

# Brain Circulation: How High-Skill Immigration Makes Everyone Better Off

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Silicon Valley's workforce is among the world's most ethnically diverse. Not only do Asian and Hispanic workers dominate the low-paying, blue-collar workforce, but foreign-born scientists and engineers are increasingly visible as entrepreneurs and senior management. More than a quarter of Silicon Valley's highly skilled workers are immigrants, including tens of thousands from lands as diverse as China, Taiwan, India, the United Kingdom, Iran, Vietnam, the Philippines, Canada, and Israel.

Understandably, the rapid growth of the foreign-born workforce has evoked intense debates over U.S. immigration policy, both here and in the developing world. In the United States, discussions of the immigration of scientists and engineers have focused primarily on the extent to which foreign-born professionals displace native workers. The view from sending countries, by contrast, has been that the emigration of highly skilled personnel to the United States represents a big economic loss, a "brain drain."

Neither view is adequate in today's global economy. Far from simply replacing native workers, foreign-born engineers are starting new businesses and generating jobs and wealth at least as fast as their U.S. counterparts. And the dynamism of emerging regions in Asia and elsewhere now draws skilled immigrants homeward. Even when they choose not to return home, they are serving as middlemen linking businesses in the United States with those in distant regions.

In some parts of the world, the old dynamic of "brain drain" is giving way to one I call "brain circulation." Most people instinctively assume that the movement of skill and talent must benefit one country at the expense of another. But thanks to brain circulation, high-skilled immigration increasingly benefits both sides. Economically speaking, it is blessed to give and to receive.

## "New" Immigrant Entrepreneurs

Unlike traditional ethnic entrepreneurs who remain isolated in marginal, low-wage industries, Silicon Valley's new foreign-born entrepreneurs are highly educated professionals in dynamic and technologically sophisticated industries. And they have been extremely successful. By the end of the 1990s, Chinese and Indian engineers were running 29 percent of Silicon Valley's technology businesses. By 2000, these companies collectively accounted for more than \$19.5 billion in sales and 72,839 jobs. And the pace of immigrant entrepreneurship has accelerated dramatically in the past decade.

Not that Silicon Valley's immigrants have abandoned their ethnic ties. Like their less-educated counterparts, Silicon Valley's high-tech immigrants rely on ethnic strategies to enhance entrepreneurial opportunities. Seeing themselves as outsiders to the mainstream technology community, foreign-born engineers and scientists in Silicon Valley have created social and professional networks to mobilize the information, know-how, skill, and capital to start technology firms. Local ethnic professional associations like the Silicon Valley Chinese Engineers Association, The Indus Entrepreneur, and the Korean IT Forum provide contacts and resources for recently arrived immigrants.

Combining elements of traditional immigrant culture with distinctly high-tech practices, these organizations simultaneously create ethnic identities within the region and aid professional networking and information exchange. These are not traditional political or lobbying groups—

rather their focus is the professional and technical advancement of their members. Membership in Indian and Chinese professional associations has virtually no overlap, although the overlap within the separate communities—particularly the Chinese, with its many specialized associations—appears considerable. Yet ethnic distinctions also exist within the Chinese community. To an outsider, the Chinese American Semiconductor Professionals Association and the North American Chinese Semiconductor Association are redundant organizations. One, however, represents Taiwanese, the other Mainland, Chinese.

Whatever their ethnicity, all these associations tend to mix socializing—over Chinese banquets, Indian dinners, or family-centered social events—with support for professional and technical advancement. Each, either explicitly or informally, offers first-generation immigrants professional contacts and networks within the local technology community. They serve as recruitment channels and provide role models of successful immigrant entrepreneurs and managers. They sponsor regular speakers and conferences whose subjects range from specialized technical and market information to how to write a business plan or manage a business. Some Chinese associations give seminars on English communication, negotiation skills, and stress management.

Many of these groups have become important cross-generational forums. Older engineers and entrepreneurs in both the Chinese and the Indian communities now help finance and mentor younger co-ethnic entrepreneurs. Within these networks, "angel" investors often invest individually or jointly in promising new ventures. The Indus Entrepreneur, for example, aims to "foster entrepreneurship by providing mentorship and resources" within the South Asian technology community. Both the Asian American Manufacturers Association and the Monte Jade Science and Technology Association sponsor annual investment conferences to match investors (often from Asia as well as Silicon Valley) with Chinese entrepreneurs.

Although many Chinese and Indian immigrants socialize primarily within their ethnic networks, they routinely work with U.S. engineers and U.S.-run businesses. In fact, recognition is growing within these communities that although a start-up might be spawned with the support of the ethnic networks, it must become part of the mainstream to grow. The most successful immigrant entrepreneurs in Silicon Valley today appear to be those who have drawn on ethnic resources while simultaneously integrating into mainstream technology and business networks.

### **Transnational Entrepreneurship**

Far beyond their role in Silicon Valley, the professional and social networks that link new immigrant entrepreneurs with each other have become global institutions that connect new immigrants with their counterparts at home. These new transnational communities provide the shared information, contacts, and trust that allow local producers to participate in an increasingly global economy.

Silicon Valley's Taiwanese engineers, for example, have built a vibrant two-way bridge connecting them with Taiwan's technology community. Their Indian counterparts have become key middlemen linking U.S. businesses to low-cost software expertise in India. These cross-Pacific networks give skilled immigrants a big edge over mainstream competitors who often lack the language skills, cultural know-how, and contacts to build business relationships in Asia. The long-distance networks are accelerating the globalization of labor markets and enhancing opportunities for entrepreneurship, investment, and trade both in the United States and in newly emerging regions in Asia.

Taiwanese immigrant Miin Wu, for example, arrived in the United States in the early 1970s to pursue graduate training in electrical engineering. After earning a doctorate from Stanford University in 1976, Wu saw little use for his new skills in economically backward Taiwan and

chose to remain in the United States. He worked for more than a decade in senior positions at Silicon Valley-based semiconductor companies including Siliconix and Intel. He also gained entrepreneurial experience as one of the founding members of VLSI Technology.

By the late 1980s, Taiwan's economy had improved dramatically, and Wu decided to return. In 1989 he started one of Taiwan's first semiconductor companies, Macronix Co., in the Hsinchu Science-based Industrial Park. Wu also became an active participant in Silicon Valley's Monte Jade Science and Technology Association, which was building business links between the technical communities in Silicon Valley and Taiwan.

Macronix went public on the Taiwan stock exchange in 1995 and in 1996 became the first Taiwanese company to list on Nasdaq. It is now the sixth biggest semiconductor maker in Taiwan, with more than \$300 million in sales and some 2,800 employees. Although most of its employees and its manufacturing facilities are in Taiwan, Macronix has an advanced design and engineering center in Silicon Valley, where Wu regularly recruits senior managers. A Macronix venture capital fund invests in promising start-ups in both Silicon Valley and Taiwan—not to raise money but to develop technologies related to their core business. In short, Miin Wu's activities bridge and benefit both the Taiwan and Silicon Valley economies.

### **A New Model of Globalization**

As recently as the 1970s, only giant corporations had the resources and capabilities to grow internationally, and they did so primarily by establishing marketing offices or manufacturing plants overseas. Today, new transportation and communications technologies allow even the smallest firms to build partnerships with foreign producers to tap overseas expertise, cost-savings, and markets. Start-ups in Silicon Valley are often global actors from the day they begin operations. Many raise capital from Asian sources, others subcontract manufacturing to Taiwan or rely on software development in India, and virtually all sell their products in Asian markets.

The scarce resource in this new environment is the ability to locate foreign partners quickly and to manage complex business relationships across cultural and linguistic boundaries. The challenge is keenest in high-tech industries whose products, markets, and technologies are continually being redefined—and whose product cycles are exceptionally short. For them, first-generation immigrants like the Chinese and Indian engineers of Silicon Valley, who have the language, cultural, and technical skills to thrive in both the United States and foreign markets, are invaluable. Their social structures enable even the smallest producers to locate and maintain collaborations across long distances and gain access to Asian capital, manufacturing capabilities, skills, and markets.

These ties have measurable economic benefits. For every 1 percent increase in the number of first-generation immigrants from a given country, for example, California's exports to that country go up nearly 0.5 percent. The effect is especially pronounced in the Asia-Pacific where, all other things being equal, California exports nearly four times more than it exports to comparable countries elsewhere in the world.

Growing links between the high-tech communities of Silicon Valley and Taiwan, for example, offer big benefits to both economies. Silicon Valley remains the center of new product definition and of design and development of leading-edge technologies, whereas Taiwan offers world-class manufacturing, flexible development and integration, and access to key customers and markets in China and Southeast Asia. But what appears a classic case of the economic benefits of comparative advantage would not be possible without the underlying social structures, provided by Taiwanese engineers, which ensure continuous flows of information between the two regions.

The reciprocal and decentralized nature of these relationships is distinctive. The ties between Japan and the United States during the 1980s were typically arm's-length, and technology transfers between large firms were managed from the top down. The Silicon Valley-Hsinchu relationship, by contrast, consists of formal and informal collaborations among individual investors and entrepreneurs, small and medium-sized firms, and divisions of larger companies on both sides of the Pacific. In this complex mix, the rich social and professional ties among Taiwanese engineers and their U.S. counterparts are as important as the more formal corporate alliances and partnerships.

Silicon Valley-based firms are poised to exploit both India's software talent and Taiwan's manufacturing capabilities. Mahesh Veerina started Ramp Networks (initially Trancell Systems) in 1993 with several Indian friends, relatives, and colleagues. Their aim was to develop low-cost devices to speed Internet access for small businesses. By 1994, short on money, they decided to hire programmers in India for one-quarter of the Silicon Valley rate. One founder spent two years setting up and managing their software development center in the southern city of Hyderabad. By 1999 Ramp had 65 employees in Santa Clara and 25 in India.

Having used his Indian background to link California with India, Veerina then met two principals of a Taiwanese investment fund, InveStar, that folded in Taiwan. In less than three months, Veerina set up partnerships for high-volume manufacture of Ramp's routers with three Taiwanese manufacturers (it took nine months to establish a similar partnership with a U.S. manufacturer). The Taiwanese price per unit was about half what Ramp was paying for manufacturing in the United States, and Ramp increased its output one-hundred-fold because of relationships subsequently built by Veerina with key customers in the Taiwanese personal computer industry. Ramp also opted to use the worldwide distribution channels of its Taiwanese partners. And when Ramp designed a new model, the Taiwanese manufacturer was prepared to ship product in two weeks—not the six months it would have taken in the United States.

Veerina attributes much of his success to InveStar's partners and their network of contacts in Taiwan. In a business where product cycles are often shorter than nine months, the speed and cost savings provided by these relationships provide critical competitive advantages to a firm like Ramp. InveStar sees as one of its key assets its intimate knowledge of the ins and outs of the business infrastructure in Taiwan's decentralized industrial system. By helping outsiders (both Chinese and non-Chinese) negotiate these complicated networks to tap into Taiwan's cost-effective and high-quality infrastructure and capability for speedy and flexible integration, such firms provide their clients far more than access to capital.

As Silicon Valley's skilled Chinese and Indian immigrants create social and economic links to their home countries, they simultaneously open foreign markets and identify manufacturing options and technical skills in Asia for the broader U.S. business community. Traditional Fortune 500 corporations as well as newer technology companies, for example, now increasingly turn to India for software programming and development talent. Meanwhile, information technology-related sectors in the United States rely heavily on Taiwan (and more recently China) for their fast and flexible infrastructure for manufacturing semiconductors and PCs, as well as their growing markets for advanced technology components. And these distant resources are now just as accessible to new start-ups like Ramp as to more established corporations.

These new international linkages are strengthening the economic infrastructure of the United States while providing new opportunities for once peripheral regions of the world economy. Foreign-born engineers have started thousands of technology businesses in the United States, generating jobs, exports, and wealth at home and also accelerating the integration of these businesses into the global economy.

## A New Policy Environment

The Silicon Valley experience underscores far-reaching transformations of the relationship between immigration, trade, and economic development in the 21st century. Where once the main economic ties between immigrants and their home countries were remittances sent to families left behind, today more and more skilled U.S. immigrants eventually return home. Those who remain in America often become part of transnational communities that link the United States to the economies of distant regions. These new immigrant entrepreneurs thus foster economic development directly, by creating new jobs and wealth, as well as indirectly, by coordinating the information flows and providing the linguistic and cultural know-how that promote trade and investment with their home countries.

Analysts and policymakers must recognize this new reality. In the recent U.S. debate over making more H1-B visas available for highly skilled immigrants, discussion began—and ended—with the extent to which immigrants displace native workers. But these high-tech immigrants affect more than labor supply and wages. They also create new jobs here and new ties abroad. Some of their economic contributions, such as enhanced trade and investment flows, are difficult to quantify, but they must figure into our debates.

Economic openness has its costs, to be sure, but the strength of the U.S. economy has historically derived from its openness and diversity—and this will be increasingly true as the economy becomes more global. As Silicon Valley's new immigrant entrepreneurs suggest, Americans should resist viewing immigration and trade as zero-sum processes. We need to encourage the immigration of skilled workers—while simultaneously improving the education of workers here at home.

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