PITT STREET RESEARCH

Weebit Nano

Collaboration with Efabless

Share Price: A$2.30

ASX: WBT

Sector: Semiconductor Equipment

11 June 2024

Weebit Nano (ASX:WBT) announced a collaboration agreement with Efabless, a Palo Alto, California-based chip design services company. eFabless helps its customers put their product ideas into chip designs using Efabless' design and workflow tools as well as its IP library. Designs can subsequently be manufactured in small quantities using SkyWater's S130 process.

Deal could drive momentum for ReRAM integration

Efabless' model allows for fast prototyping of new product ideas. Weebit Nano will initially get a small fee if its ReRAM is included in a design and chip designers will need to take out a full license agreement with Weebit Nano if the chip goes into volume production. So, while this collaboration is not likely to bring in large revenues initially, we believe the easier prototyping at SkyWater may provide Weebit Nano with some momentum when it comes to the integration of ReRAM into new chip designs. And it could provide the company with inroads into Technology companies it may not be talking to yet.

Dissecting Weebit Nano's list of prospects

In this update, we have also taken a closer look at Weebit Nano's prospects. The company has mentioned on numerous occasions it is talking to a substantial number of prospects. We have taken a closer look at the likely foundry and Integrated Device Manufacturer (IDM) prospects to get a sense of which may jump next. Although the timing of new deals is impossible to predict for outsiders, we believe there is a very good chance Weebit Nano can land several more commercial deals in 2024.

Directors have been buying shares on market

Weebit Nano recently announced that Chairman Perlmutter, CEO Coby Hanoch and Non Executive Director Atiq Raza have bought shares on market in the first week of June 2024. In our view, it is a sign of confidence when a company's leadership buys shares on-market. And at the current share price it makes good financial sense as well.

Valuation of A$9.56 per share reiterated

We reiterate our valuation of Weebit Nano of A$9.56 per share outlined in our June 2023 report. We think the gap between the company's current price and our valuation can close on the back of new commercial deals with foundries and/or IDM's. Please see page 9 for more details on our valuation and key risks.

Market cap. (A$m)	433.8
# shares outstanding (m)	188.6
# share fully diluted (m)	209.9
Market cap ful. dil. (A$m)	482.9
Free float	89.8%
12 months high/low	2.16 /7.77
Average daily volume (x1,000)	992.4
Website	www.weebit-nano.com

Source: Company, Pitt Street Research

Share price (A$) and avg. daily volume (k, r.h.s.)

Source: Refinitiv Eikon

Valuation metrics	
Valuation per share (A$)	9.56

Source: Pitt Street Research

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Disclosure: Pitt Street Research directors own shares in Weebit Nano.

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Efabless deal could drive ReRAM momentum

Weebit Nano (ASX:WBT) announced a collaboration agreement with Efabless, a Palo Alto, California-based chip design services company. Efabless helps its customers put their product ideas into chip designs using eFabless' design and workflow tools as well as its IP library.

Prototyping for chip designers made easy.

Once designed, customers can subsequently get their prototype chips manufactured at SkyWater in small quantities together with other customers' prototypes, i.e. on the same wafers. For instance, a customer may only need 100 prototype chips, which could leave a lot of empty space on a wafer (depending on the size of the chips).

It is important to mention that designers working on this prototyping program are always on the lookout for new technologies and new applications. These are not just standard designs, because those designs don't require prototyping. This opens up opportunities for innovative technologies and chip designs that will be using Weebit Nano's ReRAM to drive future growth.

Cost and speed advantages for chip designers

By manufacturing wafers with chip designs from various customers, utilising the entire surface area of the wafers, Efabless is able to keep manufacturing costs for individual customers to a minimum.

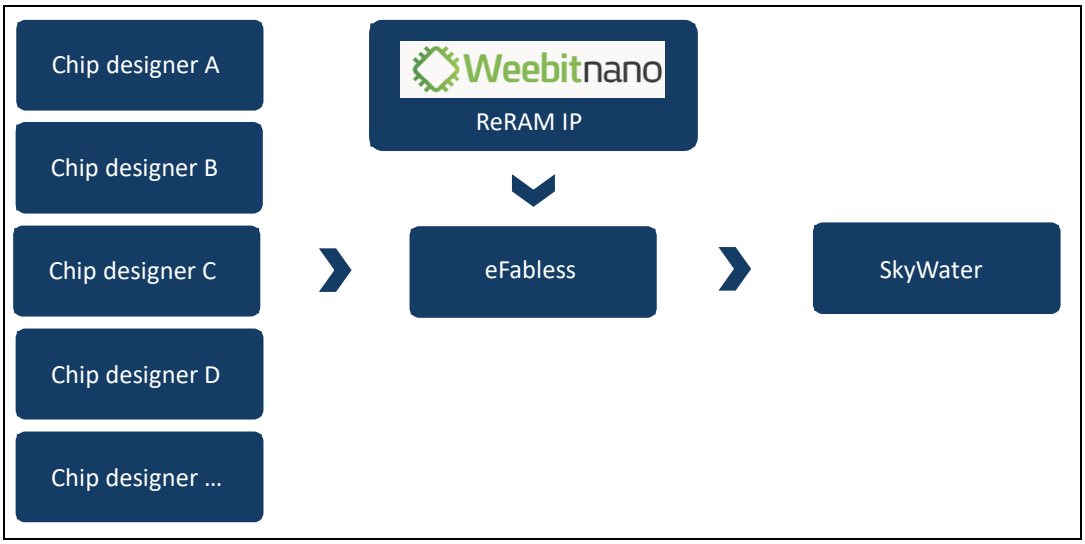
Getting chip prototypes onto silicon a lot faster and cheaper.

Additionally, prototyping for individual customers can potentially be much faster. eEfabless schedules quarterly production runs that add up to batches that are attractive enough for SkyWater to manufacture economically. Individual customers would likely have to wait until production time opens up for them, which would likely take much longer.

Manufacturing at SkyWater

Manufacturing is done using SkyWater's S130 CMOS process for which Weebit Nano's ReRAM has been fully qualified, including for automotive designs. The collaboration with eEfabless means Weebit Nano's ReRAM can now be integrated in chip designs by Efabless' customers for a small fee (Figure 1).

Figure 1: eFabless workflow including Weebit Nano's ReRAM IP



Source: Weebit Nano

If and when those chips go into volume production, the chip design company will need to get a full license from Weebit Nano.

Potential inroads with other technology companies.

While this collaboration will not immediately lead to substantial revenues, we believe it will help Weebit Nano in getting its IP embedded with various chip designers a lot faster. Additionally, Efabless is supported by Google (IP), ARM (IP) and GlobalFoundries (investment and IP), which may give Weebit Nano potential inroads with other Technology companies that it may not already be talking to, such as Google and ARM.

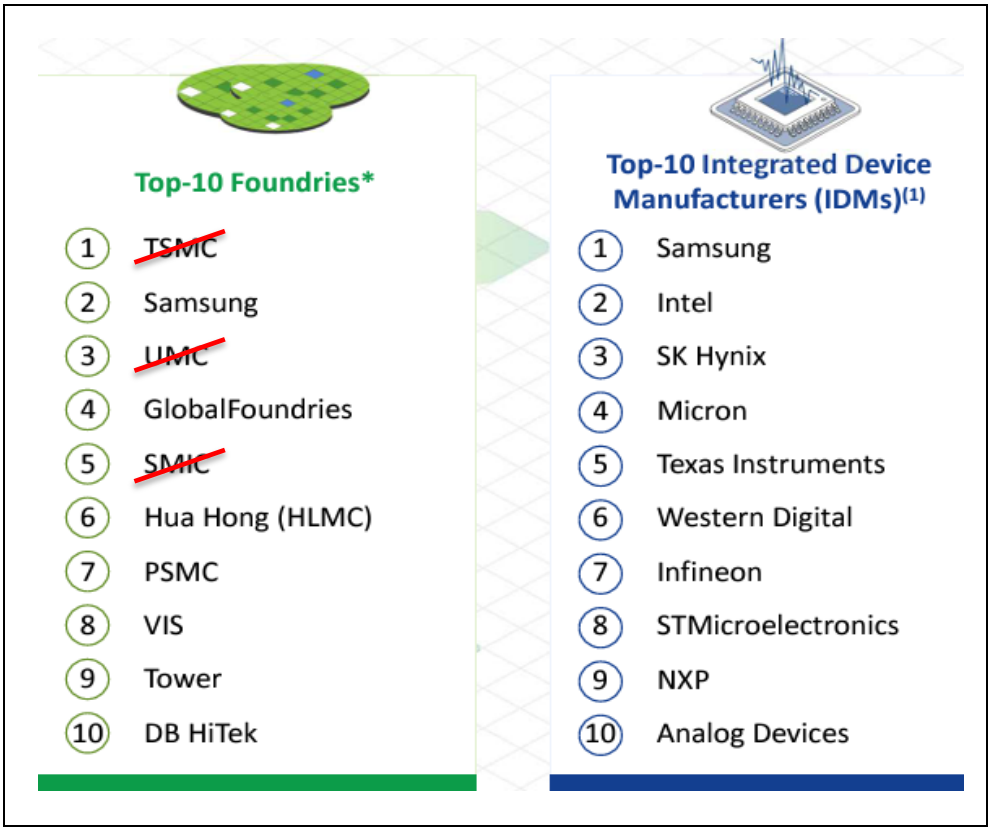
A look at Weebit Nano's foundry prospects

Weebit Nano management has talked about its commercial engagements with prospects on numerous occasions. The company is talking to three different groups of prospects;

Talking to three types of prospects.

- Semiconductor foundries that manufacture computer chips for third parties,
- Integrated Device Manufacturers (IDM's) that do most work themselves, from chip design all the way to manufacturing and (sometimes) packaging, and
- Product companies, i.e. customers of foundries and IDM's, such as manufacturers of Automotive parts that contain computer chips or electronics companies that integrate computer chips into larger modules or complete products.

Figure 2: Weebit Nano's foundry and IDM prospects



Source: Weebit Nano

Talking to the majority of the Top 10 foundries

Weebit Nano has shared the slide in Figure 2 multiple times in its presentations. It lists the Top 10 semiconductor foundries and the Top 10 IDM's in the world. And it has commented that it is in commercial discussions with the majority of the companies on both lists.

Talking to 7 of the Top 10 foundries.

Just looking at the foundries, we believe we can likely cross out the names of several companies on the list for various reasons. Firstly, TSMC and UMC have their own versions of ReRAM. TSMC developed its own, while UMC works with ReRAM from Nuvoton.

TSMC and UMC have their own versions of ReRAM.

And while foundries in general wouldn't have an issue with integrating third party IP into a design if a customer wants it, we believe at this stage there is no need for either TSMC or UMC to have a 2nd source of ReRAM IP in its IP library.

In other words, their customers are likely happy with what they are getting. Even though this could change over time, e.g. with certain customers requesting Weebit Nano's ReRAM in the products that are manufactured by TSMC or UMC, for now we believe Weebit Nano is likely not in advanced commercial conversations with either of these foundries. That is not to say that we believe Weebit Nano has never spoken to TSMC or UMC, but simply that those conversations have not been progressed to commercial discussions at this time.

SMIC is off limits due to geopolitical tensions.

Another foundry we can take off the list is SMIC. Given its importance in building Chinese self-sufficiency in semiconductors and the feature size (i.e. the resolution or linewidth of the circuitry) it can manufacture at a resolution of 5nm (nanometer), SMIC is blacklisted by the US government, i.e. any semiconductor technology with (partial) US origins can't be sold to companies on this so-called entity list.

Considering Weebit Nano's tight collaboration with CEA-Leti, which is a French government-owned entity, and the potential of the US market, Weebit Nano will, most likely, not be in commercial conversations with China-based SMIC either.

This brings down the number of foundry prospects in the Top 10 down to 7, which is indeed still a majority of Top 10 foundries.

HLMC is not off limits because its most advanced manufacturing node is not leading edge.

Company #6 on the foundry prospect list, Shanghai Huali Microelectronics Corporation (HLMC), the foundry subsidiary of Hua Hong Semiconductor, is also Chinese. However, HLMC currently doesn't manufacture at resolutions lower than 22nm and is therefore not on the US entity list. Until this changes, Weebit Nano is free to do business with HLMC.

Weebit Nano's Foundry prospects all need ReRAM

In this section we will take a closer look at the seven foundries we believe Weebit Nano is currently in conversations and commercial discussions with. All of them need ReRAM in some form or another to cope with the increasingly tight requirements for embedded NVM as semiconductor devices get smaller. In other words, they all need to find a solution to the fact that Flash memory doesn't scale well below 40nm, or only at prohibitive costs.

ReRAM needed for a wide range of end applications.

So, while application areas for each of these prospects may vary, e.g. Automotive, Robotics, Industrial, Medical, Consumer etc, the SOC's these companies manufacture all need more advanced embedded memory technology, such as ReRAM.

Samsung is the biggest fish in the foundry pond after TSMC.

Samsung Electronics (KRX:005930) is a maker of consumer appliances and electronics in addition to being a maker of electronic components including semiconductors. Its product suite includes memory products, such as dynamic random access memory (DRAM) semiconductor devices, flash solid state drives (SSD), PCIe Gen4 SSDs and DDR5 (DRAM) devices, a range of systems-on-chip (SoC's) and image sensors.

Samsung was founded and remains headquartered in Seoul, South Korea. The company has three fabs in South Korea as well as two in Texas, USA. Samsung's most important foundry customers include BestBuy, Qualcomm, IBM and Baidu.

Samsung competes head-to-head with TSMC and other foundries.

In our view, Samsung is Weebit Nano's biggest commercial target, because it is the largest foundry target on the list (that doesn't include TSMC) as well as one of the largest IDMs in the world. Samsung's foundry business competes head-to-head with TSMC and others, offering best in class process and IPs.

The IDM side of Samsung consists for a large part of memory and storage devices (DRAM and SSD (NAND Flash memory)). However, a sizeable part of Samsung's IDM activities also includes processors for mobile phones, wearables and Automotive as well as image sensors. We believe these two groups (processors and image sensors) have wide applicability for ReRAM.

GlobalFoundries (GF) (NDQ:GFS) is a semiconductor foundry that provides and manufactures various semiconductor devices, including microprocessors, mobile application processors, baseband processors, network processors, radio frequency modems, microcontrollers and power management units. GF only makes 12-nanometre and above chips.

The company was only founded in 2009 when it took over AMD's fabrication plant when AMD decided to break off its manufacturing operations into a separate company and just be a chip designer. GlobalFoundries has grown to be the world's third-largest chip foundry.

The company is headquartered in Malta, Upstate New York, where it has a fab that manufactures over 400,000 wafers annually. GlobalFoundries has a big exposure to the Automotive and Telecom sectors with its top customers including Qualcomm, AMD, NXP and Infineon. Sometimes it makes 'specialty chips' in big exclusive deals, such as its recent $3bn agreement with the U.S. Department of Defence.

Weebit Nano is already working on 22nm FD-SOI with GlobalFoundries.

Weebit Nano and GlobalFoundries have been working together on the latter's 22FDX platform for some time and demonstrated embedded ReRAM on GF-manufactured wafers at Embedded World in April 2024. In essence, this platform provides a Fully Depleted Silicon-on-Insulator (FDSOI) technology at 22nm. This technology allows a chip manufacturer to go down to smaller geometries (22nm), but at lower production costs given that fewer process steps and fewer masks are required. You can read up on 22FDX in our report from March 2022.

We believe there is a very high probability that GlobalFoundries will be among one of the next foundries that Weebit Nano can sign.

Hua Hong Semiconductor (SHA:688347) is the second-largest Chinese foundry, headquartered and listed in Shanghai, on the tech-focused STAR Market. Its product suite includes embedded non-volatile memory, standard logic and mixed-signal, radio frequency, power management integrated circuits, power discrete and automotive solutions.

Hua Hong not likely to be high on Weebit Nano's priority list at the moment.

The company also offers foundry and design services comprising standard and customized IP development, full-custom layout design and customer-specific integrated solutions as well as design support and tape out services. Hua

Hong's client list predominantly consists of Chinese companies, including Xiaomi and Lenovo.

Even though Hua Hong Semiconductor is currently not on the US entity list, we believe it will not be high on Weebit Nano's commercial priority list at the moment.

Powerchip Semiconductor Manufacturing Corporation (PSMC) (TPE:6770) is the third-largest foundry in Taiwan after TSMC and UMC. PSMC was incorporated in 2008 and is headquartered in Hsinchu City, Taiwan. It is currently seeking to open fabs in India and Japan, partnering in a joint venture with Tata in India and SBI in Japan.

Great opportunity for embedded ReRAM at PSMC.

PSMC provides chip design, manufacturing, foundry, design, overhaul and memory wafer testing services. Its foundry services for embedded NVM (eFlash) operate from 180nm down to the 40nm node. However, that eFlash offering is not available in its BCD (power-management) process. In other words, there is a great opportunity for Weebit Nano's embedded ReRAM solution, which has already scaled down to the 28nm and 22nm (22FDX at GF) nodes, and is also well suited for power management designs.

We estimate PSMC's current revenue run rate to total approximately USD1.3bn on an annual basis, which makes it an attractive target for Weebit Nano, in our view.

Vanguard International Semiconductor Corporation (VIS) (TWO:5347) is a specialty contract chipmaker. It has five fabs dedicated to 8-inch chips in Taiwan and Singapore, and has ambitions to construct a 12-inch fab, also in Singapore. Its customers are predominantly in the automotive, consumer electronics and industrial sectors, with power management chips being the company's biggest revenue contributor, followed by display driver ICs used in TV display panels.

Another great embedded ReRAM target.

Similar to PSMC, VIS offers embedded Flash memory to its customers, albeit only down to the 110nm node. So, there's substantial opportunity for Weebit Nano ReRAM at VIS as well, in our view. The company's revenue run rate in the first 4 months of 2024 puts it on track for approximately USD1.2bn in revenues in 2024 as a whole.

Multiple senior Weebit Nano staff and a Board member have worked at Tower Semiconductors.

Tower Semiconductor (NDQ:TESM) is headquartered and listed in Israel. It operates (either outright or shared) fabs in Israel, the US, Japan and Italy. The company specialises in specialty analogue integrated circuits for other semiconductor companies (typically fabless semiconductor companies) and Integrated Device Manufacturers. These IC's are used in cars, medical sensors and power management, amongst other applications.

Tower Semiconductor was subject of a takeover bid by Intel in 2022, but the deal ultimately fell through due to objections from the Chinese government. Instead, Intel struck a deal with Tower Semiconductor, extending that company's manufacturing capacity in Intel's fab in New Mexico.

Tower Semiconductor is well known for its high-voltage and power management process performance, and Weebit Nano's ReRAM technology could be an excellent fit for Tower.

Given that multiple people in senior management as well as a Board member at Weebit Nano have previously worked at Tower Semiconductor, we believe this could potentially be one of the first deals Weebit Nano closes next.

DB HiTek (KRW:000990) is based in South Korea and is the second largest Korean semiconductor foundry behind Samsung. It provides semiconductor technologies, such as power management ICs, contact image sensor, display driver ICs used in mobile phones, industrial, medical equipment and automobile applications. The company also provides wafer fabrication facilities that manufacture at a range of processing nodes.

DB HiTek is Weebit Nano's 2nd foundry customer.

Its clients include electronics and chip companies, such as Intel, Sony, Mitsubishi, Mediatek, NXP, Texas Instruments, Toshiba and Qualcomm.

DB HiTek is also Weebit Nano's second licensing partner after SkyWater Technologies, having signed a deal in October 2023. Both companies are currently working through the integration and qualification process for Weebit Nano's ReRAM in order to get it ready for volume production at DB HiTek.

Potentially talking to 7 IDM's for embedded ReRAM applications

Given that the Top 10 IDM's in Figure 1 are all US, South Korean, Dutch, French or German, i.e. not Chinese, none of these companies are off-limits from a US entity list point of view, like SMIC.

Focus on embedded ReRAM, not on discrete ReRAM applications at the moment.

However, given that Weebit Nano's near-term focus is on embedded ReRAM and not ReRAM for discrete memory applications, we believe it is less likely that the company will be talking to semiconductor manufacturers in the DRAM or storage space at this time, i.e. SK Hynix, Micron Technologies and Western Digital. Nor will it be talking to Samsung for standalone NVM applications right now, although the company is likely to be talking to Samsung for embedded ReRAM applications as we discussed previously.

We expect ReRAM for discrete memory will be something Weebit Nano can put more emphasis on once it has achieved momentum in embedded memory.

So, when it comes to IDM's, we believe Weebit Nano could be talking to 7 out of the Top 10 IDM's.

Significant opportunity for embedded ReRAM with IDM's.

In our view, the bottom line is that there is very significant potential for Weebit Nano amongst IDM's looking to replace current embedded NVM technologies with better scalable, low power and high-performance ReRAM.

Directors have bought shares on-market

Weebit Nano recently announced that Chairman Perlmutter, CEO Coby Hanoch and Non Executive Director Atiq Raza have bought shares on market in the first week of June 2024. In total, the Board members bought 44,000, 8,330 and 30,000 shares respectively.

In our view, it is a sign of confidence when a company's leadership buys shares on-market. In the case of Weebit Nano, with the many commercial discussions ongoing, it should provide investors with assurances that these commercial discussions are going well. And at the current share price on-market buying makes good financial sense as well, in our opinion.

Reiterating valuation at A$9.56 per share

We reiterate our valuation for Weebit Nano of A$9.56 per share, which we outlined in our June 2023 report. We drew parallels with Taiwanese embedded NVM player eMemory (TWO:3529). Even though eMemory's share price has appreciated by 7.6% since then, we stick to our current valuation, which implies substantial upside from the current share price.

In our view, there are several catalysts that could drive Weebit's share price higher in the next 12 months. These remain unchanged from earlier reports we published:

- First commercial customers and revenues for the SkyWater S130 process.
- Progress towards qualification with DB HiTek.
- Commercial progress with GlobalFoundries.
- Additional commercial agreements and/or collaborations with large foundries.
- In addition to foundries, IDMs and fabless chip companies are interested in Weebit Nano's technology as well, illustrated by the conversations the company is having with these prospects.
- Wider availability of embedded ReRAM in SkyWater processes, e.g. 90nm. This would expand the commercial potential for Weebit at SkyWater.
- Positive progress reports on Weebit Nano's discrete ReRAM development, initially for lower densities (smaller capacities), i.e. below 64MB.
- Potential M&A discussions involving the acquisition of Weebit Nano or part of its IP. The semiconductor industry is highly acquisitive when it comes to expanding IP portfolios.

Key risks

- **Competition risk:** Alternative emerging memory technologies are being developed by Weebit's competitors. These technologies could potentially be superior in nature and/or could be commercialised sooner than Weebit's technology, which could inhibit the company's future growth.
- **Funding risk:** Although Weebit now seems adequately funded for the medium term, the company may need to raise further capital in the medium to longer-term. That may be required, for instance, if development programmes and technology transfers/qualifications take longer than currently anticipated or multiple growth opportunities arise, resulting in dilution for existing shareholders.
- **Macroeconomic and geopolitical risks:** The semiconductor industry is quite vulnerable to macroeconomic and geopolitical risks – in particular, downturns in the global economy and tensions between China and the West. The prices of semiconductor stocks can fluctuate substantially in response to mere media reports of deteriorating conditions.
- **Operational risks:** Weebit's success is assumed on its ability to successfully produce and market the ReRAM technology. A failure in either regard for whatever reasons, such as supply chain issues or departure of key personnel, may lead to a deterioration in investor sentiment.
- **Investment risks:** Since the stock's inclusion into the ASX300 and ASX200 indices in 2023, we have seen short sellers come into the stock. This has had a substantial negative effect on the share price. Additional short selling may push the share price down further.

Appendix – Analyst certification

Marc Kennis has been an equities analyst since 1996.

- Marc obtained an MSc in Economics from Tilburg University, Netherlands, in 1996 and a postgraduate degree in investment analysis in 2001.
- Since 1996, he has worked for various brokers and banks in the Netherlands, including ING and Rabobank, where his focus has been on the technology sector, including the semiconductor sector.
- After moving to Sydney in 2014, he worked for several Sydney-based brokers before setting up TMT Analytics Pty Ltd, an issuer-sponsored equity research firm.
- In July 2016, with Stuart Roberts, Marc co-founded Pitt Street Research Pty Ltd, which provides issuer-sponsored research on ASX-listed companies across the entire market, including technology companies.

Nick Sundich is an equities research analyst at Pitt Street Research.

- Nick obtained a Bachelor of Commerce/Bachelor of Arts from the University of Sydney in 2018. He has also completed the CFA Investment Foundations program.
- He joined Pitt Street Research in January 2022. Previously he worked for over three years as a financial journalist at Stockhead.
- While at university, he worked for a handful of corporate advisory firms.

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