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Global Reach

Emerging Ties Between the San Francisco Bay Area and India

A Bay Area Council Economic Institute Report by

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Executive Summary

Ties between the San Francisco Bay Area and India run broad and deep. Starting from the 1850s, the first Indian immigrants arriving in Northern California were Sikhs from northeastern Punjab. Initially settling in Canada—the Punjab was under British rule and many Sikhs who joined the military were posted to Canada—Sikh immigrants began drifting south, riding the rails to the Pacific Northwest and eventually California. Others later made the trip directly, by steamship via Kolkata and Hong Kong; the voyage took a month.

Jobs with the lumber mills and the Western Pacific Railroad, and the opportunity to lease or buy farmland in California, were a lure. In 1920, Indian immigrants owned 2,100 acres and leased another 86,000 in California, mainly in the Sacramento and Imperial Valleys. Today their descendants produce 95% of the Sacramento Valley's peach crop, 60% of its prune crop and 20% of its almond and walnut production.

At the turn of the 20th century, Indian engineering, medicine and agriculture students began coming to West Coast universities, including Stanford and, especially, UC Berkeley. The 1965 Hart-Celler Act responded to Cold War demand by eliminating country quotas and refocusing immigration policy on attracting engineers and other people with scientific training. The change prompted a spike in Indian immigration.

Changing Demographics

Many new immigrants engaged in small independent businesses—as truck and taxi drivers, or as restaurant and small business owners. Gujarati families—often named Patel, after the record-keepers appointed by rulers in ancient India to track crops and receipts—were drawn to the lodging industry, which offered cash flow and housing. More than half of all economy lodges and 37% of all hotels in the U.S. are now Indian-owned, representing $38 billion in franchised and independent properties.

In the 1970s and 1980s, growing numbers of foreign-born engineers began coming to the U.S. on H1-B specialized skill visas to work in aerospace and defense. Technological competition with the Soviet Union and the space shuttle program, as well as telecommunications deregulation and the rise of personal computing, drove the trend. The first wave came from the U.K., then increasingly from Asia, and especially from India.

But a much broader convergence taking place in the emerging computing and software sectors would soon have dramatic impacts in both Silicon Valley and India.

Tech Immigration Explodes

In India, the 1969 decision by IBM to unbundle its computer hardware, mainframe operating system and applications software lines launched a tech revolution. Engineering and software graduates from Indian science and technical institutes pooled personal funds to start small computer and software companies. Others joined large, family-owned industrial conglomerates looking to diversify from steel or consumer products to computing and information technology.

In the U.S., hardware and software had become increasingly complex, and vendors had begun offering a wider choice of products that were compatible with IBM legacy systems only up to a point. Banks and other IBM end-users needed increased support and system integration for their off-the-shelf software. Despite India's considerable talent pool, however, strict joint venture rules and high taxes and tariffs were constraints, until Indian firms and their clients devised a solution: "exporting" Indian engineers and programmers to work in the U.S. at client sites.

By 1980, 21 Indian firms were actively sending programmers overseas. Many Indian programmers opted to stay abroad after their assignments had ended. By 1986, nearly 60% of Indian Institute of Technology (IIT) engineering graduates were migrating overseas, principally to the Bay Area. Limited options for graduate study at home, limited business opportunities in India, and the exciting new industries taking shape in Silicon Valley continued to draw Indian students, researchers and entrepreneurs to the region.

At the same time, a new set of forces was bifurcating the information technology/software sector. U.S. business had begun major restructuring, streamlining processes and introducing quality improvements that relied heavily on automation and integration. Demand grew quickly for mid-level and entry-level coders and programmers, which U.S. universities and Silicon Valley were not turning out in sufficient numbers. Competition was heating up for limited H-1B visas to bring in skilled workers.

Cheap telecommunications and networked Unix workstations enabled remote sharing of work worldwide. India, meanwhile, granted tariff exemptions and other incentives to the software industry in 1984, to reverse India's brain drain. Texas Instruments, Hewlett-Packard, Oracle, IBM and others began shifting their software R&D to India. Indian competitors, meanwhile, could keep more of their outsourcing work and employees at home. India's software industry grew from 35 firms in 1984 to 700 by 1990.

A Community Takes Shape in Silicon Valley

Research published in 1999 by AnnaLee Saxenian, now dean of UC Berkeley's School of Information, found that a third of the Bay Area's science and engineering workforce in 1990 was foreign-born. Nearly one-fourth (23%) of Silicon Valley engineers—more than 28,000—were Indian. Almost all were immigrants, more than half with advanced degrees.

Between 1990 and 2000, the number of Indians living and working in the U.S. more than doubled—including students; technology researchers; professionals in medicine, law and business; IT engineers and programmers recruited on H1-B visas; and their family members.

By 1998, at the height of the tech boom, 774 of the 11,443 Silicon Valley tech firms started after 1980 had Indian CEOs. These firms employed more than 16,000 people and generated annual sales of $3.6 billion. Fifteen percent of Silicon Valley startups in the 1995–2005 period were founded by Indians—a larger number than for any other immigrant group. California topped the list of states for Indian startups, with 26% of the U.S. total.

The Y2K scare put this trend on steroids. Lacking the domestic workforce to meet the Y2K demand, companies turned to India and its large pool of low-cost engineers. The experience increased India's credibility as an IT resource and propelled it to a new position of prominence in the industry.

By late 2001, however, the tech and Internet bubble collapsed, wiping out companies and share values, and drying up investment. The 9/11 attacks led to travel fears and tighter visa restrictions. Indians well-established in the Bay Area stayed on; others returned home or went elsewhere. Travel and immigration have since come back but in recent years have plateaued, as perceptions have grown that the U.S. welcome mat has been rolled up, and new opportunities have drawn many Indian students and professionals home.

Today the Indian immigrant population in the U.S. numbers 2.48 million. California's Indian community numbers approximately 475,000. Census figures indicate a population of Indian immigrants in the Bay Area of at least 215,000, making it the nation's second largest Indian-American community after New York-New Jersey. Broad-based organizations, such as the Indian Community Center in Milpitas, help bind the community, while a rich palette of cultural organizations supports residents from different regions and social and religious groups. By any standard, the Bay Area's Indian community is successful and affluent. Median income is more than $107,000; 75% of adults have at least a bachelor's degree, and 70% are in management and professional positions. Roughly half are homeowners.

Bay Area-India Trade: Small, but Growing

Two-way merchandise trade with India moving through the San Francisco Customs District in 2008 topped $966 million in value. This included $336.9 million in imports and $629.1 million in exports. Overall, the San Francisco Bay region has consistently maintained a trade surplus with India.

Totals for San Francisco Bay Area Merchandise Trade with India ($ millions)

	2004	2005	2006	2007	2008
Total imports	$275.1	$272.8	$328.1	$329.4	$336.9
Total exports	$393.5	$404.4	$447.1	$617.8	$629.1
Total trade	**$668.6**	**$677.2**	**$775.2**	**$947.2**	**$966.0**

Source: U.S. Census

Import numbers reflect, in part, contract manufacturing and imports by leading Bay Area retailers, including Gap and Levi Strauss (apparel), Williams-Sonoma (home furnishings, tableware, glassware, lamps, rugs and linens), Restoration Hardware (bath and kitchen fixtures), and Cost Plus World Market and Pier One Imports (clothing, furniture, cushions, linens, decorative items, window blinds, etc.).

Exports to India are led by agriculture and computers. California-grown almonds are the largest agricultural export to India, with a 2007 value of $175 million, or 9% of California's almond exports. California's high-tech sales to India totaled $606 million in 2008, according to TechAmerica (formerly the American Electronics Association). While this was a small fraction of the state's $49.3 billion in worldwide tech exports (with India as California's 19th largest market), it represents a 58% increase since 2002.

Wine presents an opportunity for Bay Area exporters, but India's market is still restricted. U.S. wine sales to India grew 350% over 2000–05, after the government granted an import duty exemption for airports and luxury hotels. India is committed under World Trade Organization (WTO) rules to a 150% maximum duty on wines, but state excise and sales taxes—and, in some states, an outright ban on imports that protects India's 40 domestic wineries—raise the price of a bottle of wine an average 266%.

Trade in goods and agricultural products, however, represents only part of an expanding Bay Area-India economic relationship that is led by IT and includes financial, educational, and other services.

Tourism: A Very Long Flight

A profile of Indian visitors shows that California is a popular travel destination, but primarily for work and family visits, not for tourism. A February 2007 report commissioned by the California Travel and Tourism Commission showed that some 35,000 Indian nationals visited the Bay Area in 2005. More than 60% were visiting on business; a third booked their stay through a corporate travel department; just over half booked lodging and stayed in a hotel or motel, suggesting that many stayed with friends or family; and 91% of visitors were men.

The long flight and expensive airfare may discourage casual travel: all flights are indirect, and the shortest (on Lufthansa) are 21 hours long. Service runs through Asia (Singapore, Bangkok, Taiwan), Europe (London, Frankfurt, Munich), and the Middle East (Dubai). The Lufthansa "Bangalore Express" service from San Francisco International Airport (SFO) was introduced in 2001 with three flights a week, increasing to five flights in 2005, and daily flights since 2006. Most flights run 90% full or better, and the route has become famous for its tech networking opportunities, at the gate and on the plane. While three Indian carriers—Air India, Jet and Kingfisher—have at various times announced plans to serve the region, none currently have a presence at SFO.

Hotels are another story, however. Tata Group's Taj Hotels and Resorts chain paid $58 million for San Francisco's Campton Place Hotel, and family-owned Khanna Enterprises, headquartered in Delhi, recently bought San Jose's historic 86-room Hotel Montgomery.

The City of San Francisco has opened a Bangalore office to market the city and the Bay Area as a travel destination and is working with hotels, tour package operators, and others to develop new travel options. It has also recently formed a sister city relationship with Bangalore, adding to a list of Bay Area-Indian sister city relationships that includes San Jose-Pune and Fremont-Jaipur.

Students: Among India's Most Valuable Exports

India is the leading country of origin for international students in the United States, with 94,600 during the 2007–08 academic year, surpassing China's 81,100; 2007–08 was the seventh consecutive year that India has sent the most international students to the U.S.

Some 8,300 Indian students were enrolled in California universities and colleges in 2007–08, up from 6,800 in the previous year and 5,600 in 2005–06. They account for 11.5% of California's international students. Indian students' proportionate share of the estimated $2.45 billion spent by international students in California on tuition, fees and living expenses in the past year amounts to $240 million.

A survey of the UC and California State University systems, Stanford University, the University of San Francisco, and Santa Clara University done for this report suggests that about 3,500 visiting undergraduate and graduate Indian students are enrolled at major Bay Area institutions, with as many as 400 more visiting scholars and researchers resident at those campuses. Most are at the graduate and post-graduate level, studying computer science, engineering, and business.

UC Berkeley and Stanford each have special initiatives—the Berkeley India Initiative and Stanford's South Asia Initiative—that leverage campuswide interdisciplinary offerings through coordinated programs, research, and alumni activities. UC Santa Cruz plans to establish a South Asian Studies center by 2010.

The Rise of Entrepreneurial Networks

The first Indian community organizations formed in the 1970s were cultural, reflecting a diverse and divided community. These were largely benevolent associations that welcomed new arrivals, held classes and sponsored group events aimed at preserving traditional cultures far from home.

As the numbers of first-generation, college-educated professionals grew, organizations such as the Silicon Valley Indian Professionals Association (SIPA), Indian Business and Professional Women (IPBW), the South Asian Bar Association of Northern California (SABA), and the Network of Indian Professionals increased the focus on career development, social networking, and community service.

By the early 1990s, Indian immigrant tech entrepreneurs saw a need for a new kind of group aimed at business networking and mentoring. The Indus Entrepreneurs (TiE) was formed in

1992 by a group of Indian technology professionals. Most had encountered difficulties in starting their own companies in the absence of mentors and a strong professional network. They talked of the need to begin building such an infrastructure in the Indian community to encourage new business and wealth formation.

A core group of 20 entrepreneurs began TiE with monthly dinner meetings at the San Jose Hilton. Cirrus Logic founder Suhas Patil was instrumental in organizing the first TiE Annual Conference in 1994, which drew a surprising 500 attendees. By 1999, it was regularly drawing nearly 1,000. Today TiE is a global organization, with 53 chapters in 12 countries, 11,000 general members, and 1,800 Charter Members (experienced entrepreneurs and senior, established executives recruited by invitation only). TiE Silicon Valley remains the global headquarters and mother ship and has played an influential role in the development of many startup companies—both in Silicon Valley and in India—and in advising Indian universities and government agencies on entrepreneurial strategies.

Other major Indian organizations in the Bay Area include:

- the Global India Venture Capital Association (formerly the US-India Venture Capital Association), formed in 2002 as a forum to connect venture capital to entrepreneurs with technologies or business plans applicable to Indian markets;
- the American India Foundation, founded in 2001 in Silicon Valley, which has tapped into Indian professional networks nationwide to raise more than $50 million for education, economic livelihood and public health projects in India;
- the Indo-American Council, an initiative launched in late 2007 by Bay Area Indian leaders to raise the political visibility and influence of the Indo-American community; and
- Enterprising Pharmaceutical Professionals from the Indian Sub-Continent (EPPIC), an association that brings together Indian professionals in the bio-pharma sector for networking, entrepreneurial mentorship and, more recently, to build bridges with India.

The Silicon Valley-India IT Hub

Nearly all major Bay Area technology companies have a presence in India. Many other Bay Area businesses, including firms not primarily focused on technology, have relationships with Indian IT service providers, drawing on those resources for call centers, back office IT, legal, financial, accounting, and design or other services. Across the board, these relationships have permitted Bay Area companies—like others around the world—to reduce costs, develop products targeted for Indian and emerging markets and, in many cases, free up U.S. personnel to focus on more innovative, higher-value activities. In that process, a symbiotic relationship has evolved in which value is created in both the Bay Area and India, based on complementary capabilities. The extensive cross-border networks that have evolved encompass:

- Indian engineers, programmers and computer scientists in Silicon Valley and the Bay Area, engaged in the forefront of product and technology development;
- successful Indian technologists and entrepreneurs reinvesting in the region's economy as venture capitalists;
- Bay Area technology companies with R&D centers designed to access India's large, educated talent pool; and
- Indian IT service and software firms moving rapidly up-market from call centers and basic software coding to provide overseas companies with increasingly sophisticated software and systems integration services, in-depth sector-specific consulting and product engineering, and knowledge process outsourcing.

Innovation Drives New Business Models

As already noted, the Y2K scare of 1998 and 1999 drove many U.S. companies facing a shortage of engineers to turn to India, and the resulting relationships catapulted India's IT sector to global prominence. Cost arbitrage drove much of this early activity.

While India's elite science, engineering and technical schools only produce about 4,000 highly-skilled students annually, India overall graduates a pool of up to 400,000 engineers and programmers who often receive additional training from the companies hiring them. The ability to deploy dozens or even hundreds of tech workers on a software or systems problem for a client, at a fraction of the U.S. cost, has lured many "captive" (foreign-owned) R&D centers to India.

While cost is still an advantage, that model is rapidly changing as India's domestic costs rise, competition for basic Business Process Outsourcing (BPO) services is growing from places like the Philippines and China, and India's IT majors are moving aggressively away from strategies based on volume (throwing large numbers of engineers at a problem) to value (more sophisticated, high-end services such as systems integration, end-to-end product development, remote systems management, and consulting). India's IT community, both foreign and domestic, is now focused less on wage arbitrage and more on creating intellectual property. Many overseas companies that located in India solely for cost advantage have encountered difficulties. Demand has narrowed India's wage advantage from 6:1 to 2:1. Attrition rates can reach as high as 40%, particularly where companies outsource only routine work and limit opportunities for advancement. Ambitious workers frequently jump to companies offering higher pay or a better career track. For many companies, therefore, the cost of operating a captive center long-distance can outweigh the benefit.

Forrester Research reported in a May 2007 study that 60% of captive centers in India were struggling to remain viable, with annual costs for a 150-person operation running as much as a third higher than for a center operated by a third-party (Indian) outsourcing firm. Other analysts agree on the trend: many smaller captives are likely to close, bring in local partners, or be sold to larger and more efficient IT firms.

This is occurring even as India's leading IT companies are continuing to expand. These diverging trends are largely explained by issues of quality and efficiency. Small captives that conduct routine work and trade primarily on lower costs are often less efficient and more expensive to operate, particularly compared to IT majors such as Wipro, Infosys and HCL that benefit from deep infrastructure and economies of scale. On the other hand, captives that perform more advanced work, engage more deeply in product development, and offer more stimulating environments for their employees fare better. The best matches of Bay Area innovation with Indian talent have been made where the primary focus is on value creation—particularly where firms have assigned their Indian centers significant responsibility for product development. Many Bay Area firms follow a hybrid model, utilizing both their own R&D centers (particularly where intellectual property is a concern) and extensive partnerships with one or more Indian majors.

Often there is a social component as well: companies can benefit from motivated developer communities and product engineers, and from external activities that deepen community engagement, nurture developer communities, and build critical masses of skilled, high-value users, such as curriculum development or donating hardware and software to schools.

The Bay Area Leads the Way

Institutional cooperation between Bay Area and Indian universities and research centers is growing:

- Berkeley's Center for Information Technology in the Interest of Society (CITRIS), through the Intel Research Berkeley Lab, has designed and built a wireless communications network linking Aravind Eye Hospital in Tamil Nadu with five hospitals and 50 rural health clinics so that eye specialists can interview and diagnose patients by videoconference.
- Stanford's South Asia Initiative has advised the Prime Minister's Office and the Ministry of Communications in India on telecom industry reform, including licensing, bandwidth pricing, opening the telephony market to local franchisees and other practices to increase service.
- Lawrence Berkeley National Laboratory (LBNL), the California Energy Commission, the California Public Utilities Commission, and Pacific Gas and Electric Company are advising the Maharashtra Electricity Regulatory Commission (MERC) on strategies to improve efficiency, including metering, replacement programs for inefficient motors and industrial machinery, new irrigation methods, cool roof technology, green data centers, and other energy-saving measures.

Leading Bay Area companies have established early footholds in India's growing market. Their activity reflects the drivers of India's economic expansion—a globalized IT sector and dynamic consumer markets:

- Levi Strauss has 450 exclusive outlets in 80 Indian cities.
- Visa has issued more than 30 million debit cards and 14 million credit cards through 32 banks and 13 non-bank partners.

- India represents Oracle's largest investment outside the U.S. ($3 billion since 2002) and is now its fourth largest global market, with a workforce of 24,000 and a 53% share of India's relational database market—including 80% of India's banks, 6,700 technology and applications customers, 400 channel and alliance partners, and an online developer community numbering 700,000.
- India hosts Symantec's largest engineering site outside the U.S., performing work on more than 80% of its products.
- India accounts for one-third of McAfee's workforce, generated 100% of its patent submissions in 2007, and is credited with doubling the firm's global margins (from 13% to 25%). Half of McAfee's staff of worldwide antivirus researchers works in Bangalore, enabling a 24/7 worldwide response capability.
- India accounts for one-third of Adobe's global engineering workforce.
- Hewlett-Packard is the largest player in India's domestic IT market.
- More than half of India's developer community—about 740,000—works on Sun platforms.
- Cisco has placed its second global headquarters in Bangalore, to leverage India's engineering resources and develop products for Indian and other emerging economy markets.
- India is Yahoo!'s base for product and service development aimed at emerging markets.
- eBay counts 2 million regular users in 670 cities and more than 10,000 dealers across India. In August 2008, the company reported an item sold every minute on its India website.
- The San Francisco office of architecture firm Skidmore, Owings & Merrill is designing replacement housing for 22,000 slum dwellers in Mumbai, involving master planning, new housing prototypes and a team of sociologists and anthropologists working with slum residents.
- San Francisco-based architecture/design firm Gensler is part of the design team for the new $300 million Chennai airport.

Bay Area venture capital (VC) firms are spearheading investment in India, identifying opportunities in sectors ranging from information technology to consumer goods:

- Draper International launched the first India-dedicated venture capital fund.
- Silicon Valley Bank led the migration of U.S. venture capital to India by organizing an exploratory delegation of Bay Area venture capitalists in 2003 and has established its both a consulting presence and an equity fund to invest jointly with VC clients.
- Evolvence India Life Science Fund is the first India-dedicated fund focused on biotechnology.
- More than 40 Bay Area venture firms have Indian leadership and/or investment activity in India.

Venture firms from the Bay Area have invested in the first consumer Internet company in India to reach a $1 billion market capitalization and in India's first on-line gaming company.

While some Bay Area venture firms are retaining their focus on technology, the wider trend is to invest in India's consumers. Most companies receiving funding from the Bay Area are not creating groundbreaking new technologies, but are providing low-tech responses to the opportunities presented by the India's fast-growing markets.

As the challenges of urbanization grow, climate change threatens India's water supply, and energy use increases, sustainable urban development and renewable energy technologies will be a growing priority for India. This presents unique opportunities for the Bay Area, with its strong cleantech base, and for venture investment in particular.

India's biotech sector is still small but growing in sophistication. With roots in India's long-established pharmaceutical industry, biotechs are moving into clinical trials, drug discovery and contract research. Bay Area biotech companies are using Indian resources to extend their limited investment dollars, increasing their chances of surviving and successfully bringing products to market. Bay Area venture and investment firms such as Burrill & Company and Lumira Capital are leading the way in U.S. investment in India's life sciences sector.

India is also starting to export capital. Global outbound investment from India grew sharply in 2007–08, to 2,200 ventures worldwide valued at $23.1 billion—a 53% increase over 2006–07. Most of that is focused on Europe, the U.S., and Africa. Direct investment in the Bay Area remains light. Beyond the hotel investments mentioned earlier, Bay Area deals focus primarily on technology.

All of India's major IT services and software firms are present in Silicon Valley and, together with their U.S. counterparts, are among the top H-1B visa applicants. While they have invested in some small, specialized Bay Area business process IT startups, they generally prefer strategic alliances and technology licensing arrangements.

Findings

When the Bay Area's innovation infrastructure—research institutions, technology companies, and capital and risk-taking culture—comes in contact with India's talent and entrepreneurial energy, the combination has been explosive, unleashing powerful business and wealth creation.

India's current growth trajectory began in 1991 with economic reforms that lifted the heavy hand of control planning and stimulated a wave of dynamic business growth that continues to the present. India's development in this period parallels China's, but is based more heavily on services than on manufacturing.

As with China, the Bay Area's economic and cultural ties with India are a unique asset, manifested by value creation at both ends of the relationship. Distinct characteristics of India's economic environment support this growth:

- India's economy is privately-led, rather than government-directed, making India sometimes less focused, but at the same time more open and diverse than China.
- India's focus on IT services and software has provided its engineers and scientists with important windows into the full range of U.S. industry sectors—finance, energy, automotive, health care, aerospace and infrastructure—that are key to value-added innovation.
- English-language prevalence in India, along with Western legal and democratic traditions and business customs, has enabled deep relationships that link talent and innovation.

The Big Picture

A new transnational model is taking shape, in which companies source materials, components, technology, capital, and talent from the most capable cost-effective worldwide locations, to develop products and services on a global scale, that are tailored to address local needs and markets. Sourcing knowledge and talent in the most cost-effective locations worldwide lowers R&D costs and improves product time-to-market by directing larger numbers of people at a given technology solution. It also frees skilled talent in home countries to devote more energy to new innovations. In India's case, the pattern that is emerging suggests a deepening relationship between Bay Area and Indian companies, based on complementary capabilities and value co-creation.

A Complementary Relationship

In interview after interview, successful Indian engineers, programmers and scientists recount a similar narrative—of coming from a culture of bureaucratic obstacles, scarce credit, limited education and opportunities, and power and water shortages, to a place where infrastructure works, advanced research is supported, government generally stays out of the way, new ideas are embraced, and capital is readily available.

Leaving more "secure" jobs with established firms to pursue innovative new technologies and business processes, these entrepreneurs helped to launch iconic companies such as Sun Microsystems, Cirrus Logic, Sandisk, Brocade, and HotMail. Many are serial entrepreneurs, launching and supporting generations of companies, either directly or as venture capitalists. Their early innovations, the mentoring networks they have established and supported, subsequent investments in the next generation of entrepreneurs, and philanthropic contributions are a vital economic asset to the region.

But in the new global economy, as R&D becomes more distributed, as developed countries grapple with slower growth, and as emerging economies such as India and China continue to expand their base of human capital, where will the next generation of entrepreneurs see opportunity?

For now, the Bay Area's leadership in advanced research and technology innovation appears secure, as innovation in India focuses more on business processes and models: India is not expected to become a source of breakthrough technology in the foreseeable future. At the same time, its growing capabilities, like China's, suggest that in the future more R&D and product development will happen overseas, and that business, investment, and employment will migrate to global centers that offer a compelling combination of talent, domain expertise, and market scale. These factors are becoming even more compelling as significant numbers of Indian students and professionals trained in the Bay Area return home. Cross-border collaboration and the leveraging of competitive assets are critical in this environment, giving rise to a new set of competitive factors: education; immigration; workforce policies; tax and regulatory policy; and access to capital.

America's turn to India and other countries for engineering talent is largely the result of the U.S. failure to generate an adequate number of home-grown scientists, engineers, and technicians. Workforce issues will remain a concern, as India's large and growing pool of talent raises questions regarding future employment in the lower and middle range of the U.S. service sector.

In this regard, the Bay Area faces a number of competitive challenges, some within its power to influence, others not. Among the most significant:

- The region's primary and secondary education system lacks qualified teachers and has failed to produce a critical mass of students grounded in science and math.
- U.S. visa and immigration policy unnecessarily restricts access to global talent, fails to compete aggressively for top foreign students and researchers, and discourages them from staying to contribute to the economy.

Indian technology and other professionals now in the Bay Area see growing entrepreneurial opportunities in India, leading students and recent immigrants to return home in significant numbers. This is happening at the same time the once-clear division of labor between Silicon Valley innovation and lower-end work performed in India is blurring.

This is an important time for the Bay Area and California to re-evaluate their roles in a global economy where value is increasingly created by and distributed across virtual communities of knowledge and expertise. To sustain their competitiveness and preserve high-quality jobs in this

globally competitive environment, the region, state and nation need to invest in areas that build on competitive strengths and on their current leadership position as centers of global innovation. By building on and strengthening that competitive base, California and the Bay Area can more effectively compete and partner with emerging global players such as India and China. Failing that, the center of action is likely to switch elsewhere.

Interviews for this report generated a number of policy perspectives and suggestions. These focus on:

- increased emphasis on math, science and technology in primary and secondary education, including magnet charter schools, stepped up recruitment of fully-credentialed teachers, and partnerships with technology companies;
- high school and college-level business courses emphasizing entrepreneurship and global economics, along side traditional economics and management;
- immigration reform—to develop a J-1/L-1 visa program that allows graduate technology professionals and researchers to take jobs without first returning home; to facilitate family unification (e.g., with ageing parents) by reducing unreasonably long waits; and to provide a fast-track to green cards for foreign students who graduate from U.S. universities with advanced degrees in priority disciplines such as computer science or engineering.
- concern with Buy America provisions in federal stimulus policy that restrict the employment of foreign nationals, cutting off U.S. companies from the talent they need to compete and removing job opportunities for foreign-born graduates of U.S. universities;
- state and federal investment in R&D and higher education, to help bring technology to market and ensure the U.S. and California's continued technology leadership;
- development of R&D, investment, and export opportunities to address India's growing renewable energy, energy efficiency, and green urban design markets;
- development of travel and tourism opportunities, through expanded air service and marketing of the Bay Area's unique connections to India.

On the Indian side, this report's research points to:

- the need for India's IT companies, if they wish to become truly global enterprises, to expand their service centers outside India and increase their hiring of non-Indian nationals to serve those markets; and
- the need for India's government to sustain and accelerate economic reform, to improve government performance and efficiency, and to allow expanded partnerships and market access in a range of areas that are currently subject to major restrictions, including banking, retail trade, legal services, wine and agricultural imports, and higher education.

The Bay Area's economic and cultural ties to India are unique. Much of this uniqueness comes from the high levels of education, wealth, entrepreneurial activity and business leadership in the

region's Indian community. India's expanding economy, with its growing business and consumer markets, also anchors the relationship. The Bay Area's focus on innovation and entrepreneurship is mirrored in India's deep reservoir of human capital and its focus on technology and other services. Bay Area companies draw on both and have led the world in establishing strategic partnerships with Indian counterparts and service providers. This relationship, properly managed, can play a major positive role in positioning the Bay Area for continued success in the global economy.