished. There are so few women and minorities in STEM fields, so few. The underlying bill our colleagues, Senator Schumer and Young, created a Diversity Office at, for the first time, over at NSF so they can focus on this issue.

We put more resources to it within this STEM category so our colleagues and those at NSF could focus on it. And we expect to really try to take a very aggressive role here. That's what we heard from NSF in their research.

STEM education can't be a passive thing. It can't be just, we're going to put some more dollars out for education. If we want to diversify in the sciences, we have to have a very, very aggressive approach. And so that aggressive approach means changing the faces of those who do the education, changing some of the faces of people who do investments, changing the dynamics of research. A lot of women were hurt in the last COVID pandemic who were researchers because they were juggling both taking care of their families, or taking care of parents, and doing their research. And so they had extra strains on them that made complexity to when they could get their research done.

So we know we have to think about STEM education from the perspective of what are some of the challenges that face people going into those fields. But no doubt, this underlying legislation before us will have a big investment in that and continue NSF's leadership in trying to grow a more aggressive workforce. So the bill also includes, I should say, a few things about how one of our goals is to diversify innovation to many different parts of the United States. The challenge there is, you know, you're not going to sprinkle some dust on some magic words on some region of the United States and all of a sudden something's going to pop up. And nor do I personally expect it to. I always give the example of Walla Walla, which is a real place, Walla Walla, Washington.

I had a journalist ask once if that was a real place. Yes, it's a real place. It's a great wine-making place. But somebody might say, Walla Walla, Washington should be a research center. It's got a University, an outstanding university, Whitman. People might say it should be a tech hub or it should be a research center. Walla Walla found its rightful place when research was done, and a university professor at University of Washington said, you know what? We can grow wine grapes. That really wasn't that long ago. That was in the 1980's. He said we can grow grapes. We weren't growing grapes. Now, a couple of decades later, we have over a thousand wineries in the state of Washington. So not everybody's going to be a tech hub, but it doesn't mean that you're not going to use science to the best and highest use for a region of your state or the country.

It's about empowering. As Panchanathan, the head of NSF says, it is about trying to have innovation everywhere, connected to opportunity everywhere, connected to universities. The point is let's build a better ecosystem that goes all throughout the United States so more and more people can take advantage of technology and innovation. So this is really, really important because we never know where the next person is going to come from, who is going to play a critical role in technology. And the more we build this infrastructure, the better.

So this allows money for regional technology hubs to help concentrate in various parts of the country and expertise, more money for our manufacturing institutes which help manufacturers all across the United States focus on being competitive in their particular area, and it supports $2.4 billion for manufacturing extension programs, which are those things that really do work with, say, a particular sector like automobiles or aviation or some other type of manufacturing and help make them competitive. And as mentioned, it also, just like in the former Competes Act bills, puts some money into DOE In this case, it puts about $17 billion into the Department of Energy so that its energy innovation can move forward.

So let me talk for a second about this issue about national security and where we are with semiconductors because I expect this will get a bunch of focus next week as we talk about this legislation. The underlying bill has about $52 billion of investment for the semiconductor industry, so I'm pretty sure people think well, wait, this is a lot of money, but it's a very big sector.

It's essential to our defense, it's essential to navigation, it's essential to satellites, it's essential to health care, it's essential to consumer products. And the United States has been a leader in this area. The United States has been a leader in this area for a long time, or I should say, was a leader in this area for a long time. When you think of companies like Intel or others. Even some of the companies that are foreign investors who made huge footprints in the United States. But the point is that we are no longer in this position. As this chart shows, only 12% of a global supply.

A report recently done on the semiconductor industry by Boston Consulting Group, I just want to read this one part. Quote, "The U.S. Has been the long-standing global leader in semiconductors with 45% to 50% share of the worldwide market. 45% to 50% share of the worldwide market in the last 30 years. However, significant focus is being placed on ending the U.S. Share in semiconductor manufacturing which now only stands at 12% installed capacity."

This is a report that I'm pretty sure you could get online. That's the end of that statement. So we have gone from 45% to 50%, that's where we started out and over the last 30 years, now we are down to 12%. 12%. So I ask my colleagues, if you were 12% of anything, how long would you be around to be competitive? How long would you drive the supply chain? How long would you drive job growth? How long would you continue to be competitive in this very, very important sector that's important to all of these things? And while I am somebody who supports continued growth of our global economy because I think we build and make great things and we want people to sell them to, this presents to us a very unique challenge, the fact that something as critical to the information age as semiconductors, we have gone from 40% to 50% down to 12%, the question is what's going to happen next.

Well, the question of what's going to happen next is if we don't make this investment, very, very likely that that 12% is going to in the next several years turn into 6%. It's going to turn into 6%. So staying status quo right now, doing no investment, it's very likely that 12% will turn into 6%. Which means people aren't going to want to locate their boundaries in the United States. People aren't going to want to locate their research in the United States.

People aren't going to want to have their companies and the supply chain and the workforce. Literally this industry is simply is clusters, its clusters. Seattle didn't get to be Seattle overnight. Seattle didn't get to be the hub of the number one STEM city in the United States of America and certainly an epicenter of software and software development overnight.

It took decades, decades. Literally, you know, even in the 1980's and 1990's, it wasn't that diversified. It's just been in the last 15 years that it's really diversified. But yes, it took the work of the University of Washington. Yes, it took the work of many companies being there. Then it took the work of then people attracting a workforce who would rather be there than, say, in Silicon Valley. And then it took the efforts of universities to produce a workforce. Then it took attracting venture capital.

Then once they got venture capital, then more companies wanted to come there because then you have the entire ecosystem. You had universities, you had venture capital, you had leading companies, you had a workforce, and you had all of this stuff. Well, that's in software, and software can continue to move forward, but if you didn't have those things, you aren't going to be a cluster for semiconductors. The United States of America, the cluster of semiconductor development is going to be in Asia. It's going to be in Korea. It's going to be in Taiwan, and it's going to be in China.

So we have to ask ourselves if we're only 6% of the supply in the future and we can't really control the development and we lose our edge in this and then basically we have to rely on a supply chain for all the chips, you know, in the world. Where is the supply chain that we're going to rely on for the national security products, and defense technology, and satellites and maybe some of these other consumer products that then end up getting used for other purposes? That's what this debate is about.

It's about that we went from 45% to 50%, down to 12%. If we do nothing, we're going to 6%, and the epicenter of a critical technology is going to move to Asia. So I personally want to see us be successful in keeping a sector in the United States. I'm very proud that that same report shows that that same Boston report shows that we have 49% of the aerospace manufacturing market in the United States. I'm very proud of that because we're an epicenter of that. 49% of the manufacturing market for aerospace is in the United States.

That represents, to my region, maybe 150,000 to 200,000 jobs in the Northwest. To the United States, that's two million jobs. More than two million probably if you think about some of the other related sectors. So being 49% of the supply chain in the United States for aerospace really, really, really matters. And I don't want to see that slip. You know, we have had a discussion about the fact that we have the Jones Act.

Now, some of our colleagues might not support the Jones Act, but the Jones Act is we decide well, we're not going to be all the shipbuilding in the world. Shipbuilding is going to get built in other places. But oh, my gosh, we have to have enough shipbuilding in the United States so if we're at war, products and services that we need to support our military can be transported on U.S. vessels. That's why we have the Jones Act. Because we decided that that sector was critical enough to support.

And what we're saying here is that this sector is critical enough to support, too. I don't know that we're ever going to be 49% like aerospace manufacturing is. Probably not, probably because it would take a lot more money than we're talking about here. Because the rest of this world is chasing this market too. They are chasing it fast and furious. We have to ask ourselves, do we want to end up at 6% or are we want going to try to reverse this trend and make an investment and make it as smart as possible?
I thought we had one more chart, but I guess we don't. So I guess, Mr. President, we're back to this. Is this bill's investment worth taking the chance on American know-how? Is it worth the history of our country and saying we have done a lot in research and development and we know how to get things done.

When I think of some of the people in this story, I think one of the guys on the GI bill was one of the first contributors to semiconductors. It's a guy who basically went to school on a GI Bill, and if you think about the capital formation and capital markets we have in the United States, it's contributed to allowing that technology to move more rapidly. Our investment in higher education has allowed this to move more rapidly.

So to my colleagues who aren't sure about this legislation or think that it sounds like a lot or thinks that it sounds like, oh, I don't understand it, it's really quite simple. Do you want to make a bigger investment in our contribution to American know-how with research and development and let them compete to winning the next generation of jobs? I do. I do.

I want to do that because I want to see what comes next. I think it's one of the most exciting things about today and where we live today. We're not in the agrarian age, we're not in the industrial age. We're in the information age where everything can be created in the blink of an eye and now distributed and transform our economy in such significant ways. I want to see what comes next. But we can't do it by passing legislation, authorizing things and then not appropriating the money and then waking up in ten years an

finding that we are at the lowest percentage of research and development to GDP in 60 years. That's where we are. The lowest percentage. So we can't do that. We have to make these investments and if we invest in American know-how, the rest of this will take care of itself. I thank the President and I yield the floor.