CALIFORNIA'S ROLE IN THE GLOBAL ECONOMY

NEW CONTEXT - NEW OPPORTUNITY

Global Economic Integration Monograph
California Regional Economies Project

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PREFACE

Global Financial Crisis and Economic Restructuring

In 2007, the California Economic Strategy Panel chose to examine the topic of California's integration into the global economy. This monograph is the latest in a series following *California's Green Economy*, *Infrastructure*, *the Food Chain*, *Logistics*, *the Manufacturing Value Chain*, and *Health Sciences & Services*.

The past several months have witnessed a global financial crisis. As credit markets tightened and economic confidence declined as a result of the housing and banking situation, economic conditions have changed dramatically over the past year. Even as we have witnessed growth in U.S. exports over the last many months, we can expect exports to slow in the coming year due to the overall slowing in the global economy.

This new reality makes resiliency in the global economy even more important. As trade and investment flows have become more international and capital moves rapidly across the globe, both the risks and rewards of an increasingly integrated economy have become more apparent. Those economies that have the critical economic foundations and ability to flexibly adjust to changing situations will survive the economic storms, while those economies that have built on weak foundations will suffer.

This global economic crisis has made this report even more important because it explains the new challenges and opportunities faced by the Economic Strategy Panel, and provides better understanding for California's roles in the changing global economy and what can be done to help our state and regions manage in these challenging times. This report both provides a diagnosis of our current situation and our unique place in an emerging global innovation network as well as implications for action.

1 The Global Innovation Economy: Integration & Transformation

The global economic context is transforming and the pace of change is phenomenal. As the international flows of communication, people, goods, and capital increase in volume and speed, the far reaches of the world become increasingly integrated into a common economic fabric yet with distinctive regional patterns. Technological advance, the political opening of vast new markets, and human ambition have ushered new and formidable economic players into the world's economic arena. While relatively new to the scene, these new competitors hold a global view beyond their native borders, are unencumbered by the inertia and inflexibility of legacy issues, and possess a fresh, optimistic outlook.

This transformation in the global economy may seem at first as a zero-sum game in which one country's gains are come by the losses of another. Instead, new access to creative resources and untapped markets is emerging from this changing set of circumstances. Successfully exploiting these new opportunities will require embracing global integration by seeking out collaborators abroad, growing diversity at home, and synthesizing Western and Eastern approaches.

What does this mean for California and its role in the global economy?

California is an important nexus and broker in the global innovation network. California's strong outward ties to other parts of the world create a global meeting place and facilitate the vital mixing and exchanges of goods and services, talent, ideas, and capital. These international ties also provide the State with the girding to help weather economic storms. California's strengths lie in the size, diversity and adaptability of its economy and in the talent and diversity of its population.

Imperative to succeeding in this period of momentous change are California's continued capacity as a leader in innovation and its continued attraction of global talent and investment. Core to each of these is sustaining a world-class comprehensive educational system that will produce talent competitive in the global market and that will generate breakthroughs in technology and business practices.

1.1 Economic Change and the Innovation Economy

Global economic growth is yielding positive gains as well as new challenges. As wealth and innovation emerge from new sources, global political power begins to shift. The current turmoil in the world's financial markets is disclosing just how intricately entwined these markets are. Rising fuel costs contribute to power shifts as oil-producing countries reap windfalls and other countries see their growth stymied. As the market for natural resources tightens and concerns about the impacts of climate change rise, environmental challenges enter the economic and political realms. The global distribution of the production process is becoming more complex and more collaborative, and the location of specific activities is becoming more important as different regions take on different specialized roles.

Structural Transformation: New Constraints, New Competitors, New Opportunities

- **The current market turmoil is a reflection of the adjustment process** when fundamental market changes create a misalignment between economic activities and the system. These include the emergence of powerful new players, the opening of vast new markets, the growth of new wealth in previously poor countries, and the appearance of new financial instruments.
- **It's a multi-polar world**. Other countries are catching up with the U.S. in productivity and prosperity and changing the constellation of economic power and influence.
- **New opportunities emerge** as the standards of living rise in other countries; such as, new consumer demand for U.S. products, new products for U.S. consumers, new opportunities for collaboration in business and research, and new markets for environmental technologies and services. In particular, in the area of clean technology, huge opportunities exist in supplying China (and other emerging economies) with technology, equipment and services that will conserve energy and reduce pollution.[1]

Global value chains: Increasing Complexity and Importance of Place

- **Complexity is growing.** Advances in communications technology and affordable transportation have made possible the global distribution of the production process changing hierarchical relationships to partnerships along the value chain. Global value chains are becoming more complex as production processes continue to be broken down into smaller, more specialized segments.
- **Place matters.** Global value chains are transforming into finer networks more widely distributed across the globe as companies pinpoint the very best location for each activity in order to capture the greatest benefit. Accessing new markets can entail building new production facilities locally and in so doing, establishing new supplier networks or bringing suppliers along into the new market. The location of particular functions is determined by numerous factors including access to materials and components, transportation costs, and especially talent.

The Global Innovation Economy

- **Innovation is about ideas and recipes,** and the recipes are the product of the innovation process. The four major ingredients to the innovation recipe include: [2]
    - **Expertise**: new discoveries, new knowledge, new insights.
    - **Interaction**: interpersonal exchange of ideas and surfacing of synergy that creates new business models, marketing plans, or products
    - **Diversity**: similar to biological organisms, when many different ideas and viewpoints mix, new, more robust ideas evolve
    - **Application**: Ideas are useless unless used. The true proof of their value is in commercialization.
- **Innovation is unpredictable and disruptive** as new technologies set off bursts of innovation. This creates a normal cycle of prosperity and recession as the novelty of invention erodes.[3]
- **Innovation is open and global**. New ideas can emerge from anywhere and anyone can take a new idea and try to make better use of it.[4]
- **Innovation is collaborative and networked**. The unit of innovation has become the network, not the firm. Through a mix of formal and informal relationships, networks organize the sharing and distribution of knowledge.
- **Innovation is place based and regional**. Geographic clustering of people, companies, and institutions is a powerful mechanism for transferring knowledge. Through this clustering, regional specializations emerge which attract others who are interested in linking into the local synergies. This process becomes self-reinforcing and deepens a region's comparative advantage.

For more detail on the above, please see Appendix A and B.

1.2 Current Changes in Terms of Trade Could be Shifting in California's Favor

California is no newcomer to grappling with tectonic shifts in its economy and the ensuing turmoil. In the early 1990s, cutbacks in defense industry spending hit Southern California and its housing market exceptionally hard. Similar to the current housing crisis, foreclosures skyrocketed. The story of Silicon Valley is marked by regular cycles of boom, bust, and reinvention. With the eighth largest economy in the world[5] California is a formidable force and has many assets that contribute to its ability to adapt to changing conditions. These strengths include the size and diversity of its economy, the world-class talent and diversity of its population, its innovation capacity, its trade volumes, and the strength of its international ties.

As current conditions shift in the global economy, individuals and businesses suffer but new opportunities also emerge. Rising transportation costs, the falling U.S. dollar, and rising incomes outside the U.S. have helped buffer the blows of the slowing economy. As a global center of innovation, California attracts companies from all over the world as a profitable location for their R&D operations. Further, new concerns about pollution and climate change will create new opportunities for California's green technology producers and service providers.

California is a global innovation broker. The State's innovation assets make it a magnet for talent and investment from around the world. California's strong outward ties to other parts of the world create a global meeting place and facilitate the vital mixing and exchanges of goods and services, talent, ideas, and capital. These international ties help provide the State with the girding to help weather economic storms.

California is a leader in green technology and services. Climate change is a growing concern. As countries, businesses and individuals wrestle with the real environmental impacts, new policy requirements, and carbon-neutral alternatives for products and processes at home, work and the factory, California's green technology producers and service providers will see growing global opportunity. This is especially the case in view of California's technological and political leadership in the development of green technology and of public policies that set efficiency standards, mandate renewable energy generation, support R&D, and provide incentives for early adoption of new technology.[6]

Exports have been rising in part boosted by the dollar's seven-year slide. In the second quarter of 2008, U.S. exports rose 9% at an annualized rate.[7] For the first time since March 1999, full outgoing containers at the Port of Los Angeles outnumbered empty containers.[8] And as of June 2008, over the twelve-month period, China's exports are growing at a slower rate than the U.S.'s.[9] While China's slowing economy is easing world demand for raw resources,[10] reducing global inflationary pressures, and possibly slowing global economic growth, other factors may result in spurring growth at home.

International transportation and labor costs are rising. A recent *McKinsey Quarterly* article addressed the rising costs of transportation (and therefore materials) and labor associated with offshoring.[11] Since 2000, the cost of shipping a standard 40-foot container has tripled due to rising fuel costs, and rising shipping costs translate into higher costs for raw materials for manufacturers. At $100 a ton, it now costs more to ship iron from Brazil to China than the mineral is worth. Wage inflation in China plus the weakening of the U.S. Dollar, make Chinese labor less cost-competitive and narrows the gap with Mexican labor. Since 2003, annual wage inflation has averaged 19% in China and 3% in the U.S.

Manufacturing is returning to our shores. As a result of rising transportation costs and wage inflation at manufacturing centers abroad, some U.S. manufacturers are bringing production capacity back home,[12] and California is well positioned to benefit from such a trend. Even as manufacturing in the rest of the country was scaling back in the 1970s and 1980s, Los Angeles's thriving container port made the regions an advantageous location for manufacturing.[13] Direct foreign investment in manufacturing in L.A. is increasing.

Case Studies of New Manufacturing in California: American Apparel & Tesla Motors

American Apparel has proven that even clothing can be profitably manufactured in downtown Los Angeles. Encompassing every production segment from design and manufacturing to marketing in-house, American Apparel is the largest clothing manufacturer in the U.S. Since its founding in 2003, the company has grown to 143

stores in 11 countries with sales estimated at $300 million in 2006.[14] A core feature of the company's success is its ability to respond quickly to new fashion trends, and this is made possible by its location in Los Angeles.

The company has been widely praised by anti-sweatshop and anti-globalization activists for treating its employees well and for keeping its production in the U.S. Employees are paid based on performance and above minimum wage. Benefits include healthcare, English lessons, and subsidized meals.

Tesla Motors, headquartered in San Carlos, California, produces a high-performance, fully electric roadster that will hit the market by the end of 2008. In order to address the broader auto market, a more affordable sedan will begin production in 2011. Tesla currently produces the roadster in England and has other locations in Taiwan and a technical research facility in Michigan. When considering the production location for the new sedan, Tesla chose California. Construction on the 89-acre site will begin in the summer of 2009, and when fully operational, the facility will employ 1,000 workers.

As Ze'ev Drori, then President and CEO, explained: "We selected San Jose in part because the region already enjoys a high concentration of highly skilled engineers and support infrastructure – people who already work for Tesla and those we might want to hire. The factory – expected to achieve gold certification from U.S. Green Building Council Leadership in Energy and Environmental Design (LEED) – will be 20 miles from the current headquarters in San Carlos."[15]

Costs did play a factor in the location decision. Originally considering New Mexico, incentives from the State of California and from the City of San Jose tipped the balance in favor of locating in San Jose.[16]

2 California: A Global Innovation Broker

California is a central nexus in the global innovation network. Not only does the State's multifaceted and innovative economy attract people, business and investment from around the world, through its innovation infrastructure, it connects widely diverse players and interests from around the world creating new value in the form of new ideas, new products, and new levels of collaboration.

In the global innovation economy, ideas drive growth. The recipe for economic success continues to evolve as the economy evolves. Two centuries ago, success was about building the biggest, most efficient farm. One century ago, it was about building the most efficient factory. Today, economic success is about ideas. New ideas are born out of diversity and a flexible environment that facilitates new connections and the exchange of ideas. Regions that become the wellsprings of ideas drive innovation in the global marketplace.[17]

California's role as a global innovation broker takes multiple forms. Three examples include the Bay Area Science & Innovation Consortium (BASIC), Global CONNECT, and California's recent invitation to be the highlight of the 2009 CeBIT.

- **BASIC** is dedicated to advancing the San Francisco Bay Area's leadership in science, technology and innovation in the increasingly competitive national and international R&D environment. It is a collaboration of the region's major research universities, national laboratories, independent research institutions, and R&D-driven business. It's activities include developing regional and global innovation networks, supporting science-related projects, developing projects, connecting researchers and businesses, and educating the public. [18]
- **CONNECT San Diego** was created two decades ago to bring together business and local leaders to transform the region from Navy town to high-tech center. The organization collaborates with local scientists, engineers, entrepreneurs and venture capitalists to commercialize technology and foster the growth of successful companies. Building on this success, **Global CONNECT**, associated with the University of California San Diego, was founded in 2003 to reach out around the world, linking innovative regions and supporting the development of their innovation systems.[19]
- **CeBIT** is the world's largest technology trade show held annually in Hannover, Germany. Each year, a country is chosen as the official partner of CeBIT, and its information and communications technology businesses are highlighted. For the first time, a state will be the partner in 2009. California was chosen for its global leadership in technology and especially in environmental technology.

2.1 The Strength of California's Global Connections and Flows

As a central nexus in the global economy, California hosts huge volumes of traffic of people and goods from around the world. As a global innovation broker, the State (its regions, firms, institutions, etc.) brings these varied and vibrant pieces together in a way that produces new connections and forms and through which California creates and furthers a global innovation ecosystem.

California's ports handle 18% of total U.S. trade, and 12% of all U.S. exports originate in California. The state attracts talent from around the globe to work in its companies and study at its universities. The convergence of talent from around the world creates enduring connections between the State and other countries through individuals, companies, and universities. The discovery process is bringing growing numbers of researchers together from across borders as evidenced in co-patenting activity between Californians and non-U.S. residents. Foreign firms establish affiliates in California and the State's firms open up shop abroad as well. Finally, venture capital investment flows both to and from California not only in the form of dollars but also expertise and networking.

2.1.1 California Industry Value Chains and Their Global Reach

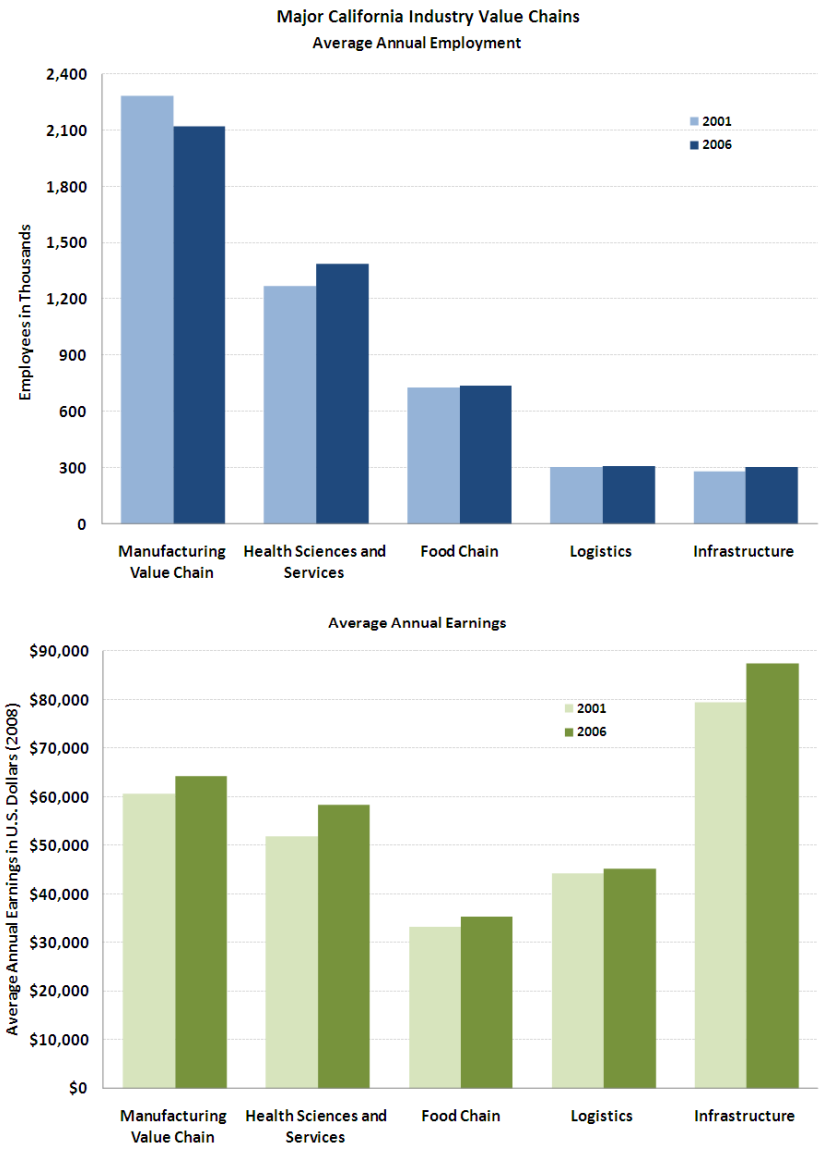
As part of the California Regional Economies Project, the California Economic Strategy Panel has produced a series of studies of key industry groupings across the State's eight economic regions with the purpose of identifying areas of growth and opportunities for workforce development. These studies include *Health Sciences & Services*, *The Food Chain*, *Manufacturing*, *Logistics* and *Infrastructure*.[20] (The studies were carried out separately at different points in time, so some overlap in employment numbers displayed does exist.)

Over the recent period from 2001 to 2006, employment increased in *Health Sciences & Services* and dropped slightly in the manufacturing value chain. All industry value chains experienced growth in average annual earnings.

These key California industry groups are globally connected, and it is a far more complex story than simply offshoring production to countries with low-cost labor. California's firms have affiliates abroad, and foreign firms locate business affiliates in California. The United Kingdom is our strongest partner in this respect. By industry group the manufacturing value chain accounts by far for the largest number of both, California affiliates abroad and foreign-owned businesses in California. Making up the largest number of foreign affiliates in this group, 418 affiliates come from Japan. California's firms in the manufacturing value chain have opened the most locations in China (367) followed by the United Kingdom (292), Canada (278), Germany (261), and Japan (226).

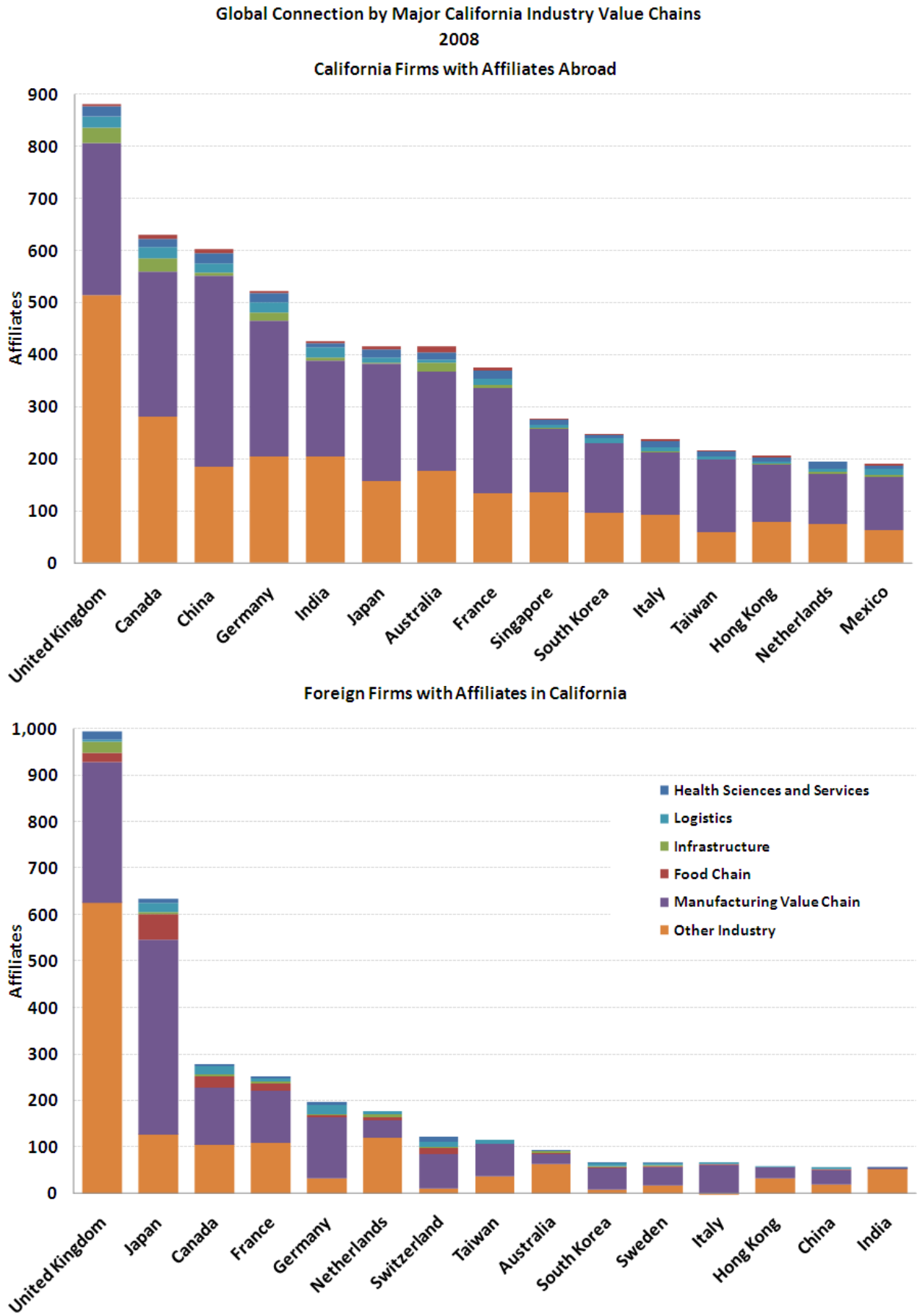
In terms of global connectedness, Japan jumps out with 55 California locations in the Food Chain, Two-thirds of German affiliates in California are in the manufacturing value chain. Other Industries consist primarily of accommodations, restaurants, finance, and insurance.

Figure 1



Note: Due to the Industry Value Chain reports having been produced separately, there is industry sector overlap in the Industry Value Chains.
Data Source: California Employment Development Department
Analysis: Collaborative Economics

Figure 2



Note: Due to the Industry Value Chain reports having been produced separately, there is industry overlap in the Industry Value Chains.
Data Source: Uniworld Business Publications, Inc.
Analysis: Collaborative Economics

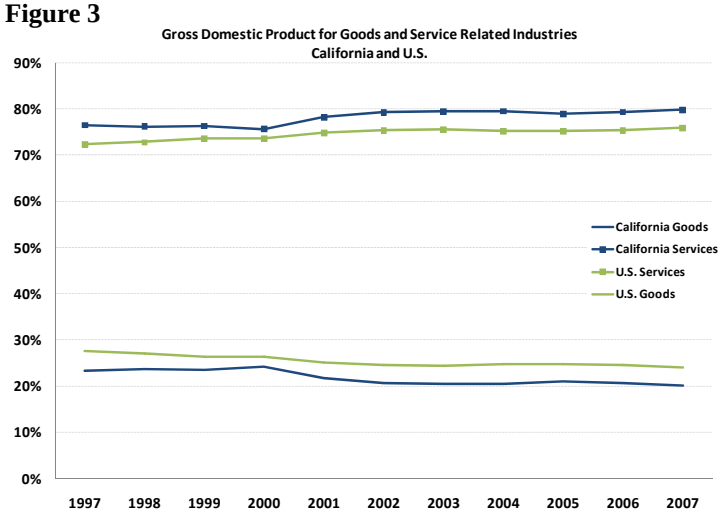
Global Connections by Major California Industry

2.1.2 International Trade Flows

California's exports are growing. Exports are not just about making a product here and selling it to a consumer overseas. As a result of the global distribution of the production process, flows of intermediate goods such as materials and components as well as expertise crisscross the globe in container ships, cargo planes and first-class airline seats. California's exports include complex production machinery, high-tech components to be assembled overseas into consumer products that will be sold around the world (e.g. the Ipod), and a very broad array of services including financial, legal, and business services.

Employment in Service Related Industries		
	California	U.S.
1997	78.1%	76.8%
2007	81.2%	80.7%

Figure 3



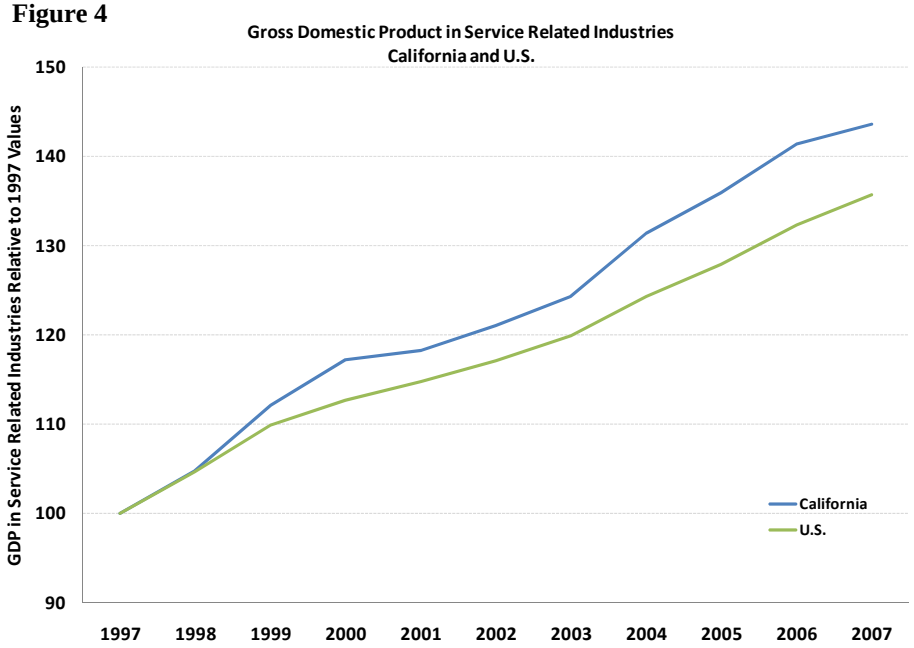
Data Source: Bureau of Economic Analysis
Analysis: Collaborative Economics

Service Exports

Worldwide, service industries are growing relative to manufacturing. Compared to the U.S., California's economy is more oriented to services than manufacturing. In terms of employment, service industries make up 81.2% in California and 80.7% in the U.S. In terms of total output, or gross domestic product (GDP), service industries make up 79.9% of the California economy and 75.9% of the U.S. economy (**Figure 3**). Relative to 1997, total output from services increased 44% in California and 36% in the U.S. (**Figure 4**).

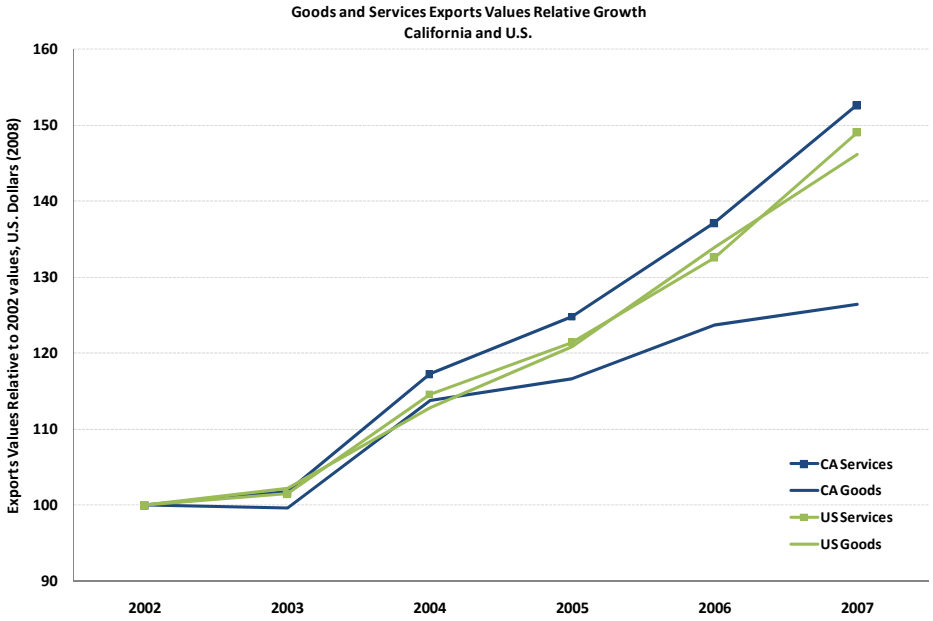
Export data for services is available only for the U.S. as a whole. State-level export data only exists for goods exports. Looking at trends in U.S. service exports can provide a rough approximation for California; however, given the fact that California's economy is more service-intensive, this derivation very likely underestimates the State's exports in services.

Figure 4



Data Source: Bureau of Economic Analysis
Analysis: Collaborative Economics

Figure 5

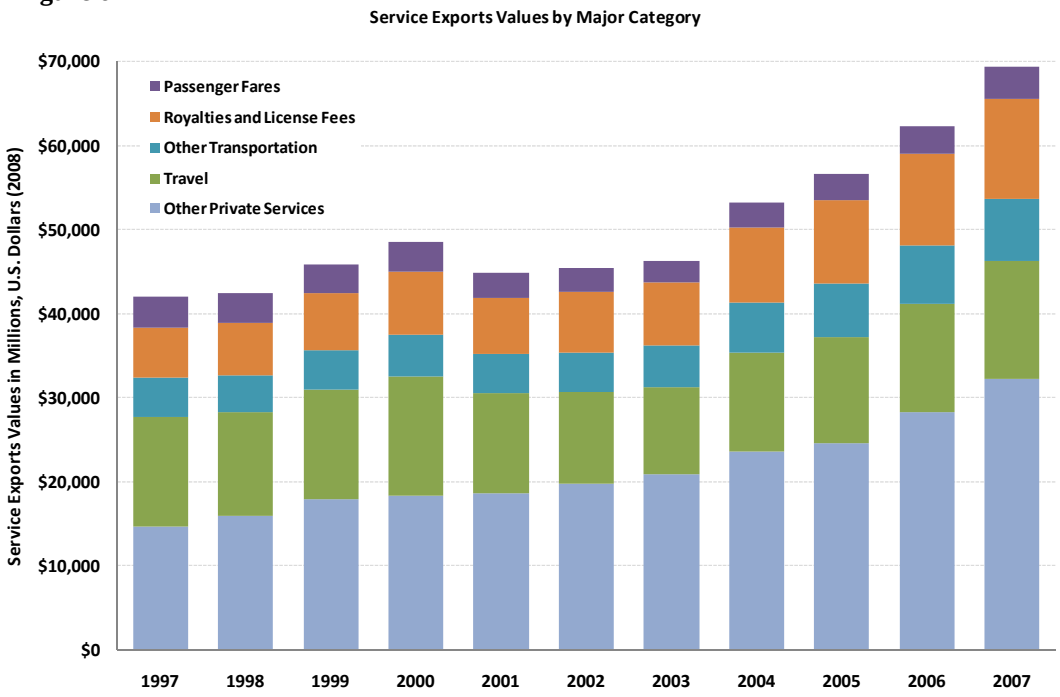


Data Source: U.S. Census Bureau, U.S. Department of Commerce, and Bureau of Economic Analysis
Analysis: Collaborative Economics

Total U.S. exports valued $1.7 trillion in 2007, and the export of services represented 29%.[21] Setting this percentage relative to U.S. GDP from service industries and multiplying by California GDP from service industries, produces an estimated value of $69.4 billion for California exports in services in 2007. Since 2002, the value of service exports have increased at a faster rate than goods exports in California, while the trends for each have been similar for the U.S. as a whole (**Figure 5**).

Service exports consist of travel services, royalties and license fees, other transportation, and passenger fares and other private industry services. Including business, professional, and technical services, insurance services, and financial services, the segment of other private industry services has witnessed the strongest growth in export value since 2001 (**Figure 6**).

Figure 6



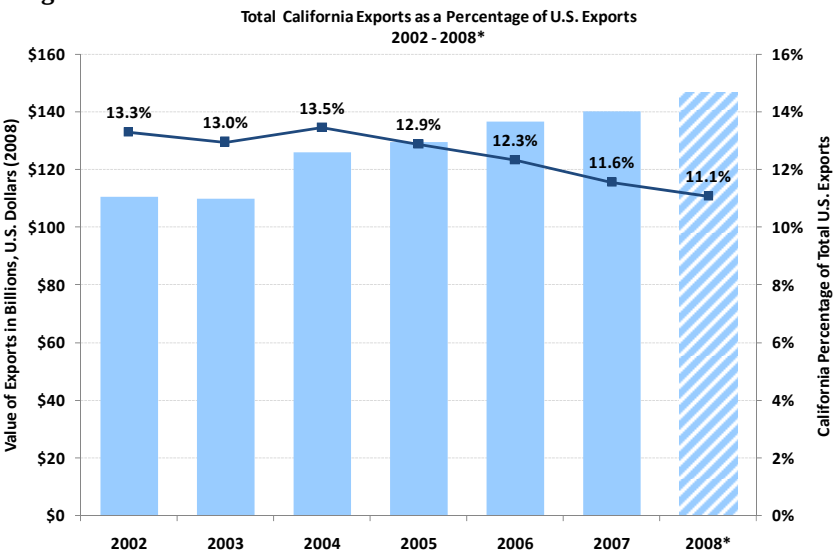
Note: Other Private Services includes business, professional, and technical services, insurance services, and financial services. Other Transportation includes freight and port services.
Data Source: U.S. Census Bureau, U.S. Department of Commerce, and Bureau of Economic Analysis
Analysis: Collaborative Economics

Goods Exports

In terms of goods exports, the U.S. is projected to be replaced by China as #1 world manufacturer; however, while China is becoming the top producer of highly visible consumer goods, the U.S. is a sizable producer of capital goods for industry which are less noticeable to most people.[22] After stalling in 2003, California's goods exports increased in value by 27% between 2002 and 2007 reaching $140 billion in 2007 (**Figure 7**). Based on the first half of the year, 2008 is projected to reach $146 billion. California's exports account for roughly 11% of total U.S. exports.

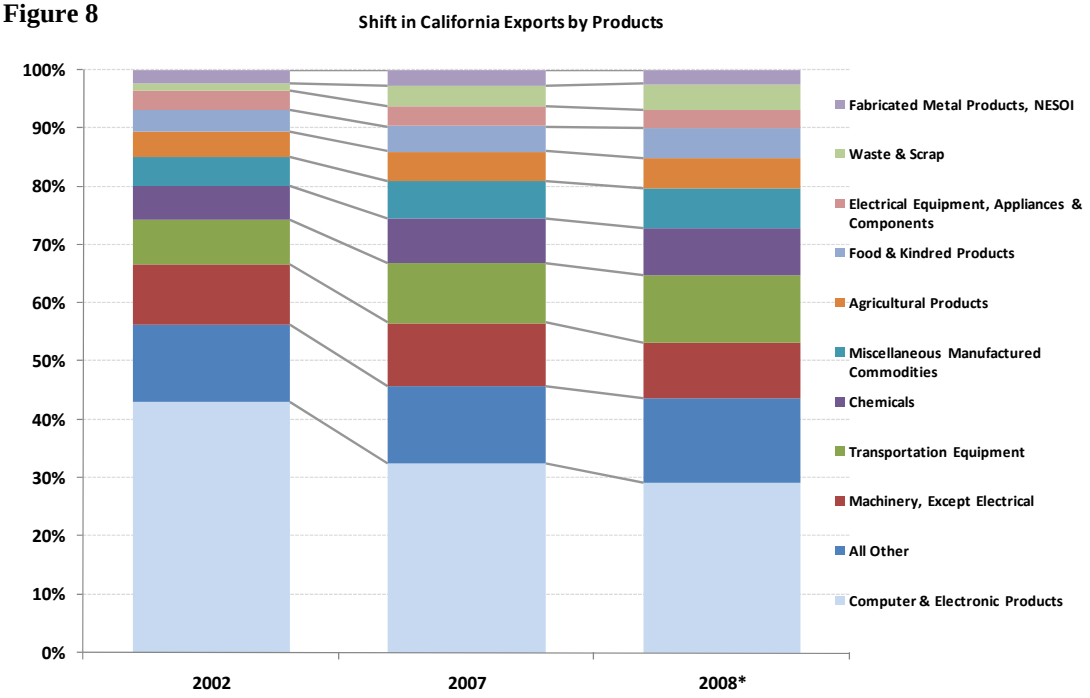
Valued at over $45 billion in 2007, Computer and Electronic Products account for 33% of total exports and make up the State's leading export goods (**Figure 8**). However, export values of other goods are growing. Exports of Transportation Equipment Products increased 69% between 2002 and 2007. Transportation Equipment Products are comprised of motor vehicle and vehicle parts manufacturing, aerospace product and parts manufacturing, and railroad, ship and boat manufacturing.

Figure 7



*Estimates based on data through June 2008
Data Source: USA Trade Online
Analysis: Collaborative Economics

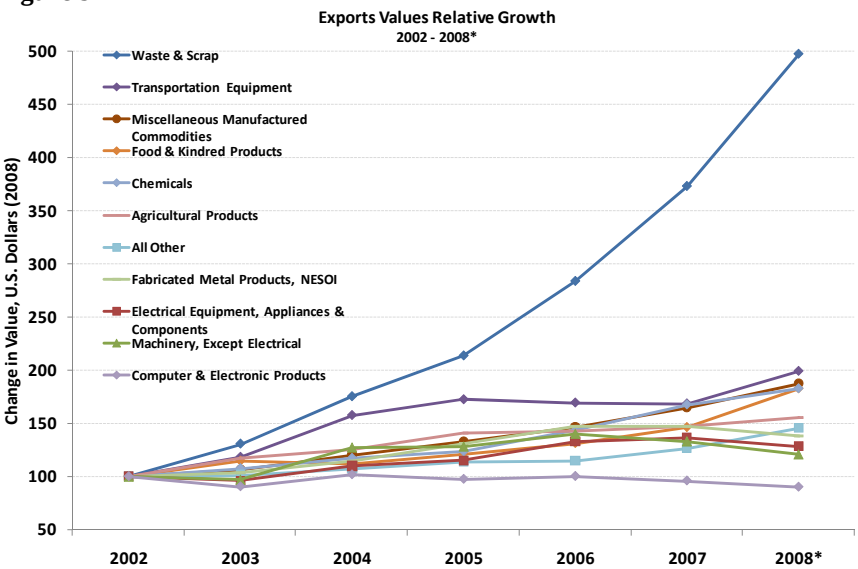
Figure 8



*Estimates based on data through June 2008.
Note: NESOI is an acronym for Not Elsewhere Specified or Indicated, used in categorizing cargo in trade.
Data Source: USA Trade Online
Analysis: Collaborative Economics

Of the top ten export goods, Waste and Scrap grew the fastest quadrupling in value since 2002 (**Figure 9**). Although not among the top ten, California's exports of Petroleum and Coal Products increased by 166% between 2002 and 2007.

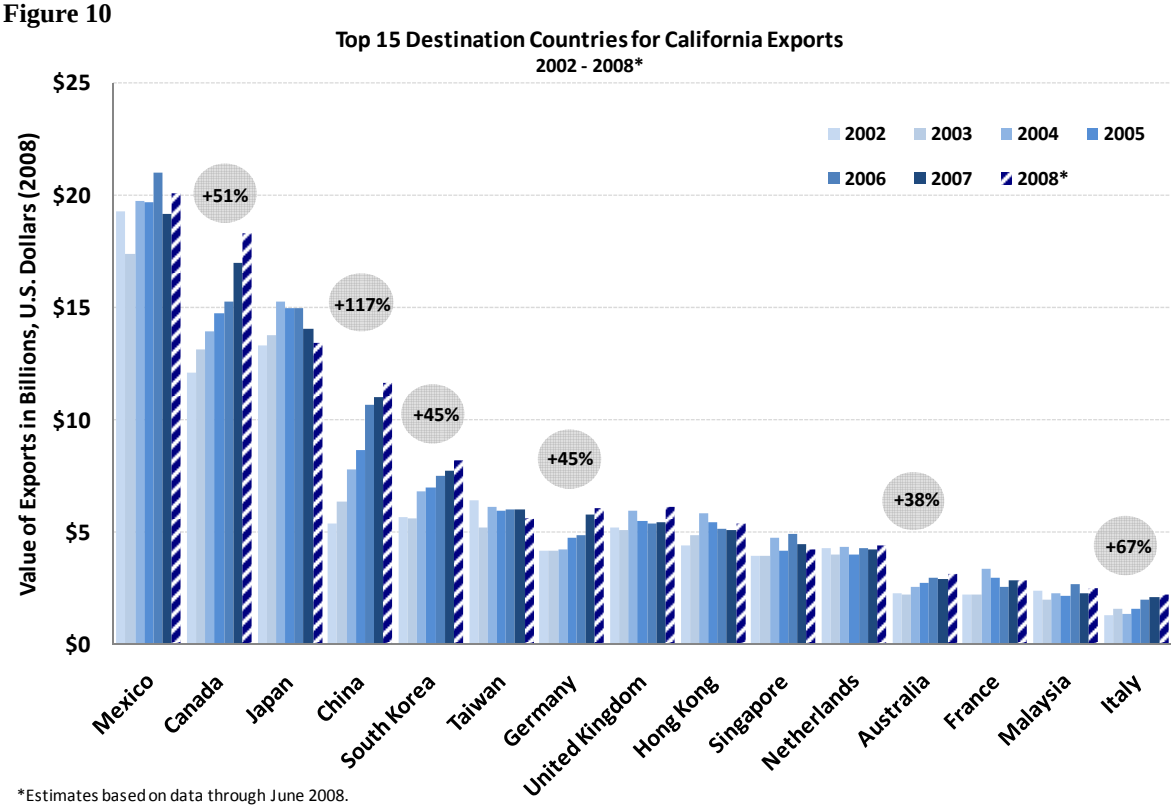
Figure 9



*Estimates based on data through June 2008.
Note: NESOI is an acronym for Not Elsewhere Specified or Indicated, used in categorizing cargo in trade.
Data Source: USA Trade Online
Analysis: Collaborative Economics

Valuing roughly $20 billion, Mexico is the top destination for California exports (**Figure 10**). Canada and Japan follow in export value with $17 and $14 billion respectively. Among the top 15 destinations, California exports to China have risen fastest - rising 117% between 2002 and 2007. [23] Up significantly since 2002, Italy and Canada are also fast-growing markets for California goods growing by 67% and 51% respectively. The value of the State's exports to South Korea and the United Kingdom expanded 45%, and to Australia, exports grew 36%.

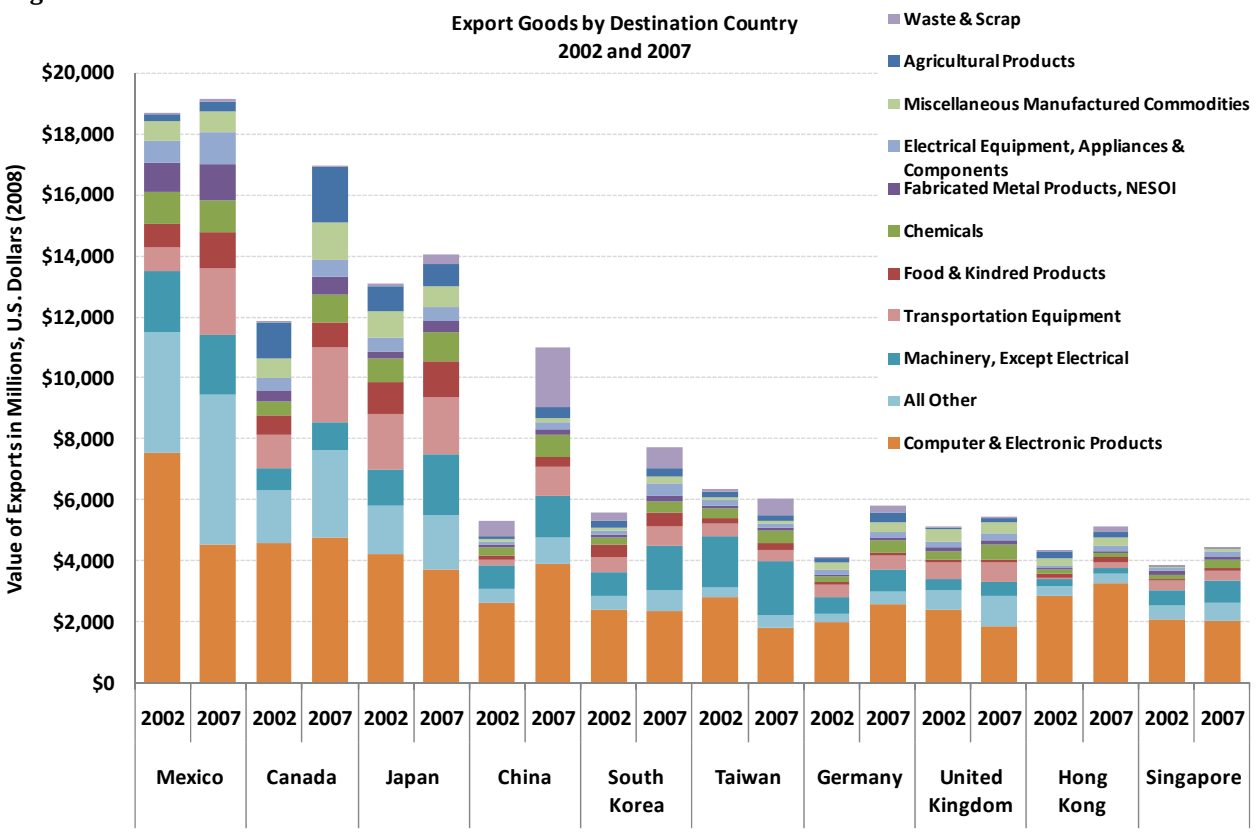
Figure 10



*Estimates based on data through June 2008.
Data Source: USA Trade Online
Analysis: Collaborative Economics

Patterns in export trends by destination market vary by product. While exports of Computer and Electronic Products to Mexico dropped 39% over the five years, exports of transportation equipment, food, fabricated metal products and electrical equipment grew. Exports to China grew across all product areas. Machinery exports increased to Japan, China, South Korea, Germany and Singapore. Exports of waste and scrap increased most significantly to China and valued nearly $2 billion in 2007. Computer & Electronic product exports were up to Canada, China, Germany and Hong Kong. In general, exports of Transportation Equipment Products increased for all but two of the top 15 countries. The value in Chemical Products exports increased in all of the top 15 countries.

Figure 11



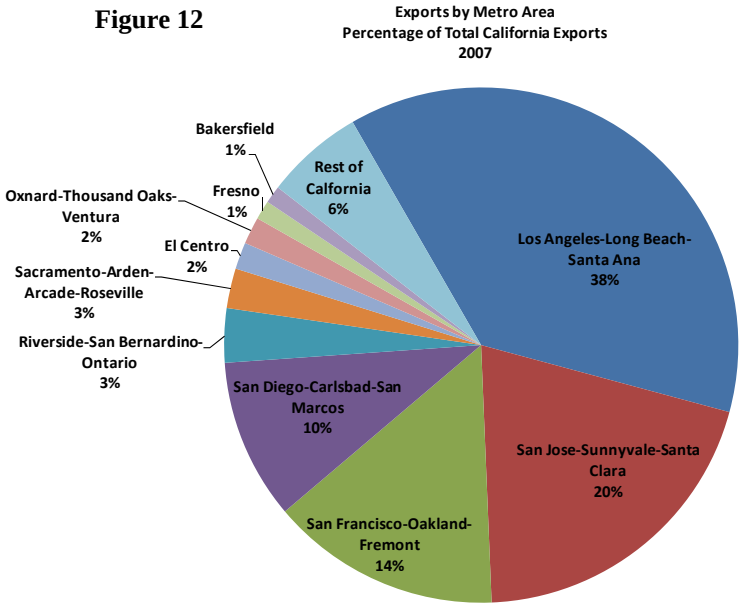
Note: NESOI is an acronym for Not Elsewhere Specified or Indicated, used in categorizing cargo in trade.
Data Source: USA Trade Online
Analysis: Collaborative Economics

Exports by Metro Area

By metropolitan area, 38% of California's goods exports originate from Los Angeles. The San Jose area follows with 20% and San Francisco, with 14%. The San Diego area contributed 10% to the State's goods exports in 2007.

Between 2005 and 2006, exports increased in value from the three top exporting regions in the State: L.A. by $3.4 billion, San Jose by $1.4 billion, and San Francisco by $3.3 billion (**Figure 12**).

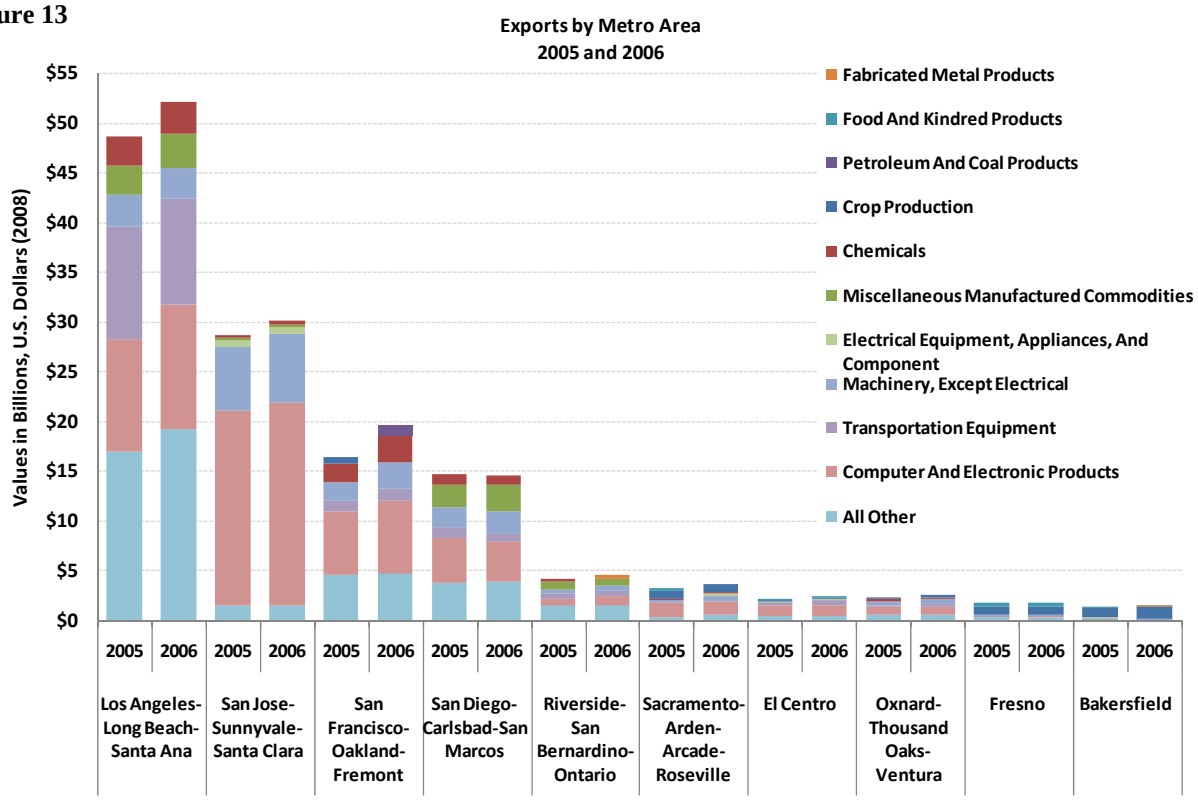
Figure 12



*The year 2007 represents the exports values through June 2007.
Data Source: U.S. Department of Commerce, U.S. Census Bureau
Analysis: Collaborative Economics

As a result of California's diverse economy, exported goods vary by region. The L.A. area exports the greatest export value and widest mix of export goods; the region does particularly well in Computer & Electronic Products $12.5 billion and Transportation Equipment$10.7 billion. Two-thirds of San Jose's exports are Computer & Electronic Products. The San Francisco area's exports of Chemicals, Petroleum & Coal Products, and Computer & Electronic Products increased from 2005 to 2006.

Figure 13

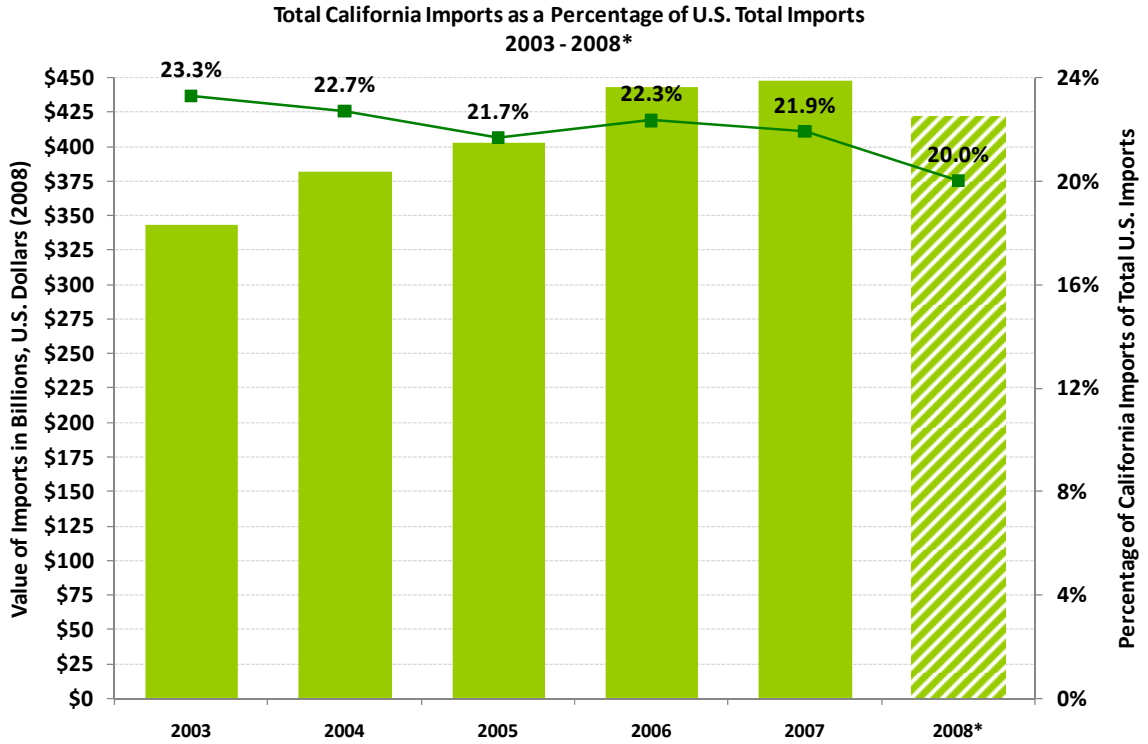


Note: Data based on top five exports by Metro Area.
Data Source: U.S. Department of Commerce, U.S. Census Bureau
Analysis: Collaborative Economics

Imports to California Ports

Imports are not tracked once they enter the U.S.; however, a large volume of imports can have a meaningful impact on the local economy around the port. Since 2003, imports through California ports have dropped slightly in percentage of total U.S. imports from 23% to 22%. Nevertheless, between 2003 and 2007, imports entering the U.S. through California grew in value by $104 billion. Projections for 2008 based on the first half of the year suggest that imports will drop from 2007 levels by roughly $25 billion.

Figure 14



*Estimates based on data through June 2008.
Data Source: USA Trade Online
Analysis: Collaborative Economics

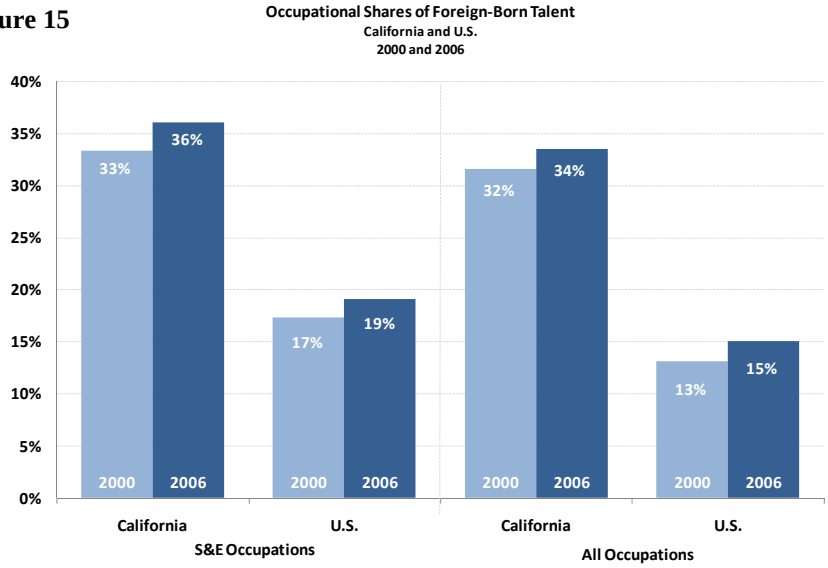
2.1.3 Global Talent Flows

California's workforce is made up of people from diverse backgrounds. Compared to the U.S., California's Science & Engineering (S&E) talent consists of a larger portion of foreign-born talent. Foreign-born employees in the S&E occupations are also growing faster in California than in the U.S. In 2006, foreign-born talent accounted for 36% of California's Science & Engineering professionals and only 19% in the U.S. Between 2000 and 2006, these professionals increased in share by 2.7% in California and by 1.7% in the U.S. Foreign-born talent is more prevalent in S&E occupations than across all occupations. In 2006, the foreign-born represented 34% of Californian workers and only 15% of all U.S. workers.

By S&E occupation, foreign-born talent was most prevalent in Chemists and Materials Scientists in 2006; however, in 2000, the percentage of foreign-born was highest among materials engineers and economists. As a percentage, foreign-born professionals increased between 2000 and 2006 among medical scientists, agricultural and food science technicians, and chemical technicians.

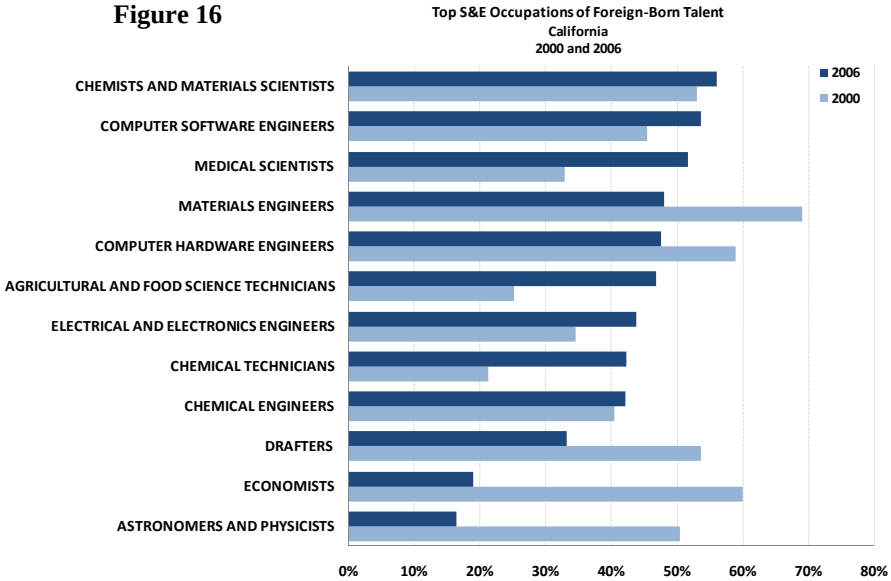
The increase in Software Engineers and the drop in foreign-born Computer Hardware Engineers between 2000 and 2006 reflects the broader structural shifts in the economy. In addition to Computer Hardware Engineers, the presence of foreign talent dropped among Materials Engineers, Drafters, Economists, and Astronomers.

Figure 15



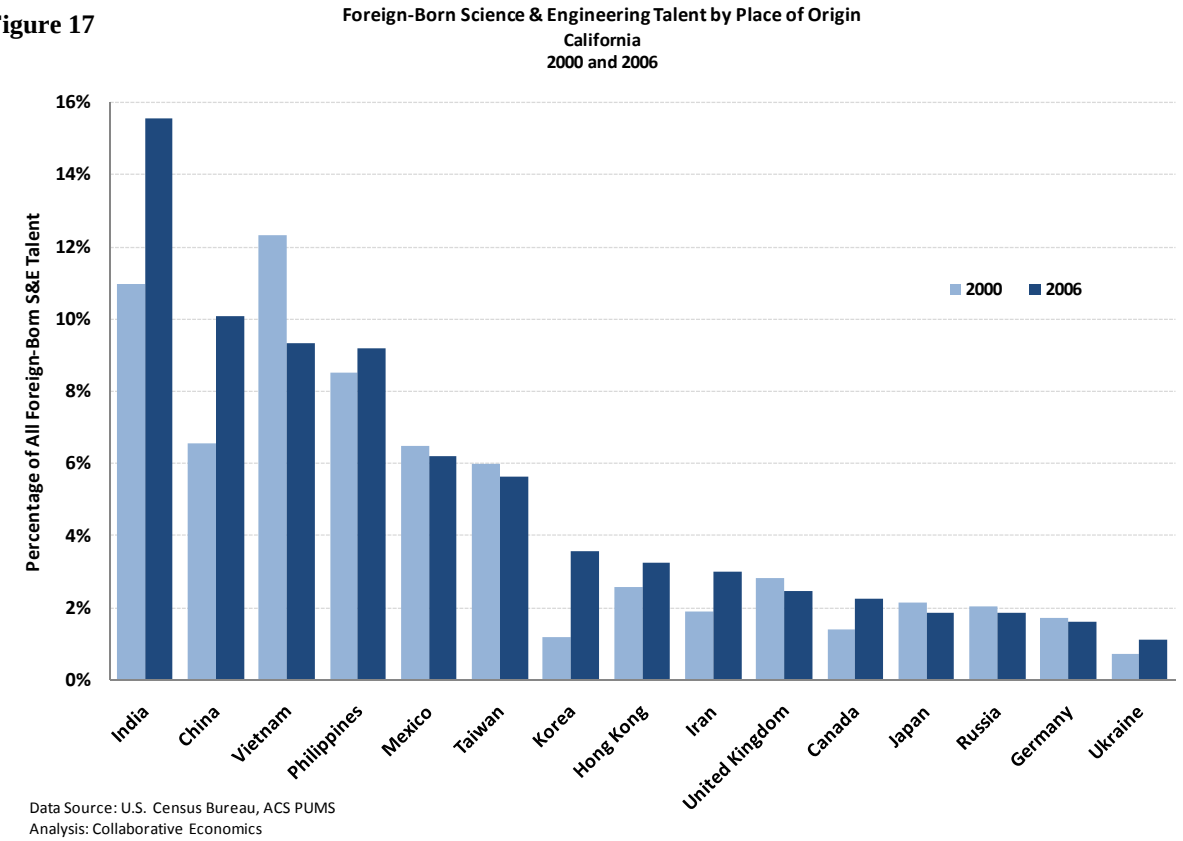
Data Source: U.S. Census Bureau
Analysis: Collaborative Economics

Figure 16



Data Source: U.S. Census Bureau, ACS PUMS
Analysis: Collaborative Economics

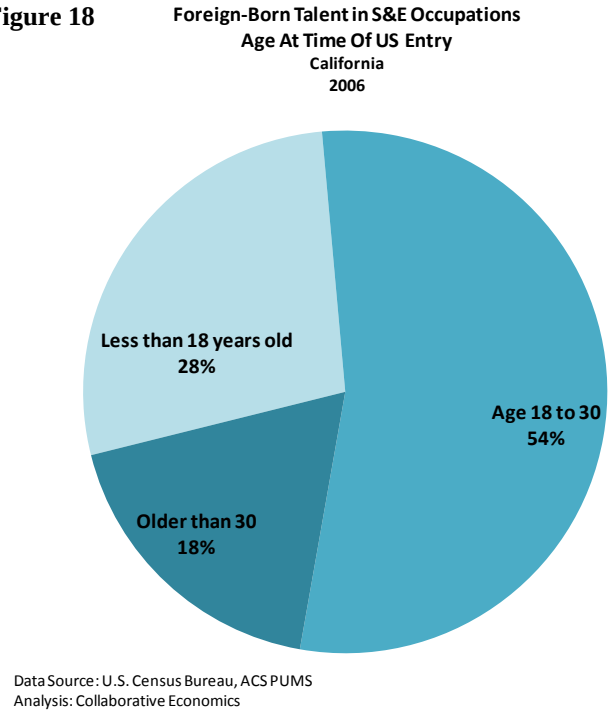
Figure 17



The patterns in the flows of Science & Engineering talent from other countries change over time. The most marked change was in the recent dramatic increases in the percentage of foreign talent stemming from India and China. Between 2000 and 2006, Indian-born talent increased by 4.6% and Chinese-born talent by 3.5%. S&E talent from South Korea increased by 2.4%.

Supporting the research of AnnaLee Saxenian[24] specifically regarding Silicon Valley, most of California's foreign-born Science & Engineering talent entered the U.S. during their college years. Of the foreign-born S&E professionals residing in California in 2006, 54% had entered the U.S. between the ages of 18 and 30. Twenty-eight percent arrived younger than 18, and therefore had spent at least one year in school in the U.S. Only 18% had been older than 30 upon arrival to the country.

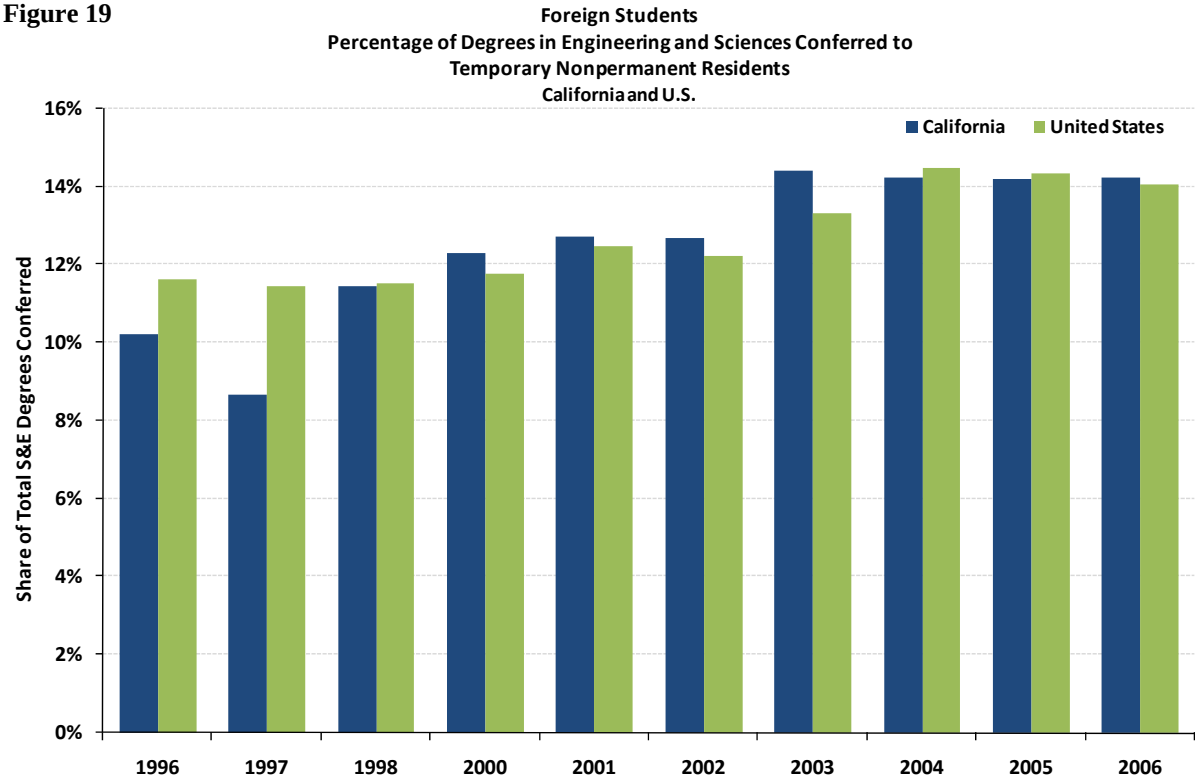
Figure 18



Educating foreign nationals represents a significant high-value service export. In addition, the ability to attract talent from around the world is a core component of a region's innovation assets. Not only does a sizable population of foreign students expand the range of diversity and enrich the innovation environment, the presence of these students vastly enforces the global connections across regions and countries. While at university, foreign students develop networks of relationships here, and whether they work here after graduation and eventually return or stay here, they continue to develop their connections with their home countries. The cross-cultural understanding that develops facilitates the globally distributed business model, easing entries into new markets and standardizing to a degree the language of business. In fact, 30% of students in the top U.S. business schools are nonpermanent U.S. residents.[25]

Foreign students no longer represent a growing portion of total S&E degrees conferred, and California is not remarkably different from the U.S. as a whole. After peaking at 14.5% in 2003, California's percentage of Science & Engineering degrees conferred to nonpermanent U.S. residents has been holding steady just above 14% and close to the U.S.

Figure 19



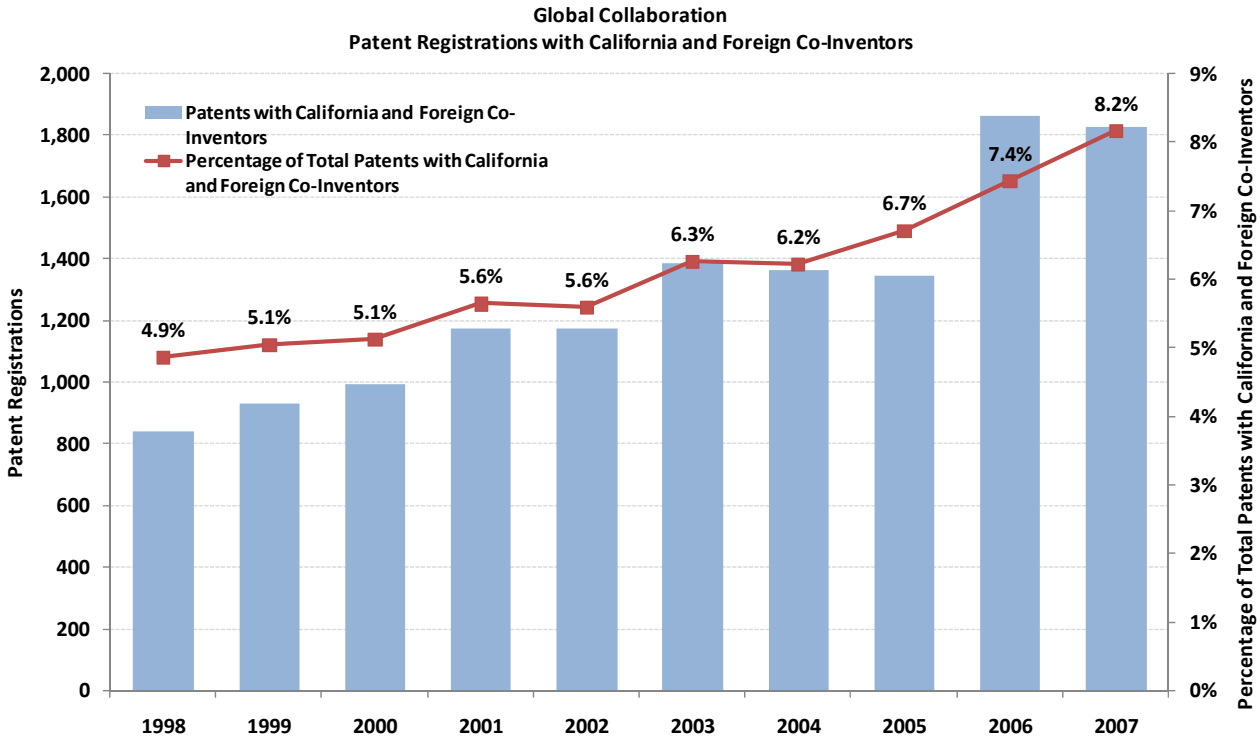
Source: National Center for Education Statistics, IPEDS
Analysis: Collaborative Economics

2.1.4 Idea Flows

As a leader in innovation, California is a leader in the generation of new ideas and the registration of patents. Increasingly, the new ideas codified and protected in a patent stem from a collaborative process among multiple individuals and these persons often are from around the world. While patent analysis typically reports the number of unique registrations by the location of the primary inventor, the analysis presented below tracks the frequency of global collaboration with California inventors.

Between 1998 and 2007, the number of patents in which a California inventor was registered with an inventor from outside the U.S. increased from 844 to 1,828, by 117%. Of all California patents, the percentage of registrations with a foreign co-inventor increased from 5% in 1998 to 8% in 2007.

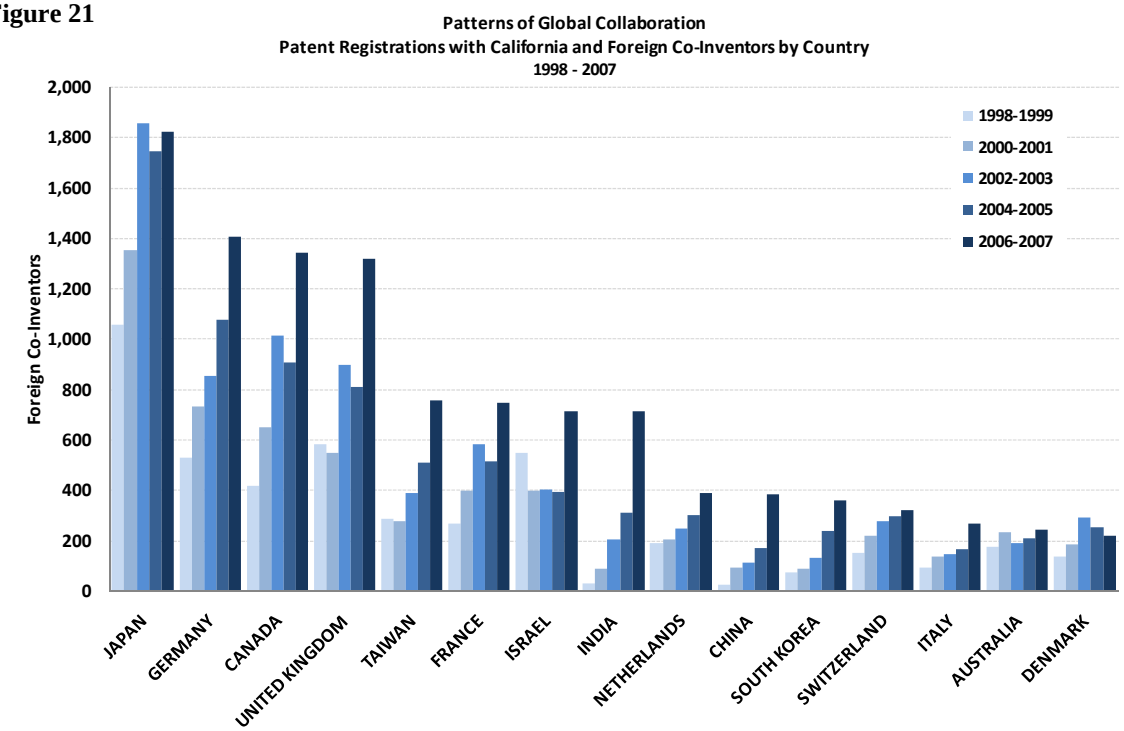
Figure 20



	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Total Foreign Co-Inventors	*2,827*	*3,294*	*3,100*	*3,989*	*4,292*	*5,003*	*4,687*	*4,756*	*6,617*	*6,301*

Note: Patent counts refer to all patents with an inventor from California regardless of inventor sequence number .
Data Source: U.S. Patent and Trade Office
Analysis: Collaborative Economics

Figure 21

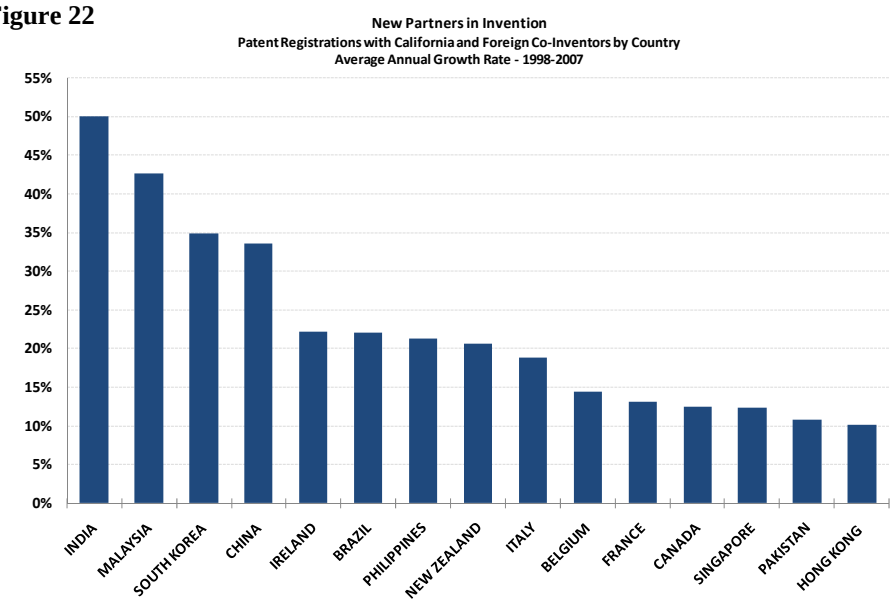


Note: Patent counts refer to all patents with an inventor from California regardless of inventor sequence number .
Data Source: U.S. Patent and Trade Office
Analysis: Collaborative Economics

The five top countries in co-patenting with Californians in 2007 were Japan (945 inventors), Canada (665 inventors), United Kingdom (657 inventors), Germany (551 inventors), and Israel (395 inventors). Across most countries, instances of co-patenting jumped during the two-year period, 2006 and 2007 (**Figure 21**).

Patterns of partnership change over time. The average annual growth rate in co-patenting with Californian inventors between 1998 and 2007 was highest for India, Malaysia, South Korea, and China (**Figure 22**). Malaysia is a newcomer, and although its robust growth rate measures from a small base, it may be an emerging partner with California in the innovation process.

Figure 22



Note: Patent counts refer to all patents with an inventor from California regardless of inventor sequence number .
Data Source: U.S .Patent and Trade Office
Analysis: Collaborative Economics

2.1.5 Global Capital Flows

Flows of capital investment between countries and regions can take many forms. When a country opens of a location of operations outside the home country, this is a capital investment abroad. Another is venture capital and private equity investment which is pooled from sources across the globe and then invested into companies or investment funds anywhere in the world. The analyses that follow include tracking foreign business affiliates in California, California affiliates abroad, employment in foreign-owned establishments in California, and venture capital/private equity investment between California and other countries.

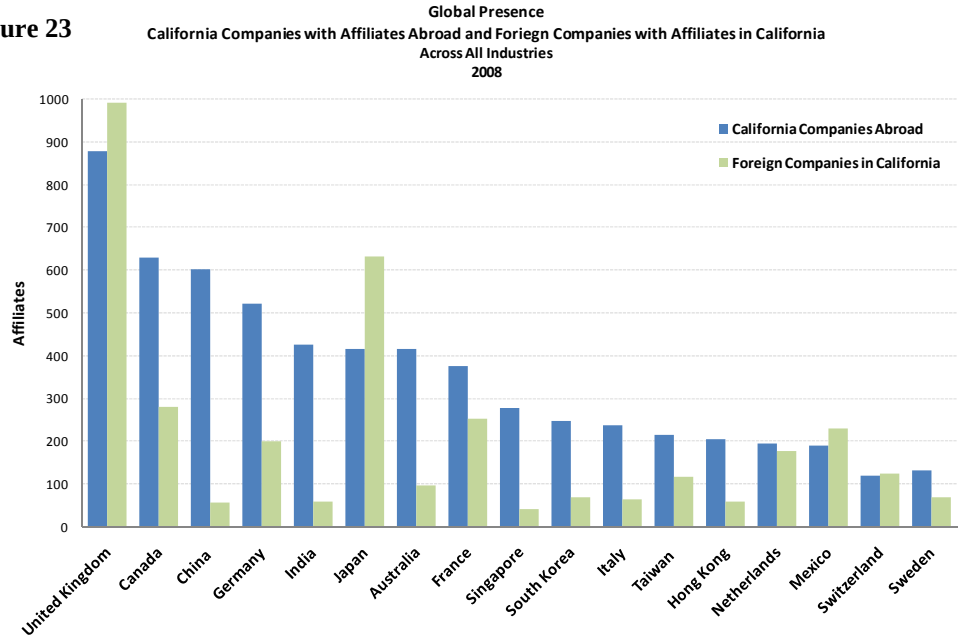
Locating Operations Abroad

Increasingly, companies distribute their operations according to where the specialized talent pools are or where access to markets is eased. At the same time, California companies expand operations across the world while the State attracts companies from around the world to locate operations in California.

Attracting foreign investment is beneficial to a local economy, and California is a top recipient in the U.S. for foreign direct investment (FDI). When foreign companies open up operations in California, they add to productivity by bringing jobs (even in manufacturing), as well as capital, R&D, technology and skills. According to the Los Angeles Economic Development Corporation, in 2003, foreign affiliates paid an estimated $19.1 billion in taxes representing 11% of U.S. corporate tax revenues, and accounted for approximately 19% of all U.S. exports ($169.2 billion).[26]

In 2008, there were 3,623 foreign affiliates located in California. Ninety percent of these came from the 15 countries represented in **Figure 23** below. Business establishments owned by companies from the United Kingdom and Japan make up 50% of all foreign affiliates in California. With 993, the United Kingdom accounts for the largest number followed by Japan with 633 affiliates.

Figure 23



Data Source: Uniworld Business Publications, Inc.
Analysis: Collaborative Economics

Establishing operations abroad varies by industry and location. Interestingly, companies in the manufacturing sector are the most prevalent foreign affiliates among California and foreign companies. As of 2008, there were 7,751 California affiliates abroad and 880 in the U.K. alone. Eighty-one percent of California's affiliates overseas are in the

manufacturing, information, and professional & technical services sectors with modest variation by country (**Figure 24**). Foreign companies with operations in California are primarily in manufacturing, professional & technical services accommodation & food, wholesale, and finance. Nearly two-thirds of Japan's operations in California are in manufacturing and over 20% of the U.K.'s operations are in accommodation and food services.

Figure 24

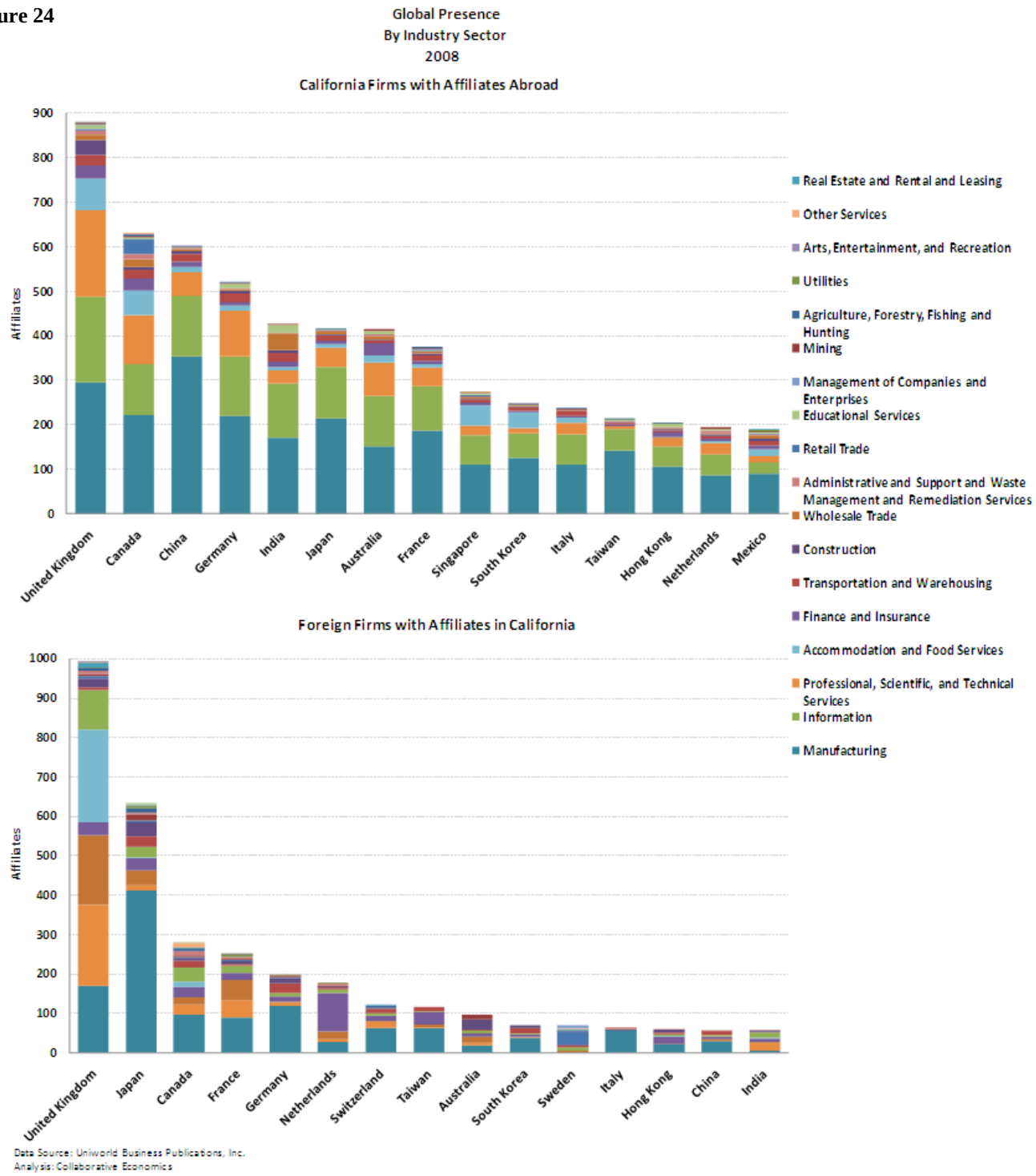
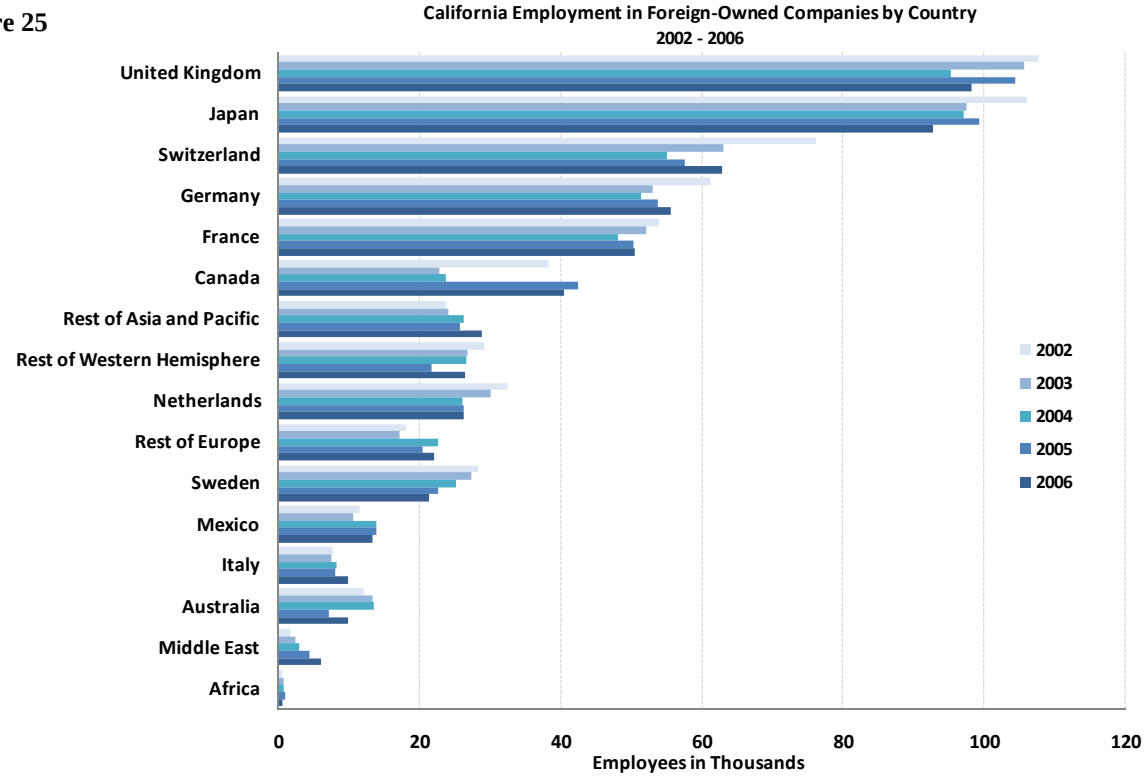


Figure 25

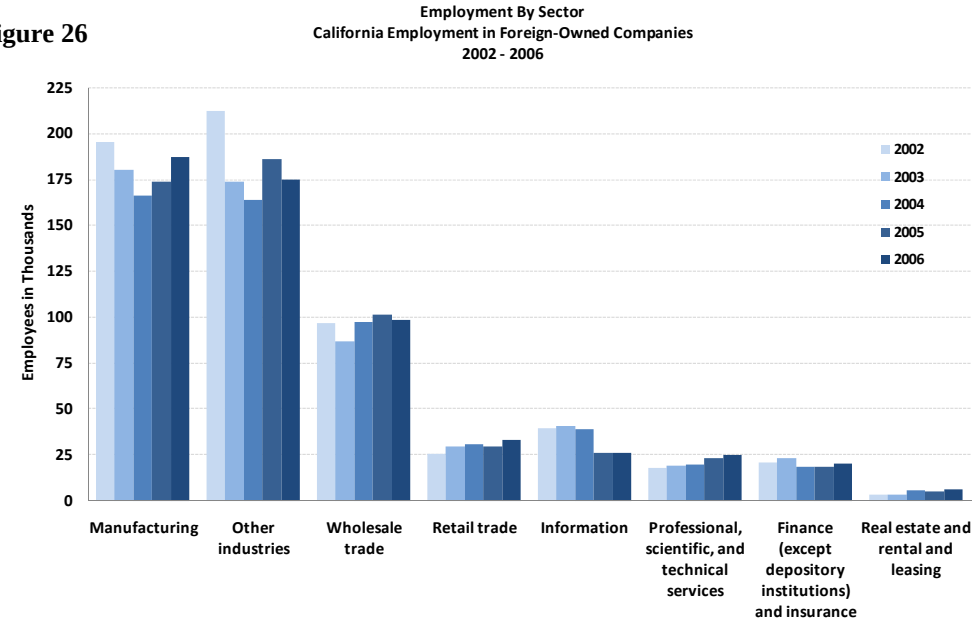


Note: Foreign Direct Investment is a companiy with direct or indirect ownership or control by a foreign person or entity.
Data Source: Bureau of Economic Analysis
Analysis: Collaborative Economics

Foreign-owned companies create jobs in California. In 2006, California accounted for almost 11% of total U.S. employment in foreign-owned firms. The U.S. Bureau of Economic Analysis maintains data on employment in affiliates of foreign firms. With 98,200 employees in 2006, the United Kingdom accounts for the largest portion of California employment in foreign-owned firms followed by Japan with 92,600 employees (**Figure 25**). Between 2002 and 2006, employment increased in firms from Switzerland, Germany, and Canada.

The manufacturing industry sector represents the largest amount of employment foreign-owned companies and increased 8% in 2006. Between 2002 and 2006, employment in Professional, Scientific, and Technical Services increased 7.7% and dropped Information.

Figure 26

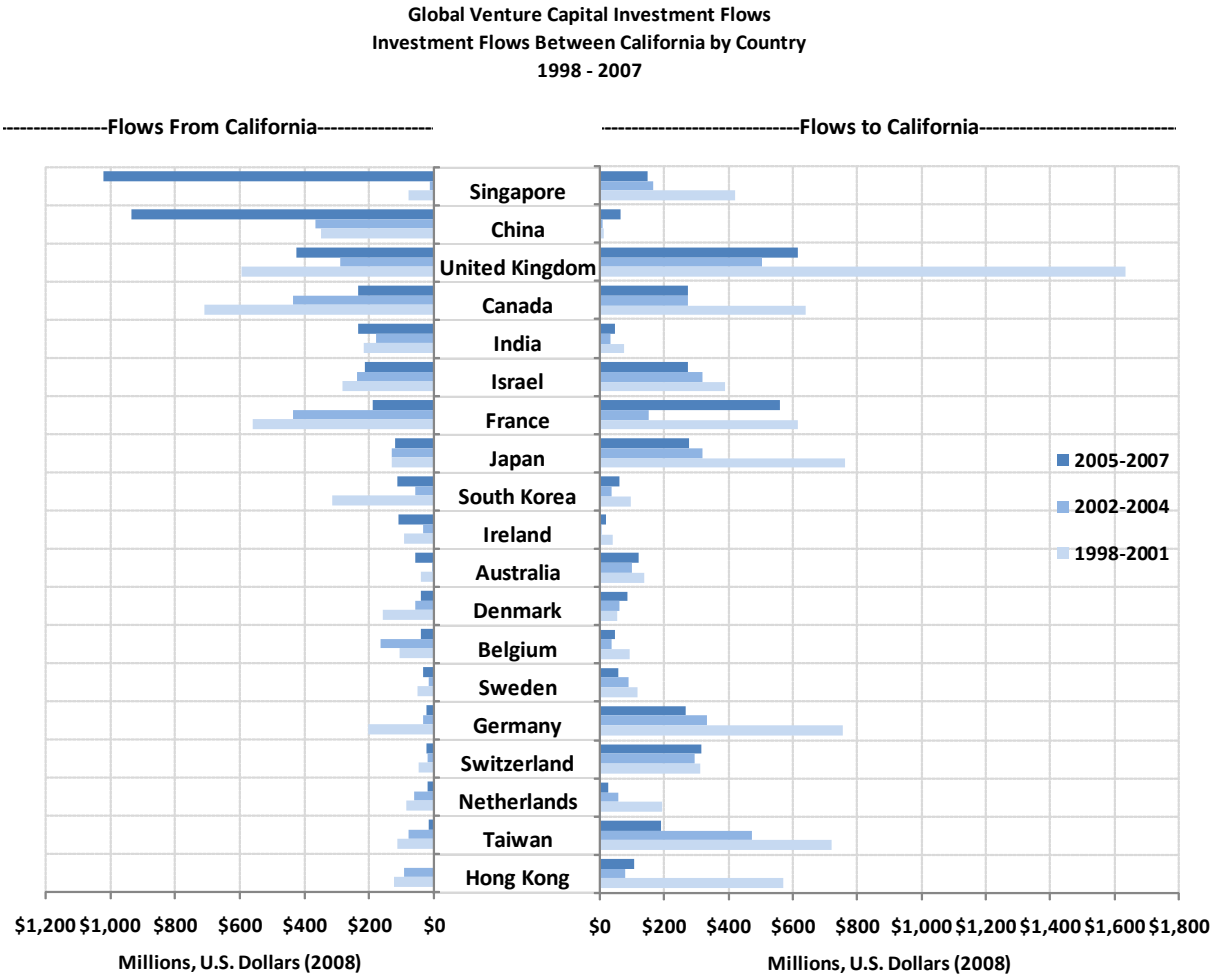


Note: Foreign Direct Investment is a companiy with direct or indirect ownership or control by a foreign person or entity.
Data Source: Bureau of Economic Analysis
Analysis: Collaborative Economics

Flows of Venture Capital

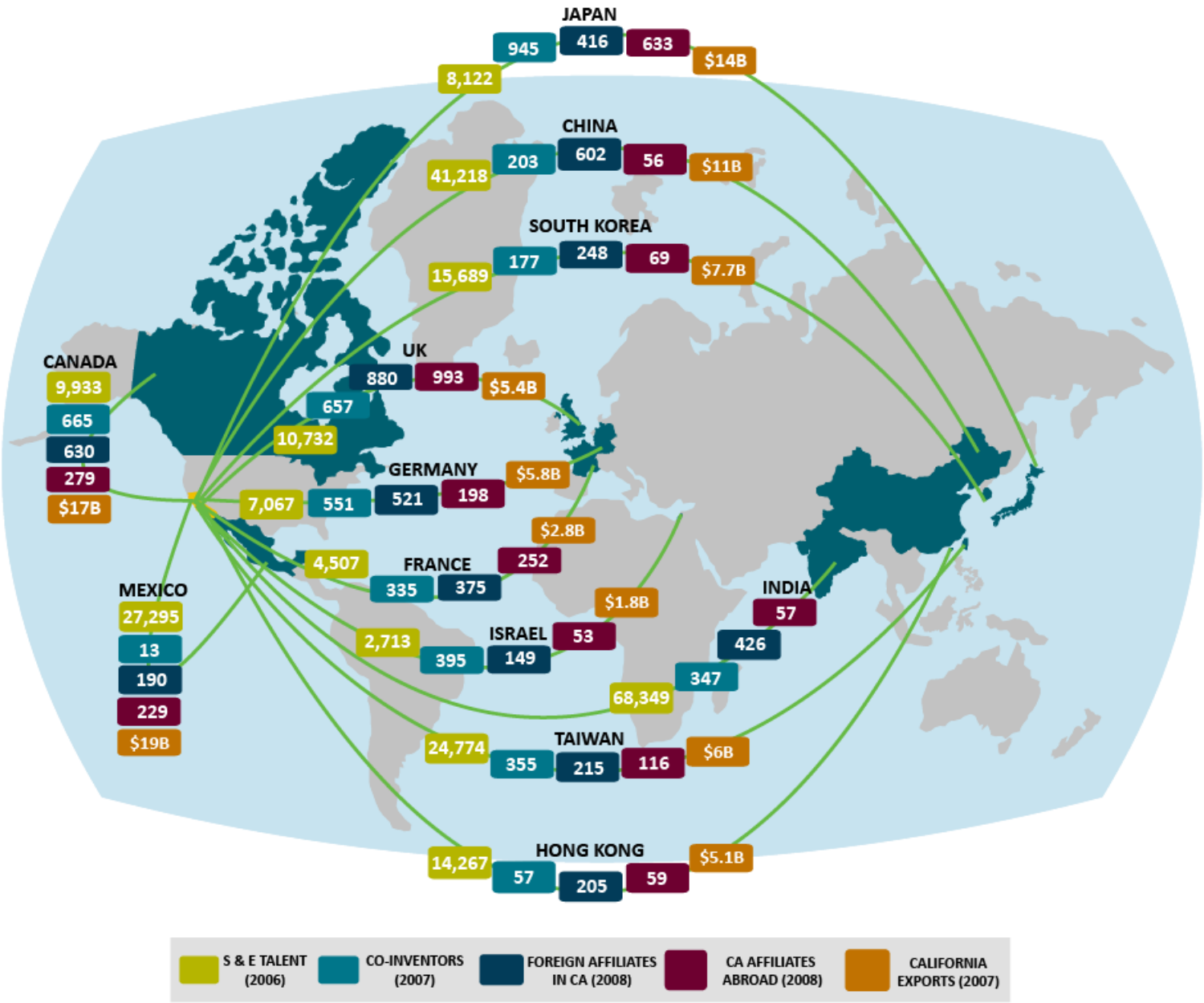
Foreign investment also comes in the form of venture capital investments. Importantly, tied to investment flows are human interactions that disseminate knowledge, expand personal and institutional networks, and build trust across cultures. There is a robust flow of venture capital and private equity funds to and from California. During the most recent period, 2005 to 2007, investment flows from California have been strongest to Singapore and China. Over $1 billion flowed from California to Singapore and $933 million to China. Patterns of investment shift over time. A decade before, flows were strongest to Canada, the U.K. and France. Although the total value of investments into California dropped since the earliest period 1998 and 2001, other countries continue to invest in California. The chief sources in the recent period were the U.K. and France, investing $618 million and $560 million respectively.

Figure 27



Note: Venture Capital Investment includes private equity and venture capital deals.
Data Source: Thomson Financial
Analysis: Collaborative Economics

California's Global Connections



Policy Implications

The global economy is quickly transforming. These changes are posing the California Economic Strategy Panel with new challenges and yet new opportunities are also emerging. The Panel is tasked to determine how California can take advantage of its position at an important nexus of the global innovation network and as a broker in the global economy.

- How can California strengthen its innovation assets?
- How can the State strengthen its global connections and expand its presence abroad?
- What forms of connections are California's companies actively seeking abroad? How can the State be supportive?
- What efforts can be pursued to ensure the State's educational system (K-12 and universities) is globally competitive?
- How can we create and support regional innovation brokers?

End Notes

[1] James Fallows, 2008. "China's Silver Lining," *Atlantic Monthly* (June 2008).
[2] This concept is based on Paul Romer's new growth theory and adapted from Bay Area Economic Institute's "The Innovation Driven Economic Development Model," (September 2008).
[3] See Joseph Schumpeter. 1934 (1996). *The Theory of Economic Development*. Transaction Publishers.
[4] See Henry Chesbrough. 2003. *Open Innovation: The New Imperative for Creating and Profiting from Technology*. Cambridge: Harvard Business School Press.
[5] As of 2006, the State's gross domestic product (i.e. the market value of the goods and services produced by labor and capital) was $1.7 trillion, positioning California just below Italy and above Canada. The State's GDP represented 13% of total U.S. output. U.S. Bureau of Economic Analysis. Gross Domestic Product by State. http://www.bea.gov/bea/regional/gsp/action.cfm; World Development Indicators database, World Bank, 1 July 2007. http://www.labor.ca.gov/panel/pdf/GDP.pdf
[6] Thomas Friedman. 2008. *Hot, Flat, and Crowded*. New York: Farrar, Strauss, Giroux.
[7] Hilsenrath, Jon, Greogry Zuckerman and Craig Karmin. 2008. "Dollar's Rise Could Damp Inflation." *Wall Street Journal*. (August 16, 2008).
[8] Container data by port: www.portoflosangeles.org/maritime/stats.asp
[9] Economist Aug 14, 2008 "Rebalancing Act" The global Economy. *The Economist*.
[10] Keith Bradsher. 2008. "Booming China Suddenly Worries That a Slowdown Is Taking Hold." *New York Times*. (August 5, 2008).
[11] Ajay Goel, Nazgol Moussavi, Vats Srivatsan. 2008. "Time to Rethink Offshoring?" in Operations, *The McKinsey Quarterly*. (September 2008).
[12] Stewart, W. 2008. "'Made in USA' starts to make a return." *Washington Times*. (July 28, 2008).
[13] Levinson 2006 p. 269
[14] *Economist*. 2007. "Face Value, Dov Charney, the Hustler" January 4, 2007.
[15] http://www.teslamotors.com/blog2/
[16] The State of California will finance the purchase of $100 million worth of manufacturing equipment and then lease it to Tesla, which will have the option to buy the equipment tax-free. Thanks to the City of San Jose, Tesla will pay no rent for the first 10 years and $1.5 million annually the following 10 years after which the rent will be adjusted for inflation each year. http://www.sfgate.com/cgi-bin/article.cgi?f=/c/a/2008/09/18/BUF312VVPP.DTL&type=autos
[17] These concepts are adapted from Bay Area Economic Institute's "The Innovation Driven Economic Development Model," (September 2008).
[18] http://www.bayareabasic.org//
[19] http://globalconnect.ucsd.edu/; http://www.connect.org/
[20] Health Sciences and Services - *Golden Opportunity, Growing Crisis: The Health Sciences and Services Cluster* (September 2004)
Manufacturing Value Chain - *Manufacturing in Transformation: Economic Change and Employment Opportunities in the Design, Production, and Logistics Value Chain* (September 2004)
Logistics - *Logistics and Manufacturing Value Chains: Meeting the Workforce and Infrastructure Demands of a "Real Time" Economy* (July 2005)
Food Chain - *California's Food Chain at Work: Agriculture Production, Processing, Distribution, and Support* (November 2006)
Infrastructure - *California's Golden Opportunity Building a World-Class Infrastructure through Innovation and Collaboration* (November 2006)
[21] Figure is reported in 2008 dollars. News release for U.S. International Trade in Goods and Services from the Bureau of Economic Analysis: http://www.bea.gov/newsreleases/international/trade/2008/pdf/trad0808.pdf. On page 4 in exhibit 1, the total value of exports for the U.S. in 2007 was $1,645,726,000,000 (reported in 2007 dollars, in millions of dollars).
[22] Peter Marsh. 2008. "U.S. unmoved by imminent loss of industry top slot." *Financial Times*. (August 10, 2008).
[23] Growing faster than China but with accounting for only $2 billion each in California exports, are India (167%), Brazil (140%), and Switzerland (124%).
[24] AnnaLee Saxenian. 1994. *Regional Advantage*. Cambridge: Harvard University Press.
[25] Harold L. Sirkin, James W. Hemerling, Arindam K. Bhattacharya. 2008. *Globality*. New York: Business Plus.
[26] Kyser, J. 2008. "Foreign Direct Investment in Los Angeles County." Los Angeles County Economic Development Corporation. (July 2008).