

"PRIME" FACTORY zation

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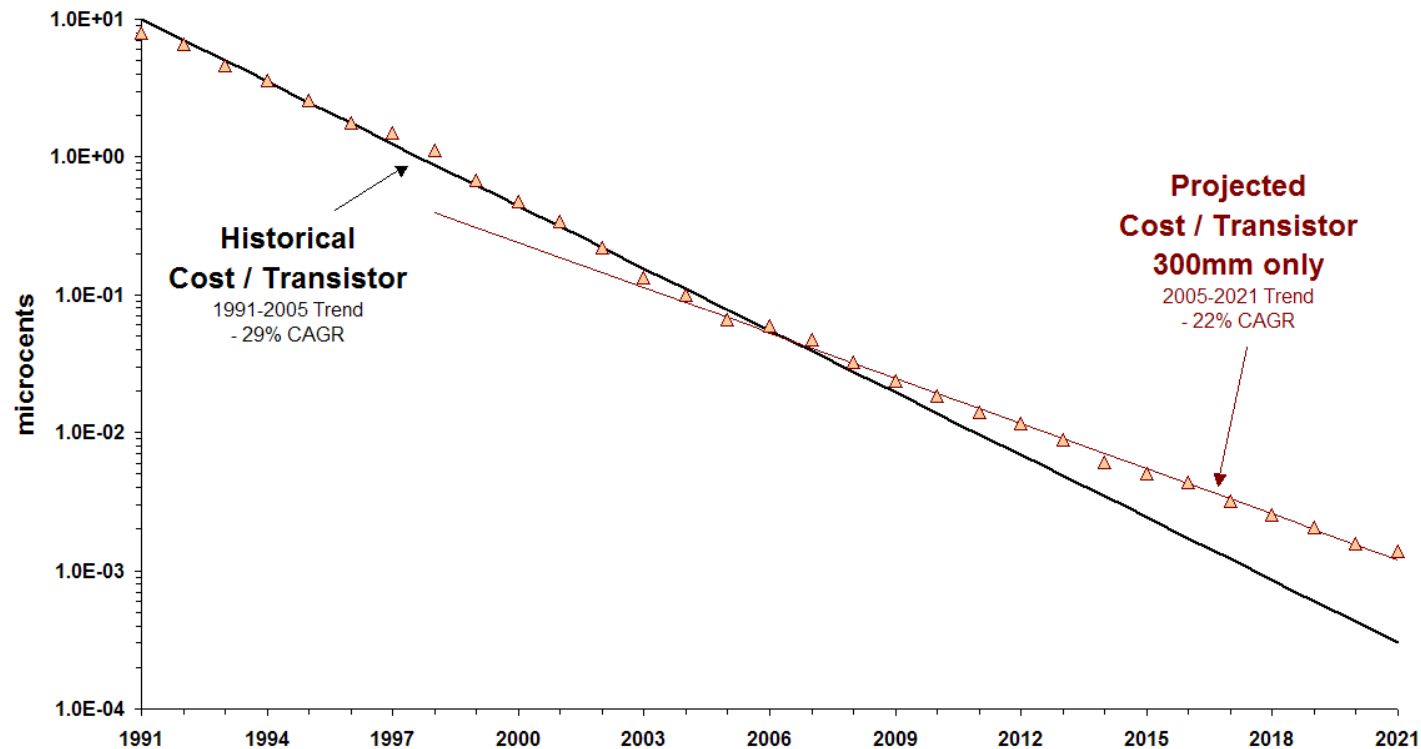
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The “Productivity” Challenge

Average Fab Costs per Transistor



Source: ISMI

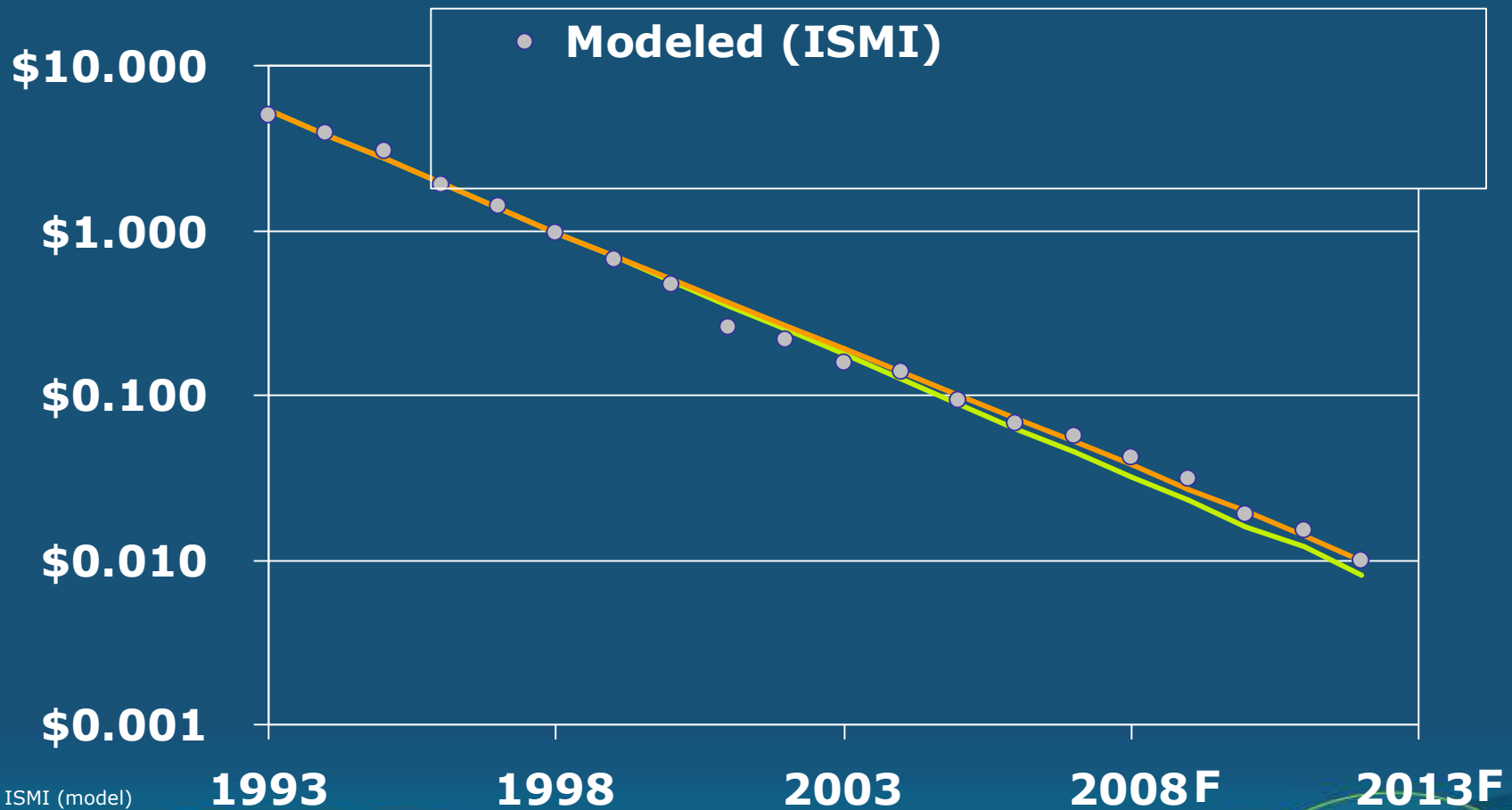
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The Challenge... Revisited

Average Fab Costs (μ -¢/transistor)



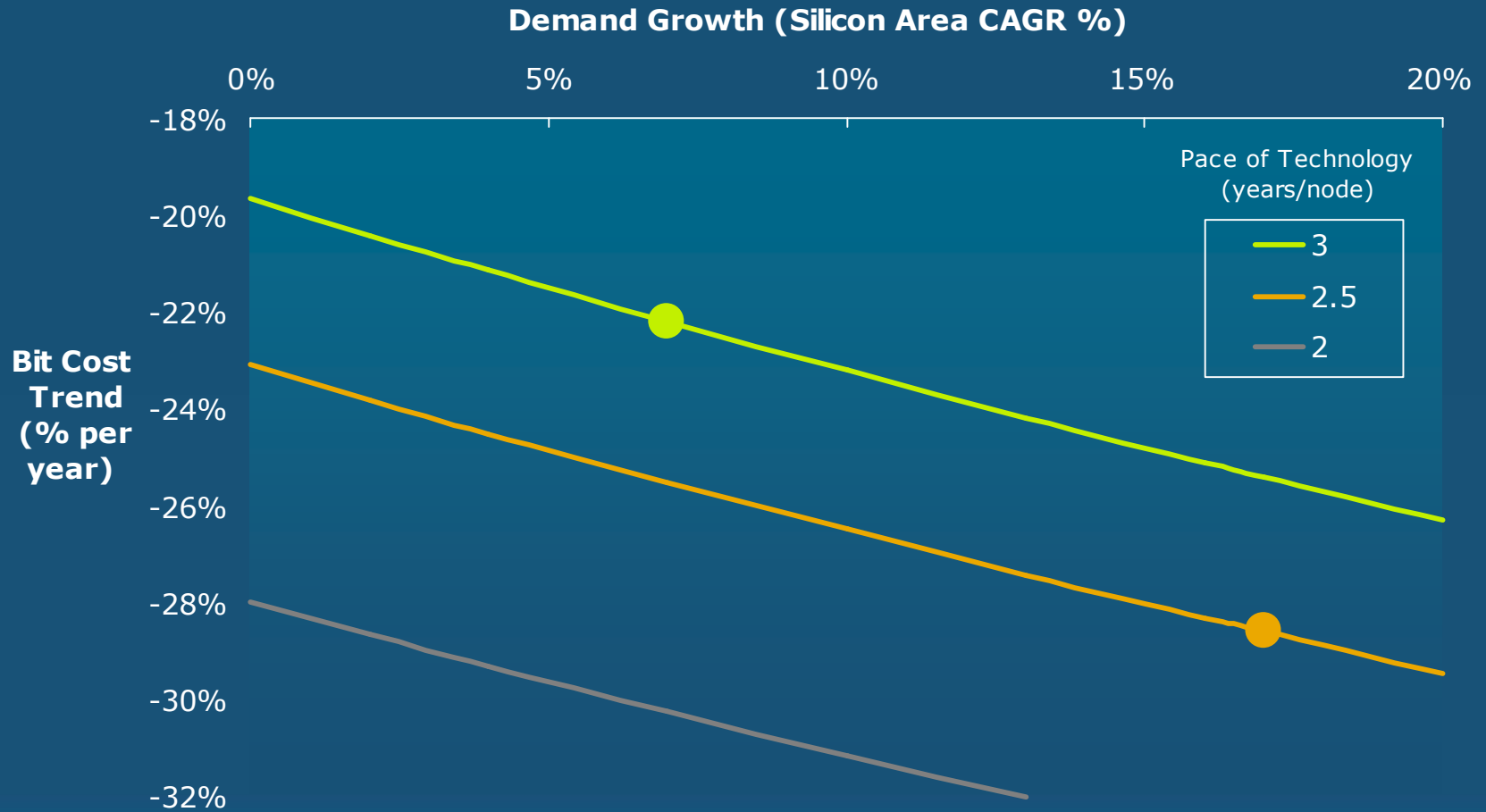
Source: ISMI (model)

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What Are The Root Causes?

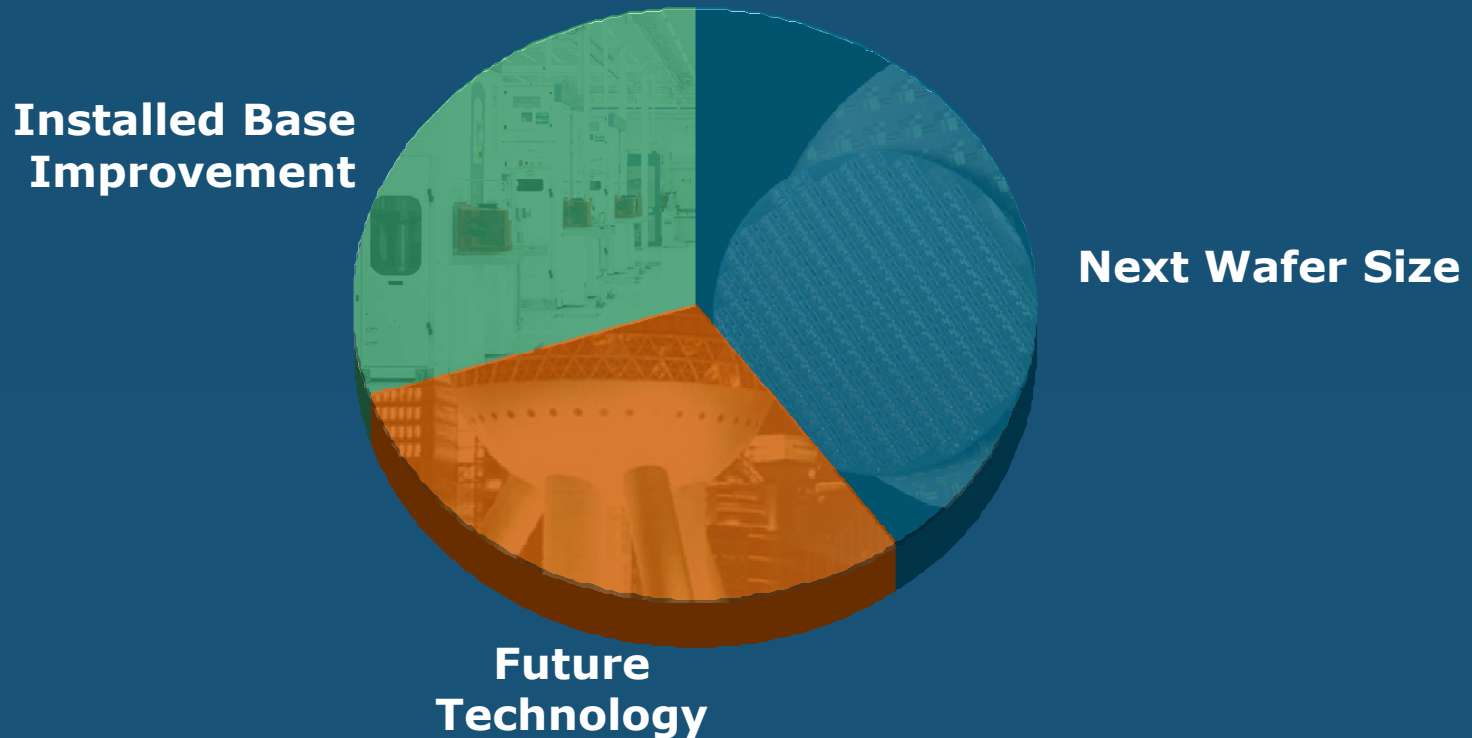


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How Should The Industry Spend Development \$?



What Should Be The Priorities?

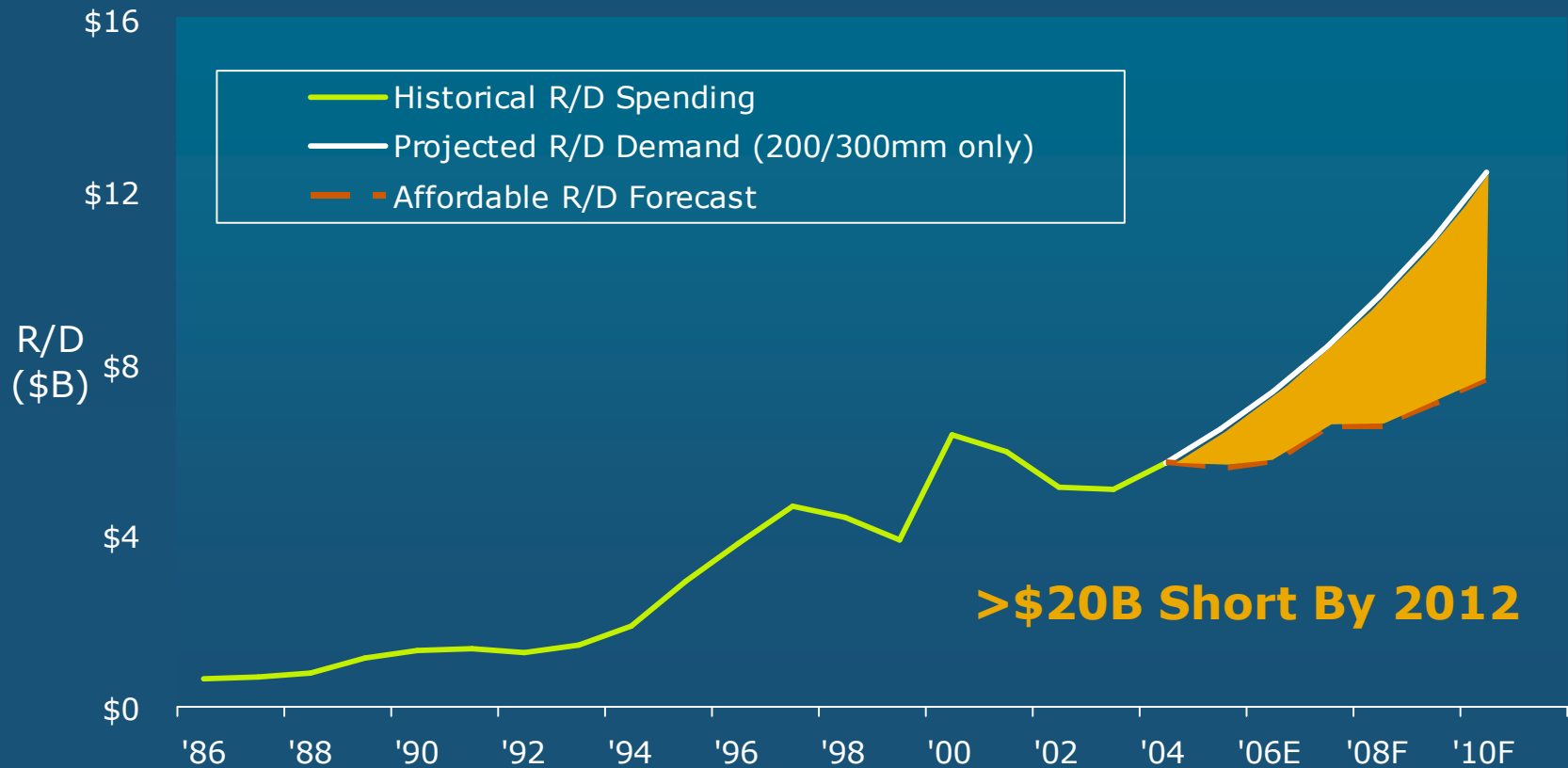
Illustrative

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Equipment R/D Gap



>\$20B Short By 2012

Note: Affordable R/D forecast assumes 14% of equipment industry revenues
Sources: S&P, SIA, SEMI, Infrastructure Advisors

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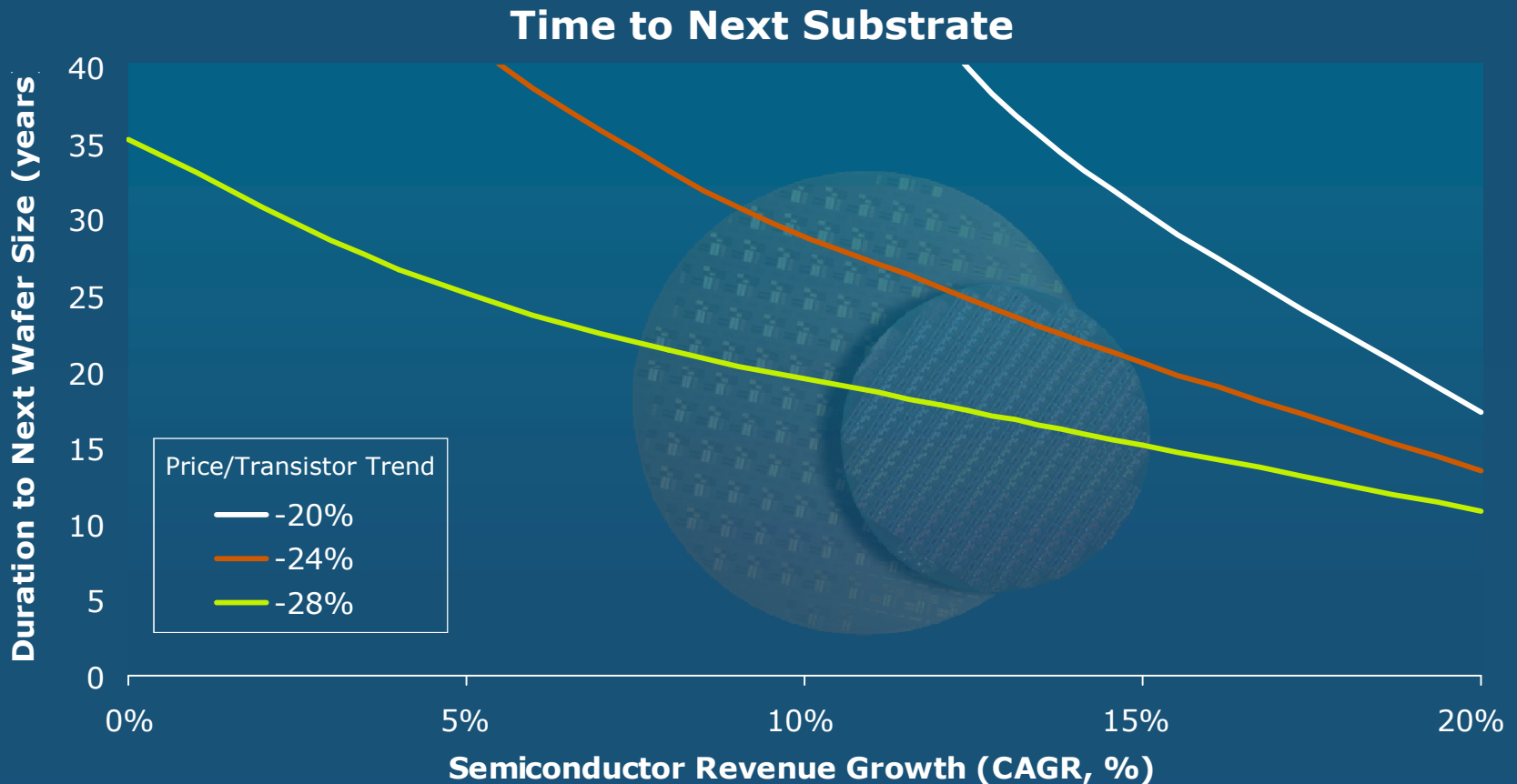
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Future Technology or Future Substrate?

	Technology	Substrate
Value Proposition	<ul style="list-style-type: none"> ▪ Double chip performance ▪ Increase devices per wafer by 100% 	<ul style="list-style-type: none"> ▪ Increase devices per wafer by 125%
Chip Demand/ASP Impact	<ul style="list-style-type: none"> ▪ Vital 	<ul style="list-style-type: none"> ▪ None
Capital Cost Impact	<ul style="list-style-type: none"> ▪ Moderate increase 	<ul style="list-style-type: none"> ▪ Significant increase in inherent costs for all tools ▪ Higher device throughput for some
Variable Cost Impact	<ul style="list-style-type: none"> ▪ Moderate increase 	<ul style="list-style-type: none"> ▪ Significant increase
Scope of Fab Impact	<ul style="list-style-type: none"> ▪ Partial 	<ul style="list-style-type: none"> ▪ Total / systemic
Installed Base Benefit	<ul style="list-style-type: none"> ▪ Significant 	<ul style="list-style-type: none"> ▪ None
Implementation/ Timing Risk	<ul style="list-style-type: none"> ▪ Significant 	<ul style="list-style-type: none"> ▪ Enormous
Investment	<ul style="list-style-type: none"> ▪ Big 	<ul style="list-style-type: none"> ▪ Huge

Demand Drives Wafer Size Life Cycle



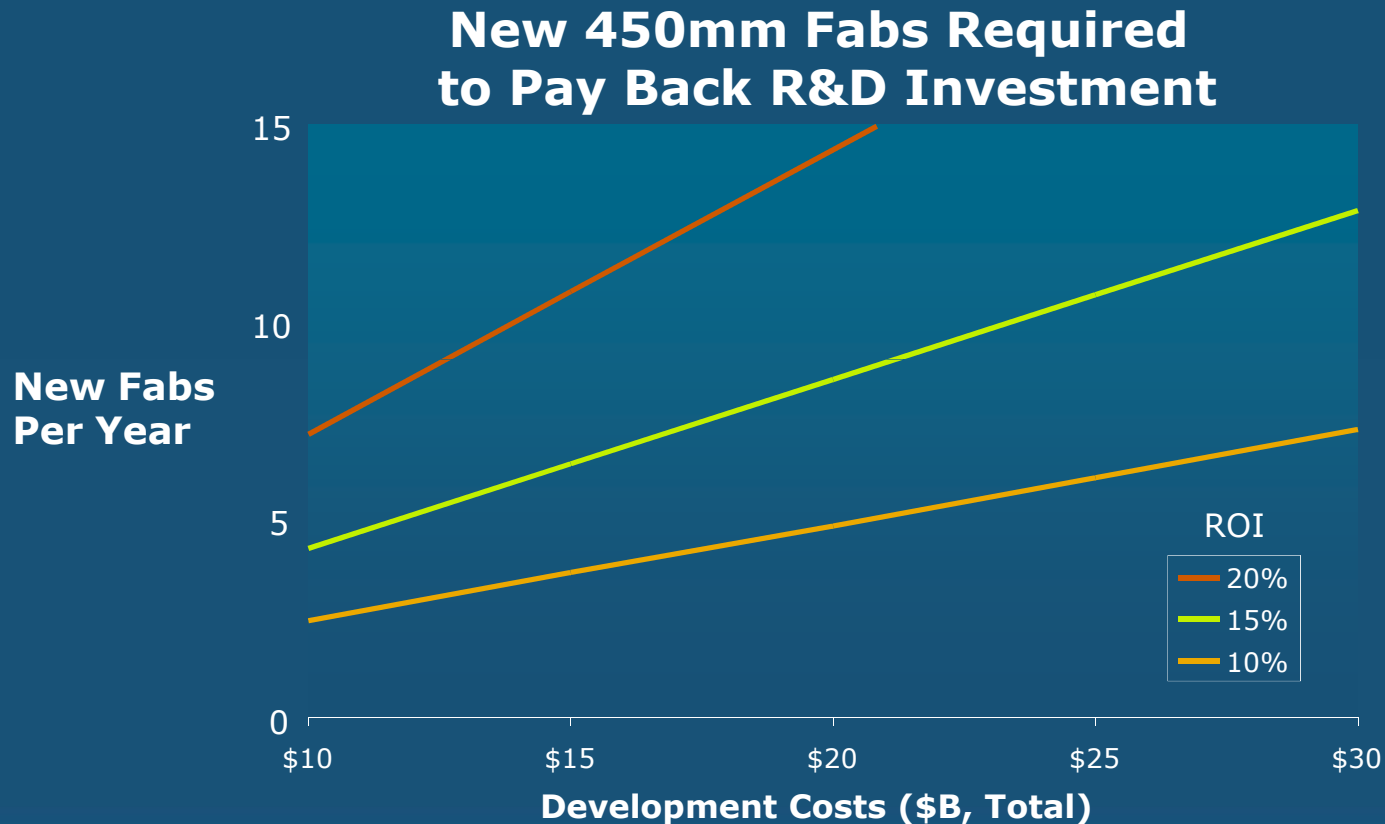
Assumptions: 450mm substrate; 3-year technology nodes; objective is to maintain constant number of fabs

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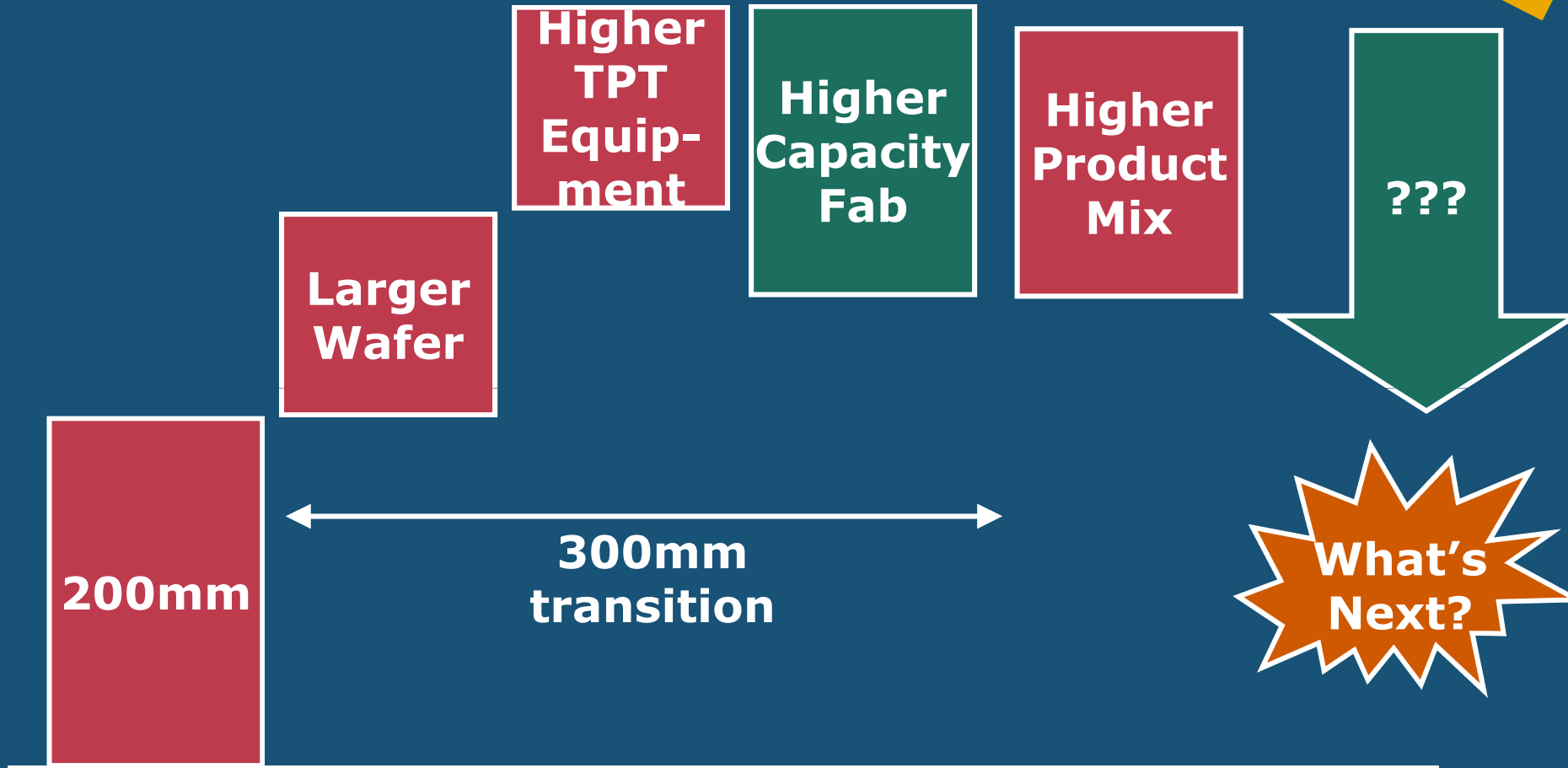
Broad-Based Adoption Required to Justify 450mm Investment



Note: Entire food chain modeled as a single entity earning back return on development funds through manufacturing cost savings

Managing Variability

Conceptual



Product + Process Variability

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Enabling Fab Productivity

Optimize fab operations

"PRIME"

Small-lot
Handling

Embedded
Intelligence/
Localized
Control

Low-variance
equipment/
Tight
Character-
ization

Single-wafer
Processing

Low-waste/
Low-impact
Operation

Build foundation of rapid, differentiated, technology solutions

- Extend Litho
- Enable transistor performance
- Scale interconnect RC
- Scale memory density (strain)
- Resolve nano defects

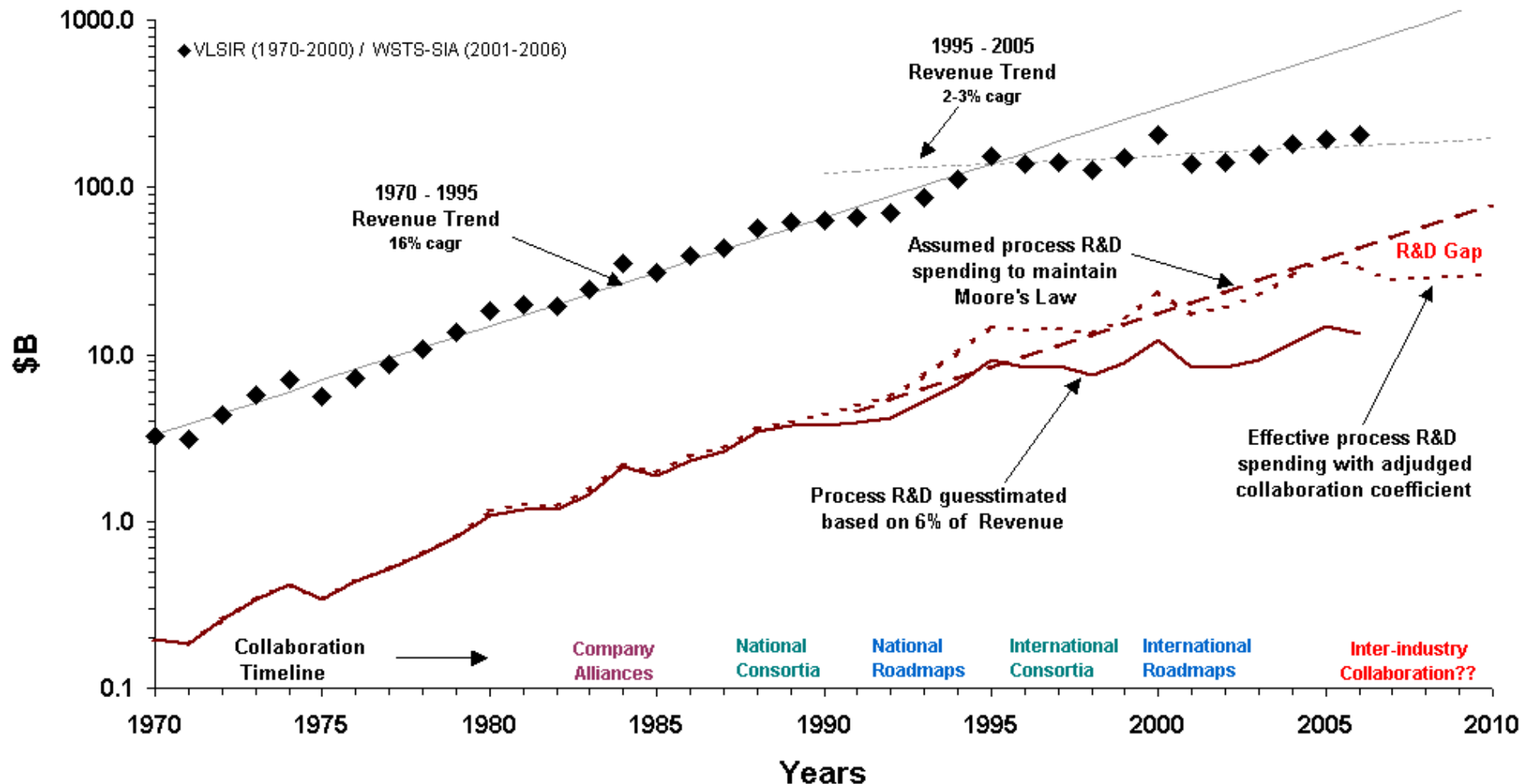
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ISMI: R&D Investment Trends



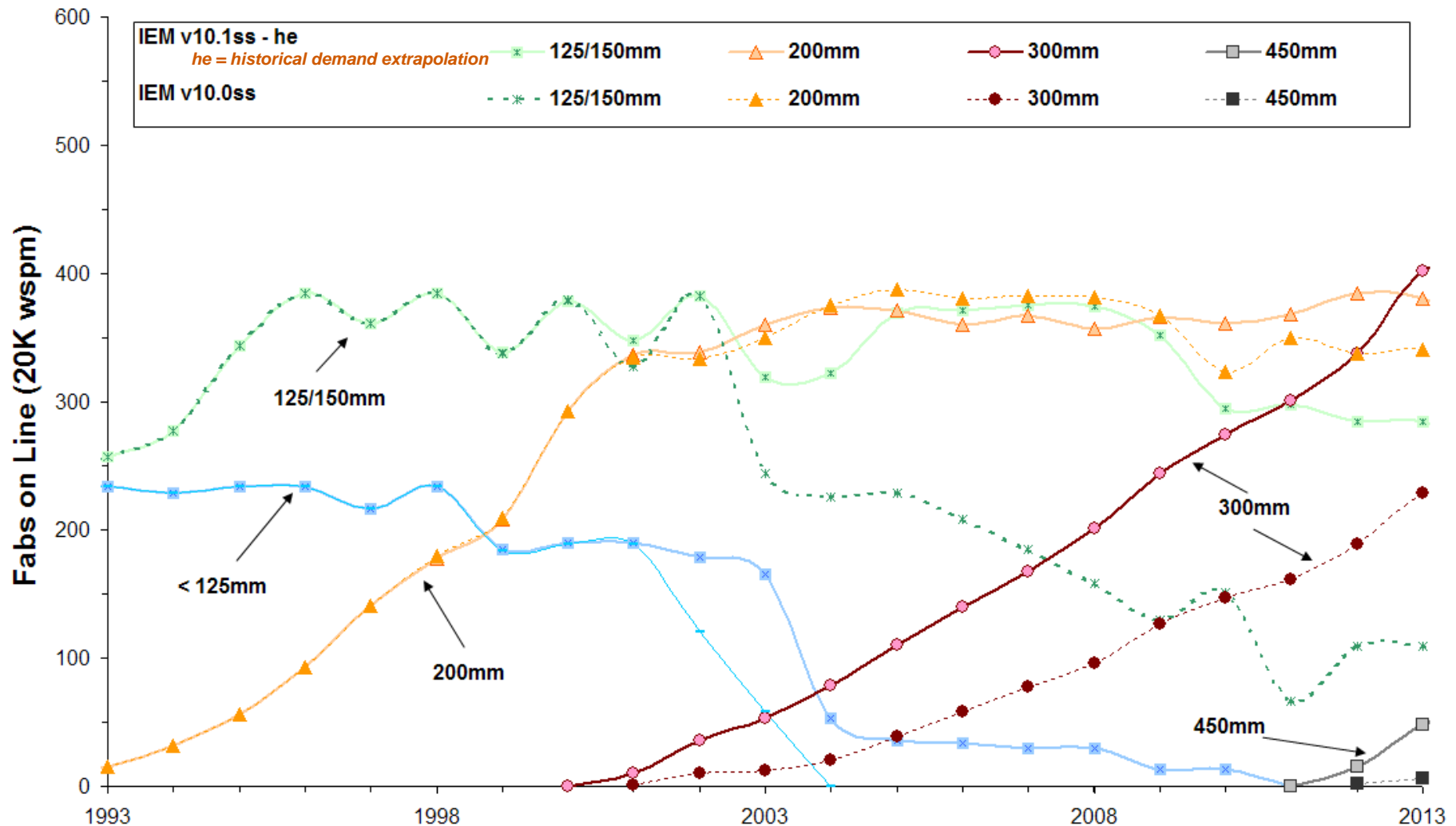
Source: ISMI

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ISMI: Impact of Slower Growth on Investment



Source: ISMI

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