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Earnings Call

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## PRESENTATION

**Jeff Su** - Taiwan Semiconductor Manufacturing Company Limited - Director of IR

(foreign language) Good afternoon, everyone. Welcome to TSMC's Second Quarter 2021 Earnings Conference Call. This is Jeff Su, TSMC's Director of Investor Relations and your host for today.

To prevent the spread of COVID-19, TSMC is hosting our earnings conference call via live audio webcast through the company's website at [www.tsmc.com](http://www.tsmc.com) where you can also download the earnings release materials. If you are joining us through the conference call, your dial-in lines are in listen-only mode.

The format for today's event will be as follows: first, TSMC's Vice President and CFO, Mr. Wendell Huang, will summarize our operations in the second quarter 2021, followed by our guidance for the third quarter 2021. Afterwards, TSMC's CEO, Dr. C.C. Wei; Mr. Huang; and TSMC's Chairman, Dr. Mark Liu, will jointly provide the company's key messages. Then we will open the line for Q&A.

As usual, I would like to remind everybody that today's discussions may contain forward-looking statements that are subject to significant risks and uncertainties, which could cause actual results to differ materially from those contained in the forward-looking statements. Please refer to the safe harbor notice that appears in our press release.

And now I would like to turn the call over to TSMC's CFO, Mr. Wendell Huang, for the summary of operations and the current quarter guidance.

**Wendell Huang** - *Taiwan Semiconductor Manufacturing Company Limited - VP & CFO*

Thank you, Jeff. Second quarter revenue increased 2.7% sequentially in NT dollar terms or 2.9% in U.S. dollar term. Our second quarter business was supported by continued strength in HPC and automotive-related demand.

Gross margin decreased 2.4 percentage points sequentially to 50% mainly due to N5 dilution, the slower rate of cost improvement and the absence of positive inventory revaluation.

Total operating expenses slightly increased TWD 1.47 billion. Therefore, operating margins decreased 2.4 percentage points sequentially to 39.1%.

Overall, our second quarter EPS was TWD 5.18 and ROE was 27.3%.

Let's move on to revenue by technology. 5-nanometer process technology contributed 18% of wafer revenue in the second quarter, while 7-nanometer accounted for 31%. Advanced technologies, which are defined as 7-nanometer and below, accounted for 49% of wafer revenue.

Moving on to revenue contribution by platform. Smartphone decreased 3% quarter-over-quarter to account for 42% of our second quarter revenue. HPC increased 12% to account for 39%. IoT decreased 2% to account for 8%. Automotive increased 12% to account for 4%. And DCE decreased 12% to account for 4%.

Moving on to the balance sheet. We ended the second quarter with cash and marketable securities of TWD 871 billion.

On the liability side, current liabilities decreased TWD 14 billion mainly due to the decrease of TWD 23 billion in accrued liabilities and others, partially offset by the increase of TWD 6 billion in dividend payable.

Long-term interest-bearing debt increased by TWD 134 billion mainly as we raised TWD 137 billion of corporate bonds during the quarter.

On financial ratios. Accounts receivables turnover days increased 2 days to 42 days, while days of inventory also rose 2 days to 85 days primarily due to N5 wafer prebuild.

Now let me make a few comments on cash flow and CapEx. During the second quarter, we generated about TWD 187 billion in cash from operations, spent TWD 167 billion in CapEx and distributed TWD 65 billion for third quarter of 2020 cash dividend. Short-term loans increased TWD 4 billion, while bonds payable increased by TWD 137 billion. Overall, our cash balance increased TWD 83 billion to TWD 748 billion at the end of the quarter.

In U.S. dollar terms, our second quarter capital expenditures totaled USD 5.97 billion.

I have finished my financial summary. Now let's turn to our third quarter guidance. Based on the current business outlook, we expect our third quarter revenue to be between USD 14.6 billion and USD 14.9 billion, which represents an 11% sequential increase at the midpoint.

Based on the exchange rate assumption of USD 1 to TWD 27.9, gross margin is expected to be between 49.5% and 51.5%, operating margin between 38.5% and 40.5%.

This concludes my financial presentation. I will turn the microphone over to our CEO, C.C.

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**C. C. Wei** - *Taiwan Semiconductor Manufacturing Company Limited - CEO*

Thank you, Wendell. We hope everybody is staying safe and healthy during this time. First, let me start with TSMC's long-term growth outlook and investment plan. We are witnessing a structural increase in underlying semiconductor demand as the multiyear megatrend of 5G- and HPC-related applications are expected to fuel massive increase in computation power and greater need for energy-efficient computing, which will require leading-edge technologies.

COVID-19 has also fundamentally accelerated the digital transformation, making semiconductors more pervasive and essential in people's lives. With our technology leadership, manufacturing excellence and customer trust, we are well positioned to capture the structural growth from the favorable industry megatrend with our differentiated technologies.

We now expect our long-term revenue CAGR from 2020 to 2025 to be near the high end of our 10% to 15% CAGR range in U.S. dollar terms.

In the near term, we continue to observe both short-term imbalances in the supply chain driven by the need to ensure supply security, as well as a structural increase in long-term demand. While the short-term imbalance may or may not persist, we expect our capacity to remain tight throughout the year and into 2022 fueled by strong demand for our industry-leading advanced and special technologies.

For the full year of 2021, we now forecast the overall semiconductor market excluding memory to grow about 17% while foundry industry growth is forecast to be about 20%.

We now expect -- for TSMC, we are confident we can outperform the foundry revenue growth and grow above 20% in 2021 in U.S. dollar terms.

To address the structural increase in long-term market demand profile, TSMC is working closely with our customer to plan our capacity and investing in leading-edge and specialty technologies to support their demand. Our capital investment decisions are based on 4 disciplines, that is: technology leadership, flexible and responsive manufacturing, retaining customers' trust and earning the proper return.

To ensure a proper return from the investment, both pricing and costs are important. TSMC's pricing strategy is strategic, not opportunistic. At the same time, we face manufacturing cost challenges due to increasing process complexity at leading node, new investment in mature nodes, expansion of our global manufacturing footprint and rising materials and basic commodities cost.

Therefore, we are firming up our wafer pricing. We will continue to work closely with our customers to provide our value. We will also continue to work diligently with our suppliers to deliver on cost improvement. By taking such actions, we believe we can continue to earn proper returns that enable us to invest to support our customers' growth and deliver long-term profitable growth for our shareholders.

Next, let me talk about automotive supply update. TSMC has actively taken steps throughout the first half of this year, and we will continue to do so in the second half to address the chip supply challenges for our automotive customers. The automotive supply chain is long and complex with its own inventory management practices.

From chip production to car production, it takes at least 6 months to reach the automotive OEMs with several tiers of suppliers in between. However, we have worked dynamically with other customers to reallocate our wafer capacity to support the worldwide automotive industry. In first half of this year, we successfully increased our output for MCUs, one of the key components in automotive semiconductor products, by about 30% as compared to first half 2020. For the full year, we expect to increase output for MCUs by close to 60% over the 2020 level which also represents about a 30% increase over the 2018 pre-pandemic level.

By taking such actions, we expect the automotive component shortage from semiconductor to be greatly reduced for TSMC customers starting this quarter.

Now let me talk about the N5 and N4 progress. TSMC's N5 is the foundry industry's most advanced solution with the best PPA. N5 is already in its second year of volume production with yields well on track. N5 demand continued to be strong, driven by smartphone and HPC applications and we expect N5 to contribute around 20% of our wafer revenue in 2021.

To further enhance our 5-nanometer family's performance, power and density improvements for the next wave 5-nanometer products, we introduced N4 technology, which is a straightforward migration from N5 with comparable design rules. N4 risk production will begin this quarter and volume production in 2022. Thus, we expect demand for our N5 family to continue to grow in the next several years, driven by the robust demand for smartphone and HPC applications.

Finally, I will talk about the N3 status. N3 will be another full scaling from our N5 and will use FinFET transistor structure to deliver the best technology maturity, performance and cost for our customers. Our N3 technology development is on track with good progress. We have developed a complete platform support for both HPC and smartphone applications of N3. We continue to see a high level of customer engagements at N3 and expect more new tape-outs for N3 for the first year as compared with N5.

Risk production is scheduled in 2021, and production will start in second half of 2022. Our 3-nanometer technology will be the most advanced foundry technology in both PPA and transistor technology when it is introduced.

With our technology leadership and strong customer demand, we are confident that both N5 and N3 will be large and long-lasting nodes for TSMC and become an important driver of our long-term growth.

Now let me turn over the microphone to Wendell.

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**Wendell Huang** - *Taiwan Semiconductor Manufacturing Company Limited - VP & CFO*

Thank you, C.C. Let me start by making some comments on our near-term demand and inventory. We concluded our second quarter with revenue of TWD 372.1 billion or USD 13.3 billion, slightly above our guidance mainly due to better demand from HPC, IoT and automotive-related applications than our forecast 3 months ago.

Moving into third quarter 2021. We expect our business to be supported by strong demand for our industry-leading 5-nanometer and 7-nanometer technologies driven by all 4 growth platforms, which are smartphone, HPC, IoT and automotive-related applications.

On the inventory side, we expect our fabless customers' overall inventory to exit second quarter of '21 at a healthy level. We expect our customers and the supply chain to gradually prepare higher levels of inventory in the second half of the year as compared to the historical seasonal level, given the industry's continued need to ensure supply security following supply chain disruptions due to COVID-19 and uncertainties brought about by geopolitical tensions.

Next, let me talk about our profitability. Our second quarter gross margin of 50% was slightly below the midpoint of our guidance, mainly due to an unfavorable foreign exchange rate. Our gross margin guidance provided 3 months ago was based on exchange rate assumption of USD 1 to TWD 28.4, whereas the actual second quarter exchange rate was USD 1 to TWD 28.01. This created about 0.5 percentage point difference in our actual second quarter gross margin versus our original guidance.

In other words, if the exchange rate had maintained at \$1 to TWD 28.4, our second quarter gross margin would have been 50.5%. Based on the exchange rate assumption of USD 1 to TWD 27.9, we have just guided third quarter 2021 gross margin to increase by 0.5 percentage point sequentially to 50.5% at the midpoint, mainly due to better back-end profitability.

Despite the rapidly rising depreciation costs and unfavorable foreign exchange rate, we are able to maintain our gross margin at about above 50% in both second quarter and third quarter. Although a higher level of capital intensity is necessary in the near term as we are accelerating our investment pace in anticipation of the strong growth that will follow, we expect to continue to earn a similar level of long-term return.

Our long-term financial objectives remain unchanged. We reiterate the long-term gross margin of about above 50% is achievable with operating margin to be above 39% and ROE to be above 20% through the cycle.

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Now let me make some comments on our cash dividend distribution policy. TSMC remains committed to sustainable cash dividends on both an annual and quarterly basis. In June, TSMC's Board of Directors approved the distribution of a TWD 2.75 per share cash dividend for the first quarter of 2021, which will be distributed in October 2021. Therefore, TSMC shareholders will receive a total of TWD 10.25 cash dividend per share in 2021. That also means shareholders will receive at least TWD 11 per share cash dividend for 2022 and the quarterly cash dividend is expected to be at least TWD 2.75 per share.

Now let me turn the microphone over to our Chairman, Mark.

**Mark Liu** - *Taiwan Semiconductor Manufacturing Company Limited - Chairman*

Thank you. Thank you, Wendell, and good afternoon, everyone. Today, I will talk about TSMC's global manufacturing footprint. TSMC's mission is to be the trusted technology and capacity provider for the global logic IC industry for years to come. TSMC always treat our customers as partners. We do not compete with our customers. We grow our business by unleashing our customers' innovations and enabling their success. We earn our business by providing solid values, by providing industry-leading technologies, the world's largest logic capacity and efficient and cost-effective manufacturing to our customers, while maintaining trusting relationship with them.

In our capital investment, our responsibility as TSMC management is to make the best decision in the interest of the company and our customers. And our fiduciary duty is to our shareholders.

As the need for semiconductor infrastructure security has increased in recent years, we are expanding our global manufacturing footprint to sustain and enhance our competitive advantages and to better serve our customers in the new geopolitical environment.

In Taiwan, we are building capacity for N5 and N3 in Tainan Science Park. Due to the strong customer demand, we have further expand -- plan to expand in Northern, Central and Southern Science Parks in Taiwan. And Taiwan will continue to be the home base and center of R&D for TSMC. As the initial phase of volume production of a leading-edge technology has to be in close proximity and closely coupled with R&D fab due to massive collaborative engineering activities, our leading node will continue to be ramped in Taiwan as well.

In the U.S., we are increasing our presence with an advanced 12-inch semiconductor fab in Arizona and the progress is well on track with our plan. We are actively in a fast-learning phase to optimize the operating efficiency for the U.S. fab.

The first wave of U.S.-hired engineers arrived Taiwan in late April for training on 5-nanometer technology. Construction of the fab has already begun with equipment moving in scheduled for second half 2022. Phase 1 volume production of 20,000 wafer per month of 5-nanometer technology will begin in first quarter '24. At that time, our 5-nanometer family will still be the most advanced high-volume production technology commercially available in the U.S.

Our customers welcome us to build capacity in the U.S. and pledged their strong support and business commitments. Therefore, we do not rule out the possibility of a second phase of expansion to meet our customers' strong demand.

In China, as our fab construction in Nanjing has already completed in 2017, we have completed the Phase 1 volume ramp in third quarter 2020, now reaching 25,000 wafer per month capacity of 16-nanometer technology. We are further expanding our presence in Nanjing with 28-nanometer technology to support our customers' urgent needs with volume production beginning in second half 2022 and reaching 40,000 wafer per month capacity by mid-2023.

For the long term, we forecast 28-nanometer will be the sweet spot for our embedded memory applications and our structural demand for 28-nanometer will be strongly supported by multiple specialty technologies.

Our global manufacturing expansion strategy is based on customer needs, business opportunities, operating efficiencies and cost economic considerations. While overseas fab are not initially able to match the cost of our manufacturing operations in Taiwan, we will work with governments to minimize the cost gap to ensure we start with a level playing field. We are working closely with our customers to firm up our wafer pricing to reflect the cost increases and ensure we earn a proper return. We will work diligently on enhancing our operations and service capabilities and optimize our efficiencies in overseas locations to continue to provide technology leadership with efficient and cost-effective manufacturing for our customers.

By taking such steps, we believe an expansion of our global manufacturing footprint will enable us to reach global talent, better serve our customers' needs, earn the proper return from our investment and deliver long-term profitable growth for our shareholders.

Thank you for your attention.

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**Jeff Su** - Taiwan Semiconductor Manufacturing Company Limited - Director of IR

Thank you, Chairman. This concludes our prepared statements. (Operator Instructions) Should you wish to raise your questions, I will translate it to English before our management answers your question. (Operator Instructions) Now let us begin the Q&A session. Operator, can we please proceed with the first caller on the line?

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## QUESTIONS AND ANSWERS

### Operator

Yes. The first caller, Gokul Hariharan, JPMorgan.

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**Gokul Hariharan** - JPMorgan Chase & Co, Research Division - Head of Taiwan Equity Research and Senior Tech Analyst

Maybe my first question I would focus on the semiconductor supply and demand. C.C., you mentioned that you're expecting demand to still remain extremely strong, supply to remain tight through end of this year potentially through next year as well.

Could you talk about when do you expect supply and demand to come back into balance? Do you see a situation where your customers go into a bit of an inventory correction mode sometime soon? Or you think that the structurally higher inventory is something that is likely to last for a much longer period of time than what originally the market thought?

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**Jeff Su** - Taiwan Semiconductor Manufacturing Company Limited - Director of IR

Okay. Gokul, let me summarize your first question. Gokul's first question is on the semiconductor supply-and-demand outlook. He notes that C.C. has said our capacity will be tight throughout this year and into 2022.

All right. So let me summarize Gokul's question again on semiconductor supply and demand. He's wondering or asking, when do we see supply and demand in the semiconductor coming back into the balance? Is there a risk of an inventory correction anytime soon? And how long can a higher level of inventory continue?

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**C. C. Wei** - Taiwan Semiconductor Manufacturing Company Limited - CEO

Well, Gokul, let me answer your question. Let's -- let me share with you our perspective on the shortage right now. The current semiconductor capacity shortage is being driven by both a structural increase in long-term market demand and also a short-term imbalance in the supply chain due to uncertainties from COVID-19 and geopolitical tensions. And that may or may not persist.

We do not rule out the possibility of an inventory correction in the future, but we expect our capacity will remain tight throughout this year and extend at least into 2022. But let me share with you also that even inventory correction to occur, we believe it will be less volatile than previous downturn as our underlying structural megatrend of 5G-related and HPC application will continue. Do I answer your question?

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**Jeff Su** - Taiwan Semiconductor Manufacturing Company Limited - Director of IR

Gokul, does that address your first question? And do you have a second question, if so?

All right. Operator, I think we have lost Gokul. Maybe we'll move on to the next caller first.

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**Operator**

Yes. The next one is Randy Abrams, Credit Suisse.

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**Randy Abrams** - *Crédit Suisse AG, Research Division - MD and Head of Taiwan Research in the Equity Research Department*

I wanted to ask the question on the trend of cost per transistor. I'm curious for 5-nanometer and 3-nanometer, how you're seeing continued improvement?

And for the customer motivation to migrate, how is that shifting between how our power performance density and cost versus also increasingly seek out the back-end system level integration?

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**Jeff Su** - *Taiwan Semiconductor Manufacturing Company Limited - Director of IR*

Okay. Randy, let me summarize your first question. Your first question is on the cost per transistor. Randy wants to know what is the cost per transistor trend at 5-nanometer and 3-nanometer. And also what do -- I guess, Randy, your question is sort of what are the customers value -- or evaluate when they look at the technologies as well. Is that correct?

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**Randy Abrams** - *Crédit Suisse AG, Research Division - MD and Head of Taiwan Research in the Equity Research Department*

Yes, right, between power performance density versus cost and also back-end integration.

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**Jeff Su** - *Taiwan Semiconductor Manufacturing Company Limited - Director of IR*

Okay.

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**Mark Liu** - *Taiwan Semiconductor Manufacturing Company Limited - Chairman*

Randy. No, actually, today, the technology has getting more complex than the simple scaling. Actually, we work with our customers very closely and we have been working on the performance and energy efficiency of a technology. And we took several approach, of course, material innovation, transistor structure innovation. We also, in recent generations, we work heavily on the design and technology cooperation. And also more recently, we work on the 3D ICs.

All these innovations combined is to deliver the value for our customer to improve the system performance and the system's power efficiency. And TSMC is at the forefront of delivering this value and as evidenced by the strong demand and continued technology migration at 5 to 3. So in doing that, we believe we can continue earn a proper return for our investment. Thank you, Randy.

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**Randy Abrams** - *Crédit Suisse AG, Research Division - MD and Head of Taiwan Research in the Equity Research Department*

Okay. My second question, if you could give an update on the 5-nanometer where there's still some dilution. Maybe how much dilution you see in the second half? And update on how you see it trending towards the corporate gross margin.

And as we look to next year, if 3-nanometer ramping late in the year, could we see a favorable like a bit more of a sweet spot for profitability as you have a more mature 5-nanometer, but not a new node yet ramping?



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**Wendell Huang** - *Taiwan Semiconductor Manufacturing Company Limited - VP & CFO*

Okay. Randy, this is Wendell. Let me answer your question. The 5-nanometer contribution to our revenue will be much higher this year compared to last year. Therefore, we expect that the margin dilution from N5 this year will be between 2 to 3 percentage points.

Now we also expect that N5, like previous nodes, will be able to reach -- the margin will reach the corporate average in about 7 to 8 quarters.

With respect to 2022, it's a bit too early to talk about it. But we believe our long-term gross margin target of 50% continues to be achievable.

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**Jeff Su** - *Taiwan Semiconductor Manufacturing Company Limited - Director of IR*

Okay. Thank you, Randy.

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**Operator**

Yes. And the next one is Bruce Lu from Goldman Sachs.

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**Bruce Lu** - *Goldman Sachs Group, Inc., Research Division - Research Analyst*

I think a lot of your customers have like different supply chain management policies. A lot of your customers signed a long-term contract with other foundry players with favorable pricing and payment terms. So does TSMC expect this will become the new norm for the foundry industry? Does the industry-wide profit pool become bigger and the earnings fluctuation will be less in the future?

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**Jeff Su** - *Taiwan Semiconductor Manufacturing Company Limited - Director of IR*

Okay. Thank you, Bruce. Let me summarize your first question. Bruce's first question is about the semiconductor supply chain, and he's observed that a lot of customers seem to be signing long-term contracts with foundries. So do we expect this to be the new norm in the future? And could this drive a bigger or larger industry-wide profit pool?

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**C. C. Wei** - *Taiwan Semiconductor Manufacturing Company Limited - CEO*

Okay. Bruce, let me answer the question. We are not able to comment on specific business terms with customers. However, we are working closely with our customers on different ways to secure their commitment. And customers understand our effort to support their growth. And if we plan our capacity well based on the structural increase in the long-term market demand profile, we believe our utilization and profitability can be maintained.

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**Jeff Su** - *Taiwan Semiconductor Manufacturing Company Limited - Director of IR*

Okay. Thank you. Bruce, do you have a second question?

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**Bruce Lu** - *Goldman Sachs Group, Inc., Research Division - Research Analyst*

Sure. So I want to focus on the automotive like automotive revenue is roughly less than \$2 billion in 2020 out of a \$40 billion market. So with most of the automotive IDM companies are passive in capacity expansion, this creates a big addressable market for the foundry. So what is the addressable market for foundry in the automotive semi industry in the coming years?

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**Jeff Su** - *Taiwan Semiconductor Manufacturing Company Limited - Director of IR*

Okay. Bruce, let me summarize your second question. So Bruce is asking about the longer-term outlook for the automotive industry. Automotive was less than \$2 billion of our revenue last year, but he points out the automotive TAM is about \$40 billion. So he's wondering about sort of the long-term TAM addressable market for TSMC.

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**C. C. Wei** - *Taiwan Semiconductor Manufacturing Company Limited - CEO*

Well, let me answer again. We are quite positive on the long-term trend of the semiconductors in -- semiconductor content in automotive as the trend towards safer, greener and smarter vehicles will continue to drive silicon content increase as well as the demand for advanced and specialty technology, both.

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**Jeff Su** - *Taiwan Semiconductor Manufacturing Company Limited - Director of IR*

Okay. Thank you. Does that answer your question, Bruce?

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**Bruce Lu** - *Goldman Sachs Group, Inc., Research Division - Research Analyst*

Can we have somehow like some specific numbers? Can you quantify that a little bit?

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**C. C. Wei** - *Taiwan Semiconductor Manufacturing Company Limited - CEO*

We cannot forecast in the future very accurately, right? I mean that is so dynamic. But let me assure you that silicon content will be very important and will be increased.

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**Jeff Su** - *Taiwan Semiconductor Manufacturing Company Limited - Director of IR*

Thank you, Bruce.

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**Operator**

The next one is a question from Gokul Hariharan, JPMorgan.

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**Gokul Hariharan** - *JPMorgan Chase & Co, Research Division - Head of Taiwan Equity Research and Senior Tech Analyst*

Yes, let me ask my second question. My second question is that on your 3-nanometer business, clearly the market is expecting you to make a lot more inroads into the HPC segment. One of your existing IDM customers have redoubled their efforts to get back into the foundry business. Could you talk a little bit about how you manage this kind of what they call as co-competition, competition as well as cooperation? How does TSMC think about this when it thinks about capacity allocation, given that HPC is now becoming a very important driver for growth and this is probably the biggest HPC customer out there in terms of revenue size?

**Jeff Su** - Taiwan Semiconductor Manufacturing Company Limited - Director of IR

Okay. Gokul, thank you for your second question. Let me summarize. He points out that HPC is -- seems to become a larger and larger contributor or driver, particularly at our 3-nanometer. He also points out that existing IDM customers are redoubling their efforts. So his question is really how -- I guess, how do we manage this duality? How do we manage the capacity allocation and the relationship?

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**C. C. Wei** - Taiwan Semiconductor Manufacturing Company Limited - CEO

Okay. Let me answer the question by, first, you mentioned that IDM is our important customer. Let me say that. And we will collaborate in some area and might competing in other areas. But let me explain again, TSMC is everybody's foundry and we support all our customers openly and fairly. We will allocate the necessary engineering resources to ensure all of our customers' product success, both existing customer and for the future customer.

How to plan our capacity to support? Actually our capacity planning is based on the long-term market demand and thus is underpinned by the industry megatrend, okay? Does that answer your question, Gokul?

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**Gokul Hariharan** - JPMorgan Chase & Co, Research Division - Head of Taiwan Equity Research and Senior Tech Analyst

So maybe just one follow-up. Do you require a lot more assurance in terms of demand, solidity and demand longevity from IDM customers given they are also competing on process technology with you compared to pure fabless?

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**Jeff Su** - Taiwan Semiconductor Manufacturing Company Limited - Director of IR

So Gokul is asking whether that we would require more longer-term assurance from our IDM customers versus our fabless customers.

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**C. C. Wei** - Taiwan Semiconductor Manufacturing Company Limited - CEO

We will not specifically comment on that on a certain customer, okay?

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**Jeff Su** - Taiwan Semiconductor Manufacturing Company Limited - Director of IR

Okay. Thank you, Gokul, and sorry for the disruption.

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**Operator**

Next one to ask question, Charlie Chan from Morgan Stanley.

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**Charlie Chan** - Morgan Stanley, Research Division - Technology Analyst

First of all, I would like to thank TSMC for the donation of the vaccine to Taiwan. I think that ensures business continuity of TSMC and also global semi supply chain.

And my question is about still your gross margin trend. So first of all, is your 3D IC or advanced packaging. It seems like Wendell mentioned that the back end product possibilities are getting better in 3Q, I'm not sure if that's true. So the question is that currently the percentage of advanced packaging of TSMC's revenue.

And would the company still believe 3D packaging can still outgrow the wafer business and whether they would create a margin dilution. So the first question is about the 3D advanced packaging.

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**Jeff Su** - Taiwan Semiconductor Manufacturing Company Limited - Director of IR

Okay. Let me summarize your question, Charlie. You're asking about our 3D IC business. Charlie is asking the back-end profitability that Wendell cited improvement in the third quarter. Is this the truth?

And then also sort of the outlook for our 3D IC business in comparison to our overall business. And whether 3D IC business will dilute our profitability.

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**Wendell Huang** - Taiwan Semiconductor Manufacturing Company Limited - VP & CFO

Okay, Charlie. First of all, the gross margin that I was talking about, improvement of back-end service in the third quarter actually is a seasonal factor. As you know, our back-end services has seasonality. So second half normally has a higher gross margin. But longer term, we expect its margin to continue to improve although it's still not as high as a gross margin of our wafer revenue. But it has a lower asset capital intensity, therefore, the returns from back-end services is satisfactory.

In terms of a revenue percentage, we expect back-end services to account for about 8% of our total revenue this year. And in the next 5 years, we expect it will grow slightly higher than the corporate average.

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**Jeff Su** - Taiwan Semiconductor Manufacturing Company Limited - Director of IR

Okay. Thank you, Wendell. Do you have a second question, Charlie?

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**Charlie Chan** - Morgan Stanley, Research Division - Technology Analyst

Yes, I do. Yes, my next question is about the long-term gross margin trend, right? Because we did create some debate about the thrust -- or the higher CapEx intensity, your bargaining power against different vendors and those customers. So really, I want to ask this openly to company management. Does TSMC believe you have acquired the monopoly of the leading edge in the industry, why and why not?

And if yes, do you think you have the monopoly, why can not TSMC charge higher wafer price to cover the increase of CapEx intensity?

And lastly, if the company were to -- need to choose between the margin sustainability and also the market share, what would be your choice?

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**Jeff Su** - Taiwan Semiconductor Manufacturing Company Limited - Director of IR

Okay. Let me summarize your second question, Charlie. So Charlie is asking about the long-term gross margin trend and bargaining power. And he is wondering -- he wants to know whether we see or believe we have a monopoly at the leading edge or not. And if we do, I guess, part of your question, Charlie, is then how -- pricing. And then also, if we have to choose between market share and profitability, how should we choose?

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**C. C. Wei** - Taiwan Semiconductor Manufacturing Company Limited - CEO

Charlie, let me answer this question. First, we do have a very high market share on the leading-edge technology node. But our pricing strategy is strategic, and we don't take an opportunistic approach.

And it's far away from you say that we try to bargaining power. In fact, we work with our customers closely and we want to help them to be successful while we get a proper return. That's all I can answer for you for our pricing.

And looking ahead, we continue our practice, try our best to hear our customers, to grow and we want to get the proper return. So that's why we are firming up our wafer pricing. And we are confident that we can get our gross margin about 50% or above in the long term.

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**Jeff Su** - *Taiwan Semiconductor Manufacturing Company Limited - Director of IR*

Okay. Thank you. All right.

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**Operator**

The next one to ask a question, Nicolas Gaudois from UBS.

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**Nicolas Gaudois** - *UBS Investment Bank, Research Division - Head of APAC Technology Research, APAC Tech Strategist & Global Sector Strategist*

Earlier, you referred to your expansion of capacity at 28-nanometer in Nanjing for about 16,000 -- 15,000 wafer per months. If the demand in trailing edge is effectively structurally higher and tying up to the leading edge, are we going to see additions in capacity in the trailing edge becoming more of a recurring feature for TSMC as for the rest of the industry going forward?

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**Jeff Su** - *Taiwan Semiconductor Manufacturing Company Limited - Director of IR*

Okay, Nick, let me try to summarize your first question. So Nick is saying that, as Chairman said, we are expanding our capacity in Nanjing for 28-nanometer. So his question is that do we see the demand at the trailing edge or the mature nodes becoming structurally higher? And then will we consider or add capacity in those trailing edge nodes?

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**Mark Liu** - *Taiwan Semiconductor Manufacturing Company Limited - Chairman*

Okay. This is Mark. Let me answer your question. Our strategy more recently in mature node is to work closely with our customer to develop specialty technology solution. This is not described by the numbers. Actually, we are leading in many 28-nanometer specialty technologies and we can meet their requirement and create differentiated long-term value for them.

And we expect this structural demand will continue. And of course, we'll focus on our investment on specialty technology to support that. So for the manufacturing greenfield, nodes expansion. And we do not rule it out, we will build case by case as long as the economics can justify and customer commitment can be secured.

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**Jeff Su** - *Taiwan Semiconductor Manufacturing Company Limited - Director of IR*

Okay. Thank you. Nick, do you have a second question?

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**Nicolas Gaudois** - *UBS Investment Bank, Research Division - Head of APAC Technology Research, APAC Tech Strategist & Global Sector Strategist*

Yes. Very quickly. Thank you, Jeff. A clarification effectively for the investment in the U.S., you say the equipment moving in, in H2 '22 and then production in Q1 '24. A reasonably long runway, I guess. So is that because new fab you need to obviously run preproduction, that qualification time will be reasonably low?

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**Mark Liu** - Taiwan Semiconductor Manufacturing Company Limited - Chairman

Yes. We make -- prepared a little bit longer preparation time just because that's a new semiconductor environment for our operations. But of course, we will continue to compress the schedule as much as we can, yes.

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**Jeff Su** - Taiwan Semiconductor Manufacturing Company Limited - Director of IR

Okay. Thank you, Nick.

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**Operator**

The next one to ask question, Roland Shu from Citigroup.

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**Roland Shu** - Citigroup Inc., Research Division - Director & Head of Regional Semiconductor Research

My first question is for your Japan R&D center. So it is stated more than 20 Japanese companies will work with you at your 3D IC R&D center in Japan. So I want to know what are the roles and responsibility for every party including yourself in this Japan R&D center?

And also, do you plan to start 3D IC packaging mass production in Japan one day? And do you plan to build a wafer fab in Japan for foundry business going forward?

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**Jeff Su** - Taiwan Semiconductor Manufacturing Company Limited - Director of IR

Okay. Roland's first question. He wants to know about our 3D IC research center in Japan. There's more than 20 companies involved according to him. So what are the roles and responsibilities of that?

And also, will we build a packaging -- 3D IC packaging integration facility in Japan. And will we consider a wafer fab in Japan. So 3 parts to this question.

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**C. C. Wei** - Taiwan Semiconductor Manufacturing Company Limited - CEO

Okay. Roland, let me answer your question. First, yes, there is more than 20 membership to join this Japan's 3D ICs research center. In fact, what's the role and responsibility, TSMC is in charge of this one. And we also -- in technology, we're also in charge of the integration for all the major partner together, too, so that we can be successful in the most advanced packaging technology, which includes TSMC's 3D IC and some of our partner's advanced material and our partner's most advanced substrate technology. Everything put together, which is necessary for the future HPC's application that we needed.

Do we have a plan to mass production in the 3D IC in Japan? It's not in our current planning yet, okay? And what's your next question?

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**Jeff Su** - Taiwan Semiconductor Manufacturing Company Limited - Director of IR

And will we consider...

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**Roland Shu** - Citigroup Inc., Research Division - Director & Head of Regional Semiconductor Research

How about the wafer fab, yes.

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**C. C. Wei** - Taiwan Semiconductor Manufacturing Company Limited - CEO

The wafer fab, we are -- actually, let me say that we are -- we do not rule out any possibility. And in Japan, we are in due diligence process now to expect to do that wafer fab, let me say that, clearly.

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**Roland Shu** - Citigroup Inc., Research Division - Director & Head of Regional Semiconductor Research

Okay. My second question is Mark also said that the key concern to build a fab overseas is considering the cost gap, and you are working with the governments to close the cost gap. However, recently there were some noises in the U.S. to request the U.S. government to invest wisely in domestic companies to support U.S. authority. So it changed U.S. government's plan and lead to fail to close the cost gap to TSMC in U.S. operations. And how are you going to close the cost gap if there is no adequate support from the U.S. government, okay?

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**Jeff Su** - Taiwan Semiconductor Manufacturing Company Limited - Director of IR

Okay. Let me summarize Roland's second question, it's about our U.S. fab and the cost gap. He points out that recently there is some discussion for U.S. incentives to invest in domestic companies. And so therefore, if this were to be the case, how would that affect TSMC and how would we manage the cost gap?

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**Mark Liu** - Taiwan Semiconductor Manufacturing Company Limited - Chairman

Okay. Roland, right? This is -- I think this current event is still developing. You know that in U.S., the originally proposed CHIPS for America Act has gained bipartisan support. And we are very happy that in the Senate they passed a bill of U.S. Innovation and Competition Act already passed in Senate. Right now it's in the hands of the House of Representatives, and we are very optimistic that they will gain bipartisan support.

The reason we -- the bipartisan support for this is to create a level playing field for the semiconductor fab investment in U.S. so that there will be a renewal fab industry in the U.S. Of course, how well it can be done in operation up to each company to do the operations well. And we are still learning the cost structure in the U.S. But in the meantime, in addition to take on this level playing field opportunities and further on, the operating cost will have to be shared with our customers. So that's a part of our firm up price -- firming up pricing, including the increased global manufacturing footprint. So we believe then...

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**Roland Shu** - Citigroup Inc., Research Division - Director & Head of Regional Semiconductor Research

So pricing from the other companies?

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**Mark Liu** - Taiwan Semiconductor Manufacturing Company Limited - Chairman

Yes. Yes. We believe in that way, we can continue to sustain our profitability as before.

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**Jeff Su** - Taiwan Semiconductor Manufacturing Company Limited - Director of IR

Okay. Thank you, Chairman, and thank you, Roland.

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**Operator**

Next one, we have Laura Chen from KGI.

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**Laura Chen** - *KGI Securities Co. Ltd., Research Division - Research Analyst*

Can you hear me?

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**Jeff Su** - *Taiwan Semiconductor Manufacturing Company Limited - Director of IR*

Yes, we can hear you, Laura.

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**Laura Chen** - *KGI Securities Co. Ltd., Research Division - Research Analyst*

First of all, I just want to ask about our global expansion plan. Can you give us more details about our expansion plan other than like the advanced node in the U.S.? Mark just mentioned that the 28-nanometer will be the sweet spot. So will we expand more other than China or other regions, would we consider that? And how would that impact our already announced USD 100 billion CapEx for the next 3 years? That's my first question.

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**Jeff Su** - *Taiwan Semiconductor Manufacturing Company Limited - Director of IR*

Okay, Laura, let me summarize your question. Your question is about our global manufacturing footprint. And I think your question is on our mature node. Do we have plans for further expansion of mature nodes in different locations? And if so, how will this affect our CapEx in the next few years?

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**Laura Chen** - *KGI Securities Co. Ltd., Research Division - Research Analyst*

Yes.

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**Mark Liu** - *Taiwan Semiconductor Manufacturing Company Limited - Chairman*

Yes. Laura, I think several project is still under planning. We do not rule out the possibility in Japan. Actually, C.C. just mentioned that we are in the due diligence process now to have a specialty technology fab in Japan. But of course, the decision is still too early to disclose because the final decision will be based on our customer needs, operating efficiency, evaluation and cost economics. So for those projects, we have not included into the \$100 billion CapEx budget. Okay?

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**Laura Chen** - *KGI Securities Co. Ltd., Research Division - Research Analyst*

Okay, very clear. Yes. And my second question is about the 16- and 12-nanometer. We know that the current supply is also quite tight and the client demand is very strong, particularly for the RF transceiver, et cetera. So I'm just wondering, do we also have the plan to expand on 16 and 12?

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**Jeff Su** - *Taiwan Semiconductor Manufacturing Company Limited - Director of IR*

Okay. And so Laura's second question continues to more specifically on 16-nanometer/12-nanometer. The supply continues to be tight, demand is very strong. Do we have any plans to expand at this node?



**C. C. Wei** - Taiwan Semiconductor Manufacturing Company Limited - CEO

Well, Laura, let me answer this question. We -- again, this is the kind of mature node for TSMC. And we will expand our capacity with the customer's commitment. And also, we have to consider the economics. And so if everything is positive, in fact, we will consider to expand the capacity to support our customer actually.

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**Jeff Su** - Taiwan Semiconductor Manufacturing Company Limited - Director of IR

Okay. Thank you, Laura.

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**Operator**

Next one, we have Brett Simpson from Arete Research.

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**Brett Simpson** - Arete Research Services LLP - Senior Analyst

I had a question on gross margins. I guess you've talked about 50% gross margin as a long-term target for quite some time now. And I understand there's been FX headwinds and the 5-nanometer ramp as a headwind. If I look at your big fabless customers, they are delivering structurally much higher gross margins as a result of accessing your leading-edge capacity, particularly in the last 12 months when your gross margins are going down. And I'd just like to ask, given your position in the industry, do you really think 50% is an appropriate level of return. And doesn't your position warrant some structural margin expansion at the gross margin level?

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**Jeff Su** - Taiwan Semiconductor Manufacturing Company Limited - Director of IR

Okay. Brett's first question is about our gross margin. He notes that, of course, we have been facing headwinds from the foreign exchange rate and also the 5-nanometer ramp, which carries some level of dilution. But he points out that our customers' gross margin is, particularly in the last 12 months, has been structurally higher than ours. So he wants to know, given our position, do we think 50% is achievable? Why would it not be something structurally higher? Is that correct, Brett?

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**Brett Simpson** - Arete Research Services LLP - Senior Analyst

Yes. Really whether 50% is an appropriate level of return. Given everyone else is right -- is seeing -- delivering higher gross margins, why wouldn't TSMC look for structurally higher gross margins as well like everyone else?

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**Wendell Huang** - Taiwan Semiconductor Manufacturing Company Limited - VP & CFO

Right. This is Wendell. Let me answer your question. First, if we look at shorter term, you talked about in the last 12 months. Foreign exchange does play a very big role in the gross margin between last year and this year, year-to-date.

Last year, the dollar against NT rate was \$29.43 in average. This year, year-to-date, is 28 -- somewhere around 28. That creates a 2 percentage point difference in gross margin, i.e., if the gross margin -- I mean, if foreign exchange rate stays where it was last year, we would be having a 52% gross margin in the second quarter already. And also, I talked about the dilution from the N5 this year, another 2 to 3 points. So with all these negatives, we still can make 50% in second quarter and the third quarter. That's the short term.

Now longer term, the investment that we are making is for future business growth. At some point of time, at the beginning, we may -- the short-term advanced technology is getting more and more challenging in cost. Then we are working closely with our customers to firm up the wafer pricing

and also working with our suppliers to ensure that the cost improvement can be delivered. And with all these efforts, we still think that 50% is a good target and is achievable.

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**Brett Simpson** - *Arete Research Services LLP - Senior Analyst*

Okay. Thank you, Wendell. And maybe just a follow-up. I noticed your China business grew from 6% of sales in Q2 -- sorry, 6% of sales in Q1 to 11% of sales in Q2. Can you talk about some of the drivers that delivered that upside?

And long term, how do we think about China scaling within your business? Do you think we'll get back to sustainably double-digit percent of sales? And what would drive that?

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**Jeff Su** - *Taiwan Semiconductor Manufacturing Company Limited - Director of IR*

Okay. So Brett's second question is related to our China business. He notes in the near term that China contribution has gone from 6% in the first quarter to 11%. So he wants to know what is driving this.

And then he asked a longer-term question, which is how should we think about our China business over the next few years? And can it return or sustain at an improving or double-digit level?

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**C. C. Wei** - *Taiwan Semiconductor Manufacturing Company Limited - CEO*

Well, Brett, let me summarize it. I think China remains a very strong and growing market. And we have developed a large customer base in China and we'll work with them to grow our business and expect our business from China will continue to increase in all the market sector that we're talking about, smartphone, HPC, IoT and automotive also.

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**Jeff Su** - *Taiwan Semiconductor Manufacturing Company Limited - Director of IR*

And also, Brett's question on the improvement from China from 6% in first quarter to 11% in the second quarter. What is driving that?

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**Wendell Huang** - *Taiwan Semiconductor Manufacturing Company Limited - VP & CFO*

That's because mainly the HPC platform.

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**Jeff Su** - *Taiwan Semiconductor Manufacturing Company Limited - Director of IR*

Okay. Thank you, Brett.

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**Operator**

Next one, we have Charles Shi from Needham & Company.

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**Charles Shi** - *Needham & Company, LLC, Research Division - Associate*

Can you guys hear me?

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**Jeff Su** - Taiwan Semiconductor Manufacturing Company Limited - Director of IR

Yes, we can hear you fine, Charles.

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**Charles Shi** - Needham & Company, LLC, Research Division - Associate

So I want to ask the first question really is about your -- the adoption of your most leading-edge node process. Historically, if I understand correctly, your smartphone platform seems to lead the adoption in the past, at least especially in the first year of the production ramp. And I think you did say that the high-performance computing will be coming increasingly important.

So the question really is about 3-nanometer, which we are about a year away from the mass production. So could high-performance computing, from what you see today, really play a bigger role or even like the leading role in the first ramp of the 3-nanometer especially in the first year? Do you even see like high-performance computing could eventually be like the actual lead adopter of the leading-edge nodes going forward?

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**Jeff Su** - Taiwan Semiconductor Manufacturing Company Limited - Director of IR

Okay. So Charles' first question is about the drivers of leading node adoption. He notes in the past traditionally it's mainly come from smartphones, but HPC also seems to becoming more important. So his question is on N3, do we expect HPC to play a bigger role in the ramp of N3, particularly in the first year? And could N3 become the first adopter or primary adopter?

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**C. C. Wei** - Taiwan Semiconductor Manufacturing Company Limited - CEO

Charles, this is C.C. Wei. Let me answer this one. The N3's first year is ramping up, still smartphone plays the biggest role. Of course, your observation is correct. HPC application is also important and getting more and more important. And in fact, HPC will be our largest revenue driver in the next 5 years. So in the N3 node, in addition to the smartphones, we do expect the HPC's application will become important also. Did that answer your question?

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**Charles Shi** - Needham & Company, LLC, Research Division - Associate

Yes, yes. Excellent. So maybe the second question, I still want to touch upon your global expansion. I know you probably are tired of answering that already, but forgive me, I'm going to ask another one.

You announced your fab in Arizona, which the technology node will be 5-nanometer. And as I understand, 5-nanometer wafers will very likely require your in-house advanced packaging solutions like either InFo, CoWoS or maybe even SoIC going forward. So -- but your current packaging facilities, as I know, are 100% in Taiwan. And I can imagine that if you are really out putting wafers in Arizona for 5-nanometer, based on your current footprint, you got to ship those back to Taiwan for packaging then send back to your customers, which I can imagine it could be a little bit challenging in terms of cost, logistical efficiency.

So I'm not going to ask for a specific plan, but do you kind of foresee maybe you want to set up an advanced packaging facility in Arizona in the near future?

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**Jeff Su** - Taiwan Semiconductor Manufacturing Company Limited - Director of IR

Right. So Charles, I'll shorten your second question. I think Charles is asking in Arizona we are building wafer capacity with 5-nanometer. Will we also consider setting up 3D IC integration capacity or -- in Arizona as well?

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**Mark Liu** - Taiwan Semiconductor Manufacturing Company Limited - Chairman

This is Mark, Charles. I understand your concern. But if you look at the current industry landscape, what you just said is nothing new. Everyone have their wafer produced in one location and packaged in another even including major chip producer in U.S. So for that matter, we do not see and compose any logistical difficulties. We just continue to evaluate, and currently, we do not have that 3D IC fab in Arizona at this point.

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**Jeff Su** - Taiwan Semiconductor Manufacturing Company Limited - Director of IR

Okay. Thank you, Chairman. Thank you.

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**Operator**

Next one, we have Andrew Lu from Sinolink Securities.

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**Andrew Lu** - Sinolink Securities Co., Ltd., Research Division - Semiconductor Analyst

Can you hear me?

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**Jeff Su** - Taiwan Semiconductor Manufacturing Company Limited - Director of IR

Yes.

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**Andrew Lu** - Sinolink Securities Co., Ltd., Research Division - Semiconductor Analyst

Okay. My first question is regarding 3-nanometer ramp-up for second half, starting from second half next year. I recall the 7-nanometer ramp-up in year 2018 second quarter with some revenue contribution and the 5-nanometer in second quarter last year, year 2020. But it seems like 3-nanometers clearly some delay for second half next year. So I want to ask, is that because the technology difficulty, we cannot ramp up in second quarter or we don't have a big customer to use 3-nanometer at the beginning stage that's why we push back the ramp-up in second half next year? That's my first question.

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**Jeff Su** - Taiwan Semiconductor Manufacturing Company Limited - Director of IR

Okay. So Andrew's first question, let me summarize, is asking about our 3-nanometer ramp. He notes that 5-nanometer and 7-nanometer in the past few years basically ramped in the middle of the year. N3, we said the ramp will be in second half of next year. So what is the reason behind this?

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**C. C. Wei** - Taiwan Semiconductor Manufacturing Company Limited - CEO

Andrew, you have a very good observation and you calculate that, yes, about 3 to 4 months is a delay as compared with 5-nanometer. Yes, 3-nanometer technology actually is very complicated and in both processing technology and also the customers' product design. So we work with a customer, and finally, we decided to ramp up in the second half of next year. And this is -- we decided with our customer with the best fit their need.

**Jeff Su** - Taiwan Semiconductor Manufacturing Company Limited - Director of IR

Okay. Thank you.

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**Andrew Lu** - Sinolink Securities Co., Ltd., Research Division - Semiconductor Analyst

Okay. My second question is recently, we believe NXP, Infineon, Renesas earlier either have some power down outage and also the fire resulting their second quarter or first quarter utilization down to almost 0. And recently, we are hearing these guys are back in the utilization rate to 100%. The wafer output may start appear in Q4. Most of these companies are leading company in automotive semiconductor, including MCU. Do we have some concern once these customers are ramping up their own fab and that will result the next year or starting from Q4 the order automotive semiconductor to us will be reduced -- largely reduced.

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**Jeff Su** - Taiwan Semiconductor Manufacturing Company Limited - Director of IR

Okay. So Andrew's second question is on automotive. He asked as IDMs ramp up their production in the second half, are we concerned or do we have concerns that heading into the end of this year or into 2022, that TSMC's automotive customers will greatly reduce their orders to TSMC?

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**C. C. Wei** - Taiwan Semiconductor Manufacturing Company Limited - CEO

Andrew, this is C. C. Wei again. Let me answer your question. A very short answer is that, no, we don't have any concern. The reason is very simple: because of we offer the technology and our customer working closely with us. And for some of the technologies, mostly in the leading edge -- not the leading edge, I'm sorry, it's 55-, 40-nanometer and 28-nanometer that our customers need TSMC's support and the demand will continue to grow. And so we don't worry about once they bring up their fab and then TSMC's demand will be decreased. The answer is no, and remain tight and actually very tight in 2022 also.

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**Jeff Su** - Taiwan Semiconductor Manufacturing Company Limited - Director of IR

Okay. Thank you, Andrew.

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**Operator**

Next one, we have Martin Lau from FSSA.

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**Martin Lau** - First Sentier Investors (Australia) IM Ltd - Managing Partner of FSSA Investment Managers

The first question relates to politics. I counted, you said geopolitical risk 5x during today's call. And someone mentioned about the fact it seems in Taiwan with vaccines are getting even more political. I just wonder, for management, how concerned are you with politics? It seems the U.S. sometimes is fighting against China; China, Taiwan. And what things have you thought about to mitigate, if anything, such political risk?

And also, are your customers concerned when COVID happened in Taiwan, when China from time to time threatened a war against Taiwan? And are your customers concerned that they are so reliant on you?

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**Jeff Su** - Taiwan Semiconductor Manufacturing Company Limited - Director of IR

Okay. So Martin's question is about politics and geopolitical risks. He notes that geopolitical is talked about more and more. His observation is that vaccines in Taiwan has become a political issue as well. So he wants to know how does TSMC manage or mitigate the political risks looking at U.S., China, Taiwan relations?

And do our customers have concerns on things such as the recent increase in COVID or the threat of invasion from China? And how does TSMC manage these risks?

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**Mark Liu** - *Taiwan Semiconductor Manufacturing Company Limited - Chairman*

Martin, this is Mark. Thank you for asking. First of all, the -- on the recent COVID situation in Taiwan, I think the confirmed case has dropped. And of course, the current -- first priority is to get the people of Taiwan get vaccinated upon variants keep coming. But I'm really grateful that us and YongLin and Foxconn come together a humanitarian donation of 10 million doses of vaccine to the Taiwan government, CDC -- Taiwan's CDC and be able to vaccinate our people in Taiwan because TSMC's employees is inevitably embedded in the community of Taiwan, and that is important.

The reason -- you know this could be political in the beginning. But at the end, we completed the contract and we did get support from all sides. So I don't think at the end it's as political anymore. Otherwise, this donation wouldn't be successful.

In a global sense, the geopolitical development is continuing. I think this is a challenge for every company. Every company's management has to deal with it. And -- but I think in the new administration from U.S., I think the development is more predictable, more rule-based. So as long as rule-based, I think it's better for every company to adopt it, too.

So that also prompted the talk I have earlier -- given earlier that the global manufacturing footprint may need to do an adjustment for our customers. Our customers in different countries, their infrastructure, supply security -- semiconductor-related infrastructure, supply security maybe come up a higher priority, and we do that adjusted to it. But of course, there is the customers' needs that we are adjusting it to upon the greater geopolitical development.

As to the invasion of China, let me tell you, nobody -- I mean, everybody wants to have a peaceful Taiwan Strait. And because not only -- because it is to every country's benefit, but also because of the semiconductor supply chain in Taiwan, no one wants to disrupt it. You have a COVID -- only a COVID situation already made a major disruption for the global economy. And I don't think that any disability in Taiwan Strait is any country wish to make it happen. So I'm optimistic on that. Thank you, Martin.

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**Jeff Su** - *Taiwan Semiconductor Manufacturing Company Limited - Director of IR*

Thank you. Do you have a second question, Martin?

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**Martin Lau** - *First Sentier Investors (Australia) IM Ltd - Managing Partner of FSSA Investment Managers*

Yes, yes. Can I follow up with a second one? It's kind of related. You mentioned about global manufacturing. You also mentioned about the need to maintain your highest -- most of your technology in Taiwan because of the proximity to R&D. My understanding is majority of our engineers are from Taiwan.

As you go for this global manufacturing, do you -- can you talk about how you are changing, say, for example, your talent acquisition? Like how you try to get more people outside Taiwan so that maybe over time you can become more manufacturing outside Taiwan?

And also maybe on the Board, I mean, because when I look at the Board, it remains largely Taiwanese. The recent 2 additions, one is Dr. Kung who's a minister; Yancei who's from Delta. Do you see also the Board maybe changing, become more international? Or maybe if I try to propose some debate, have a Mainland Chinese on the Board?

**Jeff Su** - *Taiwan Semiconductor Manufacturing Company Limited - Director of IR*

Okay. So Martin's second question is around talent and Board composition. Basically, with our expanding manufacturing footprint, he wants to know what is our strategy to attract more global talent for TSMC.

And his secondary question is also on the Board. His observation is that we -- the new Board members are primarily only from Taiwan. So will we consider board members from other countries?

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**Mark Liu** - *Taiwan Semiconductor Manufacturing Company Limited - Chairman*

The question about talent. Indeed, I think the -- we have been advocating the talent development in semiconductor field in Taiwan as well as in U.S. I think semiconductor industry talent has been underdeveloped over the past decades. And today, everyone look at the semiconductor as a key economic drivers. So the talent needs to be connected with that. And in Taiwan, I think we have been advocating the government to set up the high-end advanced research colleges across the Taiwan major universities.

In the U.S. and also President Biden talked about semiconductor human infrastructure, that is to develop the human talent in semiconductor through the vast investment of the R&D. So this is catching up in every place. And particularly in Taiwan, we get very strong support from the local government to be able to continue to supply talents in Taiwan.

As far as the Board member, yes, Delta, Yancei has joined a year ago. And more recently, I think this coming shareholder meeting, we will nominate Rafael Reif, who is the President of MIT, to come to our Board. And we hope that it will go through the blessing of our shareholders. And that is a major increment of our corporate governance and particularly in the area of the talent development.

We invited chair -- Board members upon they have a very strong knowledge and experience on the corporate governance. And that is we will continue to look for without any differentiation about nationalities.

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**Jeff Su** - *Taiwan Semiconductor Manufacturing Company Limited - Director of IR*

Okay. Thank you, Chairman. Thank you, Martin.

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**Operator**

Yes. The last one to ask question, Krish Sankar from Cowen and Company.

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**Krish Sankar** - *Cowen and Company, LLC, Research Division - MD & Senior Research Analyst*

I had two of them. The first one, you spoke about investing \$100 billion in CapEx over the next 3 years and how that does not include specialty process nodes like the ones in Japan. I'm kind of curious, can you just be more specific on how much you plan to invest in your U.S. Arizona fab or fab clusters over the next 3 years in terms of CapEx? And then I have a follow-up.

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**Jeff Su** - *Taiwan Semiconductor Manufacturing Company Limited - Director of IR*

Okay. So Krish's first question is about our investment in CapEx looking at the next 3 years. He wants to know how much specifically we are investing in Arizona?

**Mark Liu** - *Taiwan Semiconductor Manufacturing Company Limited - Chairman*

Okay, Chris. We have announced that the Arizona project will be a \$12 billion project. This was announced last year.

**Krish Sankar** - *Cowen and Company, LLC, Research Division - MD & Senior Research Analyst*

Got it. And can you just elaborate how much you plan to do it over the next 3 years?

**Jeff Su** - *Taiwan Semiconductor Manufacturing Company Limited - Director of IR*

So he wants -- Krish is asking how much will we invest in Arizona over the next 3 years.

**Wendell Huang** - *Taiwan Semiconductor Manufacturing Company Limited - VP & CFO*

Yes, \$12 billion.

**Jeff Su** - *Taiwan Semiconductor Manufacturing Company Limited - Director of IR*

Next 3.

**Wendell Huang** - *Taiwan Semiconductor Manufacturing Company Limited - VP & CFO*

Next 3.

**Mark Liu** - *Taiwan Semiconductor Manufacturing Company Limited - Chairman*

Close to.

**Wendell Huang** - *Taiwan Semiconductor Manufacturing Company Limited - VP & CFO*

Well, basically, is next 3 years is about \$8 billion.

**Krish Sankar** - *Cowen and Company, LLC, Research Division - MD & Senior Research Analyst*

Okay. All right. Perfect. And then a quick follow-up. Your auto revenues was 4% of total revenue. What technology node is that predominantly?

**Jeff Su** - *Taiwan Semiconductor Manufacturing Company Limited - Director of IR*

Okay. So Krish's second question is on automotive. It was 4% of our revenue. What particular specific nodes is automotive using?

**C. C. Wei** - *Taiwan Semiconductor Manufacturing Company Limited - CEO*

Krish, I think I have mentioned that automotive MCU is the biggest one that we have and it's in 55-, 40- and 28-nanometer with the majority still in 55 and 40. And in the next 2 to 3 years, it will be moved to 28-nanometer. That's in our current plan, and we are working with our customers on that.



**Jeff Su** - *Taiwan Semiconductor Manufacturing Company Limited - Director of IR*

Thank you, C.C. Thank you, Krish. All right. This concludes our Q&A session.

Before we conclude today's conference, please be advised that the replay of the conference will be accessible within 4 hours from now. And the transcript will become available 24 hours from now. Both of these, which will be available through TSMC's website at [www.tsmc.com](http://www.tsmc.com).

So thank you for joining us today. We hope everyone continues to stay safe and healthy, and we hope you will join us again next quarter. Thank you, and have a good day or good evening.

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