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PRESENTATION

Elizabeth Sun ***Taiwan Semiconductor Manufacturing Company Limited - Senior Director of Corporate Communication Division***

(foreign language) Welcome to TSMC's Third Quarter 2018 Earnings Conference and Conference Call. This is Elizabeth Sun, TSMC's Senior Director of Corporate Communications and your host for today. Today's event is webcast live through TSMC's website at www.tsmc.com. (Operator Instructions) As this conference is being viewed by investors around the world, we will conduct the event in English only.

The format for today's event will be as follows. First, TSMC's Senior Vice President and CFO, Ms. Lora Ho, will summarize our operations in the third quarter 2018 followed by guidance for the fourth quarter. Afterwards, Ms. Ho and TSMC's CEO, Dr. C.C. Wei, will jointly provide company's key messages. Then we will open both the floor and the line for the Q&A.

For those participants on the call, if you do not yet have a copy of the press release, you may download it from TSMC's website at www.tsmc.com. Please also download the summary slides in relation to today's earnings conference presentation.

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. So please refer to the safe harbor notice that appears on our press release.

And now I would like to turn the microphone to TSMC's CFO, Ms. Lora Ho, for the summary of our operations and current quarter guidance.

Lora Ho ***Taiwan Semiconductor Manufacturing Company Limited - CFO and Senior VP of Finance***

Good afternoon, everybody. Thank you for joining us today. My presentation will start with financial highlights for the third quarter and followed by the guidance for the fourth quarter.

Third quarter revenue in U.S. dollar reached $8.49 billion, which increased 8.1% sequentially, reflecting customers' new product launches using our 7-nanometer and a more favorable foreign exchange rate. Third quarter revenue came in stronger than the revised guidance that considered the impact from the August 3 virus incident as we were able to make up most of the delay in shipments. In NT dollars, revenue increased 11.6% sequentially.

Compared with second quarter, gross margin decreased 0.4 percentage point to 47.4% as the unfavorable technology mix was partially offset by the profitability improvement in the backend business, while the more favorable exchange rate offset the virus incident impact.

Total operating expenses increased by TWD 1.7 billion. The increase was mainly for 5-nanometer and 7-nanometer-plus development. Thanks to operating efficiency, total operating expenses represented 10.8% of revenue versus 11.3% in the second quarter. So our

operating margin improved 0.4 percentage point sequentially to 36.6%.

On tax expenses, after a step-up in tax rate to 17.5% in the second quarter due to the accrual of retained earning tax, our effective tax rate fell back to 10% in the third quarter. We expect the full year tax rate to be about 12%.

Overall, our second quarter EPS was TWD 3.44, and ROE was 23.2%.

Now let's take a look at wafer revenue contribution by application. During the third quarter, Communication and Industrial/Standard increased 24% and 6%, respectively, while Computer and Consumer decreased by 35% and 1%, respectively.

Now let's take a look at revenue by technology. 7-nanometer process technology contributed 11% of total wafer revenue in the third quarter. 10-nanometer accounted for 6%, while the combined revenue from the 16- and 20-nanometer accounted for 25%. Advanced technologies, defined as 28-nanometer and more advanced technologies, accounted for 61% of the total wafer revenue.

Moving on to the balance sheet. We ended the third quarter with cash and marketable securities of TWD 604 billion, a decrease of TWD 145 billion from last quarter, mainly as we paid out TWD 207 billion of cash dividend, while we borrowed TWD 43 billion short-term loans for hedging purpose. Correspondingly, current liabilities decreased by TWD 141 billion.

On financial ratios. Accounts receivable turnover days remain at 38 days. Days of inventory decreased 1 day to 73 days due to stronger wafer shipment during the quarter.

Now let me make a few comments on cash flow and CapEx. During the third quarter, we generated about TWD 94 billion cash from operations and spent TWD 70 billion in capital expenditures. As a result, we generated free cash flow of TWD 24 billion. After we paid out cash dividend and borrowed short-term loans, cash balance decreased by about TWD 143 billion to TWD 489 billion at the end of the quarter. In U.S. dollar terms, the capital expenditure spent in the first 3 quarters of 2018 totaled USD 6.7 billion.

I have finished my summary of financial. Now let me provide you the fourth quarter guidance. Based on the current business outlook, we expect fourth quarter revenue to be between USD 9.35 billion and USD 9.45 billion, which is a 10.7% sequential increase, at the midpoint of the guidance. Based on the exchange rate assumptions of USD 1 to TWD 30.80, our fourth quarter gross margin is expected to be between 47% and 49%. Our fourth quarter gross margin -- our fourth quarter operating margin is expected to be between 36% and 38%.

This concludes my financial presentation. Let me follow by making a few comments about the near-term demand, inventory, capacity and CapEx.

Now on the near-term demand and inventory. We conclude our third quarter with revenue of TWD 260.3 billion or USD 8.49 billion, which is above our revised guidance. According to the revised guidance, the computer virus incident on August 3 was estimated to have impacted our third quarter revenue by about 2% and gross margin by about 1 percentage point, respectively. However, we were able to make up about 75% of the affected shipments in the third quarter. So overall, our third quarter result was mainly driven by strong demand from product launches using our 7-nanometer technology.

Moving into fourth quarter, despite the current market uncertainties, our business will benefit from the continuous steep ramp of 7-nanometer for several high-end smartphones as well as the demand for 16/12-nanometer for the launches of new-generation GPU and AI. However, this growth will be partially offset by continued weakness in cryptocurrency mining demand and inventory management by our customers.

Fabless DOI exiting third quarter 2018 was several days above seasonal level, slightly higher than what we expected 3 months ago. We forecast fabless DOI to continue to stay at this above-seasonal level exiting 2018.

Now let me make some comment about capacity and CapEx. At TSMC, we build our capacity according to customers' demand. We are continuing to increase 7-nanometer capacity to meet the strong customer demand. We reiterate our 2018 CapEx to be between USD 10

billion and USD 10.5 billion.

In addition, as I have talked about before, although our leading nodes' capital cost continue to increase due to increasing process complexity, we are able to offset its impact to our CapEx by productivity improvements and further optimization of our capacity planning. Going forward, we expect annual CapEx needed to support our 5% to 10% revenue CAGR in U.S. dollar terms in the next few years will continue to range between USD 10 billion and USD 12 billion.

I conclude my remarks. Let me turn the microphone to C.C.

C. C. Wei ***Taiwan Semiconductor Manufacturing Company Limited - CEO & Vice Chairman***

Thank you, Lora. Good afternoon, ladies and gentlemen. Let me start with 2018 year's outlook.

For the full year of 2018, we forecast the overall semiconductor market excluding memory will grow between 5% and 7%, while foundry is expected to grow between 6% and 7%. For TSMC, as Lora has just indicated, that our second half of 2018 business will be strongly supported by the 7-nanometer ramp-up, which is mainly driven by a few new smartphone launches. However, our business is also negatively impacted by further weakening of cryptocurrency mining demand. As a result, we estimate our 2018 growth rate will be about 6.5% in U.S. dollar term, which is close to the foundry industry's growth but slightly below our 7% to 9% guidance given in the last conference.

Now let me update you about the August 3 virus incident. On August 3, TSMC experienced a computer virus outbreak, which affected a number of computer systems and fab tools. The infection was due to misoperation and insufficient firewall controls. We have since corrected this problem to ensure such viruses will not happen again in the future. Our remediate actions including the following: implementing an automated system to guarantee fool proof execution so that such misoperation will not happen again; enhanced firewall control for fab isolation; and network control to each individual computer. More enhancements now are ongoing, too, for further improve tool immunity against future infections. TSMC sets top priority for such security enhancement.

Now let me talk about the N7 and N7+ and the EUV's progress. TSMC's N7 technology is now available for customers to unleash their innovations. This is the first time in the semiconductor industry the most advanced logic technology is available for all product innovations at the same time. We continue to work with many customers on N7, N7+ product design and expect to see more than 100 customer product tape-outs by end of 2019. We expect 7-nanometer to be a long node and will attract multiple waves of customer adoptions.

N7+ is in risk production now. Since the N7+ has 15% to 20% better density and more than 10% lower power consumption, we are working with many customers for their second wave product designs in N7+. Although the number of tape-outs today account for a small portion of the total 7-nanometer tape-outs, we expect the activity to pick up at a rapid pace in 2020 and beyond. Because the N7+ is using a few layers of EUV photolithography to have better cycle time and patent control, we have made steady progress on EUV technology development towards high-volume production. Tool availability, EUV power, productivity, defect reduction, mask improvement, material and process optimization are all on schedule. A few customers have already made plans to adopt our N7+ in their 2019 products.

Let me move to our N5 status. Our N5 technology development is on schedule. We have completed the design solution development and are ready for customers' design start. The N5 risk production schedule in first half 2019 stays the same. Compared to N7, TSMC's N5 deliver 1.8x to 1.86x logic area reduction and close to 15% to 18% speed gain and ARM A72 core. We expect to receive first customer product tape-out in spring of 2019, followed by production ramp in first half 2020.

Now let me talk about the N28, N22 and mature nodes' strategy. Due to faster-than-expected technology migration from 28-nanometer to 16-nanometer and below, 28-nanometer's overcapacity becomes an industry-wide phenomenon, and is expected to last for a few years. TSMC's mature nodes' strategy is to work closely with our customers to develop specialty technology solutions to meet customers' requirement. For example, we continue to develop 22-nanometer for scaling benefit and better performance. We are also developing 22-nanometer for CMOS imaging sensor, MRAM and RRAM. For all mature nodes, TSMC will continue to develop a variety of special

technologies, such as power management IC, Embedded Flash, imaging sensor, MEMS, to maintain our good capacity loading rate and to increase our technology value to customers.

Now let me talk about advanced packaging update. TSMC has been developing advanced wafer-level packaging technologies to integrated advanced SoCs, memories, integrated passive device, to enhance system performance. We believe our advanced packaging solutions will contribute to our business growth. We are now expanding the applications of both CoWoS and InFO especially for high-performance computing. Most of the CoWoS products require integration of SoC with High Bandwidth Memory, HBM, in 3D stack. We are making good progress in qualifying multiple HBM sources through close collaboration with customers and the DRAM suppliers. We are also working with a few leading customer on SoIC, which stands for system on integrated chips, where multiple heterogeneous chipsets will be integrated with close proximity to deliver better performance. And we target to start production in 2021 time frame.

That's all my report, and thank you for your attention.

QUESTIONS AND ANSWERS

Elizabeth Sun ***Taiwan Semiconductor Manufacturing Company Limited - Senior Director of Corporate Communication Division***

Thank you. This concludes our prepared statements. (Operator Instructions) Questions will be taken both from the floor and from the call. Should you wish to raise your questions in Chinese, I will translate it to English before our management answers your question. (Operator Instructions) So we can start.

Deutsche Bank, Michael Chou first.

Michael Chou ***Deutsche Bank AG, Research Division - Semiconductor Analyst***

Two questions. One is, what is the outlook for 7-nanometer sales portion in 2019? Can you give some color at this moment based on your current visibility or some tape-out numbers?

C. C. Wei ***Taiwan Semiconductor Manufacturing Company Limited - CEO & Vice Chairman***

Michael, your question is what is the outlook of 7-nanometer...

Michael Chou ***Deutsche Bank AG, Research Division - Semiconductor Analyst***

In 2019.

C. C. Wei ***Taiwan Semiconductor Manufacturing Company Limited - CEO & Vice Chairman***

In 2019?

Michael Chou ***Deutsche Bank AG, Research Division - Semiconductor Analyst***

In terms of the sales portion or any indication.

C. C. Wei ***Taiwan Semiconductor Manufacturing Company Limited - CEO & Vice Chairman***

I would like to answer the question and say it's a very strong demand in all the platforms, in all the market sector, which including the mobile phone, high-performance computing, that's included graphic, a lot of AI accelerator, FPGA, you name it. A lot of customers are working with us, as I just stated, and we expect 100 or more than 100 tape-outs -- product tape-outs in year 2019. So did I answer your question?

Michael Chou ***Deutsche Bank AG, Research Division - Semiconductor Analyst***

Is it fair to say that 7-nanometer sales portion will be more than 20% of total sales for the whole year next year?

C. C. Wei ***Taiwan Semiconductor Manufacturing Company Limited - CEO & Vice Chairman***

Next year?

Lora Ho ***Taiwan Semiconductor Manufacturing Company Limited - CFO and Senior VP of Finance***

Let me answer that. You have seen our report. The third quarter 7-nanometer accounts for 11%. The fourth quarter will be more than 20%. So for whole year 2018, 7-nanometer will contribute close to 10% of total TSMC revenue. Go beyond 7 -- 2018, and we will have very, very strong ramp, in 2019 as well, we expect the revenue contribution will be much higher than 20%.

Michael Chou ***Deutsche Bank AG, Research Division - Semiconductor Analyst***

Second question. C.C., you mentioned 28-nanometer oversupply in the industry could be a normal situation over the next few years. So will management consider converting some 28-nanometer to advanced node? I know you mentioned some specialty, especially PMIC in 28, CIS in 28, so -- which should be a good volume product. But would you consider to convert some capacity to advanced node?

C. C. Wei ***Taiwan Semiconductor Manufacturing Company Limited - CEO & Vice Chairman***

Good question, Michael. Actually, we are moving from 28-nanometer to 22-nanometer, which is a smaller geometry and more advanced. I think your question is, are we consider moving into 16, convert some of them? We keep the flexibility to move the wafer around, so they can support each other. We already did that. So there are a lot of commonality in the tools, so some of that capacity -- or part of the capacity can support other technology node.

Michael Chou ***Deutsche Bank AG, Research Division - Semiconductor Analyst***

So you mean that if -- for instance, if your 16/12-nanometer demand is beyond your estimate, so you can use some 28-nanometer to some 16 node product in the future?

C. C. Wei ***Taiwan Semiconductor Manufacturing Company Limited - CEO & Vice Chairman***

We have some tools that have a commonality. For example, implanter , right, and the cleanup and a lot of things. But let me stress again, I say the overcapacity for a few years, however, we are developing 22-nanometer, we are developing a lot of specialties. And for TSMC, this is only probably a couple of years we are going to fully utilize 28-nanometer again.

Michael Chou ***Deutsche Bank AG, Research Division - Semiconductor Analyst***

Then is that fair to say your 28/22 UTR over the next few years, that you are confident you can maintain maybe above 85%, about 90%?

C. C. Wei ***Taiwan Semiconductor Manufacturing Company Limited - CEO & Vice Chairman***

I'm not going to ask -- to answer this question. But after a couple of years, it will be the high utilization rate again.

Elizabeth Sun ***Taiwan Semiconductor Manufacturing Company Limited - Senior Director of Corporate Communication Division***

Next question will be coming from Crédit Suisse, Randy Abrams.

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

I wanted to ask a question about sales and also gross margins. The sales in the fourth quarter is actually fairly good, factoring in the business environment. Could you talk maybe the forward view? You mentioned also fabless days of inventory may exit the year a few days high. So with the implication for our first half, especially relative to the last 2 years, we saw declines in first and second quarter. So if you have a view kind of the rate or magnitude of the decline relative to what you think normal seasonal is after first and second quarter.

C. C. Wei ***Taiwan Semiconductor Manufacturing Company Limited - CEO & Vice Chairman***

Are we going to forecast that second -- next year's first quarter and second quarter?

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

Initial view based on inventory and demand.

C. C. Wei ***Taiwan Semiconductor Manufacturing Company Limited - CEO & Vice Chairman***

We have very strong demand in 7-nanometer. Let me just continue to say that. For the last quarter of this year, you're talking about the profit margin, right?

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

Yes, the second question on margin, I wanted to ask, it's about 1 point or 2 below the traditional, say, 49 to 50 target.

C. C. Wei ***Taiwan Semiconductor Manufacturing Company Limited - CEO & Vice Chairman***

Yes.

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

And Lora cited product mix. Next year, 7 will be more mature. Do you think you have the catalyst to get back to that 49, 50 or other factors like 28 oversupply?

C. C. Wei ***Taiwan Semiconductor Manufacturing Company Limited - CEO & Vice Chairman***

Well, let me answer the -- your fourth quarter's profit margin is a bit lower than we used to have. That's between 49, 50. That's because of our product mix Lora just have mentioned. Product mix, one of the major reason is the 7-nanometer's ramp up much faster than we thought. And the demand is very strong. And so that lower down our margin a couple of point. But I'll let the CFO to explain the number.

Lora Ho ***Taiwan Semiconductor Manufacturing Company Limited - CFO and Senior VP of Finance***

C.C. mentioned about 7-nanometer being particularly strong compared with our other leading-edge technology in the past. It does dilute our corporate margin level starting from the third quarter this year. Going to the fourth quarter, as I mentioned, the revenue contribution will be 20% -- more than 20% of our fourth quarter revenue. And the margin for 7-nanometer at the beginning stage is still below corporate average. So the dilution in the fourth quarter will be more severe than the third quarter. Our estimation is between 2 to 3 percentage points for fourth quarter gross margin. Now going into 2019, as the ramp will continue to be very strong, so we believe the margin dilution will be eased off when we reach to the second half of 2019.

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

Okay. And maybe just -- to follow up on that first one about sales, you mentioned 7 is very strong. But I guess, do you have a view that the rest of the business may be doing some further inventory adjustments in the first quarter?

C. C. Wei ***Taiwan Semiconductor Manufacturing Company Limited - CEO & Vice Chairman***

Lora?

Lora Ho ***Taiwan Semiconductor Manufacturing Company Limited - CFO and Senior VP of Finance***

There are several days above seasonal this quarter. And going into 2019, I think inventory will be gradually digested when we move into the second half of '19.

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

Okay. The second question I wanted to ask was about the 7+ versus 5-nanometer. You mentioned 2020 would see the very strong ramp-up of tape-out and activity in volume on 7+. Is it your view -- I think last conference, Mark said 5 was a little bit more conservative at this stage. So how's your view now for interest activity and expectation for a steep ramp-up of 5 into 2020?

C. C. Wei ***Taiwan Semiconductor Manufacturing Company Limited - CEO & Vice Chairman***

We still expect very fast ramp on 5. The reason is simple. Because of a lot of products developed in the AI area, you need the speed, you need the lower power, and you also need a small footprint. So from this -- from today, we can see when we work with our customers, the ramp will be steep again.

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

Okay. Do you think mobile will also contribute in that steep ramp?

C. C. Wei ***Taiwan Semiconductor Manufacturing Company Limited - CEO & Vice Chairman***

Still come from the mobile phone first, followed by other applications.

Elizabeth Sun ***Taiwan Semiconductor Manufacturing Company Limited - Senior Director of Corporate Communication Division***

Next question will be coming from Citigroup's Roland Shu.

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

I would like to follow up for this 4Q gross margin guidance. If I compare with 4Q last year, actually, we have a similar percentage contribution from this leading edge. Last year, 4Q 10-nanometer was about 25% of the total revenue. And in 4Q this year, actually, we have a favorable exchange rate compared to 4Q last year. And also, we have this improved backend profitability. So how come we still have a lower gross margin compared to 4Q last year?

Lora Ho ***Taiwan Semiconductor Manufacturing Company Limited - CFO and Senior VP of Finance***

There's about 2 percentage point difference this 4Q versus last 4Q, okay? So one reason is product mix issue. I'm particularly talking about 28-nanometer. You know our 28-nanometer is very profitable, and the contribution to corporate revenue has declined from last year to this year. So these 2 reasons, product mix because 28 declining and also because the utilization of 28 is not full, yes. That's one reason that there's a new phenomenon.

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

Okay. So how about the standard gross margin, does it change?

Lora Ho ***Taiwan Semiconductor Manufacturing Company Limited - CFO and Senior VP of Finance***

Structural profitability is still intact, no change.

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

Okay. And also last quarter, you talked about, for longer term, our financial objective for gross margin is 50%. So is this 50% a fixed number? Or this 50% is average for the upcoming few years?

Lora Ho ***Taiwan Semiconductor Manufacturing Company Limited - CFO and Senior VP of Finance***

50% is our goal. We aim to achieve that. If we can have higher utilization, I am quite confident we can achieve that.

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

Okay. So this year I think that probably we are not able to achieve this 50%.

Lora Ho ***Taiwan Semiconductor Manufacturing Company Limited - CFO and Senior VP of Finance***

No, not...

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

Because of the utilization?

Lora Ho ***Taiwan Semiconductor Manufacturing Company Limited - CFO and Senior VP of Finance***

Not this year. And also because the 7-nanometer ramp is more severe than previous node. So first year dilution is slightly bigger, okay?

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

Okay. My second question is AMD starts its 7-nanometer CPU from server. And also, ARM recently also talked, they have this new brand server product. So is server CPU going forward to be a very significant part of our business going forward?

C. C. Wei ***Taiwan Semiconductor Manufacturing Company Limited - CEO & Vice Chairman***

It will be an important part. Significant, maybe.

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

So your 4 growth platforms, smartphone, HPC, IoT and the automotive, and so this server CPU will be in HPC then?

C. C. Wei ***Taiwan Semiconductor Manufacturing Company Limited - CEO & Vice Chairman***

That's right.

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

Okay. Can you just reiterate the growth breakdown for this 4 platforms next year?

C. C. Wei ***Taiwan Semiconductor Manufacturing Company Limited - CEO & Vice Chairman***

Okay, let me give you some color on it. In the next few years, if we look at ahead, actually, the smartphone is going to be in our daily life even more and more. So we have a 4 growth engine: one is a mobile phone, actually it's a high-end smartphone; second one is a high-performance computing; automotive; IoT. The mobile phone probably for TSMC will have a 5 year CAGR, if I look at it right from today, it will be mid-single digit growth. And the all others 3 platorms will have a very comfortably double-digit growth in the 5 year time frame. And so that's a -- did that answer your question? That's...

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

Yes.

Elizabeth Sun ***Taiwan Semiconductor Manufacturing Company Limited - Senior Director of Corporate Communication Division***

Next question will be coming from UBS, Bill Lu.

Bill Lu ***UBS Investment Bank, Research Division - MD and Asia Semiconductors Analyst***

First question is on China. So a lot of concerns about the trade tension, about the economy slowing down, et cetera. Can you talk a little bit about what feedback you might be getting from your Chinese customers, both short term and long term? And short term meaning whether you're seeing any increasing levels of conservatism on ordering, on demand. Longer term, is there any change in the strategies of these Chinese customers in terms of perhaps less reliance on the U.S., et cetera?

C. C. Wei ***Taiwan Semiconductor Manufacturing Company Limited - CEO & Vice Chairman***

To answer your question, for the short term, we did not see any impact, if there's any at all. So our China customers, no, they did not change their behaviors. So we continue to work with the customer to produce their products. For the long term, long term, due to the trade tension, your question is due to the trade tension?

Bill Lu ***UBS Investment Bank, Research Division - MD and Asia Semiconductors Analyst***

Yes.

C. C. Wei ***Taiwan Semiconductor Manufacturing Company Limited - CEO & Vice Chairman***

Let me answer the question by another way. TSMC has been proud to be everybody's foundry. So if there's a trade tension, if there is, and if it continues, I think that TSMC -- the impact to TSMC would be less or minimized because if -- we still need that -- the semiconductor device, and TSMC is everybody's foundry, right, so whether they are produced here, produced there, it's all TSMC's customer.

Bill Lu ***UBS Investment Bank, Research Division - MD and Asia Semiconductors Analyst***

Great. I know 2018 is not over yet, but if you think about the next couple of years, I know TSMC has talked about a long-term growth rate of 5% to 10%. Now I feel like more recently, you've talked a lot more about the progress on 7-nanometers. We all know about Intel's struggles with their process technology. And it's public information. They've announced it, right? So -- and then you've got some good design wins. Can you talk about your long-term outlook in 2019? Given these drivers you just said, out of the -- 3 out of the 4 new drivers will be above 10%. So are we looking at something more towards the high end of that? Or how do you think about that?

C. C. Wei ***Taiwan Semiconductor Manufacturing Company Limited - CEO & Vice Chairman***

We continue to say 5% to 10% growth rate. Probably I would like to -- following your question, I would like to say probably tends to be at the higher side of that 5% to 10%. Does that answer your question?

Bill Lu ***UBS Investment Bank, Research Division - MD and Asia Semiconductors Analyst***

Yes.

Elizabeth Sun ***Taiwan Semiconductor Manufacturing Company Limited - Senior Director of Corporate Communication Division***

Next question will be coming from Daiwa's Rick Hsu.

Rick Hsu ***Daiwa Securities Co. Ltd., Research Division - Head of Regional Technology & Head of Taiwan Research***

My first question is I know, C.C., you were talking about your more than 100 tape-outs for N7 and N7+. Can you give us a little bit more of -- a little bit of breakdown? I would like to know how many tape-out for N7 plus and also what kind of application for that.

C. C. Wei ***Taiwan Semiconductor Manufacturing Company Limited - CEO & Vice Chairman***

Okay. N7 plus' tape-out -- product tape-outs, I'm talking about tape -- product tape-outs is still a small percentage of the total N7 nanometer as a node, as I just mentioned. But then up to 2019, I expect 2020, when the current customers, they start to design on their second-wave products, then there will be more of them on N7+. So I don't have a specific number for you on 2020.

Rick Hsu ***Daiwa Securities Co. Ltd., Research Division - Head of Regional Technology & Head of Taiwan Research***

Okay. My second question is, you also mentioned that your N7 will likely be another long node. So presumably it will be probably something like N28 in term of success. So my question is, in term of capacity build -- I know you don't have the capacity number, but in term of capacity build, would you benchmark your N28 into capacity number?

C. C. Wei ***Taiwan Semiconductor Manufacturing Company Limited - CEO & Vice Chairman***

We build out capacity according to the customer demand, and that -- I can assure you that. Compared with the 28-nanometer?

Rick Hsu ***Daiwa Securities Co. Ltd., Research Division - Head of Regional Technology & Head of Taiwan Research***

Right.

C. C. Wei ***Taiwan Semiconductor Manufacturing Company Limited - CEO & Vice Chairman***

I cannot make any comment right now.

Elizabeth Sun ***Taiwan Semiconductor Manufacturing Company Limited - Senior Director of Corporate Communication Division***

Okay, next question will be coming from Morgan Stanley's Charlie Chan.

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

So my first question is regarding the semiconductor inventory. So in which segment do you see more inventory? Because we are hearing lots of noise about automotive, industrial segment weakness and some cloud CapEx cut, right? So can you give us some color about where do you see the inventory and also your 8" fab utilization rate?

C. C. Wei ***Taiwan Semiconductor Manufacturing Company Limited - CEO & Vice Chairman***

Well, I don't think we want to specify which product sector that have high inventory. But let me assure you that this year's -- at the end of this year, the inventory level actually as compared with the last year's same time is much smaller. So even we have some kind of inventory adjustment, I don't think the impact to the next year's first quarter or next year's first half would be as severe as we saw this year, right? So that's all I can say because it's very dynamic. Lora, you want to add something?

Lora Ho ***Taiwan Semiconductor Manufacturing Company Limited - CFO and Senior VP of Finance***

Just if I can add some color to your questions, if I look at the fourth quarter, we have just guided the 10.7% growth quarter-over-quarter. But looking at the segment, fourth quarter, Communication will grow very strong. Computer, small growth, lower than the corporate growth, so that area's relatively weak. Consumer's is weaker, it's negative growth. And Industrial is a small decline. So maybe this can give you some color about the -- which segment has more inventory.

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

Yes. So maybe this is also related to Bill's previous question, right? So when you analyze this inventory, customers' demand, do you think there is any impact from any macro factor, including the China-U. S. trade tension? Or it's just a normal semiconductor cycle?

C. C. Wei ***Taiwan Semiconductor Manufacturing Company Limited - CEO & Vice Chairman***

I will say it's just a normal inventory cycle.

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

Okay. Yes, and next question is also related to the 7-nanometer plus, right? So you mentioned only a few tape-outs. But sometimes, one tape-out can be very significant to revenue, right? So can you give us some comments regarding the 7-nanometer-plus revenue contribution next year?

C. C. Wei ***Taiwan Semiconductor Manufacturing Company Limited - CEO & Vice Chairman***

No, I don't want to specifically say which one.

Elizabeth Sun ***Taiwan Semiconductor Manufacturing Company Limited - Senior Director of Corporate Communication Division***

I think at this point, we would like to turn the questioning to the callers on the line. So operator, could you please put the first caller on the line first?

Operator

The first question is from the line of Mehdi Hosseini from SIG.

Mehdi Hosseini ***Susquehanna Financial Group, LLLP, Research Division - Senior Analyst***

Just want to go back to your view on 2018, an interesting year because you have the migration from 4G to 5G, which could adversely impact demand, but you also have AI and IoT ramping. How should we think about the mix changing? And would new applications and continued share gain would enable you to actually offset any adverse impact as we move from 4 to 5G?

Elizabeth Sun ***Taiwan Semiconductor Manufacturing Company Limited - Senior Director of Corporate Communication Division***

Mehdi, in fact, we can only hear your voice in a discontinued manner. So could you please repeat your question again? Maybe keep your voice a little bit away from the microphone.

Mehdi Hosseini ***Susquehanna Financial Group, LLLP, Research Division - Senior Analyst***

Okay. Sorry about that. I'm just trying to better understand how you're thinking about 2019. It seems like there are many new projects that are ramping given the number of tapeouts at 7-nanometer. And we also know that in this mark for market, we're in transition from 4 to 5G. In that context, should we expect new products, especially for AI and IoT, to get strong enough to offset any adverse impact from migration from 4 to 5G?

C. C. Wei ***Taiwan Semiconductor Manufacturing Company Limited - CEO & Vice Chairman***

So you want to repeat the question?

Elizabeth Sun ***Taiwan Semiconductor Manufacturing Company Limited - Senior Director of Corporate Communication Division***

All right. Let me try. I think Mehdi's question is that he is very positive about the outlook for us in 2019 because we have so many new product launches from our customers using 7-nanometer and smartphone is entering into a 5G era. And so he thinks that we may get a lot of new products in AI and IoT, which would be able to offset the migration from 4G to 5G.

C. C. Wei ***Taiwan Semiconductor Manufacturing Company Limited - CEO & Vice Chairman***

From 4G to 5G, well, that's the question. So looks like the question says -- indicate that 4G to 5G there will have a dip. Actually, it's not. 5G in 2019, we expect to start to grow, but not a significant number. So most of the phone -- the smartphone, I mean, it will be in 4G still in 2019. However, you mentioned about the AI and other product segment, yes, that will start to grow in 2019 and we expect a lot of new products other than the smartphone will contribute to 2019 7-nanometer business.

Mehdi Hosseini ***Susquehanna Financial Group, LLLP, Research Division - Senior Analyst***

Sir, could new products actually be big enough to help you with a 5% to 10% revenue growth? And I'm asking you this because this year, we have had adverse impact from customer inventory and cryptocurrency that impacted your overall growth target for 2018. But in '19, would new products offset any weakness that is associated with the mature products?

C. C. Wei ***Taiwan Semiconductor Manufacturing Company Limited - CEO & Vice Chairman***

Well, in 2019, as I just mentioned, the inventory correction will be much less, in fact, as compared with the 2018, beginning of 2018. So definitely, our growth rate in the 5% to 10% would be much likely in the high side, that's what I say. Not only because of the ...

Mehdi Hosseini ***Susquehanna Financial Group, LLLP, Research Division - Senior Analyst***

That's right, but...

Elizabeth Sun ***Taiwan Semiconductor Manufacturing Company Limited - Senior Director of Corporate Communication Division***

Okay. So Mehdi, accept our very positive outlook for '19, good.

Operator

The next question is from the line of Gokul Hariharan from JPMorgan.

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

My first question is on the China demand and capacity buildout. Could you talk a little bit about the progress of the buildout for N16 in Nanjing? What is the schedule for phase 2? And has there any change in plan both the weakness that we have seen in cryptocurrency demand for some of the Chinese customers. That's my first question.

Elizabeth Sun ***Taiwan Semiconductor Manufacturing Company Limited - Senior Director of Corporate Communication Division***

So Gokul's first question is he asks us to update our Nanjing fab's progress and he asks if we have any changes in plans to this ramp-up in Nanjing fab because of the weakness in cryptocurrency mining.

C. C. Wei ***Taiwan Semiconductor Manufacturing Company Limited - CEO & Vice Chairman***

Nanjing, you want to answer that?

Lora Ho ***Taiwan Semiconductor Manufacturing Company Limited - CFO and Senior VP of Finance***

We had a 10,000 wafer per month installed capacity currently. And then we're planning to increase the capacity to 20,000 wafer per month next year. And we are developing customer as well as some derivative technology that are related to the 16-nanometer. So we have progress as we planned.

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

Okay. So my second question is on N7 and N7+. Now TSMC appears to be in the best position to comment about the benefits of EUV given that you have N7 and N7+, one in production, one in risk production. Could you talk a little bit about the kind of improvements that we are seeing either from the EUV perspective or reduction in mask layers, et cetera, and the impact in terms of overall cycle time for the fab comparing N7 and N7+.

C. C. Wei ***Taiwan Semiconductor Manufacturing Company Limited - CEO & Vice Chairman***

Okay, actually the question is about the EUV and how much of the benefit we can get from the EUV, right? Usually, if we are not using the EUV, sometimes for the very critical dimension on the N7, you have to -- or N7+, you have to use the 4 layers of lithography to pattern one of the critical dimension. Now using the EUV, you're just using 1 layer so that you reduce the cycle time by 4x of photolithography, 4x of etch. Now you become 1 lithography, 1 etch. In total, how many layers we reduced? That depends on the customer's requirement, but usually I just give you a hint already, right, 4 layer can become 1 and we are replacing some of the 3 layers to become 1 and we have a few layers of that. So that give you a hint. Cycle time reduction, definitely, because you do 4x into 1x, that's a big advantage. Productivity-wise, today, EUV is progress very well -- up to our expectation. And in fact, TSMC has turned on the 250-watt power and we believe we are the only one company continuously run the 250 watts EUV power so far today. Okay.

Elizabeth Sun ***Taiwan Semiconductor Manufacturing Company Limited - Senior Director of Corporate Communication Division***

Now we can come back to the floor. Next question will be coming from CL Securities' Sebastian Hou.

Sebastian Hou ***CL Securities Taiwan Company Limited, Research Division - Research Analyst***

My first question is on the trailing-edge profitability and outlook. So a couple of your peers in the past 12 -- well, past 2 years have decided to not -- to stop going advanced. So now their strategy is to focus on the nodes they are already -- they already have and China is already ramping up some trailing edge technology capacity so it seems they are more focused on there and understand that, TSMC, as we generate a lot of the profit and cash flow from trailing-edge technology, so how do you see this dynamic going forward? Is there potential for you to -- for this to negative impact your trailing edge profitability? That's the first question.

C. C. Wei ***Taiwan Semiconductor Manufacturing Company Limited - CEO & Vice Chairman***

Okay. Actually, I don't want to comment on my competitors' strategy. But let me, again, stress our mature nodes' strategy. We continue to develop some of the specialty technology to meet the customers' requirement, right, I just stated in that. And yes, a lot of specialty technology we are doing, I give you some example already, power management IC, CMOS, MEMS, everything. So that will help us to compete with our competitor. Actually, this kind of specialty technology particularly we have to work with the customer. And so that's why I say working with the customer to meet their requirement. And that, in turn, to keep TSMC's business. And that's a way that we migrate the logic technology -- pure logic technology to the more advanced node. But for the existing capacity, we develop into the specialty technology. And so our strategy is still meet customer's requirement, but we don't increase the existing logic capacity.

Sebastian Hou ***CL Securities Taiwan Company Limited, Research Division - Research Analyst***

Right. But I thought TSMC has been doing this for a long time...

C. C. Wei ***Taiwan Semiconductor Manufacturing Company Limited - CEO & Vice Chairman***

Yes.

Sebastian Hou ***CL Securities Taiwan Company Limited, Research Division - Research Analyst***

So you'll keep doing this? But the real change is not what you are doing, but the real change is what your competitors, the dynamic, there are more competition threat from it?

C. C. Wei ***Taiwan Semiconductor Manufacturing Company Limited - CEO & Vice Chairman***

Well, we already have a lot of competition. Before they announced that, we still think there are competitors, no doubt about it. Not because they dropped out of some of the technology node they don't want to do, no, we are not going to change our strategy because of that.

Sebastian Hou ***CL Securities Taiwan Company Limited, Research Division - Research Analyst***

Fair. Second question is still on the node profitability. So I remember the rule of thumb for TSMC: node profitability is N-minus-2 node usually have very good or probably the highest profitability of -- for TSMC. So now we're already ramping up 7, so the N-minus-2 for you is 16. Understand that the 28 used to be very profitable, as Lora just said. So I'm just wondering, if based on the -- assuming 16 and 20 -- we compare 16 and 28, assuming they are both depreciated at the same utilization rate, will 16 be more profitable than 28? Or similar?

C. C. Wei ***Taiwan Semiconductor Manufacturing Company Limited - CEO & Vice Chairman***

Well, this is very specific, you asked the profitability. Lora, are we going to answer that one?

Lora Ho ***Taiwan Semiconductor Manufacturing Company Limited - CFO and Senior VP of Finance***

I probably cannot quantify that, but we don't know whether you said N-minus-2 is the most profitable node is correct. But eventually, I think, as we continue to improve productivity and we keep very competitive, specialty technology for the mature node, our margin will be all very good.

Sebastian Hou ***CL Securities Taiwan Company Limited, Research Division - Research Analyst***

Okay, let me ask from another perspective is that the -- some of this capacity on 16 or 20 was installed in 2014, '15, so which means that they will become fully depreciated very soon. So which means that these will become margin profitability tailwind for TSMC starting from next year and partially offset some of the 28 headwinds. Is that the right way to look at it?

C. C. Wei ***Taiwan Semiconductor Manufacturing Company Limited - CEO & Vice Chairman***

We certainly expect that, all right. You are talking about a fully depreciated tool to generate more profit. Yes, you can calculate. We have a 5-year depreciation period.

Sebastian Hou ***CL Securities Taiwan Company Limited, Research Division - Research Analyst***

So which means that by the same time next year, regardless of the utilization rate or whatever pricing, 16 will likely to be more profitable than 28?

C. C. Wei ***Taiwan Semiconductor Manufacturing Company Limited - CEO & Vice Chairman***

Our -- actually, TSMC's 28-nanometer is very profitable. And that is, what should I say, you say 16 is better than 28? And I hope so, but I cannot tell you the true number.

Elizabeth Sun ***Taiwan Semiconductor Manufacturing Company Limited - Senior Director of Corporate Communication Division***

I think our profitability is not depending on which node is better than which other node. We want all the nodes to be very profitable.

Okay. Next question will be coming from Morgan Stanley's Charlie Chan.

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

So after a recent industry consolidation, does that change anything like your bargaining power and also your thinking about cash return? So what does it change your thinking about, for example, the payout ratio going forward? The industry consolidation?

C. C. Wei ***Taiwan Semiconductor Manufacturing Company Limited - CEO & Vice Chairman***

Industry consolidation?

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

Yes, I mean, GLOBALFOUNDRIES exit 7-nanometer and Intel seems to be struggling with their leading edge. So I would assume competition in leading edge is getting less, right? So in that case, maybe your bargaining power can increase and also you have more cash may free up to return to shareholders.

C. C. Wei ***Taiwan Semiconductor Manufacturing Company Limited - CEO & Vice Chairman***

I don't want to say that because of my competitor. Well, in fact, Intel is my customer, so we respect their performance, of course. But TSMC's strategy actually is working with the customer. And whether I have a competition or I don't have a competition, that's independent of that. And so we think we offer a very good technology value to our customers. Customers are happy, so we are working together and growing the business together. I'm not going to tell you that's my pricing strategy, that's not in discussion. Okay.

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

Yes. So your current payout ratio is around 60%, right? So in what kind of circumstance in the long term would you consider to revise your payout ratio to maybe 70% or even above?

Lora Ho ***Taiwan Semiconductor Manufacturing Company Limited - CFO and Senior VP of Finance***

Actually, we have been paying around 70% in the past few years. And I have said many times, and with 5% to 10% growth, we are confident we can continue to generate increasing free cash flow. That will be the source for the increasing cash dividend. So we're still within that kind of commitment.

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

And next follow-up is regarding that EUV question, right? I know it could be too direct to ask about revenue contribution from 7-nanometer plus. But from another angle, what keep your customer hesitating to adopt 7-nanometer plus, right, because you mentioned few tapes. Is there any concern about -- sorry, the throughput of EUV or capacity of EUV, what keep the customer hesitating about EUV adoption next year?

C. C. Wei ***Taiwan Semiconductor Manufacturing Company Limited - CEO & Vice Chairman***

No, let me give you some explanation. Because of TSMC's 7-nanometer is very successful, so customer use the design on 7-nanometer first. But 7 plus certainly has some advantages, right. We're using the EUV, we have a shorter cycle time and I just say that it's kind of better pattern control, so that means your critical dimension has been tightly controlled that help the performance also. So we expect the customer moving their second wave product. A lot of them will go to 7 plus. And any concern about the EUV's maturity, that actually is what you are asking.

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

Yes. Everything sounds very decent, right? So what was the issue? Price or any issue?

C. C. Wei ***Taiwan Semiconductor Manufacturing Company Limited - CEO & Vice Chairman***

What's the issue? Okay. EUV progressed steadily to our expectation. But as compared with deep UV photolithography, the maturity is not comparable, not yet, not yet. EUV is still ramping up and we hope that the productivity can be better and better. But today, not yet. You just look at how many deep UV we have and how many EUV we have, you know what I'm talking about, I mean, that in the industry, just say in the industry.

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

Okay. Lastly, if I may, right? I think AI semi has been a very topical growth driver. So I think the recently it is getting more clear that some ASICs claim their performance can be 8x better than GPU. Those are general purpose, right? So now with lots of ASIC coming on line, do you think that is going to impact your overall AI semiconductor revenue? Or put it in another perspective, do you expect any reacceleration or slowdown of your AI semiconductor business in the coming year?

C. C. Wei ***Taiwan Semiconductor Manufacturing Company Limited - CEO & Vice Chairman***

I think the AI's application would be everywhere, actually, from the edge server or to the end device that's just like the smartphone of everybody. So this kind of a development is to our advantage because TSMC certainly have a technology leadership. In order the AI would be effective, you need a very advanced technology for the highest performance computing. So I don't see the effect that you are talking about, this application is better than that so that affected the growth or something. No, it will be continues to grow. And I expect this growth much faster than I predicted here.

Elizabeth Sun ***Taiwan Semiconductor Manufacturing Company Limited - Senior Director of Corporate Communication Division***

Next will be coming from Deutsche Bank as a follow-up question.

Michael Chou ***Deutsche Bank AG, Research Division - Semiconductor Analyst***

Regarding the 7-nanometer tapeout next year. So C.C., can you give some color regarding the portion of 7 nano versus of 7 nano plus EUV? So customer shift to 7 nano plus EUV, the question would be in the second half next year into 2020?

C. C. Wei ***Taiwan Semiconductor Manufacturing Company Limited - CEO & Vice Chairman***

Your question is...

Michael Chou ***Deutsche Bank AG, Research Division - Semiconductor Analyst***

You mentioned more than 100 tapeout numbers, right, for next year, right, by the end of next year. So would the majority of that be 7-nanometer or 7-nanometer plus EUV?

C. C. Wei ***Taiwan Semiconductor Manufacturing Company Limited - CEO & Vice Chairman***

Next year is still 7-nanometer because 7 plus, we're working with customers and some of the customer moving a little bit faster, some of them -- and for those customers already in the 7-nanometer, they are planning on the second wave products in the 7 plus. Okay. So next year, I can say most of them are still in 7. But then activity will start to rapidly grow in the second half and then 2020 that will be even grow faster.

Michael Chou ***Deutsche Bank AG, Research Division - Semiconductor Analyst***

Okay. But for the whole year tapeout number, right, so can we say that 7-nanometer plus EUV tapeout number increase quarter by quarter through end of next year? Can we say that?

C. C. Wei ***Taiwan Semiconductor Manufacturing Company Limited - CEO & Vice Chairman***

Will increase quarter by quarter? Yes, you can say that. This is still a smaller portion of the total 7-nanometer node.

Michael Chou ***Deutsche Bank AG, Research Division - Semiconductor Analyst***

Okay. So based on the 7-nanometer plus EUV tapeout by customer planning, right, so can you expect the 2020 we will see very big volume 7 nano plus EUV mix production and the revenue contribution? Because you mentioned increase quarter by quarter, right? So we're just trying to find out if it will become very big revenue contributor and -- yes.

C. C. Wei ***Taiwan Semiconductor Manufacturing Company Limited - CEO & Vice Chairman***

If I can forecast well, I mean, that 1 tapeout, especially for some of the application, it takes about 1 year to -- for ramp-up. So 7+ will be increasing, but the revenue I would expect 2020, '21 start to see the big number. But not 2019, not the first half of 2020.

Michael Chou ***Deutsche Bank AG, Research Division - Semiconductor Analyst***

Okay. How about second half next year? Do you think that, that will be ...

C. C. Wei ***Taiwan Semiconductor Manufacturing Company Limited - CEO & Vice Chairman***

You continue to nail down the number?

Michael Chou ***Deutsche Bank AG, Research Division - Semiconductor Analyst***

Sorry.

C. C. Wei ***Taiwan Semiconductor Manufacturing Company Limited - CEO & Vice Chairman***

Okay. 2019 less than US$ 1 billion.

Michael Chou ***Deutsche Bank AG, Research Division - Semiconductor Analyst***

Less than US$ 1 billion. That's good enough.

Elizabeth Sun ***Taiwan Semiconductor Manufacturing Company Limited - Senior Director of Corporate Communication Division***

All right. Hopefully next question will be better and it will be coming from UBS, Bill Lu.

Bill Lu ***UBS Investment Bank, Research Division - MD and Asia Semiconductors Analyst***

So it's a bit more of a long-term question. Hoping to ask you about R&D and maybe this is both for Dr. Wei as well as Lora. If you look at Moore's Law, certainly not getting easier. If you look at the number of players that can share the R&D burden, I think it's getting less. And number three, TSMC is clearly ahead of the competitors now in terms of process development. So as you look out the next 2, 3 years, do you have to think about R&D increasing at a faster rate?

C. C. Wei ***Taiwan Semiconductor Manufacturing Company Limited - CEO & Vice Chairman***

We do see the -- continue going on the smaller geometry takes a lot of effort to develop the technology. But I would like to use TSMC Founder's wording to answer your question. So long as some people can develop it, TSMC will be there. That's our commitment to the customer, all right? And in addition to smaller geometry, actually, TSMC also develop the wafer level's packaging, advanced packaging

to help the customer improve their systems' performance. And we think we have these 2 opening heads and so we are in a very good position to compete in that field.

Bill Lu ***UBS Investment Bank, Research Division - MD and Asia Semiconductors Analyst***

I guess, I'm not doubting TSMC's abilities to develop it. But I think TSMC has taken on more of the burden now, and you also have to add the cost for advanced packaging R&D as well, right? So I'm just talking about the cost.

C. C. Wei ***Taiwan Semiconductor Manufacturing Company Limited - CEO & Vice Chairman***

Yes. The cost? Actually, I would like to say the value of our technology, all right? That's what we discuss with our customer. The cost, we continue to working on it, and we hope TSMC has a capability and ability to lower down the cost as we already proven in the previous years.

Elizabeth Sun ***Taiwan Semiconductor Manufacturing Company Limited - Senior Director of Corporate Communication Division***

But I think Bill's question is whether or not R&D, as a percent of our revenue, will increase in the future because of our taking up a bigger burden.

C. C. Wei ***Taiwan Semiconductor Manufacturing Company Limited - CEO & Vice Chairman***

We might, but I cannot tell you that exact number. So that's a cost.

Elizabeth Sun ***Taiwan Semiconductor Manufacturing Company Limited - Senior Director of Corporate Communication Division***

All right. Follow-up question from Citigroup's Roland Shu.

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

Just a follow-up question for the profitability but I'm talking about the backend side because since last quarter, you kept talking about that you have this improving profitability on backend. And also in second quarter, in last quarter, you said on the backend, actually, the -- was able to partly offset the lower gross margin from this poor product mix. But consider your backend, it's just a relative small part of your total revenue, so it has to be -- with a very good gross margin in order to partially offset the unfavorable product mix. So how does your backend gross margin compare to your corporate average right now?

Lora Ho ***Taiwan Semiconductor Manufacturing Company Limited - CFO and Senior VP of Finance***

Backend margin is indeed improving, but we don't compare backend margin with corporate average. Because backend, the nature of backend is there's a very high asset turnover and lower margin compared with wafer. So the overall investment return is pretty good. If you look at ROIC, it's very good, so we don't compare backend margin with corporate average. So if our backend revenue continue to increase, it may dilute a little bit of corporate margin, but overall investment is pretty good, okay? And we have seen our advanced packaging. The -- we continue to invest in capital, and we see more customer adoptions. So we are increasing the size and the business volume of the backend. And of course, we continue improving the productivity. So backend is -- will be accretive to TSMC going forward.

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

Okay. So can we have the rough number of how much the revenue is coming from backend so far?

C. C. Wei ***Taiwan Semiconductor Manufacturing Company Limited - CEO & Vice Chairman***

It's around 2.5 billion this year.

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

2.5 billion? Does this include wafer bumping? Or is this purely for InFO and the CoWoS?

C. C. Wei ***Taiwan Semiconductor Manufacturing Company Limited - CEO & Vice Chairman***

Including all the backend that including the wafer bumping, testing, InFO, CoWoS, everything.

Lora Ho ***Taiwan Semiconductor Manufacturing Company Limited - CFO and Senior VP of Finance***

Okay. That's roughly a little more than 7% of this year's revenue.

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

Okay. But Lora, you said on your -- if the backend revenue exceed a certain portion of the total revenue, probably, the corporate average gross margin will be diluted. So what is the threshold percentage of the backend?

Lora Ho ***Taiwan Semiconductor Manufacturing Company Limited - CFO and Senior VP of Finance***

No, the backend is only 7%. It's still low compared to our very big wafer size. But backend, I think the backend is probably cyclical because this is very concentrated on several segment. Cyclicality is more of an issue. But in terms of financial return, we have guarding our model. So we're not worried about them. Of course, we continue to improve the profitability in that.

Elizabeth Sun ***Taiwan Semiconductor Manufacturing Company Limited - Senior Director of Corporate Communication Division***

Follow-up question from Morgan Stanley's Charlie Chan.

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

Sorry for coming and begging for another follow-up, right? So I think because, this time, market weakness, so I need to -- there will be microscope on your comments on near term, right? So C.C., you previously mentioned that 2019 inventory correction in 1Q wouldn't be as severe as the beginning of this year, right? So -- I don't know why now you have this kind of visibility. Is it because of customers order behavior or what have you seen for the coming 1Q that can make your inventory correction less severe than the beginning of this year?

C. C. Wei ***Taiwan Semiconductor Manufacturing Company Limited - CEO & Vice Chairman***

You ask where I get that -- those information to get the conclusion that next year's 1Q inventory correction would be less?

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

Less severe than this year, yes.

C. C. Wei ***Taiwan Semiconductor Manufacturing Company Limited - CEO & Vice Chairman***

Less severe. That's interesting, because of -- we work with customers, right? And Lora just mentioned about those market segment, communication, consumer and computer, and we look at that, we work with the customer and we understand their business, not 100%, but we understand quite well. And so we can do this kind of forecast, okay?

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

Yes. So is that fair to link the industrial segment declined to 8" utilization rate? Can I assume that that 8" utilization is not that full -- as full as before? Is that a fair assumption?

C. C. Wei ***Taiwan Semiconductor Manufacturing Company Limited - CEO & Vice Chairman***

You can repeat what I said to answer that question, all right? I mean, that's -- you're asking a very specific that utilization and the customers' demand. Actually, let me say that we are very optimistic because of -- we work with the customer. As I said, we work with the customer. We understand their business. And going forward, we know that they are doing the inventory adjustment. But they also discuss about what they want in the 2019, which I'm not going to give you some forecast today, not yet.

Elizabeth Sun ***Taiwan Semiconductor Manufacturing Company Limited - Senior Director of Corporate Communication Division***

Questions will be coming from CL Securities, Sebastian Hou.

Sebastian Hou ***CL Securities Taiwan Company Limited, Research Division - Research Analyst***

A follow-up on the advanced packaging. I have the impression that of this year, more than 50 7-nanometer tape-out, a huge part of that or a large portion of the customers will use our advanced packaging solution. So moving to next year, so our tape-out number will be 100 or 100 more on 7. So it's still -- that kind of the percentage was still the same which means that the advanced packaging customers on 7-nanometer will also double?

C. C. Wei ***Taiwan Semiconductor Manufacturing Company Limited - CEO & Vice Chairman***

Let me answer the question that advanced packaging, that included CoWoS and InFO. And the CoWoS is for very high-speed performance, such as like graphic chip such as some of the networking processor. So those are huge in CoWoS. And for the InFO, that a lot of them are using InFO, the mobile phone business. So that I can answer you, but I cannot give you, say, which one.

Sebastian Hou ***CL Securities Taiwan Company Limited, Research Division - Research Analyst***

No, no, I'm not asking which one. I'm just asking that, still, of the next year, 100 tape-out, a large portion of this using our...

C. C. Wei ***Taiwan Semiconductor Manufacturing Company Limited - CEO & Vice Chairman***

Oh, okay. Well, sorry that I misunderstood your question. So the next year, the InFO for the mobile phone application was -- some of them will move into the high performance computing also because that offer a little better cost structure. And the CoWoS continue to be the high end, so high performance computing product. And we also introduced SOIC, as I just mentioned, that even much better system performance. So we continue to progress our technology, and that -- did that answer your question?

Sebastian Hou ***CL Securities Taiwan Company Limited, Research Division - Research Analyst***

Sort of. Well, anyway, my question is very simple, actually. I just want to -- I simply just want to know that the -- your earlier comments on the large portion of the 7-nanometer customer tape-out will use our advanced packaging. And now our tape-out number is like, based on your comments, it seems like double from this year to next year. So this large portion still apply on the double -- doubling the 7-nanometer tape-out next year. Is that right?

C. C. Wei ***Taiwan Semiconductor Manufacturing Company Limited - CEO & Vice Chairman***

Oh, I see. Develop one new backend process -- packaging process, it actually will last for many years. So next year, so 7-nanometer or 7 plus application for those products are still using the InFO and also using the CoWoS, yes. And whether you stop or not, I am not ready to answer that question yet.

Sebastian Hou ***CL Securities Taiwan Company Limited, Research Division - Research Analyst***

Okay. That's clear. Second follow-up is I remember, last quarter when, C.C., you talked about the 28-nanometer outlook or you mentioned 2019 will come down and expect the recovery -- nice recovery in 2020 because of the 22-nanometer's adoption. So today, you just mentioned that you expect the overcapacity will be a norm for several years. So what I interpret is that it sounds to me, over the past 3 months, you've become more cautious, conservative on 28 compared to 3 months ago. Am I interpreting that right?

C. C. Wei ***Taiwan Semiconductor Manufacturing Company Limited - CEO & Vice Chairman***

You maybe right because of recently, a lot of capacity has been built on 28-nanometer as compared with 3 months, 6 months ago, right? So that means overcapacity a little bit more severe than previously predicted. However, I would like to stress again -- I mean that TSMC develop shrink of the geometry for customer to gain the benefit of performance and better density. We also develop specialties. So that's why I say that we have confidence a couple of years later that our 28-nanometer will enter into a new era with a high utilization rate again.

Sebastian Hou ***CL Securities Taiwan Company Limited, Research Division - Research Analyst***

Do you view those excessive 28-nanometer capacity or the more they expanded newly add 28-nanometer capacity is a real threat to you or they're non-event? I mean, they're effective capacity or they're...

C. C. Wei ***Taiwan Semiconductor Manufacturing Company Limited - CEO & Vice Chairman***

We always are competing in the market, whether it be overcapacity. But of course, let me answer the question directly. Overcapacity is not good for any player in this field, definitely. Okay?

Elizabeth Sun ***Taiwan Semiconductor Manufacturing Company Limited - Senior Director of Corporate Communication Division***

All right. I think given the consideration of time, we'll just have Randy Abrams to have the last question.

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

Yes. Just one quick follow-up to that last line of discussion because just in the last few months, on the 28, have you changed your view on the 16 migration? Because one factor -- some foundries, if they stop at 28, can address the 16. So are you taking a more aggressive approach? So is part of your view on 28 view getting more positive on 16, and you're trying to encourage more customers to migrate to that node where there's fewer players?

C. C. Wei ***Taiwan Semiconductor Manufacturing Company Limited - CEO & Vice Chairman***

So your question is, are we going to repeat this kind of a 28 migration on 16?

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

Well, just, in the last few months, are you also seeing more and more customer's demand to actually migrate to 16? And is it also more your strategy with some competitors not moving on, you actually have less -- a bit less competition on 16 and below?

C. C. Wei ***Taiwan Semiconductor Manufacturing Company Limited - CEO & Vice Chairman***

Yes, we have less competition in 16 and below, yes. But then so long as you have 1 competitor, that's good enough, right? I mean that you have to work really hard to compete.

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

Okay. But I guess, on the customer side, are you starting to see more -- as part of your 28 coming down, you're actually seeing more customers with an urgency or desire to actually do that shrink? So you're seeing any change in that cadence of customers moving from 28 to 16?

C. C. Wei ***Taiwan Semiconductor Manufacturing Company Limited - CEO & Vice Chairman***

Can you be more specific? Your question is...

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

Just a view -- you're now -- you do feel like there's more capacity on 28.

C. C. Wei ***Taiwan Semiconductor Manufacturing Company Limited - CEO & Vice Chairman***

Yes.

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

But flip side, are you seeing some of the demand you previously expected on 28 now shifting to 16 and 12?

C. C. Wei ***Taiwan Semiconductor Manufacturing Company Limited - CEO & Vice Chairman***

Oh, oh, okay. A lot of my competitors can do 28-nanometer. But not a lot of my competitors can do 16- or 14-nanometer, at least for today. And so far, we did not see the same phenomena as a 28-nanometer. Did that answer your question?

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

Okay. Yes, just more about demand, do you see more customers now trying to make that shift to 16, so on the customer side?

C. C. Wei ***Taiwan Semiconductor Manufacturing Company Limited - CEO & Vice Chairman***

Oh, okay. We will continue doing this way, actually, that the customer migrate faster than we expected into 16, right? And you expect that in the 16 or 14 will migrate faster than we expected into 10 or 7.

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

No, the question is now 28, you're more worried about oversupply. Is part of that from you're seeing more customers migrate to 16?

C. C. Wei ***Taiwan Semiconductor Manufacturing Company Limited - CEO & Vice Chairman***

Yes, that -- the answer is yes. And that they migrate into 10 and 7 also, so they're faster than we expected, yes.

Elizabeth Sun ***Taiwan Semiconductor Manufacturing Company Limited - Senior Director of Corporate Communication Division***

Okay. This will conclude our conference today. Please be advised that the replay of the conference will be accessible within 4 hours from now. Transcripts will be available 24 hours from now, both of which will be available through our website at www.tsmc.com. Thank you for joining us today. We hope you will join us again next quarter. Goodbye, and have a good day.