MILKEN INSTITUTE

THE NORTH AMERICA SEMICONDUCTOR CONFERENCE:

SUMMARY OF CONCLUSIONS AND RECOMMENDED ACTIONS

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THE NORTH AMERICA SEMICONDUCTOR CONFERENCE

The Milken Institute participated in the first North America Semiconductor Conference (NASC) hosted by Arizona State University (ASU) and the Semiconductor Industry Association (SIA) in Washington, DC, on May 18–19, 2023. The conference—a key commitment from the January 2023 North American Leaders' Summit meeting between Canadian Prime Minister Justin Trudeau, Mexican President Andrés Manuel López Obrador, and US President Joe Biden—convened high-level industry, government, and academic representatives from all three countries to discuss increasing the competitiveness of regional semiconductor manufacturing and enhancing semiconductor supply chain resilience.

The May 18 program featured government presentations on key policies and areas of competitive advantage, followed by expert workshops on semiconductor supply chain mapping and workforce development. On May 19, US Secretary of Commerce Gina Raimondo; Mexican Secretary of Economy Raquel Buenrostro; Canadian Minister of Innovation, Science, and Industry François Champagne; and Canadian Minister of Small Business, Export Promotion, and International Trade Mary Ng met with industry and academic leaders to share priorities and solicit insights on public and private sector actions to increase investment and rebalance global supply chains.

The three governments released a joint statement on May 24 announcing the launch of the North American Ministerial Committee on Economic Competitiveness and a commitment to hold biannual dialogues to advance trilateral cooperation on (1) information exchanges to support semiconductor research and development, (2) industry and academic partnerships on semiconductor workforce development, and (3) investments in the development, manufacturing, and packaging of semiconductor technologies and related innovations.

The Milken Institute is pleased to publish this summary of conclusions and recommended actions, at the invitation of ASU and SIA, to capture the lessons learned from the NASC and provide a roadmap for future government, industry, and academic collaboration.

BUILDING THE REGIONAL SEMICONDUCTOR ECOSYSTEM

The NASC occurred within the broader context of a significant and ongoing global realignment of semiconductor supply chains spurred by COVID-19 pandemic-induced shortages, the Russian invasion of Ukraine, and the intensification of US-China geopolitical tensions. Participants discussed national, bilateral, and trilateral programs designed to boost competitiveness, build resiliency, and deepen integration amid this rapidly shifting landscape.

The US, already a leader in high-value-added supply chain segments, including design and semiconductor manufacturing equipment (SME), enacted the $52.7 billion CHIPS Act (Creating Helpful Incentives to Produce Semiconductors) in August 2022 to reverse a decades-long trend of outsourced manufacturing by incentivizing domestic fabrication and innovation. US officials emphasized the critical roles of Mexico and Canada as partners in efforts to strengthen supply chain resilience and the high potential of North America to operate as an integrated and globally competitive production platform.

Mexican and Canadian officials underscored shared components of this vision. Mexico has a small existing footprint concentrated in limited segments of the semiconductor value chain: specifically, assembly, test, and packaging (ATP) and design. Mexican officials explained the federal strategy to increase back-end semiconductor investment by complementing US and Canadian strengths—in particular, highlighting tax incentives and infrastructure development to encourage investment in the Interoceanic Corridor, a logistics hub connecting Mexico's Pacific and Gulf coasts intended to accelerate economic development in the Isthmus of Tehuantepec.

The Canadian semiconductor industry specializes in research and development; chip design; niche, high-value-added manufacturing such as compound semiconductors; and advanced packaging. Canadian officials detailed objectives for the Northeastern Semiconductor Manufacturing Corridor linking the US and Canada and their plans to bolster upstream resilience through investment in critical minerals mining and back-end resilience by attracting additional advanced packaging facilities.

SUPPLY CHAIN MAPPING

The United States, Mexico, and Canada committed during the January 2023 North American Leaders' Summit meeting to coordinate semiconductor supply chain mapping efforts with the aim of developing a collective understanding of unmet needs and identifying complementary investment opportunities. Participants in the supply chain mapping workshop reviewed progress to date and discussed strengths, gaps, and opportunities in North American supply chains.

Summary of Conclusions

- Shortages induced by the COVID-19 pandemic and the Russian invasion of Ukraine exposed the need for an improved understanding of semiconductor supply chains, including upstream inputs and downstream distribution, to understand vulnerabilities and improve resilience.
- Companies and governments require enhanced supply chain visibility beyond the first and second tiers and should prioritize identifying nexus suppliers that serve many companies and single points of failure.
- Initial mapping efforts such as the US 100-day supply chain review revealed (1) a highly globalized semiconductor supply chain nonetheless rife with choke points due to the high concentration of individual segments and (2) highly developed regional clusters and complementary national strengths within North America that offer a robust foundation for regional integration.
- The Canadian government previewed a comprehensive North American semiconductor supply chain map that will include critical minerals and other upstream inputs as well as major downstream end users.
- Packaging and advanced packaging constitute a major gap in North American semiconductor supply chains and present a significant opportunity for all three countries. Capturing a greater share will require developing a regional back-end ecosystem that is cost-competitive with Southeast Asia. Additional incentives may be required.
- Chemical manufacturing is a significant upstream gap in North American semiconductor supply chains. More than 500 chemicals are required for semiconductor manufacturing. Refining capabilities and slow regulatory approval processes present challenges.
- North America is a global leader in design but risks losing market share in the absence of concerted action due to new incentive programs announced by South Korea, China, and India.
- Proximity to end users, such as the auto industry, increases Mexico's attractiveness as a destination for ATP investment.

- Total Cost of Ownership (TCO) studies can help reduce uncertainty and improve the quality of incentive packages.
- Greater regulatory cooperation would accelerate project timelines and reduce inefficiencies in cross-border supply chains.
- Investment in manufacturing, logistics, and transportation infrastructure is required to enhance regional competitiveness and support semiconductor industry expansion.

Recommended Actions

- The Canadian government will release the final version of its North American supply chain map in June 2023. More broadly, the US, Mexico, and Canada should complete and integrate their semiconductor supply chain and critical minerals mapping efforts with a mechanism for updating the maps over time, to account for progress and new challenges in advance of the next North American Leaders' Summit meeting.
- The US, Mexico, and Canada should explore opportunities for trilateral research through the US National Semiconductor Technology Center (NSTC), as well as other research organizations based in Canada and Mexico, in advance of the next North American Leaders' Summit meeting.
- The US, Mexico, and Canada should pursue shared standards for ATP to ensure interoperability across North America.
- The US, Mexico, and Canada should promote shared chiplet standards and address proprietary ATP technology that could impede co-packaging across North America.
- The US, Mexico, and Canada should explore using provisions in the United States–Mexico–Canada Agreement to hold targeted discussions on regulatory cooperation, including sharing regulatory priorities, risk assessments, and data.
- The US should consider using portions of the $500 million CHIPS Act International Technology Security and Innovation Fund in support of regional industry mapping, gap analysis, and TCO studies.
- The Milken Institute will release a report on strengthening US-Mexico semiconductor supply chains in June 2023.
- Mexico should consider re-establishing elements of ProMéxico—an international trade promotion program that ended in 2019—to attract semiconductor investments.
- The US should consider returning to R&D expenditure deductibility as opposed to amortization.

WORKFORCE DEVELOPMENT

The United States, Mexico, and Canada committed during the January 2023 North American Leaders' Summit meeting to convene industry and academic experts in semiconductors for design sessions focused on the skills needed to develop the North American workforce over the next five years. Workshop participants exchanged insights on the industry's evolving workforce needs and discussed strategies to address emerging challenges.

Summary of Conclusions

- Workforce development presents a major challenge for the North American semiconductor industry, which threatens to impede regional competitiveness and resilience objectives. Industry, government, and academia should develop new partnerships to fill expected gaps.
- The semiconductor workforce can be roughly divided into technicians and engineers, two categories requiring different development strategies. The technician pipeline can be expanded regionally through industry partnerships with community and technical colleges. Immigration policies are essential to increasing the talent pipeline, especially for engineers, entrepreneurs, and senior executives.
- Programs in Canada at Sherbrooke University and CMC Microsystems offer promising examples of successful multistakeholder initiatives to attract, develop, and retain skilled workers through cutting-edge partnerships involving industry, academia, and nonprofit entities.
- Mexico offers a skilled workforce with a high ratio of STEM graduates and an existing technician pipeline. Collaborations among government, industry, and academia at the state and local levels support the development of curricula that meet industry requirements.
- Integrating industrial knowledge and professional skills into advanced academic and research training accelerates workforce readiness and improves retention of international students.
- Negative perceptions of manufacturing—compared to software and design roles—are exacerbating technician pipeline challenges. Government programs, such as the US' Unlocking Career Success, empower secondary students by exposing them to multiple career pathways and preparing them to succeed.
- Pipeline strategies should be designed to increase the industry's gender and racial diversity.
- Students may benefit from neutral environments, like the MiQro Innovation Collaborative Centre (C2MI) in Canada, that enable them to work on advanced production equipment without the pressure of formal industrial environments.

- Talent programs can be successful by targeting non-traditional sources such as active-duty military and veterans who offer relevant skill sets.
- Workforce shortages in semiconductor design reflect broader difficulties in attracting students to pursue hard engineering (i.e., hardware).

Recommended Actions

- The US, Mexico, and Canada should explore the development of a North American semiconductor talent map that includes information on education supply and demand gaps in advance of the next North American Leaders' Summit meeting.
- The US State Department welcomes applications from the semiconductor industry for the "100,000 Strong in the Americas" initiative, an innovation fund that supports dynamic higher education partnerships, increases student training and exchange opportunities, and strengthens regional education cooperation and competitiveness throughout the Americas.
- ASU committed to working with institutions of higher education across North America to expand the region's semiconductor workforce pipeline. This effort builds on the memorandum of understanding that ASU signed with the Embassy of Mexico in November 2022 to develop joint semiconductor workforce development programs with higher education institutions in Mexico.
- The US, Canada, and Mexico should explore additional avenues for incentivizing students to pursue hard engineering and STEM education more broadly.
- SIA will release a report on US workforce readiness in summer 2023.

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The Milken Institute is a nonprofit, nonpartisan think tank focused on accelerating measurable progress on the path to a meaningful life. With a focus on financial, physical, mental, and environmental health, we bring together the best ideas and innovative resourcing to develop blueprints for tackling some of our most critical global issues through the lens of what's pressing now and what's coming next.