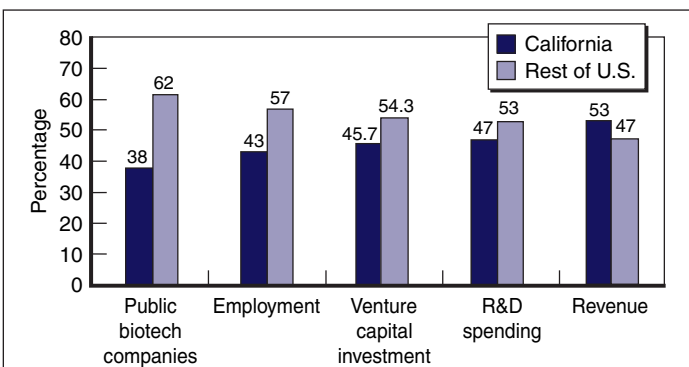


California's Edge in Biotechnology

California is the birthplace of the U.S. biotechnology industry and home to a lion's share of the industry (see the figure). Other states, however, have their eye on California's biotech industry. All 50 states in the nation have developed strategies to promote their own biotech economy, and many not only look to California for lessons and ideas but also seek to recruit the state's talent and companies. In the biotech manufacturing area, California is particularly vulnerable because of the state's high cost of doing business.

California's Share of the U.S. Biotechnology Industry, 2002



SOURCES: Ernst & Young, *Beyond Borders: The Global Biotechnology Report 2002*, New York, 2002; Industry-University Cooperative Research Program, *Overview: Industry-University Cooperative Research Program, 1996-2002*, 2003, available at http://uc-industry.berkeley.edu/pdf/performance_report.pdf; and author's calculations.

California's biotechnology industry employed 60,000 people and generated over \$13 billion dollars in 2002.

In *The Dynamics of California's Biotechnology Industry*, Junfu Zhang and Nikeshe Patel provide a detailed examination of the biotech industry in California. They look in particular at the relationship between venture capital and the formation of new firms, the entrepreneurs who start these firms, and the extent to which biotech firms are leaving California. Their data show more biotech establishments have moved out of California than have moved in. However,

this net loss of businesses has not caused a net job loss in California, because more employees in this sector have moved into the state than have left the state.

Dynamics of the Biotechnology Industry

Biotechnology refers to techniques that are used to genetically modify living organisms to produce marketable products. Today, the biotechnology industry is generally considered to include firms that specialize in genetic research, the development of genetically engineered therapeutic proteins and antibodies, and the manufacturing of such biotech drugs and vaccines; companies that develop or produce genetically modified agricultural products; and companies that apply genetic engineering techniques to industrial production and environmental management.

In Silicon Valley, biotech is generally expected to be one of the growth engines that pulls the region out of the economic decline it has experienced since the burst of the Internet bubble in 2001. Yet today, the industry remains relatively small, although it is evident that it has considerable upside potential.

Biotech is sometimes misperceived as just another high-tech industry like the computer, semiconductor, and software industries. However, the biotech industry differs from the information technology (IT) industries in many ways. Biotech is substantially more knowledge intensive and relies more on academic research as a source of innovation and entrepreneurship. Biotech firms do not expect profits for a long period of time and lose money for years before developing a marketable product. Although it is widely applicable, biotech is not an "enabling technology" like IT, which lays the foundation for other industries and promotes growth in many other sectors. As a result, it is likely that biotech will change the economy less dramatically and at a slower pace than information technology.

Although the biotech industry relies heavily on venture capital investment and venture capital is essential for the development of biotech, it is not sufficient for creating a strong biotech industry. Scientific research is the powerful driver of the biotech economy. Industry leaders such as Amgen, Biogen, and Genentech were all founded or co-founded by prominent professors. These “star scientists” are an important factor in determining the timing and location of firm founding in the biotech industry. Scientists working at universities or research institutes have founded close to half of all venture-backed start-ups—firms with the greatest growth potential. About two-thirds of these professional entrepreneurs chose to remain in the same state to start their biotech firms. In California, the fraction is even higher. Eighty-two percent of California’s professorial entrepreneurs started their biotech firms in California. Thus, venture-backed biotech start-ups often represent technology transfers from academic institutions to the industry, and such transfers often take place locally.

The authors’ analysis shows that biotech business relocating from California to other states has had negligible effects on the state economy. For example, during 1990 to 2001, 52 biotech establishments moved out of California, together eliminating 815 jobs. During the same period, 45 establishments moved into California, adding 1,739 jobs to the California economy.

For some states, recruiting existing firms or their manufacturing facilities from California’s major biotech centers (located in San Francisco, Los Angeles, and San Diego) is more attractive than creating new ones. However, although California is undoubtedly a high-cost state in which to do business, it is not in an entirely disadvantageous position to compete for biotech manufacturing and related services. The industry is already concentrated in California, and many firms prefer to locate manufacturing close to research and development operations. California’s strength in research, long tradition of venture capital investment, high quality labor pool, as well as its large share of the U.S. biotech industry, will continue to make it one of the most attractive places to form biotech companies.

Policy Discussion

In the area of biotech, California enjoys many advantages. The recently passed Proposition 71 will further enhance California’s advantageous position. It pledges a tremendous amount of financial support to stem cell research, which is likely to tilt the playing field of biotech in favor of California. It could also make the Golden State a magnet for bioscientists, whose research will feed the industry with innovative ideas.

The authors note that the state government has already been supportive of California’s biotech industry, promoting its research and commercialization through legislation and government programs. In thinking about ways to further cultivate the industry, the authors suggest three priorities for policymakers.

Support biotech research. California’s largest advantage in biotech is its world-renowned universities. As long as California’s universities continue to conduct pioneering research in biological, medical, and chemical sciences, California will continue to lead the biotech industry. While Proposition 71 will greatly boost stem cell research, many other areas of biomedical research are equally in need of support. Policymakers should remain wary of cutting research budgets in the University of California system. California’s Washington delegation could help secure federal funding for biotech R&D.

Facilitate technology transfer to the industry. Incentives can be created to encourage technology transfer from universities to businesses. Both state and local governments can sponsor biotech incubators near major research institutions to help accelerate the process of commercialization of technology through entrepreneurship among academics.

Accommodate biotech manufacturing. State government could establish an office to develop short- and long-term plans to prepare for the industry’s growth. This office could educate policymakers and the public, coordinate local activities and partnerships, monitor the industry’s progress, and respond to its needs and concerns.

This research brief summarizes a report by Junfu Zhang and Nikesh Patel, The Dynamics of California’s Biotechnology Industry (2005, 158 pp., \$15.00, ISBN 1-58213-102-3). The report may be ordered online at www.ppic.org or by phone at (800) 232-5343 or (415) 291-4400 [outside mainland U.S.]. A copy of the full text is also available on the Internet (www.ppic.org). The Public Policy Institute of California is a private, nonprofit organization dedicated to independent, objective, nonpartisan research on economic, social, and political issues affecting California.

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