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Southern Connection

Innovation Clusters in Mexico and the Bridge to Silicon Valley

Executive Summary

Mexico's National Economy

With a GDP of USD 1.2 trillion and a population of almost 130 million, Mexico's economy is the second largest in Latin America and the 15th largest in the world measured by 2019 GDP. In recent decades it has moved from one based heavily on agriculture and manufacturing to being led more by services. Growth, which since 2015 had been in the range of 2.1–3.3%, became negative in 2019 and has remained so due to COVID-19, but has been forecast by the IMF to recover to 4.5% in 2021. Key sectors include manufacturing (led by automobiles, aerospace and medical devices), agriculture, energy, telecommunications, IT, and financial services, with telecom, IT and financial services seeing particularly strong growth.

In global rankings for innovation, ease of doing business, and competitiveness, Mexico falls in the middle, but at or near the top in Latin America. In the mid 2000s, the Mexican government initiated a series of reforms to stimulate competition and open the country's telecommunications and energy markets. As a result, telecommunications costs have dropped dramatically and access to service has increased, laying the foundation for a growing digital economy. The de-nationalization of the energy sector has spurred foreign investment, increased production, and accelerated the shift toward renewable energy. In another initiative, INADEM (the national institute for the

entrepreneur), invested government funds to jump-start a venture capital industry.

Lately, under the administration of President Andrés Manuel López Obrador, many of those reforms have been challenged or reversed, as government priorities have shifted toward social services and support for state-owned entities such as PEMEX and CFE. INADEM was dissolved in 2019. As national government policies have become less supportive of business, attention is shifting to Mexico's states and cities, many of which have adopted policies that actively support business development and innovation-led growth.

Entrepreneurs, Startups and Venture Capital

As the economy evolves toward advanced manufacturing, business services, and innovation-led growth, new economic actors are taking the stage as startups with venture capital play a more active role.

Mexico's venture industry is young but has grown significantly since 2016, when infusions of funding from INADEM helped to launch a wave of new venture capital firms. From USD 55 million in 2010, yearly



capital investment grew to more than USD 1 billion in 2019. Investment is primarily at seed and early-stage, with most funds concentrated in Mexico City, followed by Jalisco (Guadalajara) and Nuevo León (Monterrey). An important corner was turned in 2019 with the launch of Softbank's USD 2 billion Innovation Fund to invest in Latin American startups; now a \$5 billion fund, its entry into the market validated Mexico and Latin America as a field for global venture investment.

Most venture deals are concentrated in the consumer discretionary and financial services sectors, with fintech a major focus. Successful companies such as Cornershop, Clip, Kavak, Konfio, and Jüsto have confirmed the ability of Mexican startups to scale. To scale further, many are expanding into Latin America, particularly Colombia and Chile.

The venture market still faces limitations: conservative investors, a shortage of growth capital, a narrow window for exits, and low visibility for Mexican startups outside Mexico. But investment growth in 2019 and 2020 and the success of a handful of now well-known startups point to continued progress.

Innovation Clusters in Mexico's States and Cities

Key states and cities across Mexico are developing innovation ecosystems, often with the active support of state and local governments and university and business community partners. A number stand out: Tijuana/Mexicali/Ensenada (Baja California), Ciudad Juárez (Chihuahua), Monterrey (Nuevo León), Guadalajara (Jalisco), Mérida (Yucatán), Mexico City, and the Bajío region, an economic grouping of all or part of four states—Aguascalientes, San Luis Potosí, Guanajuato, and Querétaro, known together as El Bajío—along with adjacent portions of the states of Zacatecas and Jalisco.

Tijuana/Mexicali/Ensenada

What makes Baja California unique is the scale of investment in the cities of Tijuana, Ensenada, and Mexicali, which capitalizes on its proximity to San Diego and California. This has enabled a dynamic cross-border economy in what is known locally as the Cali-Baja region.

The San Ysidro Land Port of Entry is the busiest land border crossing in the Western Hemisphere, with an average of 90,000 passengers and pedestrians making the northbound crossing of the Tijuana-San Diego border each day. In 2019, there were more than 36.7 million northbound crossings of vehicle passengers and pedestrians at San Ysidro (which doesn't allow freight crossings) plus 1.7 million northbound truck and full truck container crossings 6 miles away at the Otay Mesa port of entry.

With a population of 2 million and one of the fastest growth rates in Mexico, Tijuana is the country's fifth largest city and concentrates much of the state's economic activity. The region is an important center for binational manufacturing in industries including aerospace, medical devices, biotechnology, automobiles, and electronic equipment, supporting jobs on both sides of the border. Production concentrates in 101 industrial parks, including 65 in Tijuana and more than 25 in Mexicali.

Engineering is a strength. Led by universities such as UNAM (the national autonomous university of Mexico) and UABC (the autonomous university of Baja California), approximately 27% of the students graduating each year from Tijuana's more than 35 universities are engineers. Other noteworthy universities and research institutes include CETYS (the center for technical and higher education), CICESE (the center for higher education and research in Ensenada), and CNyN (the center for nanosciences and nanotechnology).

Baja California is attempting to create an environment that is conducive to startups but faces several challenges, including a shortage of venture capital, the lack of high-profile exits by local startups, and few large companies that are locally based and could support or nurture young companies. Its assets include a large pool of skilled engineers, a sophisticated manufacturing sector that is working to increase its value-added capacity with new technologies and increased R&D, and proximity to California.

Ciudad Juárez (Chihuahua)

On the Texas-US border opposite El Paso, Ciudad Juárez is another major center for manufacturing, hosting 329 maquiladora companies with more than

300,000 employees. The city is a center for binational production; key sectors include transportation, computer-related equipment, and electrical equipment. Parts and components flow south from the US for sub-assembly in Juárez and are re-exported to the US, often for advanced processing. Because most inputs are imported from the US, the city is seeking to increase the share of local content.

Together with partners at universities and in the business community, Juárez is working with some success to create an innovation ecosystem that will move the city toward higher-value production and new business creation by startups. This includes providing tools and infrastructure to increase R&D by the more than 70 Fortune 500 companies that operate in Juárez. Leading universities—UACJ (the autonomous university of Ciudad Juárez), UTCJ (the technological university of Ciudad Juárez), and ITCJ (the technological institute of Ciudad Juárez)—contribute. Research capacity is growing through centers that include CIITA (the center for innovation and integration of advanced technologies), IA.Center (the artificial intelligence center), and CICTA (the center for research in applied science and technology).

An array of state and local government initiatives focus on entrepreneurial development. University-based and private incubators provide support, including Technology Hub, a 55,000 square foot facility that hosts approximately 100 companies. Three small regionally-based venture funds have also been created.

The startup community in Juárez is small and access to venture capital is very limited. A constrained supply of STEM graduates and low visibility both inside and outside Mexico are also challenges. But the leadership of the city is strategically focused on building its innovation ecosystem. The strong base in Juárez of manufacturing and binational production in particular creates a platform for both investment and the application of innovative and advanced technologies as the city grows its technology and R&D base.

Monterrey (Nuevo León)

The state of Nuevo León has a per capita GDP (USD 17,844 in 2019), which is 88% higher than the national average (USD 9,489), while its capital Monterrey has

the highest GDP per capita in Mexico and the second highest in Latin America. Nuevo León leads other states by a significant margin in foreign direct investment, with manufacturing accounting for 58%. Most investment comes from the United States, and manufacturing worker productivity is the highest in Mexico.

A national center of private business, the city is home to a high percentage of Mexico's largest companies and many multinationals. Business connections to Texas are particularly strong and business culture more closely resembles that of the US than most other states in Mexico.

The city and the state are working to move the economy to higher levels of value-added production and nurture an ecosystem that is conducive to innovation and entrepreneurship. Early initiatives include the establishment under the science and technology agency I2T2 of PIIT (the technology research and innovation park), followed more recently by the research and innovation strategy Nuevo León 4.0 that focuses on the adoption of technologies and business processes such as IoT, machine-to-machine communication, AI, digital manufacturing, big data, 3D printing, and advanced design, with the goal of helping Nuevo León's industrial sector compete globally through the development of smart factories.

A strong pipeline of human capital is provided by universities including UANL (the autonomous university of Nuevo León), UDEM (Universidad de Monterrey), UMM (Monterrey metropolitan university), and the private Tecnológico de Monterrey (Mexico's equivalent to MIT). In 2019, 193,000 students were enrolled in undergraduate and graduate programs, of which 82,000 were in science, technology, and engineering fields. Twenty-six thousand were at the graduate level, of which nearly 13,000 were in science and engineering programs. Tecnológico de Monterrey, a globally recognized university, particularly stands out for its orientation toward and programs dedicated to business and entrepreneurs.

The city's startup ecosystem includes an IT sector that is one of Mexico's largest, with more than 400 ICT companies working in software development, e-commerce, fintech and mobile apps. That includes Softtek, the largest private technology company in Latin America. Approximately 350 of those companies

are entrepreneur-led, and serial entrepreneurship is common. Venture capital has been hard to find but this is getting easier.

Founders are supported by angel investors, a venture capital community, and local family offices. The dollar value of angel and venture investment is low by US standards but growing, with nearly half of angel investment coming from the founding families of the city's large companies. Initiatives like the Monterrey Digital Hub link the city's large companies with startups and other sources of digital innovation. INCmty, a major national startup conference associated with Tecnológico de Monterrey, had 8,000 participants from Mexico and around the world in 2019 and 10,000 in 2020 when the conference was virtual. Despite these assets, scaling young companies in Monterrey remains a challenge, with much of its engineering and technology talent drawn to the United States.

Monterrey's unique positioning comes from its large manufacturing base, business community leadership, and the presence of headquarters of many of Mexico's leading companies which serve as both a market and a source of investment for entrepreneurs. Tecnológico de Monterrey (known as Tec de Monterrey) is a critical source for talent development and entrepreneurial support both inside and outside the university.

Mexico City

Besides being the national capital and administrative and cultural center of Mexico, Mexico City (CDMX) is at the heart of the national economy. When combined with the surrounding State of Mexico, CDMX accounts for more than a quarter of the national GDP. The city is also home to twelve of Mexico's fifteen largest companies. In contrast to Monterrey, which is home to the country's leading industrial companies, Mexico City's profile is weighted more toward commerce and state-owned companies. Between 1999 and 2020, Mexico City received the highest amount of foreign direct investment (USD 129.9 billion) in the country, and the surrounding State of Mexico received the third highest amount (USD 56.1 billion).

The city also concentrates scientific research and academic talent. Key institutions include UNAM (the

national autonomous university of Mexico) which is Latin America's largest university, UP (pan American university), IPADE (the post-graduate business school of UP), IBERO, Universidad Anáhuac, the Mexico City campus of Tec de Monterrey, and ITAM (the autonomous technology institute of Mexico). All support active startup and entrepreneurial programs.

Venture investment has been growing. Mexico City concentrates most of Mexico's venture funds, and in 2019 it accounted for 75% of all venture transactions and nearly 80% of all invested venture capital in Mexico. The city is also home to leading accelerators such as Endeavor México, and corporate initiatives such as Google's Launchpad Accelerator Mexico and the Latin American headquarters of San Francisco's 500 Startups. Leading startups such as Clip, Konfio, and Kavak call the city home.

At the urban level, the government of Mexico City is working to accelerate digital infrastructure and the digitization of city services through ADIP (the digital agency for public innovation), which has been given responsibility for leading, designing, and monitoring the implementation of data management policies, open government, digital government, and the governance of technological infrastructure.

Guadalajara (Jalisco)

Guadalajara, in the state of Jalisco, is at the heart of Mexico's technology economy. Jalisco itself has the fourth largest economy in Mexico after Mexico City, the State of Mexico, and Nuevo León. Reflecting its technology base, the state ranks near the top in Mexico for innovative companies, trademark and patent applications and registrations, and higher education.

Guadalajara is home to leading universities and a large number of technical universities, technological institutes, and technical colleges. In 2020, 442,000 students were enrolled in Guadalajara higher education institutions. In 2019, the city produced more than 15,000 engineering graduates, of which approximately 6,500 were in high technology fields. Major universities that anchor the business and technology economy include Universidad de Guadalajara (the leading university in the state, with 260,000 students, and the second largest in the country

behind only UNAM), the Guadalajara campus of Tec de Monterrey, ITESO (the technological institute of higher studies of the west), and UAG (the autonomous university of Guadalajara). Together they offer a range of technology and entrepreneurship programs. Universidad de Guadalajara and Tec de Monterrey also host significant research laboratories and have collaborative internship programs with companies such as Intel, IBM, and Oracle.

Anchored by manufacturing, Jalisco is also home to 40% of Mexico's IT companies, with software development, software services, and business process outsourcing (BPO) to top fields. More than 1,000 high technology companies operate in Guadalajara, supporting 150,000 jobs, with large clusters in technology, e-commerce, financial services, health, and transportation. In contrast to other parts of Mexico, Guadalajara also enjoys a well-developed R&D base. In addition to global technology companies such as Flex, Foxconn, Sanmina, AstraZeneca, Tata, and NXP Semiconductors, it is also the Mexico base for an array of Silicon Valley companies including Oracle (which employs 1,500 in the development of core technologies, growing soon to 4,000), HP, and Intel (which employs 1,200 at its Guadalajara Design Center, the company's largest engineering center in Latin America and one of only six global centers that focus on long-term product development). Connection to the Bay Area is supported by three-hour direct flights, enabling the movement of personnel and closer integration of field operations with headquarters than is possible with technology centers in China or India.

Guadalajara's success in attracting global technology companies results in part from a sustained alignment and cooperation between the government, universities and businesses, which has produced initiatives such as IJALTI (the Jalisco institute of information technologies), COECYTJAL (the Jalisco state council of science and technology), and Consejo Jalisco 4.0 (an initiative to strengthen the contribution of higher education to technology innovation).

Growth in technology is mirrored in a growing number of startups, particularly in fintech, some with dual headquarters in Guadalajara and Silicon Valley. While its base in engineering is strong, growth of the startup ecosystem has been limited by a small pool of venture

capital compared to Mexico City and Monterrey. Despite this, the system has been growing due to accelerators like StartupGDL and Talent Land, an annual week-long conference that draws 35,000 participants, including students, entrepreneurs, and large and small businesses, for programs around themes of technology and talent development.

El Bajío and Yucatán

Though not as advanced in their efforts to develop startup and innovation ecosystems, the Bajío region in central Mexico and the city of Mérida in the state of Yucatán offer interesting possibilities.

The Bajío region (an economic grouping of all or part of four states—Aguascalientes, San Luis Potosí, Guanajuato, and Querétaro, known together as El Bajío—along with adjacent portions of the states of Zacatecas and Jalisco)—is a major manufacturing center that has enjoyed higher growth than much of Mexico, supported by business-friendly policies. Aguascalientes, Guanajuato, and Querétaro in particular rank high among Mexican states for their economic competitiveness. In recent decades, the region has become a major magnet for foreign investment, particularly in the automotive and aerospace sectors, and is second only to the northern border states as a destination for FDI. With a strong of universities and public technology research centers, a significant IT sector is growing.

Mérida, the capital of the state of Yucatán, is also attracting attention due to its sustained growth, quality of life, appeal to creative industries, and favorable business and security environment. While the state's economy is led by tourism and agribusiness, Mérida is pushing into information technology with the goal of becoming an offshore service center for US companies. That ambition is supported by a higher education base that includes universities such as Anáhuac Mayab and UPY (the Yucatán polytechnic university) which support IT skills and entrepreneurial activity. The city has generated medium-sized IT companies such as 4th Source and Plenumsoft, but venture capital is scarce and it remains difficult for startups in Mérida to scale. However, universities and initiatives like *tecniA*,

a technology park and entrepreneurial center that provides founders with business and incubation services, are supporting the ecosystem's development and helping to expand its international connections.

Mexico in the Bay Area

Out of all its global partnerships, the Bay Area's relationship with Mexico is unique due to its hemispheric setting, differences in economic structure, and shared history dating to the Spanish colonial era. The recent evolution of Mexico's economy—toward one where technology, innovation, and entrepreneurship play a greater role—is adding new depth, opening doors that go well beyond the lens through which US-Mexico economic relations are typically viewed.

Three Mexican consulates serve the region, which is also connected to Mexico by deep university ties. A rich array of Mexican-oriented community and cultural organizations, including major museums, connect to the Bay Area's demographics and history. With his wife Frida Kahlo, famed Mexican muralist Diego Rivera made two highly productive visits to San Francisco, where he produced three powerful murals at locations throughout the city.

Mexico's business footprint can be seen, for example, in organizations such as the Mexican-American Vintners Association (MAVA), which links sixteen Mexican family-owned wineries in Sonoma and Napa Valley. Many were founded by immigrants who came to the region decades ago as contract farm workers.

Investment from the Bay Area and California to Mexico has a growing technology focus. Investment from the state rose significantly in 2018 and dramatically in 2019. The largest category when measured by transactions was by far software and IT services (46), followed by transportation and warehousing (15), business services (14), automotive components (11), communications (10), electronic components (8), food and beverages (7) and real estate (7). In 2020, software and IT services saw the strongest growth. Of 160 investments from California, 72 were made by Bay Area companies, predominantly from Santa Clara County (31) and San Francisco (27), reflecting the strong technology focus of Bay Area investors.

Alameda County accounted for 8, while 6 came from San Mateo County. While spread across Mexico, California investment was concentrated in four cities: Mexico City, Tijuana, Guadalajara, and Monterrey.

Bay Area technology companies are expanding their presence in Mexico, often to access engineering talent. Most focus on Guadalajara and Mexico City. Beyond the presence of long-established companies such as Oracle, HP, and Intel in Guadalajara and Plantronics in Tijuana, new companies are tapping into Mexico's markets and human capital resources. In 2020, Lyft established an engineering office in Mexico City. Construction drone startup Skycatch has an engineering team in Guadalajara. In the consumer space, Uber operates in 57 Mexican cities, making Mexico one of its largest global markets. Netflix had more than 8,000,000 subscribers in Mexico in the second quarter of 2020 and is investing to increase production there. Stripe launched in Mexico City in October 2019, its first presence in Latin America.

Bay Area venture capital firms don't yet have a large presence in Mexico but interest is growing, with firms such as Sequoia, Accel, Andreessen Horowitz, Foundation Capital, and other leading firms investing. Bay Area-based VC firms with a core focus on Mexico and Latin America such as LEAP Global Partners, MITA Ventures, B37 Ventures, and SV Latam Capital are also active, as is Silicon Valley Bank through its role as a financial partner for Mexican and Latin American startups and their investors. Accelerators such as 500 Startups and Y Combinator play an important bridging role, as do universities such as Stanford that graduate Mexican founders. A number of Mexican startups such as Platzi, Wizeline, and Nebia are now headquartered in the Bay Area, in some cases with dual headquarters and engineering in Mexico.

Conclusions

As the Bay Area's role as a global technology and innovation center has grown, the scope of its relationship with Mexico has expanded to include technology R&D and an active connection through startups. This presents opportunities to expand the relationship.

While manufacturing remains the base and Mexico's production has continued to grow in sophistication and efficiency, US companies are also finding a large base of engineering talent that can be harnessed for sales, customer support, and R&D serving the Mexican, Latin American, US and global markets.

The United States-Mexico-Canada Agreement (USMCA) provides an important framework for investment. Its approval ended a period of uncertainty and enables the continued integration of North America's markets. Tensions between the United States and China and regarding over-dependence on China for strategic and other goods have led to a growing interest in resilient and secure global supply chains. With its proximity to the US and economic integration at the hemispheric level already underway, Mexico is in a strong position to benefit from the nearshoring of production by US companies.

Investors from the Bay Area will look to the quality of infrastructure, ease of doing business, a favorable tax environment, security, and labor market flexibility when making location decisions. Technology companies will particularly look to the quality of the local workforce and the access to talent to support R&D and engineering. This makes the role of public and private universities in education and training particularly important in economic development strategies and business attraction plans. The availability of direct air service

between the Bay Area and Mexican cities is also a consideration for venture and other investors who travel frequently to engage with partners, customers, and portfolio companies.

Mexico's venture market is maturing, supported by innovation clusters and pockets of startups in cities and states across the country. The potential for venture investment in Latin America is also growing. While Bay Area VCs often look for later-stage companies, growth in startup activity and the increased interest shown by investors such as Softbank suggest that to fully benefit from Mexico's growth they should examine the market more deeply and consider investing earlier.

There are also opportunities to strengthen California's economic ties with Mexico. Climate and renewable energy is one potential area, where despite the reticence of Mexico's national government, many states and cities are actively pursuing renewable projects. The reactivated Commission of the Californias offers a platform for collaboration and deeper ties with Baja California; a focus on border infrastructure and a smart border that makes the most of data and new technology will be important. And the University of California's Alianza UCMX initiative, which links several UC initiatives with Mexico, can support economic ties beyond education by including a stronger focus on entrepreneurship exchanges in its plans.



Diego Rivera, *The Marriage of the Artistic Expression of the North and of the South on This Continent*, also known as *Pan American Unity*, 1940; courtesy City College of San Francisco; Banco de México Diego Rivera and Frida Kahlo Museums Trust, Mexico City / Artists Rights Society (ARS), New York; Image: Cultural Heritage Imaging