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PRESENTATION

Blayne Peter Curtis - *Barclays Bank PLC, Research Division - Director & Senior Research Analyst*

Thanks for joining. I'm Blayne Curtis, semiconductor analyst at Barclays. Very happy to have Analog Devices for our next presentation. Format will be a 30-minute fireside. From the company, we have Karim Hamed, the GM or the instrumentation business as well as Mike Lucarelli, recently promoted to VP of Investor Relations. Thinking about maybe the best way to start this is actually pass it to Karim. This is a business that I'm not as familiar with. I'm sure a lot of investors aren't as well. So maybe Karim, if you could just give us a little bit on your background and really describe the business and the segments you plan.

Karim Hamed

Sure. Thanks, Blayne, and it's good to be here today. My name is Karim Hamed. I'm the Vice President of the Instrumentation business here at Analog Devices. To tell me about my background, I have over 20 years of experience in semiconductor industry prior to this current role in instrumentation, I was responsible for the RF franchise here in ADI. I came to ADI through the Hittite acquisition, so I worked in Hittite as well and I was responsible for the olefin Micro portfolio.

And prior to that, I also worked in other semis companies developing handset piece and stuff. So very long history in the Olefin and the semiconductor world. So if we are talking about instrumentation, the instrumentation business in ADI is mainly comprised of 3 segments. The first 1 is the ATE Automatic Test Equipment, as we say, and this is actually about high-volume manufacturing test of semiconductors, everything that goes from memory to high-performance compute chips like modems and processors to high-power are devices for electrification, automotive. This is all the high-volume manufacturing under ATE. So this is the first segment.

The second segment is our electronic test and measurement business, which is mostly around lab and R&D measurement test equipment. This is the type of equipment that you will see in laboratories for R&D or in the field when you like a technician is installing a base station or even coming to your home to install the fiber. You have a specific type of equipment. This is our ATM business. And the third 1 is our -- and we're shifting here scientific instruments. So scientific instrument is shifting it from measuring the electrical performance, actually measuring in the physical property materials. And this is the type of equipment that you can see in a drug in R&D, drug discovery in laboratories and stuff like that. So these are the 3 main businesses within EBI, roughly equal in size in terms of business inside us.

QUESTIONS AND ANSWERS

Blayne Peter Curtis - *Barclays Bank PLC, Research Division - Director & Senior Research Analyst*

I want to ask you, Mike has been helpful to kind of describe some of the moving pieces within industrial and which ones are a record, which are not. When you look at these 3 segments, I can answer the first part on ATE. I mean, clearly, some just be short and I find it ironic the circular nature where you can't get the equipment to make the semis and they're short and now they're shorting people who make the equipment. But maybe just talk about the demand profile you've seen across all 3 segments this year?

Karim Hamed

Yes. So you're right, Ben, the demand has -- across all 3 have been very strong and very positive -- So we talked about ATE with semiconductor shortage, but also like the economy coming back online and see strong demand for lab and test equipment, like companies are really investing in creating and developing new products, and that will require some of the R&D economic activity and is going back. So you start seeing a lot of field deployments that drive the demand for some of our ATM business as well. And same when you look at the scientific instrument side was with the rapid development of vaccines and drugs put a lot of emphasis and a lot of spend in the R&D for biopharma and drug that also help boost our scientific instrument business. So I would say across all 3 segments, very positive signal in demand for this year, and we see this demand continue as well.

Michael C. Lucarelli - Analog Devices, Inc. - Senior Director of IR

And I think 1 thing to add to what Karim said is actually, if you go back to 2020, right now, this year, everything is good 2021. If you go back to the bad times, even in 2020, this business was quite strong for us in a down market, and it goes through the diversity of that business and different applications we play in that were quite strong ATE and ETM side. And just switch to 2021, 3-mile underwrite everything is good. Everything is being stronger as GDP picks up and also you get secular drivers across 5G, EVs, semi cap equipment and pharmaceuticals.

Blayne Peter Curtis - Barclays Bank PLC, Research Division - Director & Senior Research Analyst

I want to ask you about the kind of 2 questions. The products that you're selling to these different end markets, Clearly, converters have been a franchise for ADI for a long time, but you came through Hittite. You've now made 2 acquisitions as a company, so you're selling a much broader portfolio. And then you can kind of layer on to that just kind of your share position and kind of I'm sure converters is you have a very strong share. Kind of how is the position for the rest of the portfolio?

Karim Hamed

Yes. So you can see like the business is 1 of the beauty of the business is so diverse. The applications have stood at first. And that plays very well to the sense of ADI because the depth of our technology portfolio, and again, high performance because this market is a performance-driven market. Simply when you build the test equipment, it has to have a higher performance that's not being tested. So it's really the truly performance-driven market. So the depth of our portfolio really play well for this diversification. So to your point from power high-speed converter -- precision comparator, RF microwave, even DSPs, it really plays well to the to the breadth of our technology and it differentiates us from our competitors because when you look at the competitive landscape, you won't find a company with the breadth of high-performance portfolio that suits into this market. So I would say one of our biggest transfer the biggest differentiation is this a world-class portfolio of analog and mixed-signal high performance that 3D really plays very well in this market.

Blayne Peter Curtis - Barclays Bank PLC, Research Division - Director & Senior Research Analyst

I want to ask you on the ATE side? I mean, the semi cycle is going to be -- do what it does, and we'll get to -- we'll get to all those cycle questions for you. But maybe you could just talk about within the ATE business and it might even extend to some of the RF stuff in terms of you see next-generation ships have a multiple higher of test times. I think 1 cellphone SSC guy was just talking to their next cans like 4x longer. Can you talk about the trends outside of the semi cycle that are driving longer or usage equipment, and therefore, you need more of it and that's.

Karim Hamed

Absolutely. So I said, instrumentation actually the beauty of it realigned to all the leading megatrends. So if you think about it from an electrification, connectivity, like cloud connectivity and data centers, all of this stuff needs to be tested. And again, at the various stages, various stages from

manufacturing or R&D or lab. So all these leading megatrends. It's clearly drive actually think about it like the complexity is increasing, right? So what you mentioned, Blayne like the highest-performance compute chips has 4x, 3x, 10x, the density of the transistors. Going to find a new geometric mean that you can compact more functionality. So that in its own drive test time, right? That's on its own drive like increased SAM for ADI more test time mean more testers does increase SAM for us.

So that's 1 of the things on the leading megatrends of how its impact. And then you have the whole semiconductor out, say, reinsuring that's happening and taking place globally. By the way, it's not only in the U.S. or Europe, it's happening globally. That also drives the demand of the ATE. So beyond the -- to your point about the short term, the demand of semiconductor. But all of these leading megatrends is driving like the continuous growth of our SAM growth and also share count and growth in ATE. You compile that with a very strong portfolio that we have, diversity of our products, we've been like supplying this market for 20-plus years. We have a very strong position in terms of most of the lead customers. That put us in a very, very, very exciting place when it comes to ATE longer term.

Blayne Peter Curtis - Barclays Bank PLC, Research Division - Director & Senior Research Analyst

Just I guess a question for you or Mike, but I'm curious the perspective just on your business in terms of the shortages and how -- what type of lead times are you seeing? I mean, we continue to hear equipment vendors say they can't get semis in terms of how is your business and in terms of your lead times or kind of -- I'm kind of also curious, do you get into a situation where other components are short, if you're not short and kind of that's impacted demand, which I'm assuming you'll eventually fulfill. I'm just curious what the current environment is.

Karim Hamed

Yes. I can comment and Mike you can try. So -- We are not placed again with et semi, like we definitely have our own constraints. So demand is extremely strong across all segments. That driving definitely constraints in our fabs and -- But that being said, we work pretty closely with our customers, Blayne, we want to make sure that we are not the longest pole attempt and say, so we work close with our customers. We try to understand the demand profile and how we match it. Not saying we're not constrained. We definitely have our constraints. But we also have a very symbiotic relationship with our customers, where we sell our chips, we turn back the sellers testers, we test our shares. So we have a very good symbiotic relation with our customers. So again, definitely a challenge in supply, but we overcome some of these by working very closely with our customers in terms of what to prioritize and whatnot.

Michael C. Lucarelli - Analog Devices, Inc. - Senior Director of IR

I think -- said it well, I think -- We need the testers they need our components. So you can have a give take relationship that we bolted each other, which helps us from a priority standpoint, not that we're not sure and I have lead times extending, but they know they need us and we need them. So it works out for both parties to help you other out.

Blayne Peter Curtis - Barclays Bank PLC, Research Division - Director & Senior Research Analyst

Maybe just transitioning to the whole business, Mike. The -- you just reported 1 part you talked about was that lead times are kind of stabilizing, which people are going to read is that you're finally catching up -- Can you give us a perspective? I mean, I think you also said the demand is still outserving supply. But clearly, those 2 are kind of coming closer together. So here's a view of where we are today on the supply side?

Michael C. Lucarelli - Analog Devices, Inc. - Senior Director of IR

Yes. No, I mean demand is way about supply. I mean I think the lead time stabilizing it is net positive overall. I mean they have to at some point stabilize. And when you say that's a month or 2 trend. It's a trend for only a couple of months, not really a long-term trend. But supply being better, what we're seeing is that where it's really extended on the back end of the long tail being like over 26 weeks, it's not being much worse. But as you said, the good news is lead times are stabilizing, but at the same time, demand remaining strong. And that's step one. as long demand remains

strong, that's a net positive, I would say, to the cycle. And I think as you go forward, I think at some point, lead times will contract because they have to. It's just math, right? Over time, supply gets better demand. And when that happens, a question what happens to the demand at that point. And our view right now, it remains strong. I think the lead times contraction and lead time stabilization will help allay some fears out. There is a lot of real demand out there. Despite all the supply constraints. And once those stabilize, you'll see that real true underlying demand, that's what we look forward to. Now when will that happen, hopefully, in 2022, but we'll see.

Blayne Peter Curtis - Barclays Bank PLC, Research Division - Director & Senior Research Analyst

And when you look and try to evaluate the semi cycle, people typically pointing to the channel. Now given things have been short so long, I can't imagine the channel is ever going to have much inventory to sell rate through what's your visibility to the end customer? You have to have some customers that are on consignment. And kind of how do you track that? And kind of where do you feel like how those levels are?

Karim Hamed

Yes, good question. I mean we do so on the auto side, the portion of our business and alanine. Those inventories are down from pre-pandemic levels. So we're not building inventory on the consignment level, at least on our balance sheet, for example, because it's consigned. You're right. I mean, channel sells through. We do track. We have conversations with our customers. Obviously, everyone wants more chips. But will we monitor and what we think is the best indication that this is, I would call it, more true demand that most people think is the amount of calls --. When you have a CEO of a company calling our CEO, it's not about getting inventory. That's about getting a product to ship out the door for revenue. And I think what we talked about in the last earnings call was those calls in our fiscal fourth quarter were higher than 3Q. So that does tells us there's still a very -- demand is really using supply. And it goes back to lead-in, stabilizing, but there's still a lot of demand out there that we need we need to fill.

Blayne Peter Curtis - Barclays Bank PLC, Research Division - Director & Senior Research Analyst

Curious, this period has changed a lot of things for a lot of people. Prior to the pandemic, you guys were more in the mode of outsourcing, particularly front-end setting down some fabs and being more fables and flexible. I would say, going to the pandemic, maybe a company like a Hittite was all internal, said they were better positioned, but they're probably not the most short because it's a fixed amount of capacity. Has this whole period changed the way you guys think about internal versus external capacity on the front end? And is there any change also on the back end?

Karim Hamed

Good question. Yes and no. I think the hybrid model works and we like the hybrid model. We'll continue to stick with that. post -- before Maxim, we were about 50-50 on the front end, 50 external 50 internal. Post-Maxim are about 40, 45 external, sorry, internal, so it went down internal. Now we're changing that, and we're adding more capacity internally in the Beaverton fab that will kind of bring us back to 50-50. But we don't really target a level of 50-50. We kind of look and say, can we make it internal if we can, we will. If we can't, we go external. And for us, it's a decision on node. Anything below \$350 million used to go external.

Now with Maxim, they had 180 to our portfolio, 180 nanometer. Now we can do more 180 internally. And that's what we'll do. You'll see us pull more 180 internal. So it gets back to kind of that 50-50 mix. Second, the other benefit of having that fab is people capacity increase and CapEx is increasing, there be oversupply. The increased capacity that we're doing at least for ADI, it's flex capacity. We'll have our foundry partners, and we have our internal manufacturing that we can push in and out depending on where you are in demand. Demand is strong. You push it out manage week, you can pull it in. So the underutilization charges on that additional capacity is very low. So it's a high ROI investment we're making, not just for the near term but for the long term of our business.

Blayne Peter Curtis - Barclays Bank PLC, Research Division - Director & Senior Research Analyst

And are you kind of following this trend of things changing, do you think customers are thinking about the way they hold inventory, where they hold inventory differently. And when you look at the way you interact with the customers, does this when you see a ETI trying to be totally direct versus going through distribution, do you think about changing any way you address your customers?

Michael C. Lucarelli - Analog Devices, Inc. - Senior Director of IR

I'll pass it create talk to customers more to see what he -- what the customers are telling him the standpoint about inventory, whether it's our balance sheet or their balance sheet -- And then I have my own thoughts to as always.

Karim Hamed

Yes. No, I can add some color. So thinking there is -- especially in the broker business, taking customer direct, this is something that we have a lot of relationships and we take a lot of customers, but -- the reality of the matter is that on never, especially with the horizontal business, you won't be able to have 100% of your customer direct. So you have to have some sort of a hybrid model where you can take like a big percentage of your customer direct, but you have to have this hybrid model, given the horizontal nature of the business. The other thing that as well do is really trying to understand more on the demand side of things. And of course, we get the signals from our -- the customers that we have direct and that's going to continue. But I would say, Blayne, to be honest, I don't think I think the hybrid model works well for us. You will -- no matter how you try like 100% is not -- I don't think you can take 100% you have ADI how like tens of thousands of customers. It's just more than 100,000 customers here to go. So it's more like -- it's hard to take everything, but see smart about what accounts you take direct. What's the right hybrid model -- And what's the overall cost of your channel and how you optimize that? I think that's the key.

Michael C. Lucarelli - Analog Devices, Inc. - Senior Director of IR

And I don't have much to add. I think it's same thing as manufacturing, having the ability to do both is beneficial because sometimes you want more direct and we do have more through channel. Same thing on manufacturing, it's nice to have both levers to pull. And that's how we manage the business. Balance is good, increases resiliency. And we've seen the channel help us out over the past, call 1.5 years where things went down during COVID, we had channel inventory build that we can still ship to customers. So it's a balance between the 2. We always look to see what's the optimal mix and what drops through the most profit dollars as well.

Blayne Peter Curtis - Barclays Bank PLC, Research Division - Director & Senior Research Analyst

I want to ask you is kind of a question for the two of you on the acquisition of Maxim, right? So previously, you came from Hittite, I think Hittite linear, there was clear franchises that you're buying, and it made a lot of sense. And a little known fact, the use to. So I'm not dumping on them, and clearly, they had good employees. They hired me, right? But not clearest franchise that fits in. So maybe it'd be interesting to hear from you as you look at their portfolio, what do you find interesting to drive your business?

Karim Hamed

Yes. So to put it right, Hittite and Linear had a strong play in the instrumentation mode. So we really -- we power -- When you look at Maxim, we see opportunities. We see customers like the products, again, high-end market, high performance driven. They like the products of Maxim, but Maxim didn't focus in the instrumentation is a market. So we see that as an opportunity. So we take these high-performance products with the AI service model. We see that, that could be a very good revenue synergies and opportunities for us moving ahead, at least when it comes to instrumentation.

Michael C. Lucarelli - *Analog Devices, Inc. - Senior Director of IR*

You're right, I think we did hit to a linear is very obvious, like you kind of plug the hole or expanded a technology or a scope of our portfolio, where Maxim is probably a little more on the scale side, less than the scope. And it not that they didn't have scope to it, but it was a little more tilted towards scale and scout matter, especially in this industry, as we've seen in the past few years. And I think did a great job outlining of benefits where they don't ship into the instrumentation market. They do a bit, not much. So now his job is to take that portfolio from Maxim and see what can you bring to the Board that we own? Is there additional power sockets we can add an additional converters that they had that we didn't have maybe that we can add -- and the good thing for us is we have a strong hold in that market. So it's easy to bring that product into that customer because we already have the relationship. So I think invitation is going to be an area of highly profitable revenue synergy for us as a company.

Blayne Peter Curtis - *Barclays Bank PLC, Research Division - Director & Senior Research Analyst*

Well, I mean, I feel -- I think you've mentioned that Maxim wasn't investing as much in the back end. I mean, as they run for sale and then obviously, conserving cash while the deal was in progress. But in terms of their design pipeline, if you restart something now, it's probably not revenue for 3 to 5 years. I mean creates probably how long your design cycles are. How fast can you kind of position this and drive growth in Maxim? They have some existing products you can just send to your customers? Or is it more about new products in longer cycle time?

Karim Hamed

I mean I think the idea here is no one-size-fits-all. It's just the diversity of application allows us to have all of the above what you described. yes, some of the technologies that might really exist. But again, you didn't have the power because again, you might have 1 socket, but now what we own all of the board, it's easier to get in the socket design then. So that's tail what we got based on the portfolio that already exists. Some of the stuff were required like leveraging some of the technology from -- something new. So it's all of the above. One thing I want to highlight as well, a, is that the clock speed of the market has already increased. So yes, it used to be maybe a year point like multiple years. Now we see designs in cycle really shortened, right? Customers sometimes go to 6 months, sometimes goes to a year in terms of cycle. And again, these products are very sticky. So once we get in, they are in for like 10-plus years, I would say. But the clock speed in the cycle is really -- is changing. And again, different segments will have different. But I would say, overall, it's speeding up.

Michael C. Lucarelli - *Analog Devices, Inc. - Senior Director of IR*

It's fast for analog, right? I think analog like you know, Blayne, it's a long life cycle market. So it does take time to get from design win to revenue. But as we said, they are going faster. It's just still a slower process, meaning we'll get a design win today, it probably won't start shipping for 1 or 2 years and then it kind of ramps from there. You don't really peak revenue, especially in Karim's markets or industrial for 5 or 6 years. And I think that as we look at the revenue synergies and the profile we've had for Hittite and Linear it takes about 5 years to really start hitting that near of the curve on kind of the revenue contribution from these acquisitions.

Blayne Peter Curtis - *Barclays Bank PLC, Research Division - Director & Senior Research Analyst*

I had a question again for the 2U, a little different, but it has a commonality. In terms of seen some of the Analog companies now start to look like linear, and it was a great company, but it was high margin, no growth. One, can ADI push margins towards 70% and still drive growth. And then I guess the part for Karim is just, we didn't talk about the profitability of your business, but if that's outgrowing the segment, maybe talk about the effects on gross margins and overall profitability.

Michael C. Lucarelli - *Analog Devices, Inc. - Senior Director of IR*

I'll start at corporate level, and I'll pass it to Karim to go in deeply. So we're about 70%, and we're about 71%, we think for the full year in '22. And when we did the deal at Maxim, I remember, we announced deal people like, "Oh, my gosh, so goes your gross margin models be below 70%. We

are year 1 of the deal, we'll have Maxim for the full year and our gross margin will be above 71%. So yes, we can grow this business very profitably above 70% and grow it at a strong rate. And I think there's -- we keep getting gross margins going higher, we could, but attention with growth. So I think we like the model of 70% plus because it allows us to grow the business with healthy gross margins. And then over time, what we'll do is drop more through on the leverage to really drive operating margins, operating profit dollars and free cash flow, and that's how we manage it. I'll pass it to Karim -- his business and profitability.

Karim Hamed

Yes. So for instrumentation, Blayne, I think it is the largest segment within industrial. So it's north of 25% of the industrial business. And it also has profitability that's, I would say, north of the average -- corporate average, which is 71%. And it has historically also the strongest growth within industrial. So to answer your question, can we grow it? Yes, we can. We can grow it while maintaining our margins and again, very doable.

Blayne Peter Curtis - Barclays Bank PLC, Research Division - Director & Senior Research Analyst

One of the -- another component of growth is R&D. And it wasn't someone actually highlighted I mean I lost track and clearly lost target your gross margins, too. But it's interesting that your R&D is larger than TI, double the percent of revenue. Can you talk about that R&D line in terms of driving growth? And whether it trends down closer to -- not to just keep same TI, but I mean you're now consolidated there's only to your competitors. So as a benchmark, they still are. Does R&D trend closer to that level? Or are you going to continue to invest for growth?

Karim Hamed

Yes. So I can piece of from my perspective as opposed to Mike. So I think when you look at ADI, it's again, this -- we're a technology-driven company. I think that's our game. Really driving cutting-edge technology. It helped me definitely in the instrumentation market because, as I said, it's a performance-driven market. That's why we have this very strong play. But I think our game is to continue the innovation, and I think that's how we can extract more value. So I would say it's -- the R&D spend is something that, again, is driving growth, and it's allowing us to really creating these technologies that really help us in the instrumentation market. That's from a market standpoint.

Michael C. Lucarelli - Analog Devices, Inc. - Senior Director of IR

Of course at the end of the year, always lots more R&D. Yes. No, but no, it's true. I mean, there is benefits of scale. I think historically, we look pretty maximum we're about 19% of sales always. I think as a percent of sales, our R&D has probably kind of peaked at 19%, I think it will come down from there, but not that meaningfully. I don't think -- we're not going to pull out TI, as you said, go to 10%, not where they're at 9% now. We are innovation-first. So we'll always be more R&D-intensive than everyone out there. And we get paid for that innovation in our gross margins. We're the only 1 in the analog industry with 71%-plus gross margins as long as we can drive those gross margins and maintain that 70%, we're going to keep spending R&D and drive growth that way. But you're right to think there will be leverage on the R&D line as you look ahead, and it goes back to our earlier conversation about scale. Scale matters -- and as you have more scale, you can kind of peanut butter that R&D across more applications.

Blayne Peter Curtis - Barclays Bank PLC, Research Division - Director & Senior Research Analyst

I like these dual questions, maybe because you're sitting in the same camera shot. But in terms of the investments you're making today that maybe people aren't paying his attention to what the drivers will be over the next couple of years. Just overall for ADI, where do you see targeted investments driving growth -- And then I'm just kind of curious for Karim within your segment, where do you see some opportunities? Talk about some megatrends, some of the market wise, but where do you see opportunities?

Karim Hamed

Okay. So I thought I mean from my segment, where we see opportunities are mostly in the high-performance compute. I think the push for like AI, machine learning, like really pushing the demand on the final geometries and high-performance compute. I think that will continue to drive longer-term growth. Electrification will be a good growth driver. And I think that's another area that we can in our growth. And the other 1 is actually really like when you think about the drug discovery. You can see with a COVID vaccine like the cycle of this is getting very quick, and they're driving a lot of investment in the biopharma and the doctors can help us with sentiment. So I would say among again, very diverse business, but these will be the that will at least very positive. We have a very strong position in comp test, 5G test in data center that will continue. But I'd say stuff that we add that will fuel further these growth that I described.

Michael C. Lucarelli - Analog Devices, Inc. - Senior Director of IR

At a company level, I mean stay there's definitely more growth drivers than have been in the past decade for our business part of the acquisition we made. But look at our business to go down kind of the markets industrial to have market, which is fantastic. You can outline those. Automation is a huge 1 for us. Aerospace and the space market is taking off bad pun there, but that's not was doing. Going down to automotive, EVs were the leader in BMS, that's just starting now. last year, I continue to see that thing grow at least 20% more than that given our portfolio there. And we're also the leader in came connectivity. You have A2B Maxim or serial link technology. So we have a lot of ability to bring those new customers and grow that market and be a market leader there as well.

And then if you go to comps, we to 5G. I mean ADI organic was a leader in 5G. Now with a portfolio the data center deeper new opportunity set for growth and consumer, which is historic headwind bolder Maxim and ADI has turned the corner. I think you see a multiyear growth trajectory. Not to do a win socket win here or there because with where we invested in the business across different applications with different customers to make it more sustained, smaller type growth in that market as well, which is a net positive because it's a very low R&D market, high fall run margin market for us on the consumer side.

Blayne Peter Curtis - Barclays Bank PLC, Research Division - Director & Senior Research Analyst

We'll end it there. Appreciate the time Karim and Mike. Thank you very much.

Karim Hamed

Thank you, Blayne.

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