



When the chips are down



employs roughly 32,000 people and operates from more than 60 locations worldwide. It has a market cap of \$230bn and is the sole supplier worldwide of extreme ultraviolet lithography (EUV) photolithography machines. These machines cost in the region of \$150m each, are as big as a bus and weigh 180t. They are used in the chip manufacturing process, to etch intricate patterns onto silicon wafers. The outlook for global chip manufacturing spending is very strong. Last week, the US Senate

opment to stay at the cutting edge of chip manufacturing. The whole idea is to cram as many transistors onto as small a wafer of silicon as possible, measured in nanometres (nm). Last week, TSMC completed its latest fab – a \$10bn plant in Arizona, which will produce 5nm chips. Most of TSMC's fabs are in Taiwan. This has caused global political anxiety in the context of China's stance towards Taiwan. Nevertheless, TSMC has opened up such a technological lead against its competitors that its growth outlook is very strong.

Intel

Two decades ago, Intel was the undisputed leader in the semiconductor industry. It operates across the areas of design, manufacturing and selling of microprocessors. But Intel has lost its way, with its market cap dropping to below \$150bn last week, on the back of very disappointing quarterly results. While Intel has clung on to its lead in central processing units, the speed and complexity required by artificial intelligence and cloud computing have seen the repurposing of graphic processing units (GPUs) to do far more than just manage graphics. Today, GPUs are the chosen solution for all kinds of heavy-duty processing, including bitcoin mining. Under Pat Gelsinger, who rejoined Intel as CEO in 2021, a very ambitious (and costly) plan has been announced that Intel will spend more than \$100bn over the next few years to try to catch up with the latest semiconductor technology. Still, it might not be enough.

While the global chip shortage of the past two years might turn into a short-term chip glut, the long-term future of the global semiconductor sector is favourable, spurred on by geopolitical tensions. With the share prices of most major companies operating in this sector down more than 20% year to date, it might well be time to nibble on some chips.

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One of the benefits of investing globally is gaining exposure to profitable companies and sectors which aren't available on the stock exchange of your home country, such as the semiconductor sector. The sector can broadly be categorised into three industries: the manufacturing of the devices used in the microchip fabrication process; the fabrication of the microchips themselves; and the design of products which use microchips, such as microprocessors. The chips themselves can also be categorised as memory, logic or analogue chips. Just about anything and everything that uses electricity contains microchips – it is the world's fourth-most traded product in terms of value. Let's have a look at some investing opportunities in this sector:

ASML Holding

Netherlands-headquartered ASML

passed the Chips+ Bill, which could unlock \$50bn in subsidies for US chip fabrication plants (fabs). The European Chips Act, which was passed six months ago, offers subsidies of a similar magnitude. The act seeks to boost Europe's global market share of chip production from the current 9% to 20% by 2030. With about half of ASML's revenue typically generated from the sale of new EUV machines, its prospects look bright.

Taiwan Semiconductor Manufacturing Co (TSMC)

TSMC is the world's largest chip manufacturer, or foundry, and has a market cap of \$460bn. Its big break came in 2010, when Apple picked TSMC as its outsourced manufacturing partner for iPhone and iPad chips. The benefit of Apple's burgeoning demand for chips has allowed TSMC to become the dominant foundry globally, with a market share now approaching 60%. TSMC's scale allows it to spend billions of dollars in research & devel-