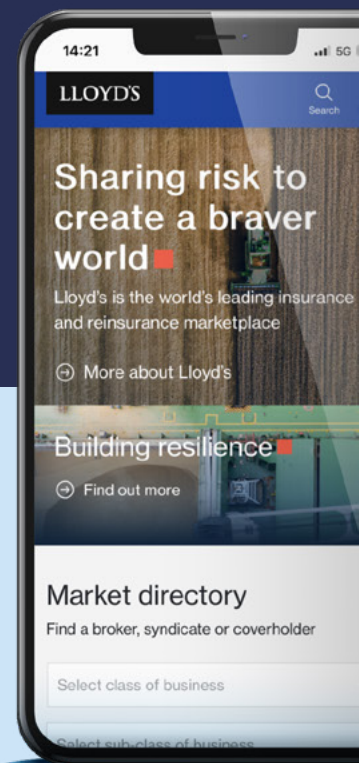
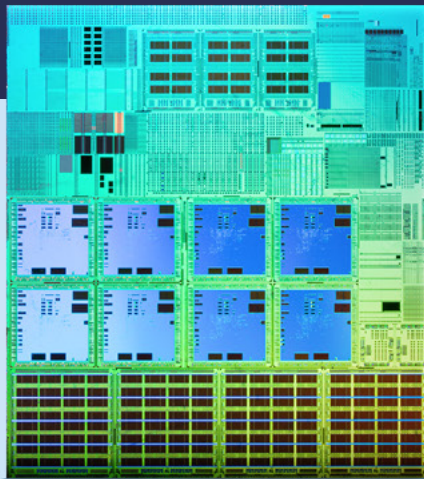
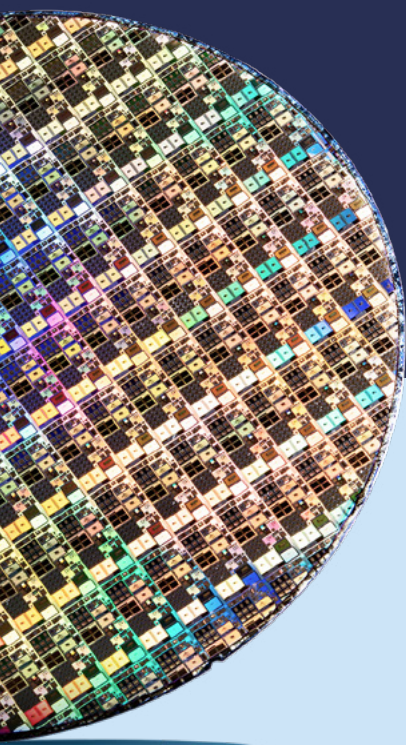


# Loose connections: Rethinking semiconductor supply chains

Part 1: Executive summary





# 01 Executive summary

## Semiconductor connections

The semiconductor industry has been a key enabler of digitalisation in recent decades. Across the world, this precious chip has powered a range of global products and functions from electric vehicles and consumer electronics to various enterprise deployed technology.

Currently estimated to have a global market value of \$596bn<sup>1</sup>, the semiconductor industry supports a \$2.2trn electronics sector, which in turn drives \$89trn of global GDP. The world's transition to a digital economy therefore relies on a resilient and thriving semiconductor industry – especially in light of recent global economic and geopolitical shocks.

This report is the second in a series of three exploring supply chain risks, delivered in collaboration with WTW. The report follows from the findings in: [‘From farm to fork: Rethinking food and drink supply chains’](#), which recommended three steps to advance the insurance industry’s supply chain risk solutions:

- Explore product innovation opportunities
- Enhance data sharing across supply chains
- Increase communications between supplier and insurer

This detailed review of the semiconductor industry finds there is significant scope for collaboration between the sector and their insurers to address protection gaps, particularly around the medium term risks that pose the greatest challenge to the semiconductor industry. It also highlights large financial exposures across semiconductor supply chains that make end to end insurance solutions less effective - unlike food and drink chains where these products are preferred. Instead, semiconductor suppliers favour more bespoke interventions along key points of the supply chain.

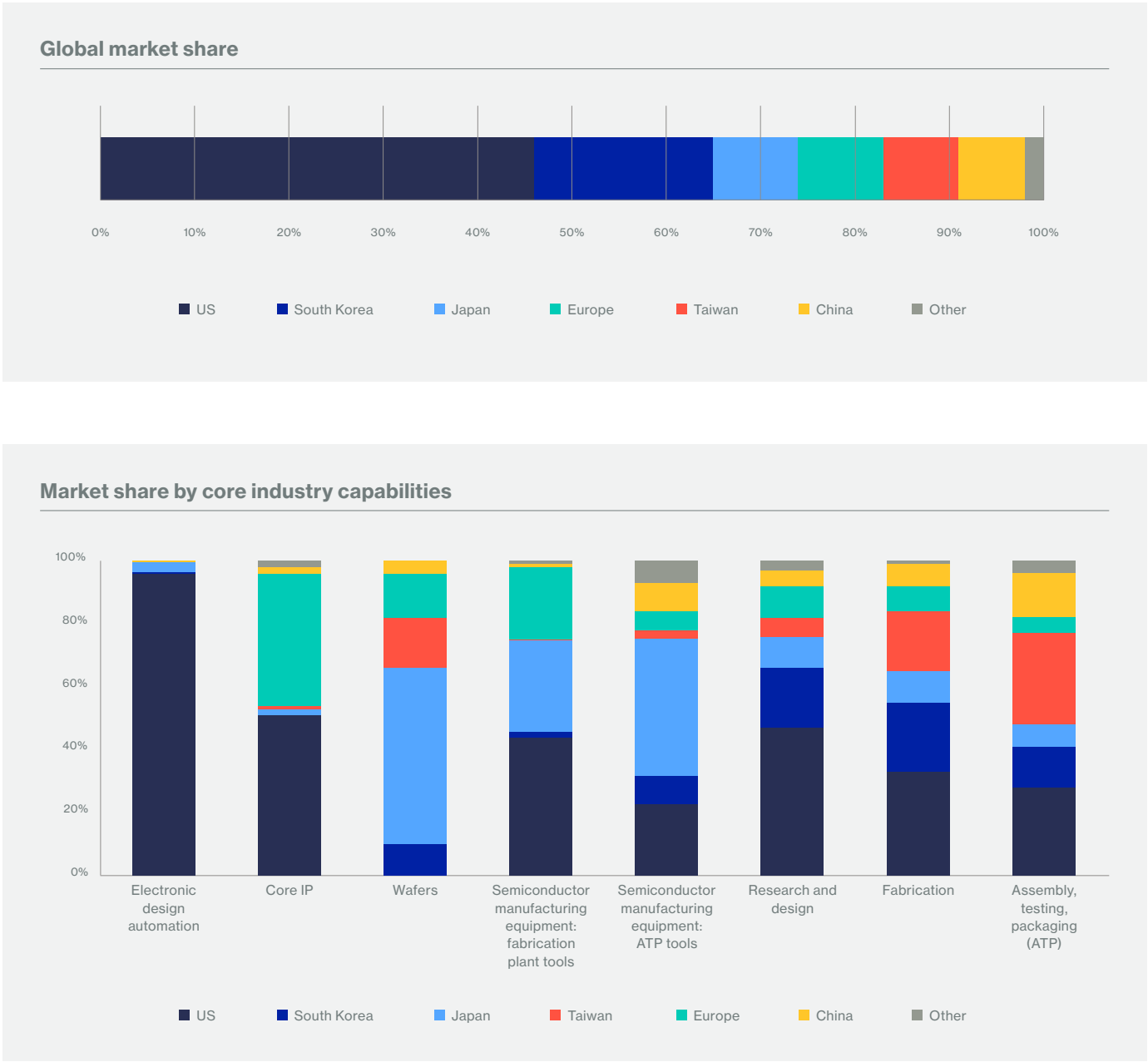
As the semiconductor industry has grown in size, volume, and complexity, the associated risks to business supply chains have also increased. Anyone looking to buy a new car in 2021 and 2022 would have felt the impact of disruption to semiconductor supply chains, with pandemic-induced manufacturing and logistics challenges creating a gap between chip supply and demand. The value of second-hand vehicles rocketed as a result<sup>2</sup>.





This shift happened because a typical chip requires raw materials and components in its production from a range of suppliers across the globe. No single country has end-to-end dominance over the production and supply segments that result in finished semiconductor chips, with different key countries each leading separate market segments that rely on one another (see **Figure 1**, below).

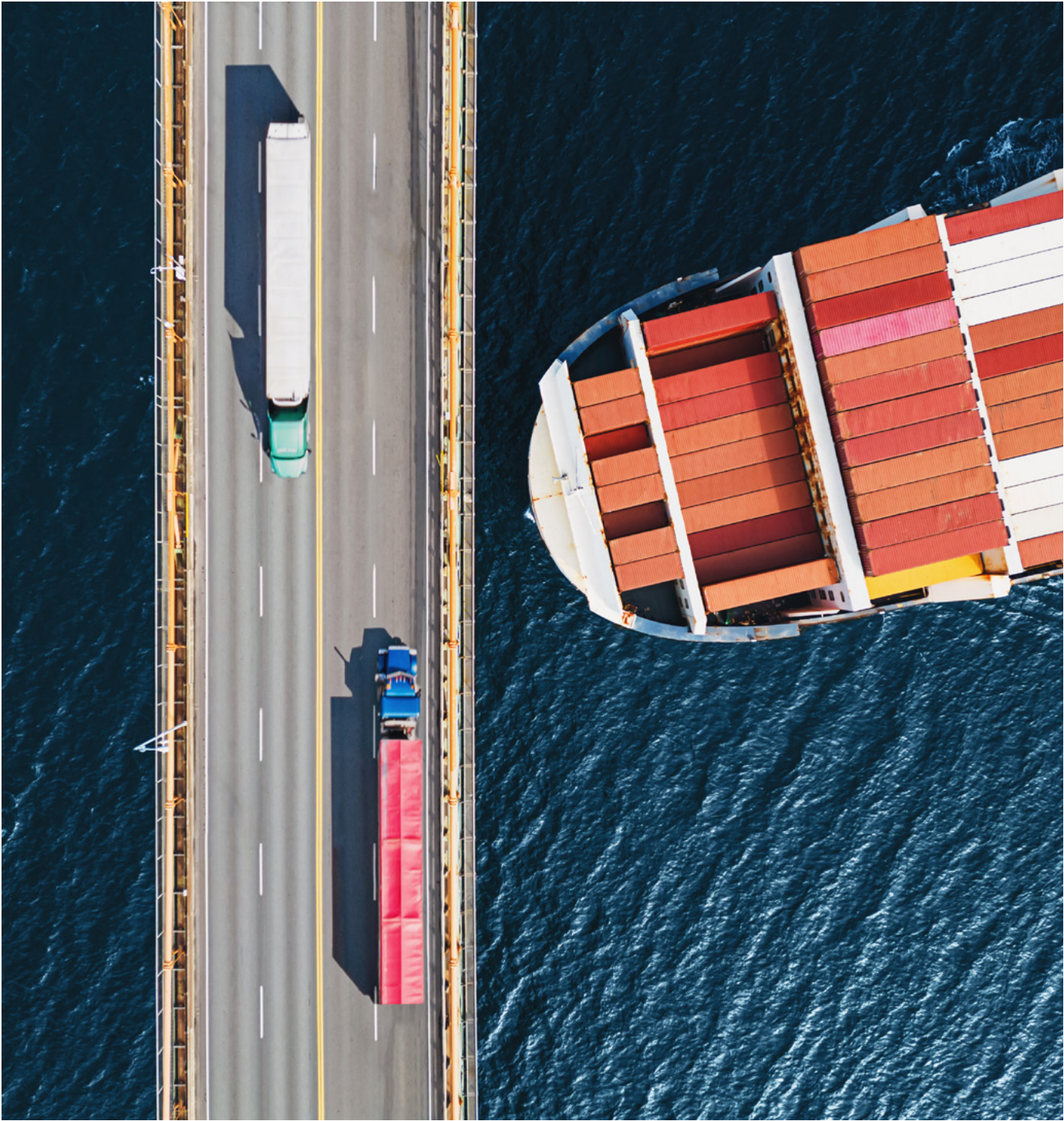
**Figure 1: Understanding market dynamics**  
2021 data which includes all subsectors of the value chain



Source: Adapted from Centre for Security and Emerging Technology<sup>4</sup>, [SIA](#)<sup>5</sup>

As with all supply chains, reliance on a global trading system comes at a cost. In today's complex geopolitical environment, national interests can threaten an ecosystem that has, to date, effectively shared both the workload and the risk.

The 2011 Thai floods provided the first real indicator of the vast ripple effects supply chain disruption can have on the semiconductor sector. Since then, other (and perhaps less visible or planned for) events have further demonstrated the cascade effect: global talent shortages, droughts impacting water availability for the factories making the semiconductors, and a fire at a factory responsible for 60% of the world's epoxy resin<sup>a</sup>.



<sup>a</sup> Epoxy resin is a relatively small overall part of the chip fabrication process but without it, due to a limited number of specialist suppliers, the process would grind to a halt.



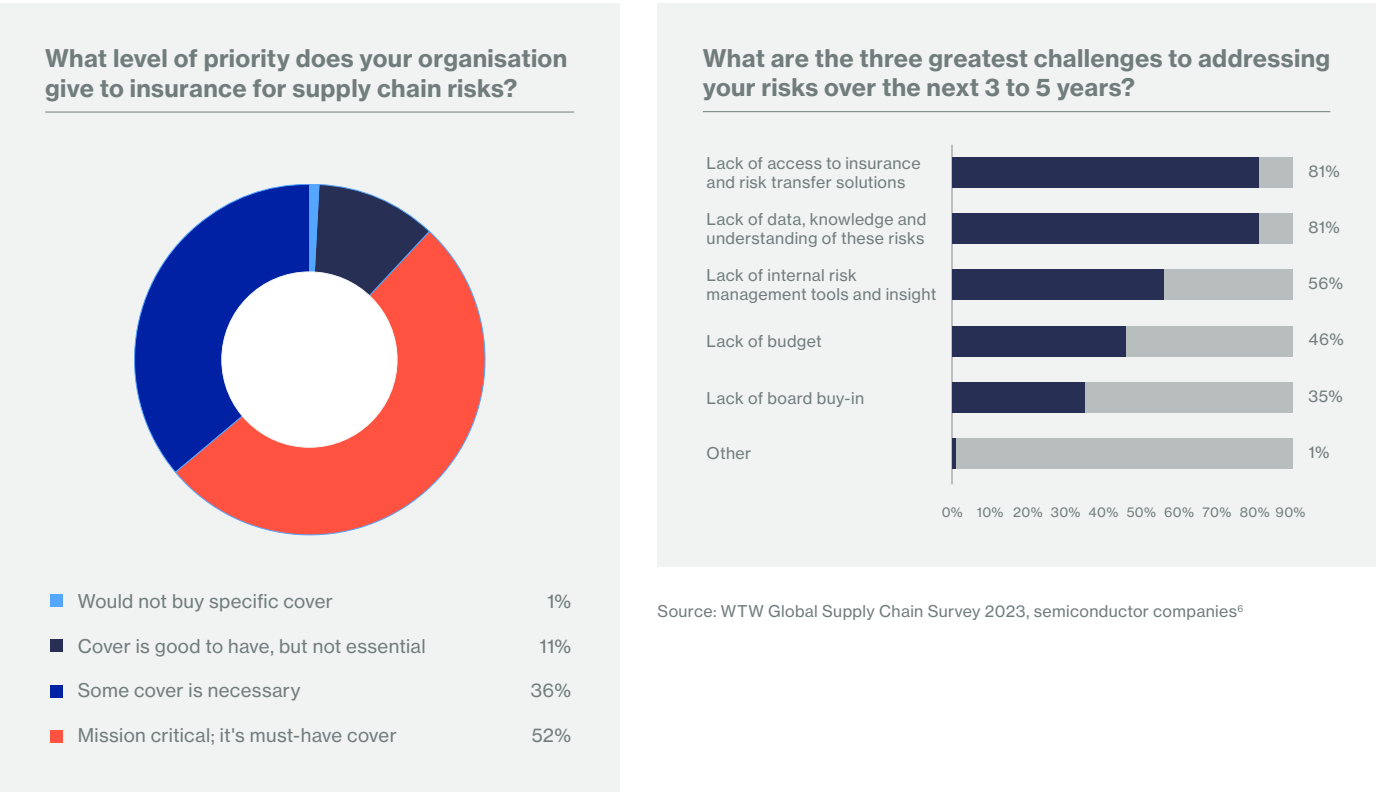
# Strengthening loose connections

Given the complex landscape they operate in, semiconductor suppliers take risk seriously: investing heavily to ensure they have robust contingencies in place as well as embracing technology to support operational efficiencies. Importantly, this includes gaining better visibility of exposures and digitising supplier data, which helps insurers build a more detailed picture of an exposure. Entirely eliminating potential supply chain risks will never be possible for the sector, but with increasingly abundant data for modelling, and emerging and innovative insurance solutions becoming available, the ability to analyse outcomes and mitigate impacts is growing.

Semiconductor businesses are not alone in these investments. Governments and regional blocs are actively rolling out new multi-billion dollar policies and legislative packages to strengthen and onshore semiconductor activities, in what they see as a national security imperative<sup>3</sup>; examples include the U.S. and EU Chips Acts, worth \$106bn and €43bn in public and private investments. These investments will need protection, and global insurance markets are responding to new construction projects – relationships that are valued by the semiconductor industry, who are keen to understand where insurers can support supply chain innovation.

The WTW Global Supply Chain Survey (**Figure 2**) highlights the willingness of the semiconductor industry to explore new insurance solutions to meet future risk transfer challenges. 88% of semiconductor companies said that insurance for supply chain risks was either mission critical or necessary, and 64% shared that supply chain risks were covered by specific insurance. In the medium term (the next 3-5 years), 81% said a lack of access to insurance solutions was among the greatest challenges to addressing their risks. This is a clear signal to the insurance industry that their support in boosting resilience is both wanted and needed.

Figure 2: WTW Global Supply Chain Survey 2023



Our ‘Rethinking supply chains’ report series, created in collaboration with global broker WTW highlights three key findings to increase awareness, availability, and uptake of supply chain insurance in the semiconductor industry:

## 1. Exploring closer synergies between semiconductor businesses and insurers

There is a strong awareness of risk across the semiconductor industry, with businesses investing in risk management practices or actively partnering with third parties to provide new data sources in the face of ongoing global change. There is also recognition that they can do more, and interest in working with insurers to act on this. Of the semiconductor companies surveyed 61% said they had either completely overhauled or made significant changes to their supply chain in the last two years in response to the challenges outlined, which includes a lack of suitable insurance solutions. 56% said they would be making significant changes in the next 12 months.

The view across the industry on supply chain risk is also not static. One risk director explained, “It changes from year to year, moment to moment.” At least half of the companies surveyed, feel confident they can manage root causes of supply chain risks, and seven in ten have at least some influence over the quality of supply chain risk management.

There are eight key supply chain risks and drivers currently on the minds of semiconductor businesses:

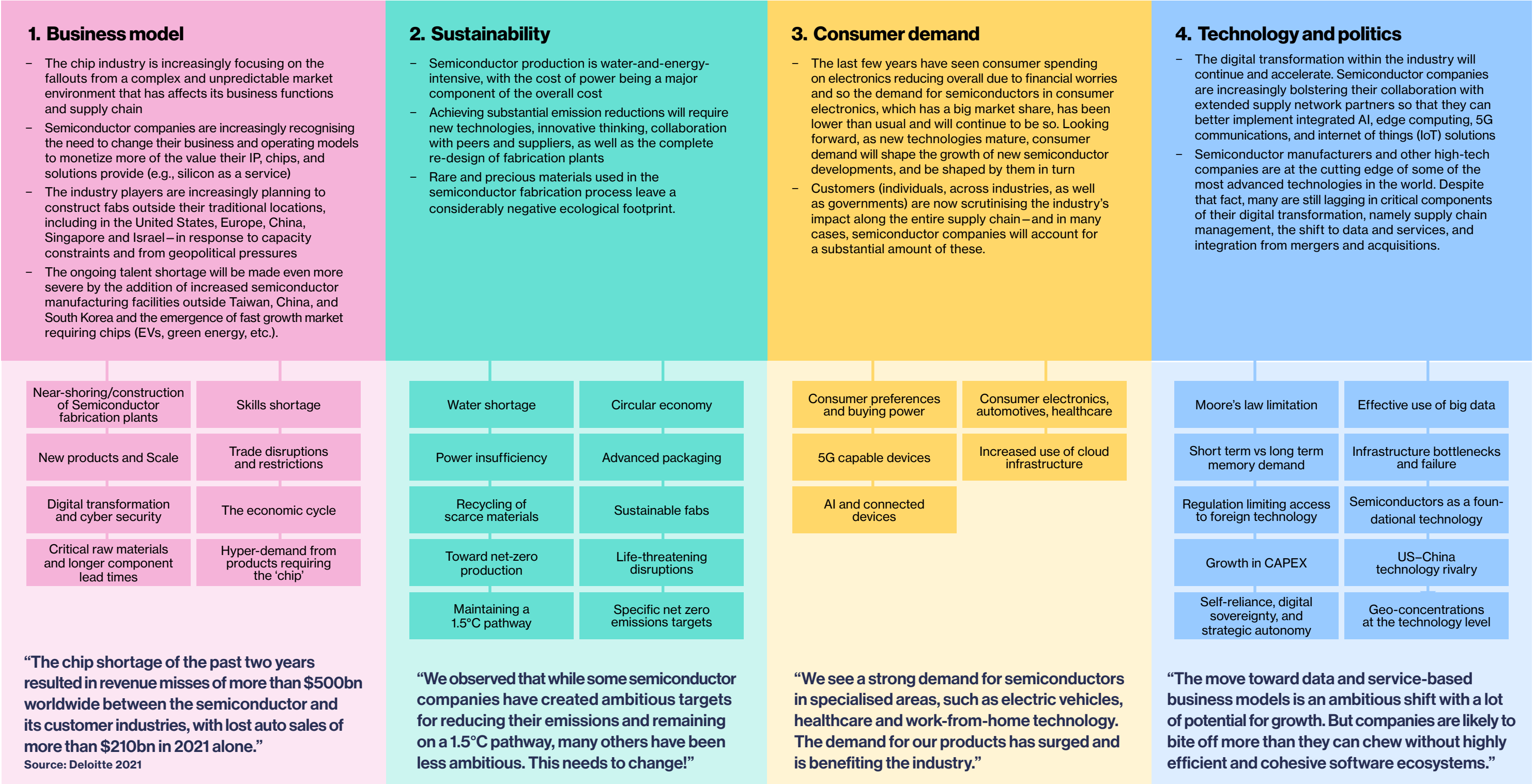
- Economic pressures
- Supply and demand changes
- Talent and labour
- Raw materials and components
- Technology
- Packing and transport
- Regulatory and geopolitical risks
- Climate change and sustainability

These drivers indicate there is room for further dialogue between the semiconductor industry’s technical stakeholders and the insurance market to ensure better knowledge transfer and analysis of risk and data. Cross-sector collaboration and conversations could help drive insurance product innovation and attract more interest from semiconductor businesses to purchase insurance solutions that meet their needs most effectively.



As well as the shorter-term risks and drivers facing businesses, there are four key areas where change is expected to increase:

Figure 3: A forward look at drivers, trends and risks



## 2. Developing innovative products to meet a growing demand

This report highlights significant scope for increased collaboration between the semiconductor industry and their insurers to consider product development. Some parametric solutions already exist for semiconductor supply risks however there is significant scope for insurers and brokers to further support the semiconductor industry by sharing examples of where risks match solutions, and the role of risk transfer in supporting resilience. This can help all stakeholders become better protected against the risks.

While most semiconductor businesses recognise traditional risk transfer for end-to-end supply chain risks is not feasible due to the aggregations involved, they have outlined a series of areas they would like to explore with insurers in the box below.

The risks and drivers outlined in part two of this report provide a deep view into the challenges semiconductor businesses are facing. Section two also highlights associated risk areas, such as intellectual property (IP) where the insurance industry may support the sector with wider risk transfer. To make headway against these asks, some barriers that may need to be overcome include closer alignment of market and customer appetite (including risk sharing), reducing the manual burden of information required from customers, and developing new products that can be accurately and sustainably priced. Overcoming each of these barriers may increase the opportunity to develop new targeted supply chain insurance solutions and address existing protection gaps in the semiconductor industry.

- Providing insurance cover for the loss of Tier 2 suppliers (and potentially further along the supply chain)
- Wording improvements to insurance contracts and further specified cover, such as specific supply chain cyber wording or reputational damage, as scrutiny of environmental, social and governance (ESG) responsibilities across the supply chain increase
- Exploring disruption caused by key bottlenecks or suppliers
- Alternative risk transfer solutions such as parametric products for the impact of adverse weather, power, and water shortages
- Innovation from more traditional contingent business interruption insurance to hybrid solutions also involving capital markets
- New market support to grow new centres of semiconductor manufacturing. The semiconductor industry would welcome additional carriers to be able to offer blanket limits as well as offering better sublimits for named and/or unnamed suppliers





3. Accessing real-time supply chain data and analytics models

Availability of quality, timely and usable data across supply chains has always been a challenge for both businesses and insurers. For the semiconductor industry, that challenge still exists – but as businesses look to understand their supply chains in greater detail and invest in risk management and business continuity efforts, the outlook becomes more promising. 70% of semiconductor businesses surveyed feel they have either identified all the data they require and either have robust processes in place to gather it, or are establishing those processes now. At the same time, the quality of accompanying data is improving through partnerships with supply chain specific technology companies, and the increased availability and deepening of these tools as Software as a Service (SaaS).

For insurers, being able to support or incentivise organisations to take action will ultimately result in greater mitigation of risk and exposure. Resilinc, e2open and Blue Yonder provide examples of third parties using technology, risk engineering expertise and insurance to help clients identify, assess, mitigate, and transfer supply chain risks. Utilising real-time risk and analytics models that provide a framework to digitally enable supply chain portfolio components could allow the semiconductor industry to measure, monitor and visualise each of these elements. It can also support risk conversations with their insurers.

With increased collaboration comes opportunities to innovate and develop solutions that allow insurers to grow in partnership with the sector. This is where Lloyd's – through its Futureset platform, Lloyd's Lab incubator or the brokers advising the industry – can convene stakeholders and support conversations to enable new partnerships to be forged.



Resilience through knowledge

This report – a collaborative effort between Lloyd's Futureset and WTW – aims to highlight the supply chain challenges facing the semiconductor industry and to come up with suggestions that could ultimately boost the resilience of a sector that has become essential for smooth running of the world's technology offering. Over the past four months, we have surveyed and interviewed over 145 risk, supply chain, and insurance practitioners.

These perspectives have provided real-life, practical insights into the challenges that companies across the semiconductor industry are facing as a result of the highly interconnected world we live in and a reliance on highly specialised models.

In addition to these interviews, we have combined proprietary data and bespoke research with analysis of a wide range of thought leadership and other third-party analysis to develop insights that can help build common understanding between the industry and insurers to build further insight and resilience into an ever changing, uncertain and complex world.

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Supply chain cover does exist today, but it can often be complex to underwrite and costly to buy. Additionally, these products will need significant development to support supply chain resilience against future systemic risks. Having affordable and accessible product and service solutions will be key to instilling confidence in businesses when facing the future. As an industry we need to develop a wider range of solutions that can fulfil this growing need, but to do this we will need the data to understand the complex supply chain networks that exist and the risks to which they are exposed. I see this as a great opportunity for our industry to work with all stakeholders, businesses, and governments around the world, to develop a greater level of certainty on supply chain resilience amid a world filled with challenges.

John Ludlow, Former Airmic CEO, Lloyd's Futureset supply chain masterclass, March 2021<sup>3</sup>

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