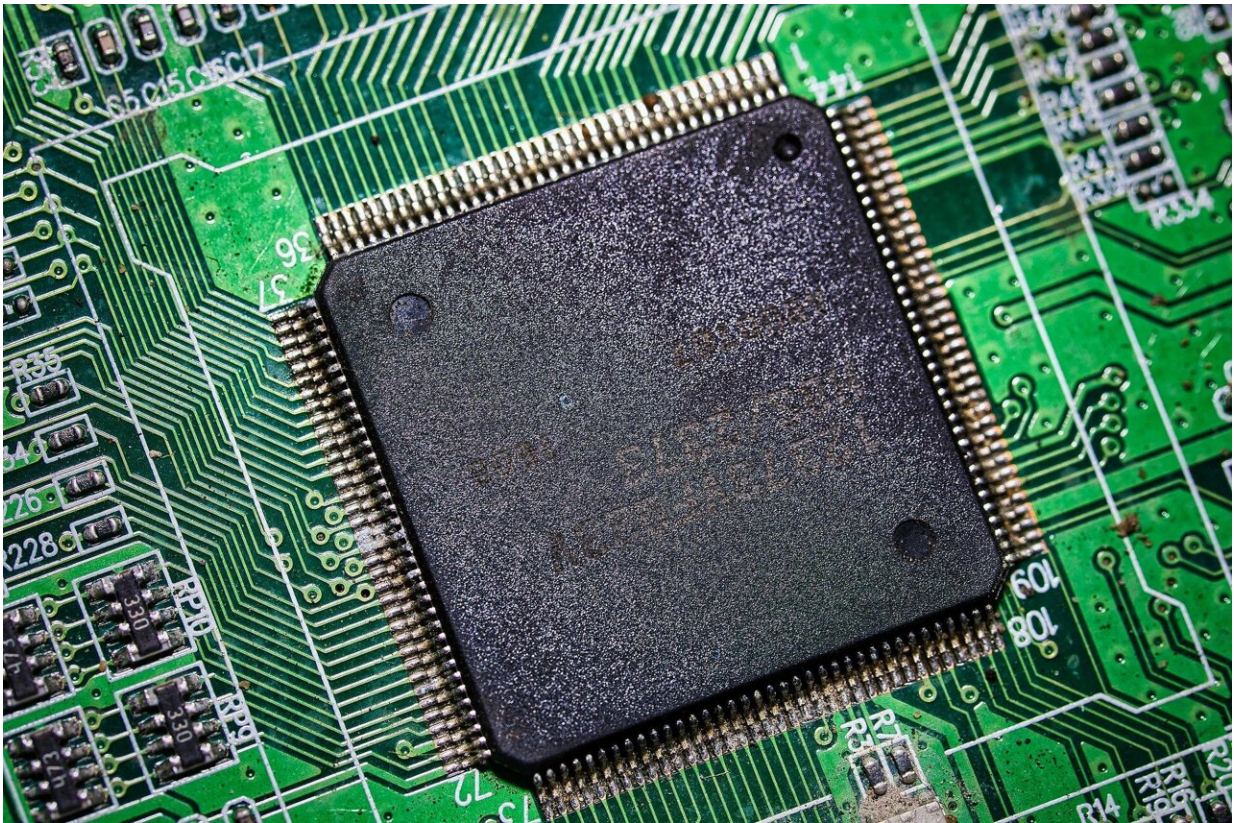


Expert explains the content of the CHIPS and Science Act, the 'semiconductor bill'

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On Aug. 9, President Joe Biden signed into law the CHIPS and Science Act, which invests \$52 billion in domestic semiconductor manufacturing through tax credits, as well as supports STEM research and education

initiatives through the National Science Foundation.

Semiconductor chips are key components of many electronic devices, ranging from automobiles to refrigerators. The U.S. currently manufactures approximately 12% of the world's supply, with 75% coming from East Asian countries like Taiwan, South Korea, and China. Because it dramatically disrupted demand patterns in 2020, the COVID-19 pandemic is oft-cited as the "root cause" of a global shortage and that has endured since.

Morris A. Cohen, the Panasonic Professor Emeritus of Manufacturing & Logistics in the Wharton School, explains the implications of the new law and its potential to reinvigorate global competition in the [semiconductor industry](#)—even if it doesn't end up being as transformative as some may like.

What are the significant features of the semiconductor bill that was just signed into law? Subsidies and incentives look to be the bulk of it.

The big deal here is exactly as you say: There are billions of dollars going to semiconductors in various forms of incentives and rebates, and the bottom line is they want to encourage companies who are in the business of manufacturing [semiconductor chips](#)—the Intels of the world—to build more manufacturing capacity in the U.S. I believe that's the intent of what's going on here. Because historically, when this industry started many years ago, the U.S. was in a dominant position as far as capacity. We now have a much smaller percentage of global output and a lot of jobs were outsourced, following the offshoring of manufacturing. This is all about reshoring: Bringing capacity back, bringing jobs back, and giving [financial incentives](#) to the companies who make these decisions.

Did this bill have broad support in the business world? HP, Intel, Lockheed, etc., all seemed to show up for the bill signing.

Well, all the companies in the industry who are benefitting like it, I'm sure. This lowers their costs to add capacity. You must bear in mind that decisions to add capacity were already announced: Companies like Intel and Taiwan Semiconductors announced multiple billion-dollar projects to add and rebuild factories; this just increases the likelihood that they will follow through, or perhaps increase the scope or range of proposals.

So, this is more about retention than attracting?

The argument is it creates high-paying advanced jobs in our economy. It also gives us security for sourcing critical inputs for many products, like automobiles, and has defense implications, because all defense products—airplanes, missiles, you name it—are heavy users of semiconductors. Many products use semiconductors today. So, having more domestic capacity will increase security. That is the objective, but of course there's a big cost here, which is why some people are against it.

If someone is against it, what is their argument?

I guess there are two. One is, "This is a government manufacturing policy," and that's something not everyone agrees with. Should the government be in the business of declaring how to invest in capacity? The [government] wants to influence the decisions that companies are making. This is an age-old debate as to whether governments or companies should make these decisions.

Companies never make capacity decisions in this industry without taking into consideration constraints, incentives, and political realities for all

the countries or jurisdictions in which they operate. At the same time, they want to maximize their profit, their shareholder value, and all the other objectives a company has. This is a balancing act that has always been there. The bill will now put more weight into making decisions that increase domestic capacity. This will have consequences for improving supply chain performance—but at a cost. So, is this the best use of our resources? What will it do to inflation? What will it do to taxes? Those are questions people are asking.

Will this make a dent in Asia's hold on the industry?

I don't think it will. I think the dominance of Taiwan, of [South] Korea, and now a rising China, is probably not going to disappear. You have to remember every country has similar objectives: They want to have their population have access to high-paying jobs, generate new technology, enjoy the benefits of availability of highly performing, low-cost, quality products. These are objectives that every country shares and, therefore, every country that can is going to compete in trying to influence domestic manufactures to expand and attract new capacity from other companies. The argument has been that the growth in Taiwan, [South] Korea, and China has been heavily subsidized by their governments, and now the U.S. is going to do more than it has done in the past. So, it's a competition of who can subsidize more.

I don't expect that Asian competitors will roll over and not counter with their own tariffs and incentives. What the net result will be is an interesting question.

Where is Europe with its semiconductor manufacturing?

It depends on what part of Europe. Western Europe has some very

advanced semiconductor companies, i.e., in Germany, Holland, France and England. They have tradeoffs similar to those of U.S. companies. They don't want to see jobs go. I predict that they are going to compete in the same way. This is a global competition and always has been.

What this bill does is try to influence, through incentives, what the ultimate course will be. It will have an impact, no doubt, and it will push things in the desired direction, but will it lead to a major structural change? That remains to be seen. I don't think it will cause other producers to stop producing in Taiwan or [South] Korea. They will produce more in the U.S. now that it will be more economically attractive to do so, as they have already said they would. But will we go back to where we have majority capacity in the U.S.? That's probably not going to happen.

The U.S. is still the major source of innovation in this industry, and I think that will continue.

And the bill also funds research, correct?

Absolutely, which is good. The dynamics of this industry are quite interesting because it has amazing volatility. The life cycle of a product design is a couple years, the life cycle of a process engineering design for factories is a couple years, and so every few years there's a new generation of product or technology and this has been going on since the beginning. I'm sure you've heard of Moore's Law, and the result has been lowering the cost of these products and therefore lowering the cost of products that make use of these components.

Has the shortage of these chips gotten better or worse?

It's probably gotten a bit better. There was a big, big shortage and everyone recognized that. The answer to alleviating the shortage was more capacity, and the problem is that it takes more than a year to build the factories. It can take up to a year after they're built to tune the processes, so you have an acceptable yield. You're looking at one to two years of lag from when you make the decision that you want to add capacity to actually getting it.

So, I don't think the projects contemplated and announced when this crisis unfolded have led to new production capacity. We're probably six to nine months away from seeing an impact. And on the margin, perhaps it's changed the way some products have been allocated, but I think the aggregate impact of capacity will still take a little more time.

The fact remains: Good luck finding a PlayStation or new car

We see the result. You can't find a new air conditioner; you can't find a new car. And that's because the manufacturers don't have the chips. And if they don't have the chips, you don't have availability of the products. It is important to note that demand is changing as well.

Are you surprised the bill got done?

No. I think it would be very hard to not do something like this bill, given the need for capacity and the risks that are present. We now have better recognition of this problem. And so, eventually [government] was going to have to do more than what they have done in the past. It makes sense that something like this got passed. Its impact remains to be seen, however. On the margin, it will have a positive impact in the intended direction, but it is not clear if it will have a major impact on location and sourcing of semiconductors and the shifting of risk—which politicians

have promised, but I'm not sure that these results will be delivered. But I'm not surprised something was passed.

Provided by University of Pennsylvania

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