

Crossborder Innovation & Competitiveness Initiative

Issue Overview

Semiconductor Fabrication - An Opportunity for Crossborder Collaboration?

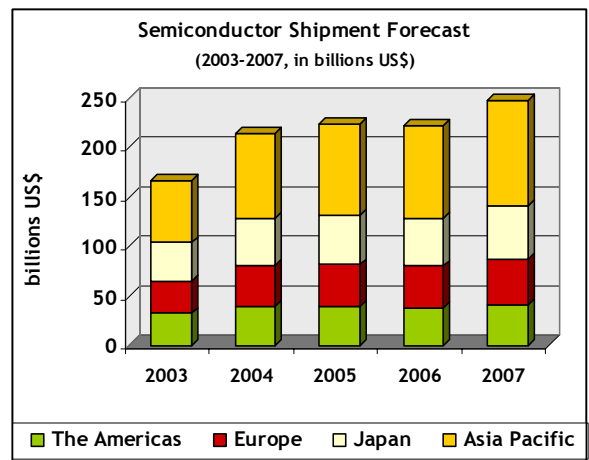
Introduction

- San Diego Dialogue’s *Crossborder Innovation & Competitiveness Initiative* is dedicated to exploring how the San Diego-Baja California region can become more globally competitive in key science and technology sectors by leveraging opportunities across our border. Such opportunities potentially exist both in terms of crossborder research partnerships, and by connecting San Diego and Baja California in high value-added economic clusters that link regional R&D capabilities to manufacturing and service industries in our region.
- With this in mind, UCSD’s San Diego Dialogue has prepared this *Issue Overview* to aid an initial discussion about a potential area of crossborder collaboration that is being championed by the State of Baja California: the establishment of a semiconductor/IC supply chain centered in Mexicali, Baja California. The private sector-led effort, announced in July 2004 as “*Silicon Border*”, would involve attracting semiconductor fabrication, design, assembly, and test operations to a high-technology industrial park developed in a 10,000 acre area adjacent to that city.

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- **Semiconductor Shipments By Region:** Despite overcapacity concerns, semiconductor manufacturing will continue to be a growth market, with worldwide sales expected to increase from \$166.4 billion in 2003 to over \$247.3 billion by 2007 (see graph at right). As might be expected, a substantial amount of the overall increases will occur in the Asia Pacific market (Taiwan and China, in particular), with slower growth still forecast for North America and Europe.

That said, while the size of the Chinese semiconductor market will surpass that of the United States before 2010, it is still the case that U.S. and North American semiconductor demand will continue to grow, especially in light of the broadening uses for semiconductor products.



- **Costs:** Fabrication facilities that are currently in process of being built (such as Texas Instrument’s new 300mm facility in Richardson, TX) typically cost in the \$2.5-4.5 billion range. Some industry analysts, however, estimate that state-of-the-art fabrication facilities may cost as much as \$10-12 billion by the year 2010. Such increasing costs may make it nearly impossible to develop such facilities without significant governmental incentives and multi-company partnerships.

In terms of labor costs, while these have been considered an issue in terms of Baja California’s competitive position against many Asian countries, it is not clear whether relatively higher costs will be a significant disadvantage for Mexico in the case of

semiconductor manufacturing. This is due to the fact that labor represents a relatively small portion - only 6-8% - of the overall cost for a finished semiconductor wafer.

- **Intellectual Property (IP) Protections in Mexico:** IP is a critical issue for successfully developing a semiconductor supplier network, given the industry’s competitive nature and high costs involved. As stated by the World Semiconductor Council in 2003: *“Semiconductor makers must invest a very high percentage of sales in R&D, and the intellectual property that results is the lifeblood of the company. Failure to adequately protect intellectual property is very damaging to the semiconductor industry.”*

Mexico’s Industrial Property Law (IPL) conforms to the WTO’s TRIPS agreement (protecting layout designs of integrated circuits), with the provision that such designs must be registered before IMPI (Mexico’s Intellectual Property Institute).

- **Factors for Attracting Semiconductor Fabrication Facilities:** Some of the key factors that are traditionally needed for attracting such operations include:
 - proximity to University technology centers & researchers;
 - proximity to international airport and highly reliable energy, telecommunications, and water infrastructure;
 - legal infrastructure to protect IP;
 - a highly educated workforce including engineering, sales and marketing skills;
 - and financial support or incentives.

Implications for San Diego & California?

Retaining California’s leadership in not just semiconductor manufacturing but also research and development may be enhanced if Baja California is successful in its efforts to establish semiconductor fabrication facilities. As noted by the U.S. Semiconductor Industry Association (SIA): *“...[It] has become increasingly important for companies to co-locate silicon process research and advanced manufacturing operations....If leading edge manufacturing moves offshore because foreign governments have created more attractive investment environments, over time R&D facilities for manufacturing processes are likely to follow.”*¹

Already, San Diego universities and some private companies (such as those involved with semiconductor equipment design) could potentially play a valuable role in helping to catalyze a semiconductor supply chain in Northern Baja California. In addition, the strong presence of wireless, telecom, biotech, and emerging nanotechnology-related companies in San Diego County may also present a strategic opportunity for the types of semiconductor firms that could eventually take hold in the San Diego-Baja California region.



¹ Semiconductor Industry Association, *“Fab America - Keeping Manufacturing in the U.S.”*, p.1