Low-k Dielectrics

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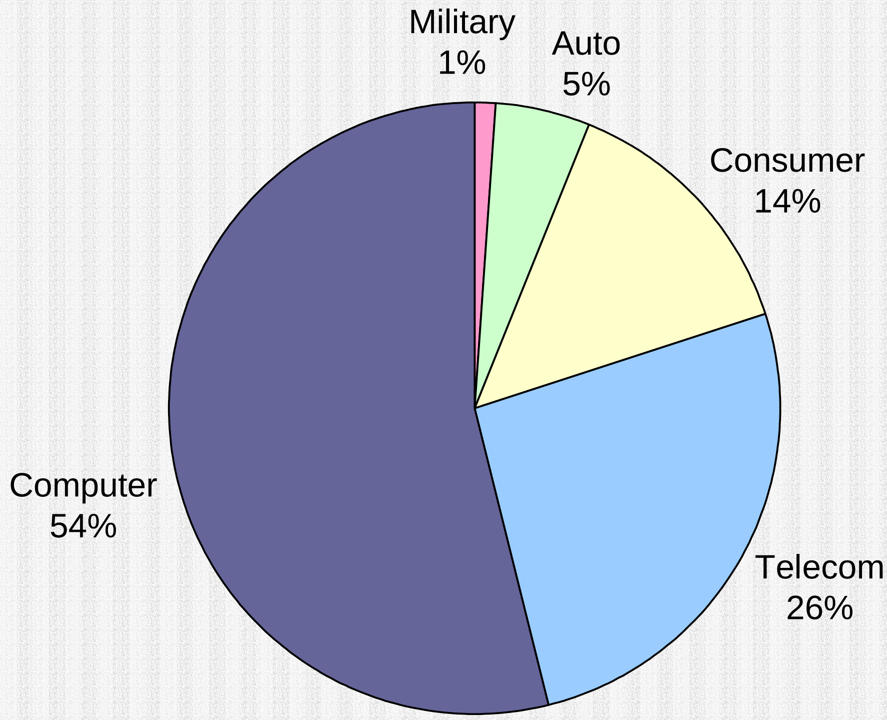
Industry Facts & Figures

- US 2001 Sales = $72 Billion
- WW Sales = $139 Billion
- Capital Investment = $18 Billion
- R&D Investment = $13.3 Billion

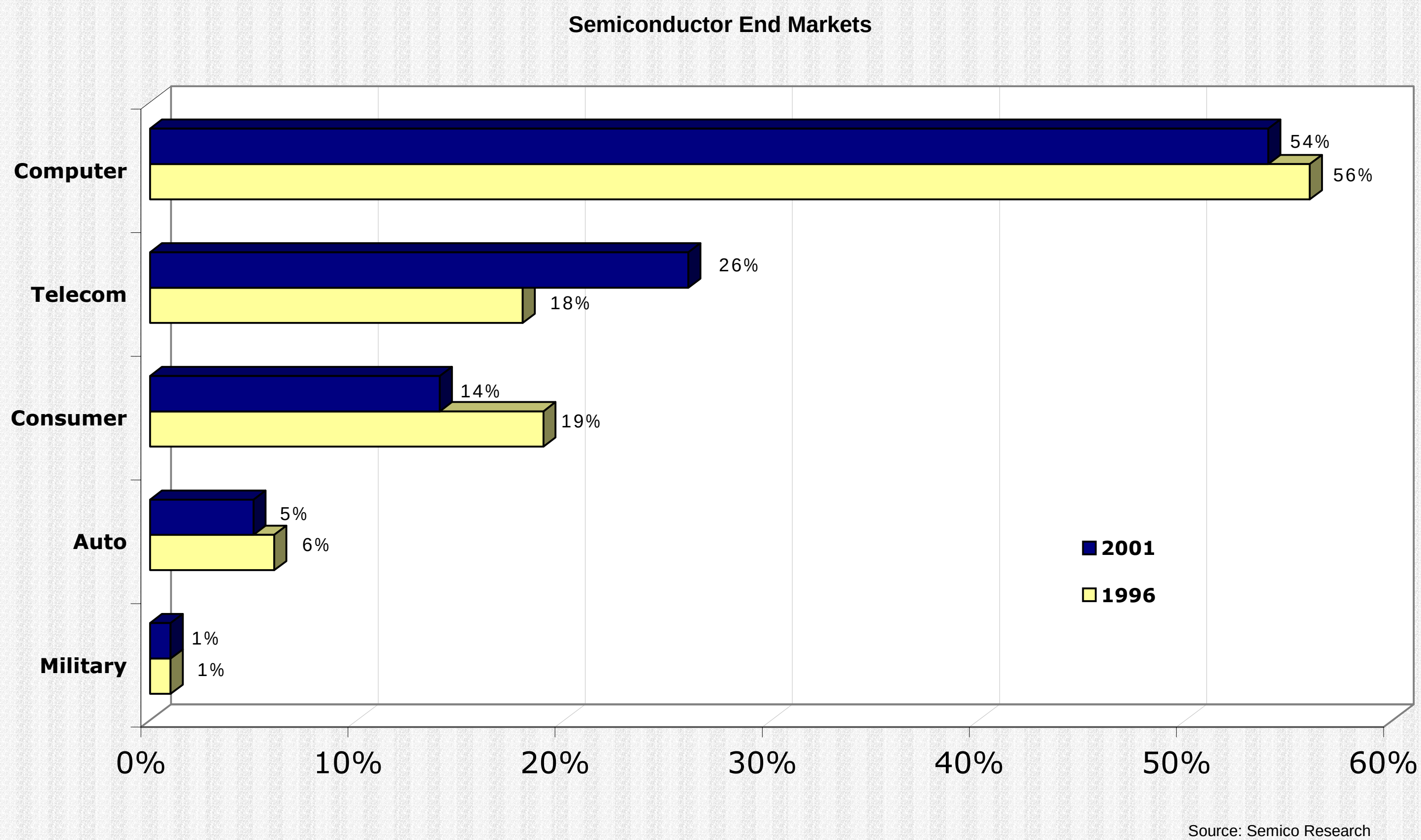
Source: SIA

End Market Breakdown



Source: IDC

Consumer & Telecom Have Become Bigger Pieces of the Pie



Source: SEMICO Research

Industry Status

- Worst Downturn in History
- No End in Sight (Best Buy, Radio Shack)
- Technology Continues to Advance
- New Materials
- Bright Future

Growth Drivers

- Production of 130 and 90nm Devices
- Transition from Aluminum to Copper
- Transition to 300mm Wafers
- Increasing Number of Metal Interconnects per Device
- Increasing Complexity of Transistor Structures

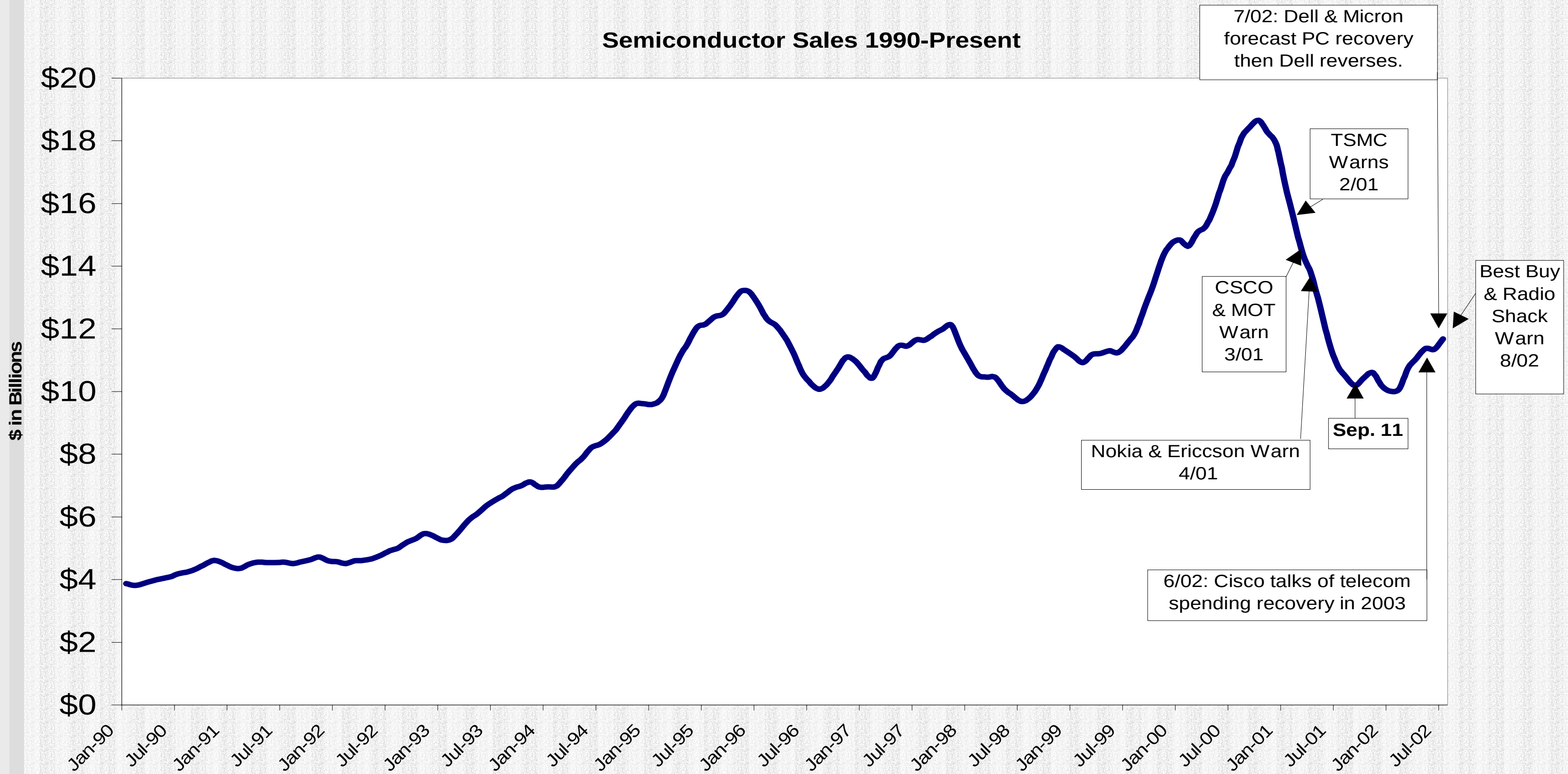
Low-k Integration

- 1997 ITRS Predicted low-k will be needed for 180nm node
- 2001 ITRS Pushed Back Need for Dielectric Constants Below 3 to 90nm node
- SiO_2 and FSG Still Dominate

Problems With Low-k

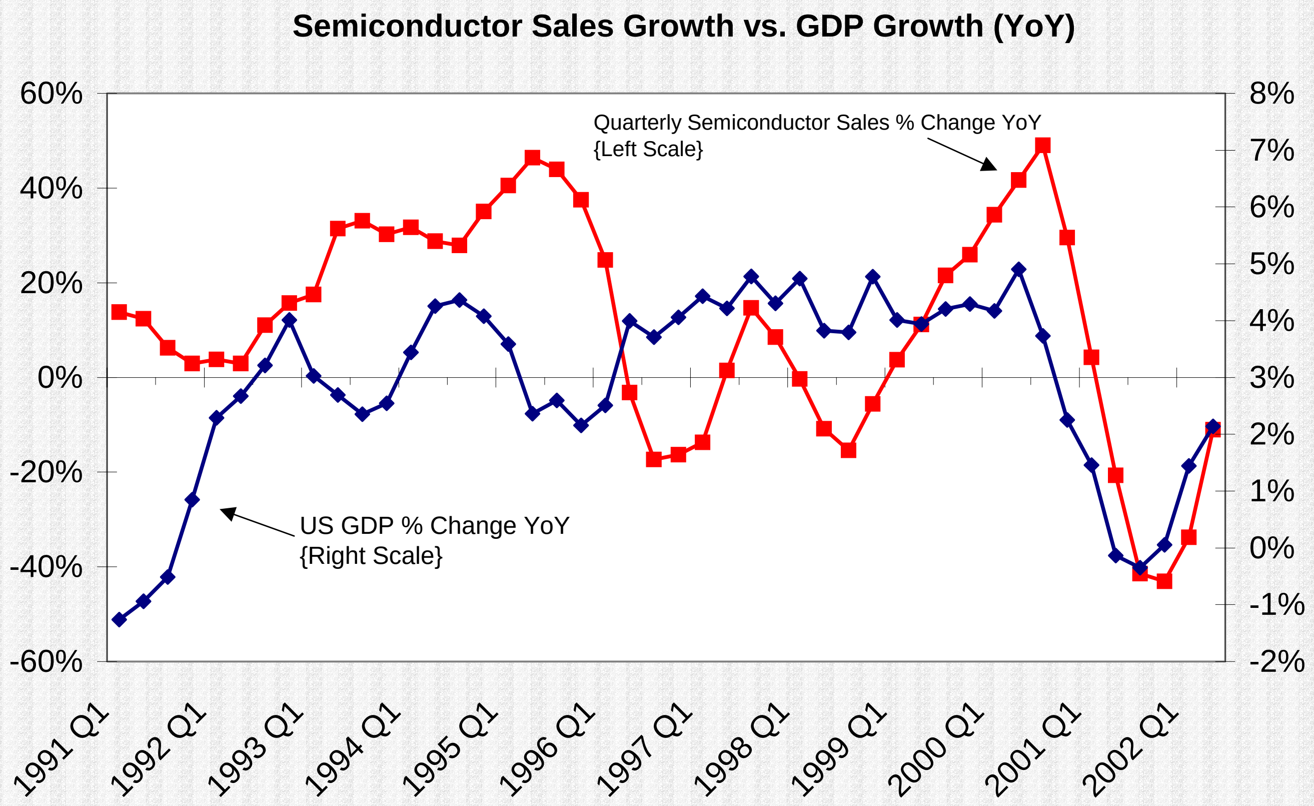
- Temperature & Long-term Stability
- Compatibility with Copper
- Fabrication Difficulties
- Fragility
- Adhesion
- Low Shear Force

Semiconductor Sales



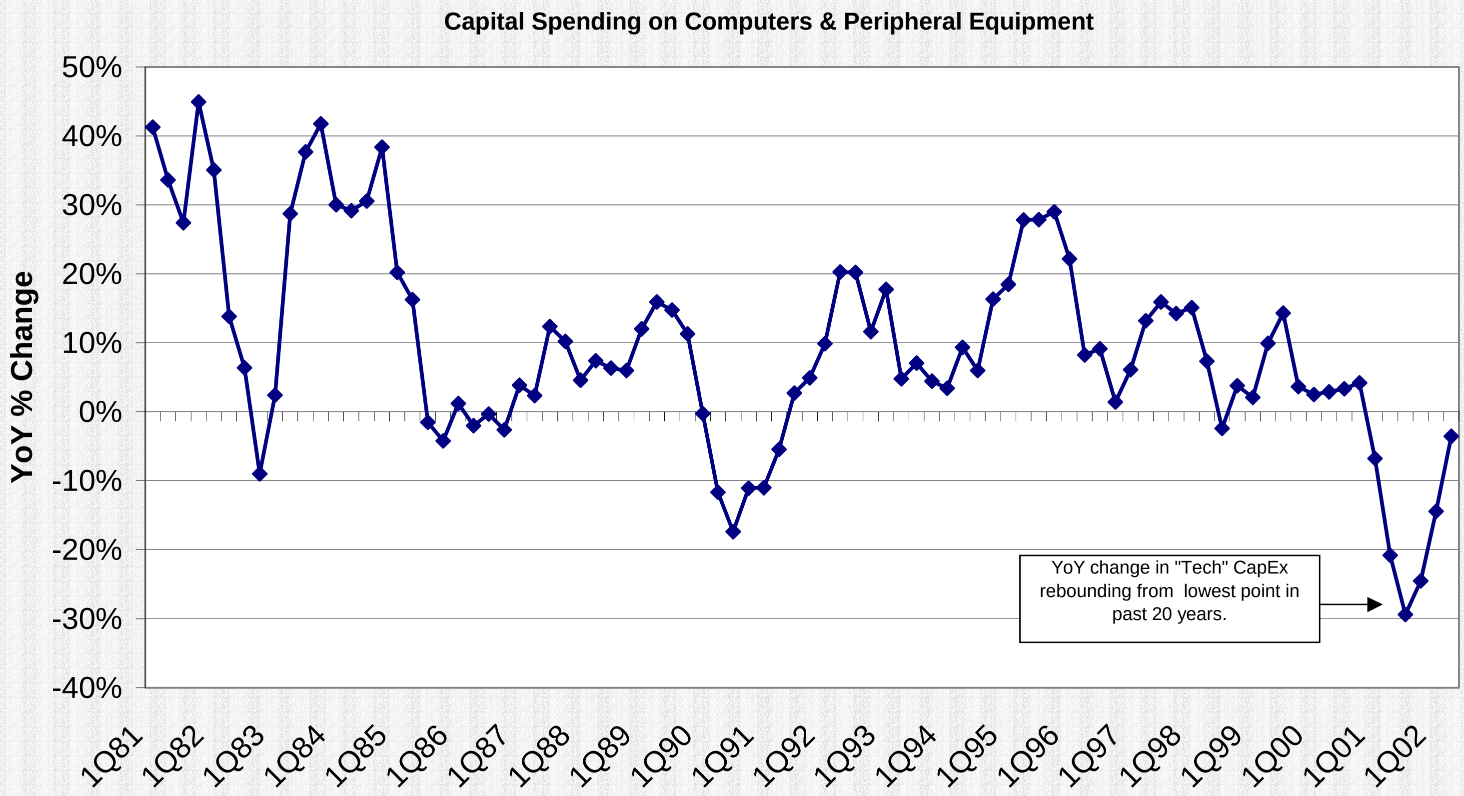
Source: SIA

GDP & Semiconductor Sales



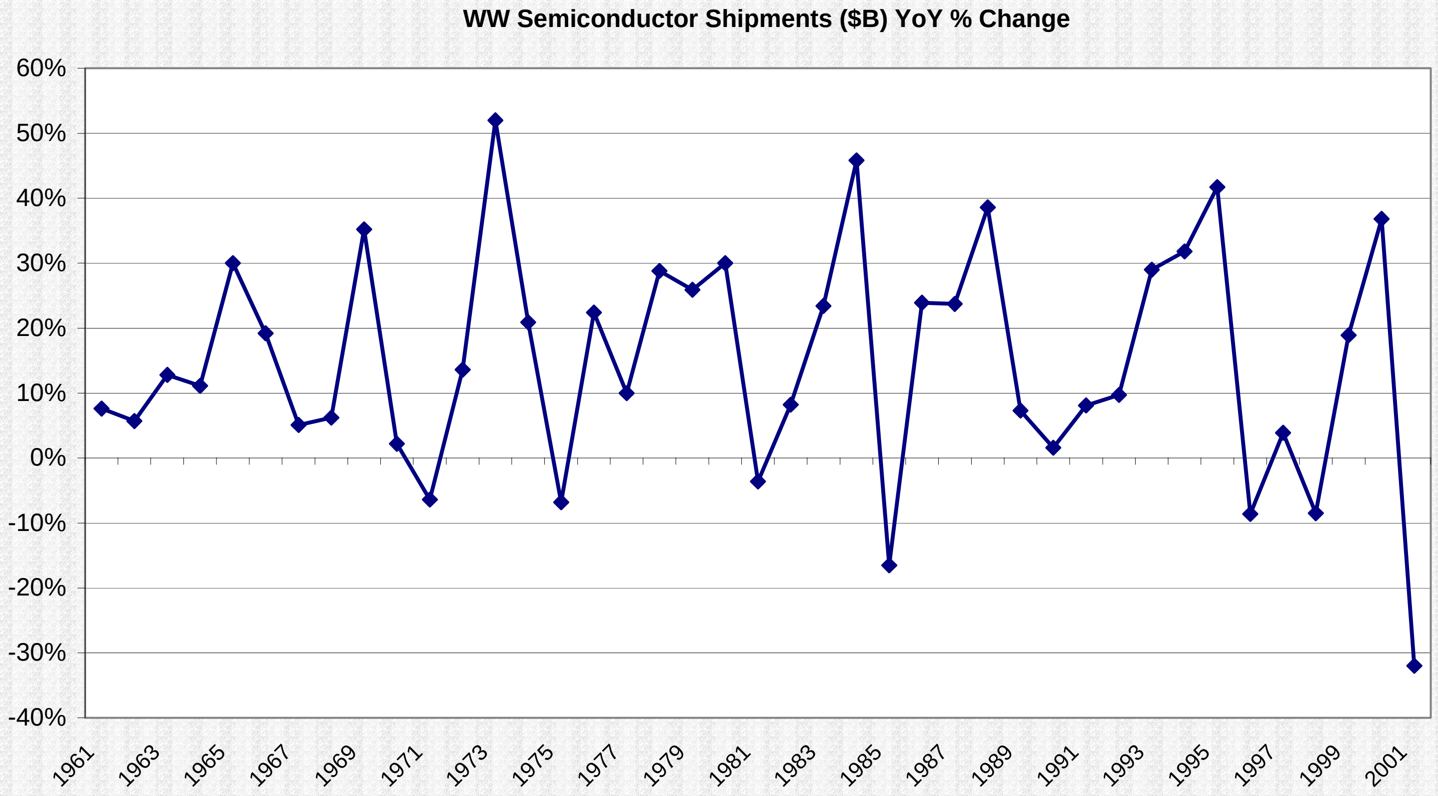
Source: Bureau of Economic Analysis & SIA

Tech Capital Expenditures



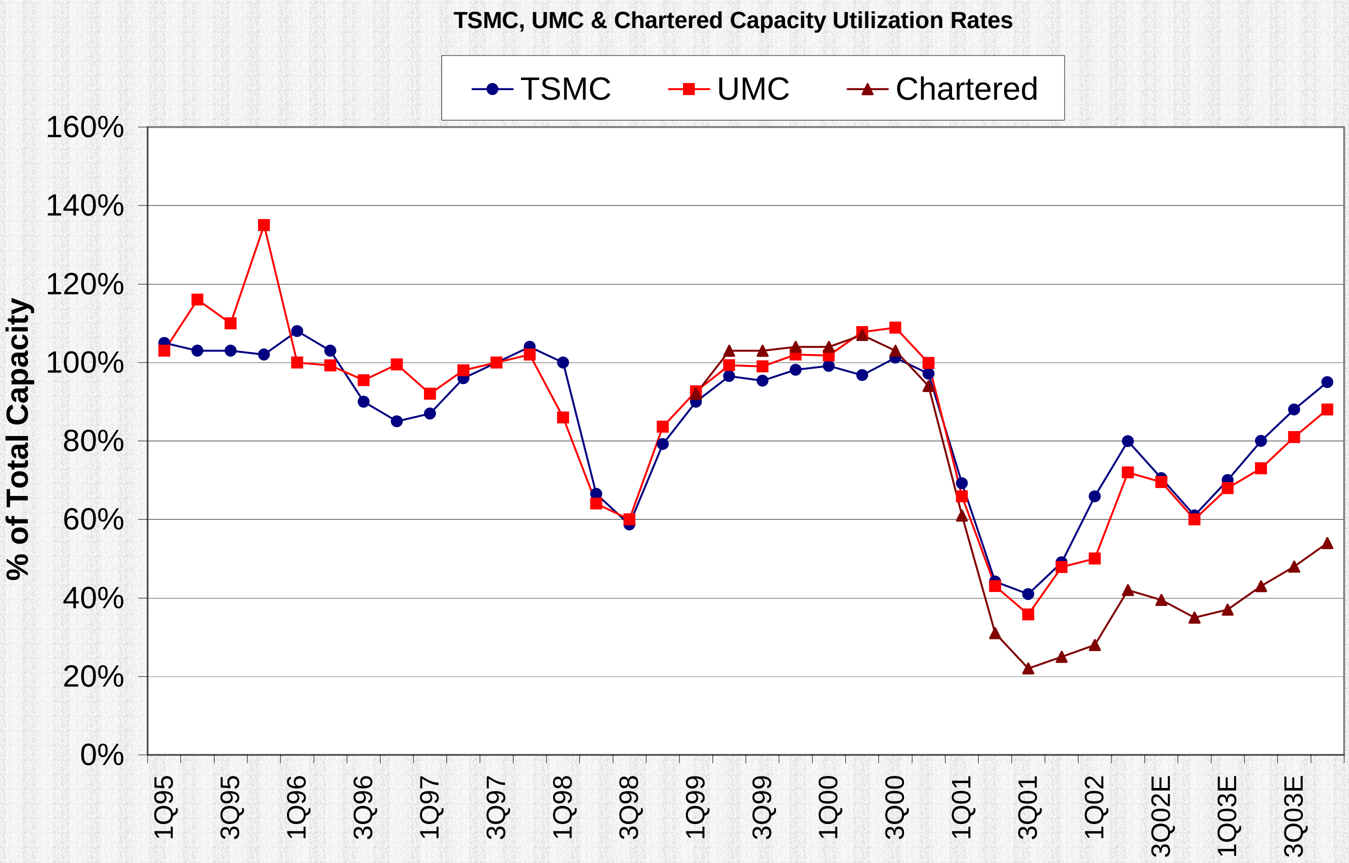
Source: Bureau of Economic Analysis and Salomon Smith Barney

Semiconductor Cyclicality



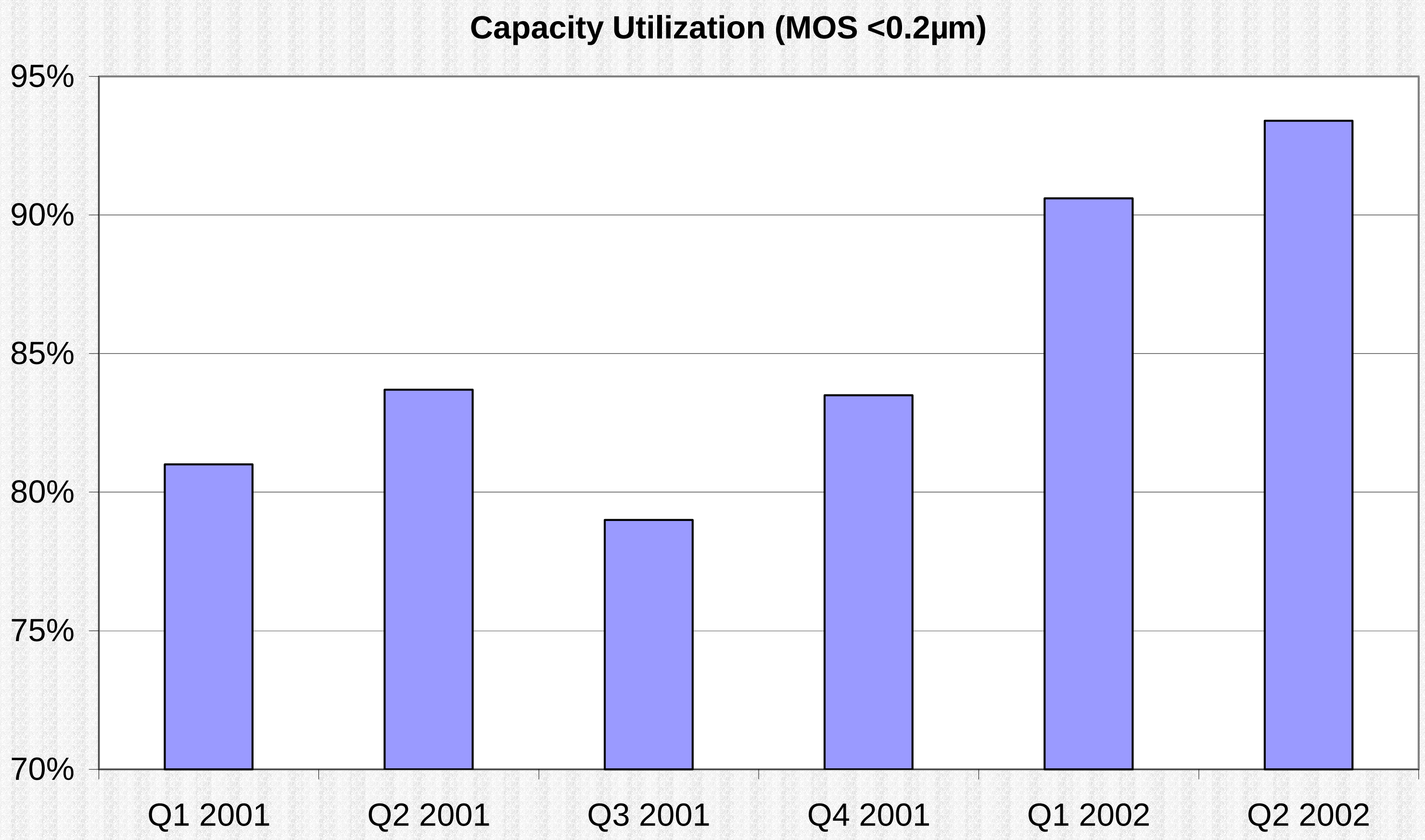
Source: SIA

Fab Capacity Utilization



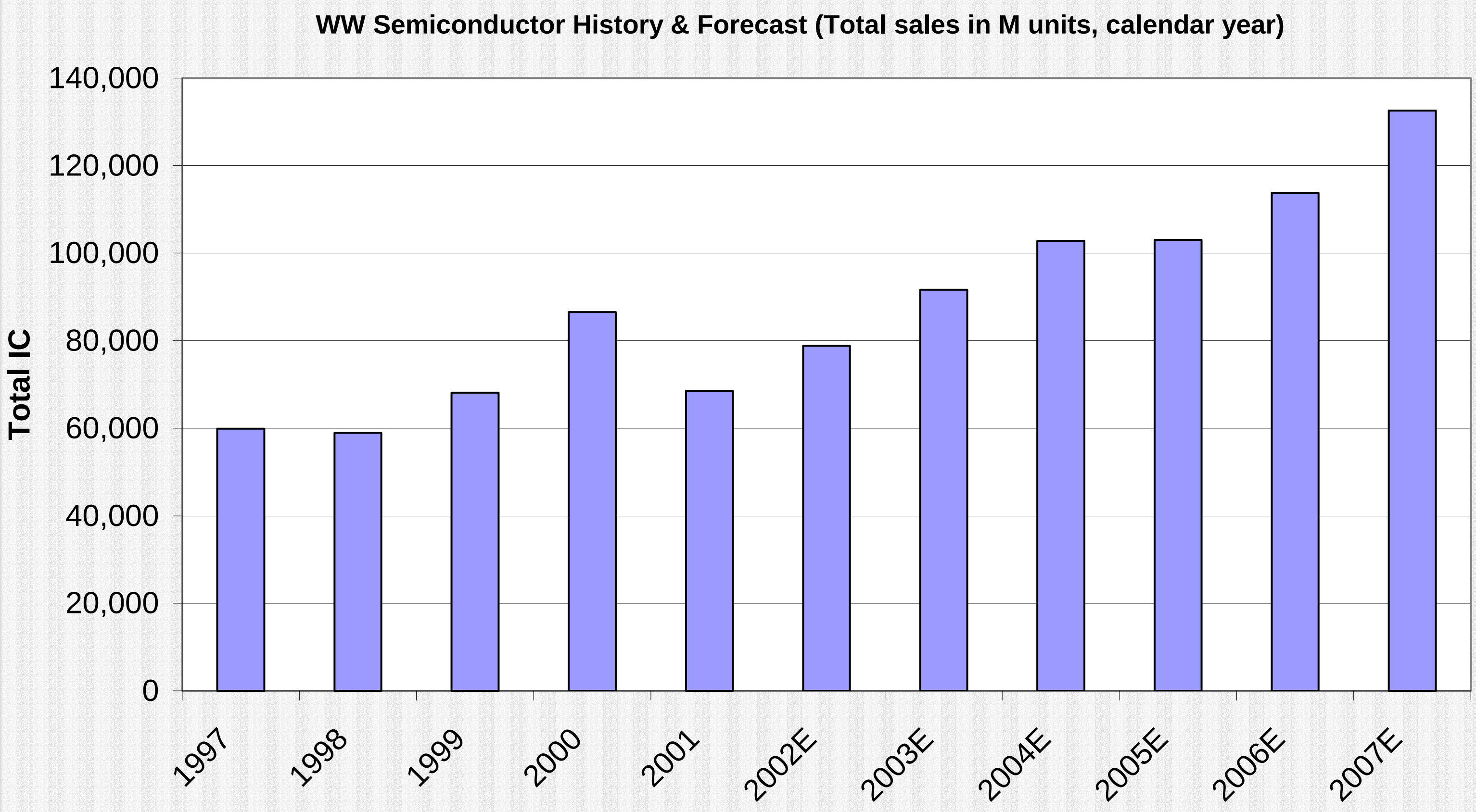
Source: Company reports and Salomon Smith Barney

Advanced Semiconductor Capacity Utilization Strong



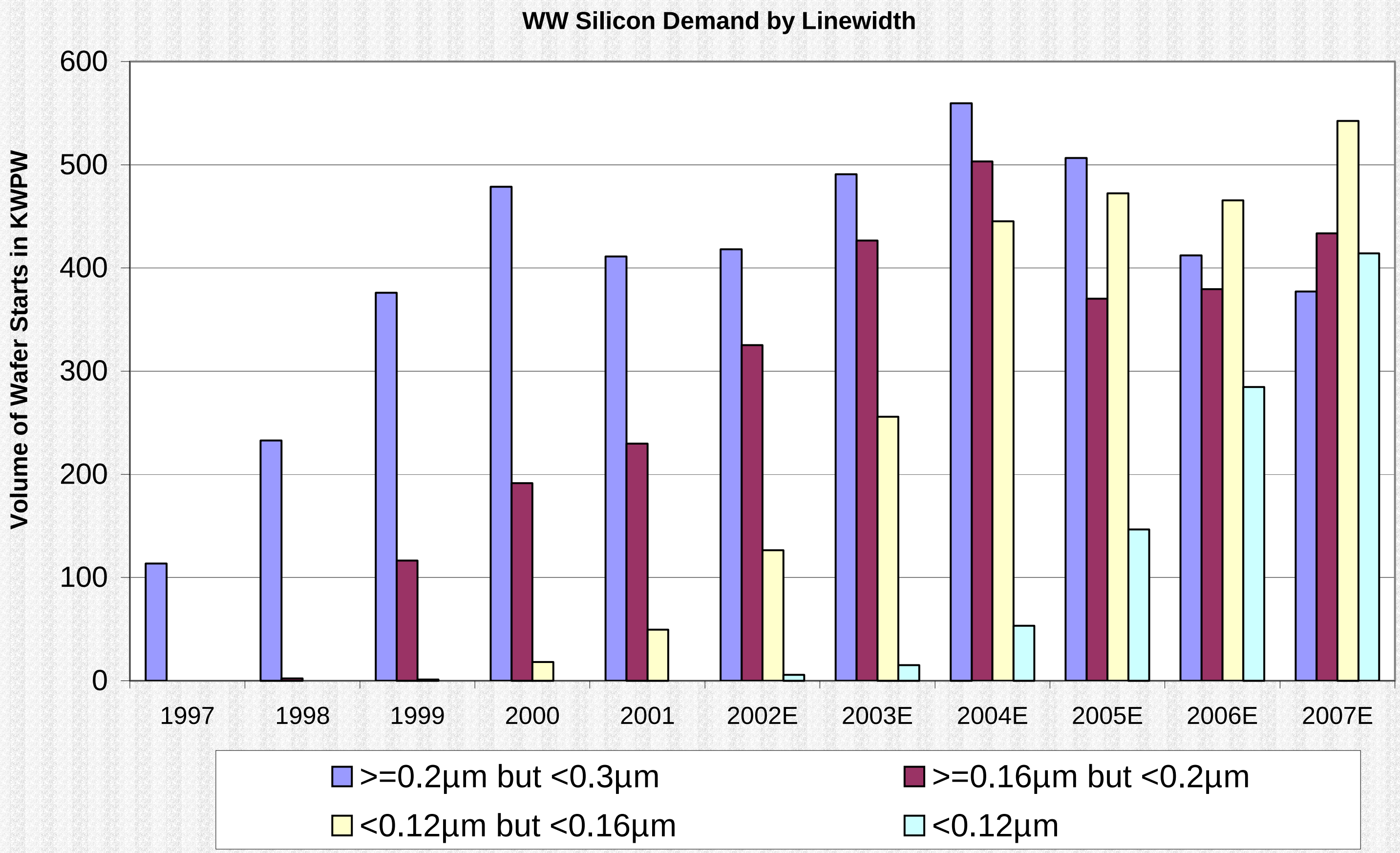
Source: SICAS

IC Unit Forecast



Source: VLSI Research

The Future is Submicron



Source: VLSI Research

KWPW = Thousand Wafer Starts per Week

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