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Navigating a downturn: Supply chain strategies to consider for success in the semiconductor industry

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# Semiconductor downturn looms: What to expect in 2023

Semiconductor companies have been enjoying a golden age of profitability and growth over the past two to three years, thanks to the pandemic-induced shift toward remote work and the resulting surge in demand. This has led to higher share prices and valuation multiples, as well as intense competition for talent.<sup>1</sup> However, the short-term growth and profitability of the industry will likely be hindered by factors such as decreasing demand, high wages, trade restrictions imposed by the US government, and rising inflation countered by interest rate hikes.

According to data gathered from publicly available third-party sources consolidated and analyzed by Deloitte Consulting LLP, inventory levels in the industry have increased by 26% compared to the same period last year.<sup>2</sup> Additionally, the memory market, often an early indicator of future semiconductor trends, is experiencing average selling price decreases of 14% to 15% in 2022, with drops expected to reach 31% to 32% in 2023.<sup>3</sup> Semiconductor demand from consumer markets is expected to continue deteriorating,<sup>4</sup> which is leading to higher inventory levels and curbing order

bookings. Other end markets, such as enterprise and hyperscale data centers, may soon see similar weaknesses in demand, further exposing excess inventory levels and underutilized capacity.

With the combination of inflation, weakening demand, and excess capacity, the semiconductor industry is likely on the brink of a bearish cycle. According to our analysis based on publicly published revenue guidance, 62% of semiconductor companies have already reduced their guidance for next year in their latest earnings cycle.<sup>5</sup> As the semiconductor industry faces a downturn, executives and boardrooms are working to understand the potential duration of the downturn and which kinds of chips will be most heavily impacted. A key question is: What is the best way to prepare and respond to these challenges?

Despite strong long-term growth projections, the semiconductor industry is expected to hit a cyclical trough in the second half of 2023 (figure 1).



### Figure 1. Annual semiconductor revenue growth history and forecast: Peaks and troughs<sup>6</sup>

Note: Chart created by Deloitte based on Gartner research.

Source: Gartner Semiconductor and Electronics Forecast, 4Q22 update, presentation materials

Although downturns are always a cause for concern, the relative unexpected nature of the current one amplifies its significance. In a space of only five months (June to November 2022), the industry standard revenue forecast for 2023 declined to \$557 billion from \$680 billion, a \$123 billion drop, or about 30% of industry revenue in 2019 (figure 2). While past downturns in the industry have had different triggers, three key themes across demand, capacity, and inventory behavior remain common.





WSTS global semiconductor revenues, actual and forecast in billion USD, June and November 2022 forecasts

Source: World Semiconductor Trade Statistics (WSTS) Semiconductor Market Forecast, spring and fall 2022.



- 1. Demand weakness: This has already happened in the consumer market segments and is expected to spread to almost all sectors of the industry, though some may be more affected than others. The extreme supply shortage that preceded this weakening has caused certain market segments to continue catching up on delinquent demand, masking the full extent of the decline in demand even though the peak has passed. It may be crucial for semiconductor companies to closely monitor demand and consider adapting their supply chain strategies accordingly. This could be achieved through a variety of methods such as monitoring pricing signals, tracking distributor inventory levels, statistically evaluating product ramp models based on design wins, utilizing integrated scenario modeling to spot risks and opportunities, and regularly evaluating the effectiveness of market intelligence efforts.
- 2. Capacity expansion: Timing is key when it comes to allocating capital for capacity expansion in the semiconductor industry. During periods of high demand, companies often invest in adding capacity. However, supply chain disruptions and difficulty in accurately assessing demand variability and structural changes can lead to over-investment in wafer capacity. In addition, government incentives to build local semiconductor capacity in 2020–2022 have further exacerbated the industry's natural

cyclicality.<sup>8</sup> While this over-investment may result in excess capacity and short-term margin erosion as the market turns, it will ultimately be beneficial in the long term in future decades.

**3. Inventory builds:** During growth cycles, the focus often can be on meeting demand and maximizing capacity utilization rather than strictly monitoring inventory levels. This can sometimes result in overlooking poor working capital management and excess inventory buildup. However, when demand begins to fall, customers may tend to cancel orders and stop overstocking, leading to a surge in inventory levels and a subsequent decline in fab utilization (figure 3). Semiconductor companies, being at the beginning of the electronics value network, can be vulnerable to this volatility as distributors and end customers make decisions to build or reduce inventory, driving fluctuations that tend to propagate backward along the supply chain. This can result in semiconductor companies over- or under-shipping end demand, a phenomenon commonly known as the bullwhip effect.<sup>9</sup>

These themes provide insight into the potential challenges and opportunities facing the industry during this downturn and can help inform strategies for responding to these challenges and seizing on opportunities.

### Figure 3. Actual and projected Gartner Index of Inventory Semiconductor Supply Chain Tracking (GIISST) and foundry utilization rates<sup>10</sup>



# What is different about this downturn?

While symptoms such as softening demand and elevated inventory levels may seem similar to previous downturns in the semiconductor industry, there are key differences in the underlying causes and potential outcomes of this cycle. The current downturn is not solely driven by market forces, but rather a complex combination of factors including the lasting impact of the COVID-19 pandemic, increased geopolitical complexity, and shifts in the labor market. *Deloitte's*. *2023 semiconductor industry outlook* offers insights on the distinctive characteristics of the current downturn and areas of focus that, with proper planning and strategic decision-making, can assist companies in overcoming current industry challenges and becoming stronger exiting the downturn. Some of these opportunities are listed below, but we encourage readers to read our outlook for more information.

- In the face of volatile market conditions and a growing emphasis on ESG performance, semiconductor companies and governments are seeking ways to strengthen their supply networks. By reconfiguring their supply chain, they aim to create a more resilient and adaptable system that can respond quickly to changing market dynamics and evolving sustainability standards. Policymakers are considering a mix of solutions, including onshoring, nearshoring, and friendshoring through direct funding of investments, changes to the labor market, and increasingly attractive, geographically inspired tax structures.<sup>11</sup>
- The semiconductor industry is facing a talent and skill shortage that is expected to worsen in 2023 and continue to be a challenge for the rest of the decade. Deloitte predicts that the semiconductor workforce will need to grow by more than one million additional skilled workers by 2030.<sup>12</sup> To address these needs, the chip industry should consider partnering with universities and local schools and collaborating with local governments, among other things.

 Companies have likely been laser-focused on navigating the current constrained supply environment, doing everything they can to stay competitive. However, as the market slows down and the need for additional capabilities becomes more apparent, companies are often expected to take a step back and consider investing in building more resilient capabilities to thrive in a more balanced market. By doing so, it's likely they can not only weather the current storm but also emerge stronger and better equipped to succeed in the future.

As such, we recommend semiconductor companies consider a series of tactical activities to prepare for the downturn and strategize for the long term. These activities have been carefully selected based on our analysis of the market trends and our work with semiconductor companies. By taking these steps, businesses may be better prepared to respond to changing market conditions and remain competitive.

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# A practical approach to consider for strengthening supply chain capabilities in the semiconductor industry

Fluctuations in the economy could expose shortcomings in a company's core capabilities. Over the past two years, some businesses may have over-indexed on addressing supply issues at the expense of investing in their long-term supply chain capabilities. However, as the market pivots, it will likely be important for these businesses to consider how they could quickly reconfigure their capabilities to respond effectively. Failing to do so could leave them vulnerable to future disruptions and unable to compete in an increasingly dynamic global economy. Through our work with semiconductor companies during previous economic downturns, we have developed a practical and effective framework to help quickly identify and overcome challenges, while driving toward solutions (figure 4). This framework can be a valuable tool to introduce new capabilities as well as drive continuous improvement in existing, but perhaps underperforming, capabilities as businesses prepare and respond to the downturn.



#### Figure 4. Framework to strengthen supply chain in the semiconductor industry

#### As the business environment is rapidly changing, companies may need to quickly visualize the impact on their supply chain. Seeing the problem can be key to identifying the challenges Surface critical Deploy manual solutions to impact disrupting the organization. While many challenges disrupting operations, transforming data to immediately, leveraging companies have data available, the governance, processes, scattered nature of the data can often insights to decisions and brute force make it difficult to rapidly understand the root causes of problems and inform the required actions. SUSTAIN THE SOLUTION To scale and sustain solutions that have been designed and tested through pilots, businesses often need to rely on enterprise-grade, technology-enabled **Build** innovation Automate the solution solutions to key solutions. This can help reduce the through enterprise technology enablement operational challenges reliance on manual error-prone controls and sustainable change management and drive and fully realize the benefits of the adoption rapidly designed solutions.

#### CONTROL THE PROBLEM

Once the issues affecting the supply chain have been identified, swift and decisive action to **control the problem** and prevent further damage may be critical. Some businesses may hesitate to take action because of concerns about technology enablement, maturity of automation, and the impact on their workforce. However, taking action, even if it is painful and challenging, could help to fully understand the root causes of the issues and inform their future strategy.

#### SOLVE THE PROBLEM

After implementing manual controls to help mitigate financial risks and customer escalations, businesses can **solve the problem** by designing sustainable solutions to their challenges. By leveraging learnings from the manual controls, businesses can iteratively refine the rootcause analysis and design solutions that truly address the issue. To ensure that the solutions are practical and effective, businesses can pilot the solutions before implementing a final design.

SEE THE PROBLEM

#### SEE THE PROBLEM Create visibility to pipeline inventory

To prepare for an inventory glut, companies should have a comprehensive view of their inventory across the supply network, including partner facilities and internal warehouses. **This requires an integrated view of inventory and an understanding of the drivers of inventory position.** However, this can be

**position**. However, this can be challenging due to the distributed nature of inventory and the latency in visibility caused by inventory being stored at various stages in the value chain. To effectively manage inventory, near-real-time data refreshes and iterative analysis can help to identify root causes of rising inventory levels and provide opportunities for corrective action.

### CONTROL THE PROBLEM Establish an inventory desk

To optimize inventory, consider standardizing demand signal interpretation rules to accurately assess production needs. We frequently encounter inconsistent inventory valuation financials and inventory units of measure across different stages of the supply chain, which **requires reconciliation between finance, operations, and physical count data.** An early-warning exception

process can help identify excess inventory and dispose of aged and obsolete inventory in a timely manner. Using a task force may aid the evaluation of trade-offs between operating margin and free cash flow to facilitate excess inventory disposition. This can help ensure that actions are based on a comprehensive understanding of gaps to target.

## SOLVE THE PROBLEM

postponement

To structurally address inventory challenges, businesses can adopt a flexible manufacturing model that segments the supply chain based on product and demand characteristics. Implementing an assemble-to-order (ATO) approach can help manage supply chain operations, in which wafer starts are primarily driven by forecasts and assembly starts are based on customer orders. To implement a segmented postponement strategy, businesses may need to reevaluate lead times, customer allocation, order promising rules, and inventory staging policies. This requires a robust data foundation and a shift in mindset across the organization, from sales and planning to manufacturing and raw material procurement.



#### SUSTAIN THE SOLUTION Design and deploy a responsive demand-supply matching solution

To sustain inventory mitigation solutions and build a responsive supply chain that maximizes demand attainment with the lowest inventory valuation, businesses need to design a responsive demand-supply matching capability. This capability connects (pegs) demand and supply, to provide visibility to gating constraints, and prescriptive resolution options to manage disruptions in demand, supply, and capacity. Additionally, business operations

Auditionally, business operations could work with field sales to design a "go-sell" process that considers the magnitude of excess inventory, working capital tied up in inventory, and product margin per unit to help conduct targeted and purposeful demand-shaping actions.

Source: Developed based on Deloitte's analysis and past projects

# Opportunities for future growth

While it may be important for companies to address and manage the challenges presented by a downturn, truly innovative and successful organizations also look beyond the current cycle to fundamentally restructure and improve their operating models. To capitalize on the strong, long-term growth projected for the semiconductor industry—a global market size of \$1 trillion by 2030<sup>13</sup>—companies may consider making strategic changes and investments that can help set the stage for future success. We recommend that companies take a proactive approach and consider the following three areas to help emerge from the downturn in a stronger position than before.

### 1. Collaborative planning

In order to minimize latency in their supply chains, semiconductor companies may need to prioritize the development of robust collaborative planning capabilities that transcend organizational boundaries.<sup>14</sup> This could mean working closely with supply chain partners to develop processes such as demand planning and sales and operations planning, which are driven by a clear understanding of customers' forecasted needs and efficiently manage changes in demand, while considering the cost of agility. While some companies may rely on internal customer-facing teams for this information, a more accurate signal can often be obtained by collaborating directly with customers, then validating and using any additional market intelligence from the internal customer-facing teams. Without visibility of actual and anticipated demand at the point of consumption, companies may waste valuable resources and be forced to implement reactive, "firefighting" processes when actual demand differs from the forecast. Collaboratively developing a demand plan that is supported by predictive analytics is a crucial step toward reducing supply chain uncertainty and improving planning efficiency as it can allow companies to more effectively allocate resources.

### 2. Technology portfolio digitization and optimization

Supply chain systems and data architectures in the semiconductor industry can often become customized, complex, and fragile due to organic growth over time or mergers and acquisitions activity. Companies may turn to quick-fix solutions to their data and IT needs, but these short-term approaches can have long-term consequences and may not be sustainable. In order to scale and stay competitive, it may be essential for semiconductor companies to prioritize optimizing their technology footprint and aligning on an enterprisewide data strategy. This could include establishing data policies, standards, and controls; exploring the use of edge technologies to enable near-real-time visibility; and machine learning-enabled decision orchestration across multiple tiers of the supply chain. By implementing systems for machine-to-machine collaboration, such as automated data exchange, companies may stand to reduce latency and improve synchronized planning and execution. Additionally, artificial intelligence can be used to improve bill of materials tracking and delivery timelines of machines and components, providing granular insights into customer demand expectations across tiers.<sup>15</sup> The current economic downturn presents a valuable opportunity for companies to carefully review and prioritize their technology investments, focusing on those that support the development of a fully connected and optimized end-to-end supply network.

### 3. Design for Supply Chain

When designing a product, it can be crucial to consider the long-term impact of component choices, as it can be difficult to make product structure changes after it has been designed. Implementing a Design for Supply Chain (DfSC) strategy during the design process can help mitigate this issue by using fewer, more fungible components that can be configured into a variety of end products. This approach could lead to reduced SKU proliferation, lower inventory levels, more accurate demand signals, and the production of profitable SKUs. To effectively implement DfSC, it can be important to involve cross-functional teams, including design engineers, marketing, procurement, manufacturing, and logistics, and to review product structures through the lens of potential supply chain issues. We have found that introducing a DfSC mindset in the early stages of product design could prove to be an effective strategy for semiconductor companies to help manage supply chain risk.



# Conclusion

The current economic and geopolitical environment could require immediate action to address short-term challenges in the semiconductor industry. However, it is important to remember that the industry has a history of resilience and adaptability, and it is likely to continue experiencing strong growth in the long term. As new technologies continue to emerge in a wide range of consumer markets, the next peak in demand likely is not far off. To capitalize on this growth potential, manufacturers should consider implementing the strategies outlined in this article. By addressing short-term challenges and investing in mediumto long-term solutions, companies can position themselves for sustained success in the ever-evolving and complex semiconductor industry.



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