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The Integration of Trade into California Industry: Case Studies of the Computer Cluster and the Food Processing Industry

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### Authors

Kroll, Cynthia A.  
Kirschenbaum, John

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**The Integration of Trade into California Industry:  
Case Studies of the Computer Cluster and the Food Processing Industry**

by

Cynthia A. Kroll  
Josh Kirschenbaum

**Fisher Center for Real Estate and Urban Economics  
Haas School of Business  
University of California  
Berkeley, CA 94720-6105**

510/643-6112 [kroll@haas.berkeley.edu](mailto:kroll@haas.berkeley.edu)  
510/642-2897 [convert@ced.berkeley.edu](mailto:convert@ced.berkeley.edu)

**(Fourth in a series of working papers on the general topic of *Foreign Trade and California's Growth*, by Dwight M. Jaffee, Cynthia A. Kroll, Ashok Deo Bardhan, Josh Kirschenbaum, David Howe)**

**Working Paper: 98-260**

February 1998

**Foreign Trade and California's Growth**  
*A Series of Working Papers*

This working paper is part of a series of papers that report on the results of a 15-month research project funded by the California Policy Seminar under its Policy Research Program. The full series of working papers is listed here.

Kroll, Cynthia A. *Foreign Trade and California's Economic Growth: Issues and Research Approach*, Working Paper 98-257. Fisher Center for Real Estate and Urban Economics, University of California, Berkeley, 1998.

Jaffee, Dwight M. *International Trade and California's Economy: Summary of the Data*, Working Paper 98-258. Fisher Center for Real Estate and Urban Economics, University of California, Berkeley, 1998.

Jaffee, Dwight M. *International Trade and California Employment: Some Statistical Tests*, Working Paper 98-259. Fisher Center for Real Estate and Urban Economics, University of California, Berkeley, 1998.

Kroll, Cynthia A., and Josh Kirschenbaum. *The Integration of Trade into California Industry: Case Studies of the Computer Cluster and the Food Processing Industry*, Working Paper 98-260. Fisher Center for Real Estate and Urban Economics, University of California, Berkeley, 1998.

Bardhan, Ashok Deo, and David K. Howe. *Globalization and Labor: The Effect of Imported Inputs on Blue Collar Workers*, Working Paper 98-261. Fisher Center for Real Estate and Urban Economics, University of California, Berkeley, 1998.

Bardhan, Ashok Deo, and David K. Howe. *Transnational Social Networks, Transportation Costs, and the Geographic Distribution of California's Exports*, Working Paper 98-262. Fisher Center for Real Estate and Urban Economics, University of California, Berkeley, 1998.

Kroll, Cynthia A. *Foreign Trade and California's Economic Growth: A Summary of Findings and Directions for Policy*, Working Paper 98-263. Fisher Center for Real Estate and Urban Economics, University of California, Berkeley, 1998.

The work is also reported in two publications of the California Policy Seminar:

The research is summarized in depth in Cynthia A. Kroll, Dwight M. Jaffee, Ashok Deo Bardhan, Josh Kirschenbaum and David K. Howe, *Foreign Trade and California's Economic Growth*, California Policy Seminar, Berkeley, 1998. A much briefer summary is available in a California Policy Seminar *Policy Brief* of the same title.

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**The Integration of Trade into California Industry:  
Case Studies of the Computer Cluster and the Food Processing Industry**

**Abstract**

The growing role of foreign trade in California's economy is affecting the production structure and employment base of California industries. Case studies of the computer cluster and the food processing industry demonstrate how changing global linkages are affecting different sectors. Although both computers and food products are important exports from California, foreign trade plays a much stronger role in the computer cluster than in food processing. Many of the state's largest computer cluster firms (including computer, component and peripheral manufacturers) sell between one and two thirds of their output abroad. However, although the firms are headquartered in California, much of this output is produced at overseas locations. These manufacturers import between 15 and 20 percent of inputs to products manufactured in California. Computer software firms in general are less directly integrated into global markets for both sales and production, but their global sales and production activity is growing. Food processing firms headquartered in California are much more likely than computer firms to maintain the large majority of production within the state. With the exception of almond and citrus packagers, most food processing firms export 10 percent or less of their output. Similarly, they make little use of imported inputs. Food processing is a stable, rather than a growing industry in the state, and most producers are concerned with maintaining a balance between production capacity in the state and the existing domestic market, rather than with expanding foreign sales. With such different production processes, location considerations and policy concerns vary among the two industries. Nevertheless, California offers (different) location advantages to each industry. Interview respondents from both industries were more concerned with maintaining key competitive resources in California (e.g. skilled labor, growing conditions) and assistance in expansion needs or meeting regulatory requirements, rather than with state assistance in export promotion.

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# **The Integration of Trade into California Industry: Case Studies of the Computer Cluster and the Food Processing Industry**

## **Introduction**

The data on trade through ports and on exports at the state level make it clear that foreign trade is growing increasingly important in state economies.<sup>1</sup> California, for example, saw a 66 percent increase in exports and a 78 percent increase in trade through major ports between 1990 and 1995, a period when income grew by 20 percent and employment showed little change. However, the summary estimates that can be made for California from available data on foreign trade are quite limited, as discussed in related working papers.<sup>2</sup> Many global linkages that affect the state's economy and firms within the state cannot be measured with the available trade data. Data on exports from California are available only at a very aggregated level (in terms of industries), while there is no data on the destination of imports by state. There is even less documentation of other ways in which sales to foreign markets may affect California firms, for example through the investment of California firms abroad.

One remedy for this lack of data is through detailed case studies of industries, company by company. This paper reports the results of case studies of two California industrial sectors that play a significant role as exporters from the state. In this paper, we delineate in some detail the ways in which the global economy may influence the operations of California companies. We then select two very different sectors--the computer cluster and the food processing industry, and examine their worldwide

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<sup>1</sup> See Rondinelli and Vastag 1997.



operations in detail, to better illustrate the ways in which global economic forces are affecting the pace, location, and structure of growth in California industries.

### **A Model of Global Integration on a State Economy**

In many states, exports are the focus of efforts to benefit from foreign trade, but foreign trade actually impacts a state's economy through many other mechanisms in addition to exports. Trade can have both positive and negative effects on a state's economy, and indirect effects may counteract some of the direct effects.<sup>3</sup> There is no doubt that foreign markets provide a growing source of export demand for many products produced in the US. However, as US companies strive to meet the growing demand overseas, foreign companies may be equally diligent in trying to meet US demand, thus spurring the growth of imports as well as of exports. Of industries significant to California, for example, US industrial equipment exports (SIC 35, including computers, SIC 357) grew by 46.5% between 1991 and 1995 (by 68.1% in California), while import growth to the US in this industry has been 91%. Exports of food products (SIC 20) grew by 48.6%, while imports grew by 19.1%.

Net trade balance figures are not available at the statewide level. Even if they were, a net trade balance does not fully indicate the opportunities and challenges of an increasingly global economy. First, a small positive or negative balance could indicate either a sector where trade is relatively unimportant or one where competition is intense for sales both abroad and domestically, and flows of exports and imports are very large.

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<sup>2</sup> See Jaffee 1998a and 1998b.

<sup>3</sup> See Jaffee 1998b.

Second, besides providing markets and competing producers, foreign countries may also provide a labor force for domestic firms, so that products sold to foreign markets may be produced overseas, with only administrative and research and development related to those sales remaining in the US. Third, in addition to the import of final products, US producers may import inputs from foreign producers or from their own overseas divisions or subsidiaries, or may export products that are used as inputs by foreign competitors. Finally, to improve access to US markets, foreign firms may locate divisions within the US, or enter into joint venture agreements with US companies.

California firms may participate in an increasingly global economy in several ways, depending on the firm size, production process, market area, and, to some extent, personal characteristics and preferences of the owners and management. Drawing from our observations, we separate firms into different types, depending on their degree of globalization.<sup>4</sup> Some industries, such as the computer cluster, may include firms representing each stage of globalization. Other sectors, such as food processing, may have firms primarily at the early stages of globalization.

*Stage I--Export Base*--Classic regional economics assumes a local firm is a distinct entity, located within the region, employing local labor (or labor that migrates to work in the region). Sales may be within or outside the region, and a portion of sales may be outside of the country. Inputs may be purchased locally or imported, either from other parts of the country or from overseas. Overseas markets may affect firms either through the demand or supply side. On the demand side, changing income and tastes overseas will affect the local firm's ability to export its product. On the supply side, production

overseas may have a positive or negative effect on the local firm. Foreign production of a competing product may cut into sales both abroad and in the local market (import competition). Foreign production of inputs will affect the local firm's cost of production, and may reduce costs or improve productivity for the local firm.

*Stage IIA--Raw Materials Variant*--Firms for which raw materials are a significant part of the product (agricultural firms, oil, gas and minerals), for reasons of cost, availability, and environmental regulation, may begin to locate a portion of production overseas. This may occur either to continue to meet demand and compete in domestic markets (a response to high costs of materials or shortages domestically), or to expand sales to foreign market areas (where product shipping costs would be high between market areas, or where perishable products make travel time a consideration).

*Stage IIB--Labor Cost Variant*--Firms for which labor is a significant cost in a portion of the production process may seek a low cost production location outside of the US. This may even occur to satisfy requirements for skilled labor. The move of production overseas may be aimed either at providing products for sale to foreign markets or at producing a lower cost product to be sold domestically. Import competition is likely to be a spur to overseas production, as domestic firms try to lower costs in the face of competition from firms producing in a lower labor cost environment.

*Stage II--More Complex Variants*--Cost-related factors may combine with other production-related concerns to determine where firms locate overseas production sites. Sites that combine sophisticated production techniques and access to suppliers with lower cost labor become important location sites for technology-dependent firms.

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<sup>4</sup> The location activity noted here is consistent with product cycle theory, as summarized in Shove 1996

*Stage III--Production to Market--*As firms begin to sell large amounts in overseas markets, they may find advantages to producing close to foreign markets. Under this model, establishment of foreign production sites would be determined by the location of markets as well as by the location of raw materials or low cost labor.

As firms enter *Stage II* or *Stage III* in their production process, measures of export and import activity will no longer be sufficient to reflect the effect of foreign markets on industry production and employment levels. A rise in sales overseas from an overseas branch of a California firm will contribute to the income of the firm and may help to support increased administrative, research and development, and sales employment domestically. However, the sales will not show up in export numbers, and the rise in the firm's shipments will not be fully reflected in domestic employment growth.

Case studies of the computer cluster and food processing industry help to illustrate the degree to which California firms are becoming integrated in the global economy, providing a picture of the overall impact of global trade that cannot come from summary statistics. By concentrating on the structure of firms, firm location decisions and the flows of firm inputs and outputs across borders, we are able to identify direct and indirect paths by which global trade may affect California employment.

### **Selecting the Case Study Industries**

We selected two case study sectors based on several criteria. First, the industries had to have significant foreign trade components, either as export sectors, or as sectors affected by import competition. In California, high tech sectors dominate exports, as

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and described further in Markusen 1985, Malecki 1979 and 1985 and Miller 1989.

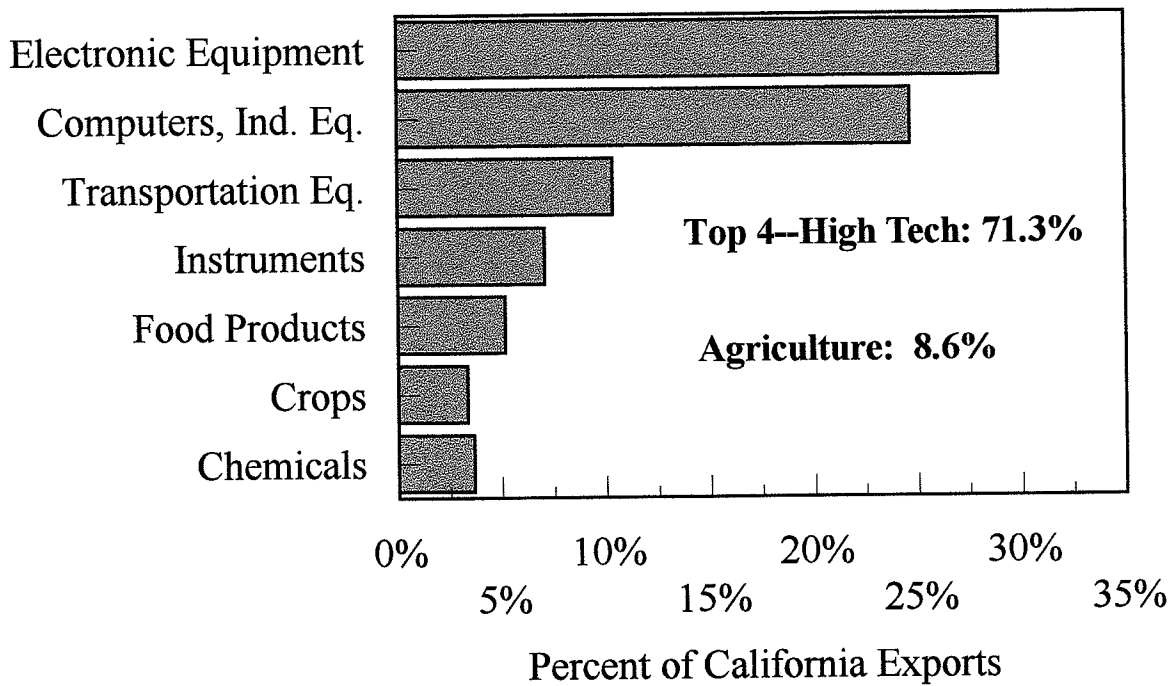
shown in Figure 1. High tech manufactured products represent 70% of the state exports, and the top two export sectors--electronic equipment and industrial equipment, are both computer-cluster-related sectors. After high tech manufacturing, food products and agricultural crops are the next most important exports. Food products alone represent more than 5% of state exports, and agriculture as a whole, including crops, represented 8.6% of exports in 1995. Both of these sectors saw significant export growth between 1990 and 1996. The computer cluster is also a sector significantly affected by imports, as shown in Figure 2.

Second, the industries had to be major employers in the state. At the two digit level, the largest manufacturing industries in the state have between 100,000 and 200,000 employees, as shown in Table 1, while services sectors can be much larger, as shown in Table 2. The computer cluster, which includes parts of SIC Codes 35, 36 and 73, has approximately 350,000 employees, while food products includes close to 170,000 in manufacturing but also is supported by over 350,000 in agricultural production and services (see Table 3).

Third, we were interested in dominant industries in California, sectors where California operations were a significant share of the US as a whole. California has 27 percent of US computer and office equipment manufacturing employment (SIC 357), 24 percent of US electronic component manufacturing employment (SIC 367), 22 percent of US preserved fruits and vegetables manufacturing employment (SIC 203), and 29 percent of US employment in prepackaged programs (SIC 7372). (See Figures 3 and 4).

In addition to these basic criteria (which fit a number of other industries beyond the two chosen), we also aimed to provide some breadth in coverage by balancing the two

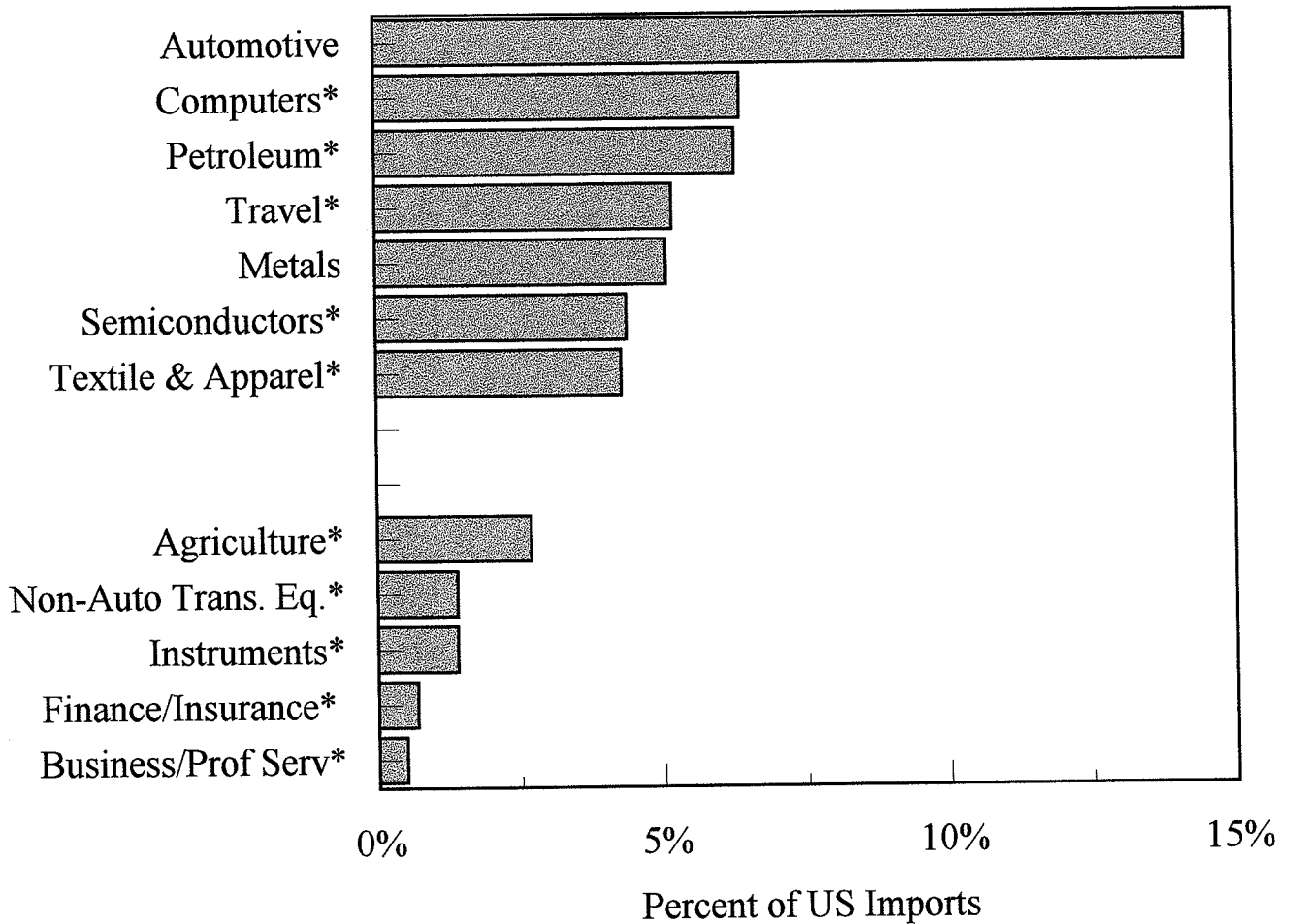
Figure 1  
Top California Merchandise Export Sectors  
Percent of California Exports, 1995



Source: Authors from California World Trade Commission

Figure 2

## US Top Import Sectors, 1995 and US Imports, Other Key California Sectors



\* Key California Presence

Source: Authors from Survey of Current Business, July 1996.

Table 1  
California's Largest Manufacturing Sectors  
(2 Digit and 3 Digit SIC Codes)

	SIC Code	Employment		SIC Code	Employment
2 Digit			3-Digit		
Electronic Equipment	36	226,441	Electronic Components	367	124,499
Transportation Equipment	37	209,952	Aircraft/Parts	372	95,478
Food and Kindred Products	20	168,668	Women's Outerwear	233	82,496
Industrial Machinery and Equipment	35	166,817	Missiles/Space Vehicles	376	68,978
Instruments and Related Products	38	163,729	Plastics-Misc.	308	63,909
Printing and Publishing	27	154,509	Computers	357	68,414
Apparel and other Textile Products	23	133,912	Commercial Printing	275	57,893
Fabricated Metal Products	34	124,308	Search and Navigation Eq.	381	57,862
Rubber and Plastic	30	82,759	Newspapers	271	48,839
Chemicals and Allied Products	28	58,750	Medical Instruments	384	47,619
Furniture and Fixtures	25	47,439	Measuring and Controlling Devices	382	46,766
Lumber and Wood Products	24	47,366	Preserved Fruits and Vegetables	203	43,060
Stone, Clay and Glass Products	32	42,229			
Miscellaneous Manufacturing	39	37,906			
Paper and Allied Products	26	36,950			
Petroleum and Coal Products	29	14,360			
Textile Mill Products	22	10-25,000			
Leather and Leather Products	31	5-10,000			
Tobacco Products	21	<20			

Source: Taken from County Business Patterns, 1993, CD-Rom files.



Table 2  
California's Largest Services Sectors  
(Excluding 3-Digit Health Care)

Sector	SIC Code	Employment
<b>2 Digit</b>		
Health Services	80	993,562
Business Services	73	785,036
Engineering and Management	87	369,667
Motion Pictures	78	213,328
Social Services	83	206,079
Educational Services	82	197,471
Membership Organizations	86	189,564
Hotels and Other Lodging	70	177,862
Amusement and Recreation'	79	172,414
Legal Services	81	135,728
Personal Services	72	131,966
Auto Repair and Parking	75	125,878
Miscellaneous Repair	76	49,249
Services N.E.C.	89	11,798
Museums, Botanical, Zoological Gardens	84	6,973
<b>3 Digit</b>		
Personnel Supply	736	261,258
Misc. Business Services	738	171,256
Hotels/Motels	701	170,467
Motion Picture Production	781	161,856
Computer/Data Proc.	737	156,101
Misc. Amusement/Rec.	799	119,140
Religious Organizations	866	112,871
Engineering/Architecture	871	111,647
Management/Public Rel.	874	106,747
Colleges/Universities	822	105,917

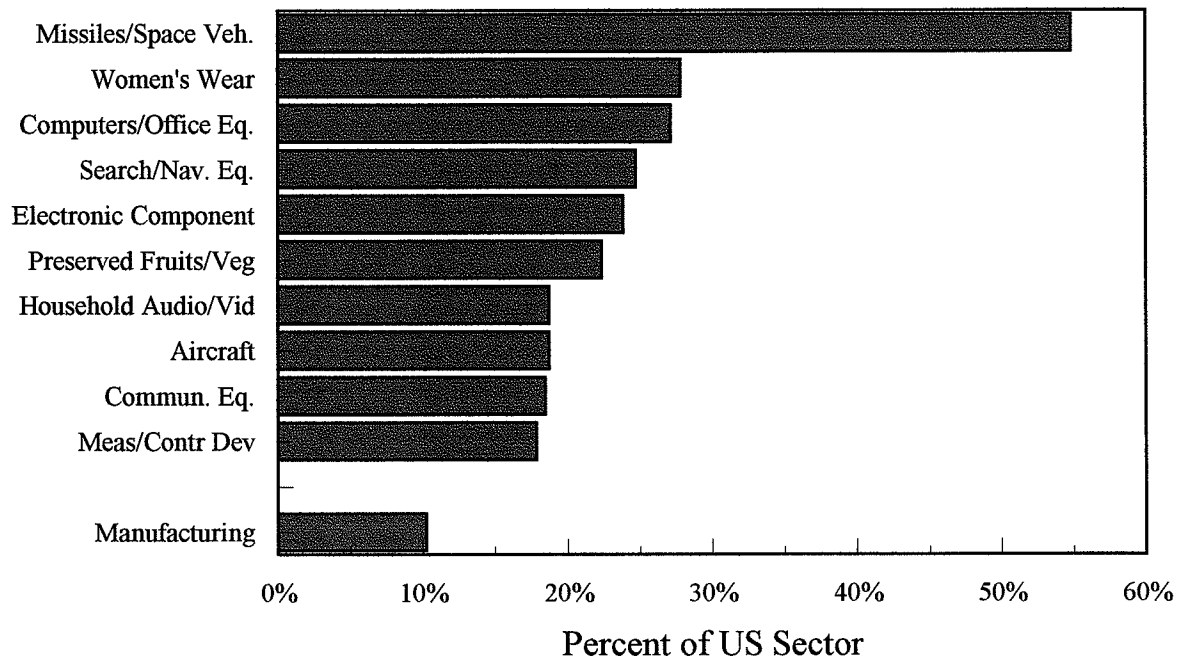
Source: Taken from County Business Patterns, 1993, CD-Rom files.

**Table 3**  
**Employment in Case Study Sectors**

Sector	SIC Code	Employment 1993
<b>Computer Cluster</b>		
Computer and Office Equipment	357	68,414
Semiconductors	367	124,499
Computer and Data Processing Services	737	156,101
<b>Food Cluster</b>		
Food and Kindred Products	20	168,668
Agricultural Production	-	222,200
Agricultural Services	-	140,100

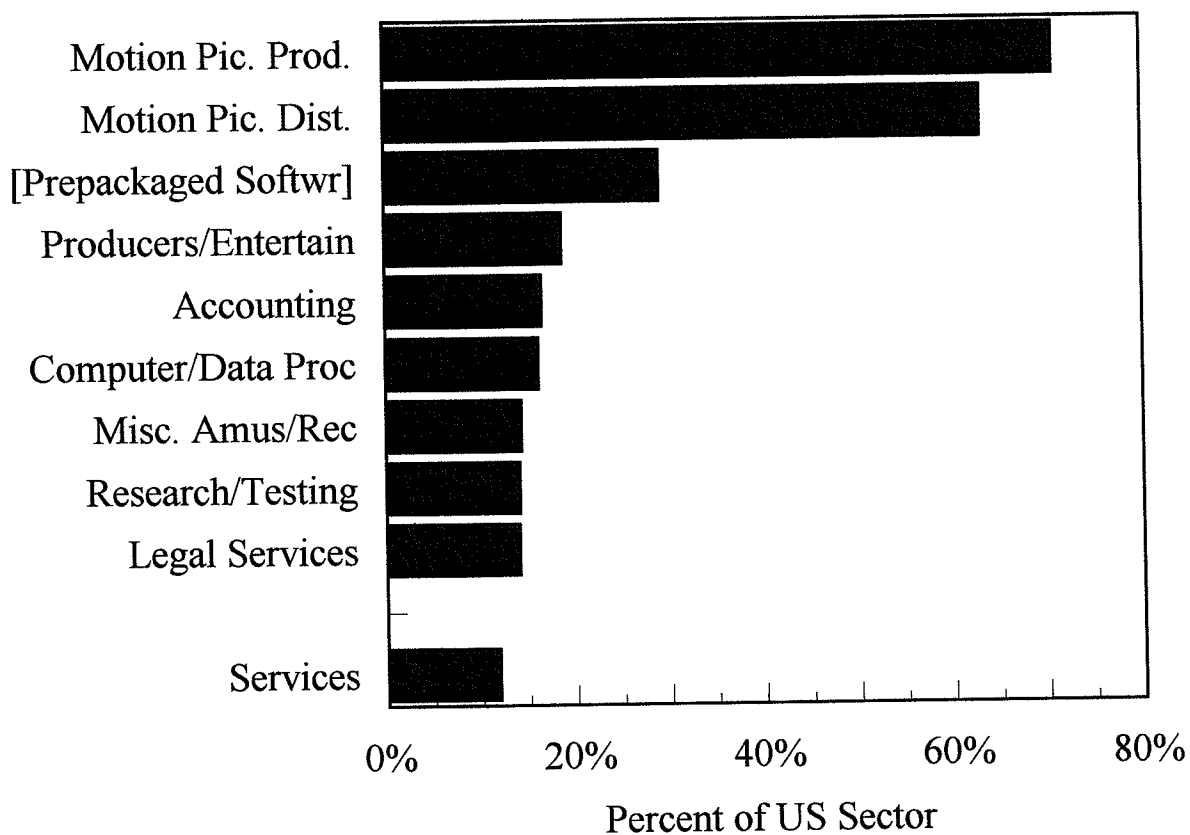
Source: County Business Patterns, 1993, CD-Rom, and Employment Development Department, Web Page Spread Sheets, for Agricultural Production and Services.

Figure 3  
California Manufacturing Sectors with Largest Shares  
of US Employment



Source: Authors from 1993 County Business Patterns CDRM.

Figure 4  
California Services Sectors with Largest Shares of US  
Employment



Source: Authors from 1993 County Business Patterns CDROM.

case study sectors according to their geographic area of importance, type of sector represented (manufacturing versus nonmanufacturing), and wage levels. The computer cluster is very heavily concentrated in northern California (although a small number of firms in southern California and the Central Valley were included in the sample), while the food products sector is spread throughout central California, northern California, and the Los Angeles area. In both sectors, manufacturing is an important component, but the computer cluster also includes programming and data processing--a services sector, and food processing is linked to agricultural production--a primary production sector. In terms of wages, the computer cluster represented the higher end of hourly wages (\$16.98/hour in SIC 357 in 1994, \$17.17 in SIC 737), while food processing wages in significant California sectors were below average for manufacturing (\$10.92 in SIC 203 in 1994), as shown in Table 4.

Finally, while both industries contribute significantly to the total of California exports, their net and gross export flows differ significantly (as measured at the US level, because there is no California import data). Within manufacturing operations (not considering services or primary resource levels), the computer sector is a net importer while food products is a net export sector. The computer sector is a high trade flow sector, as shown in Figure 5--exports and imports are each large relative to domestic demand. In contrast, food processing is a low trade flow sector.

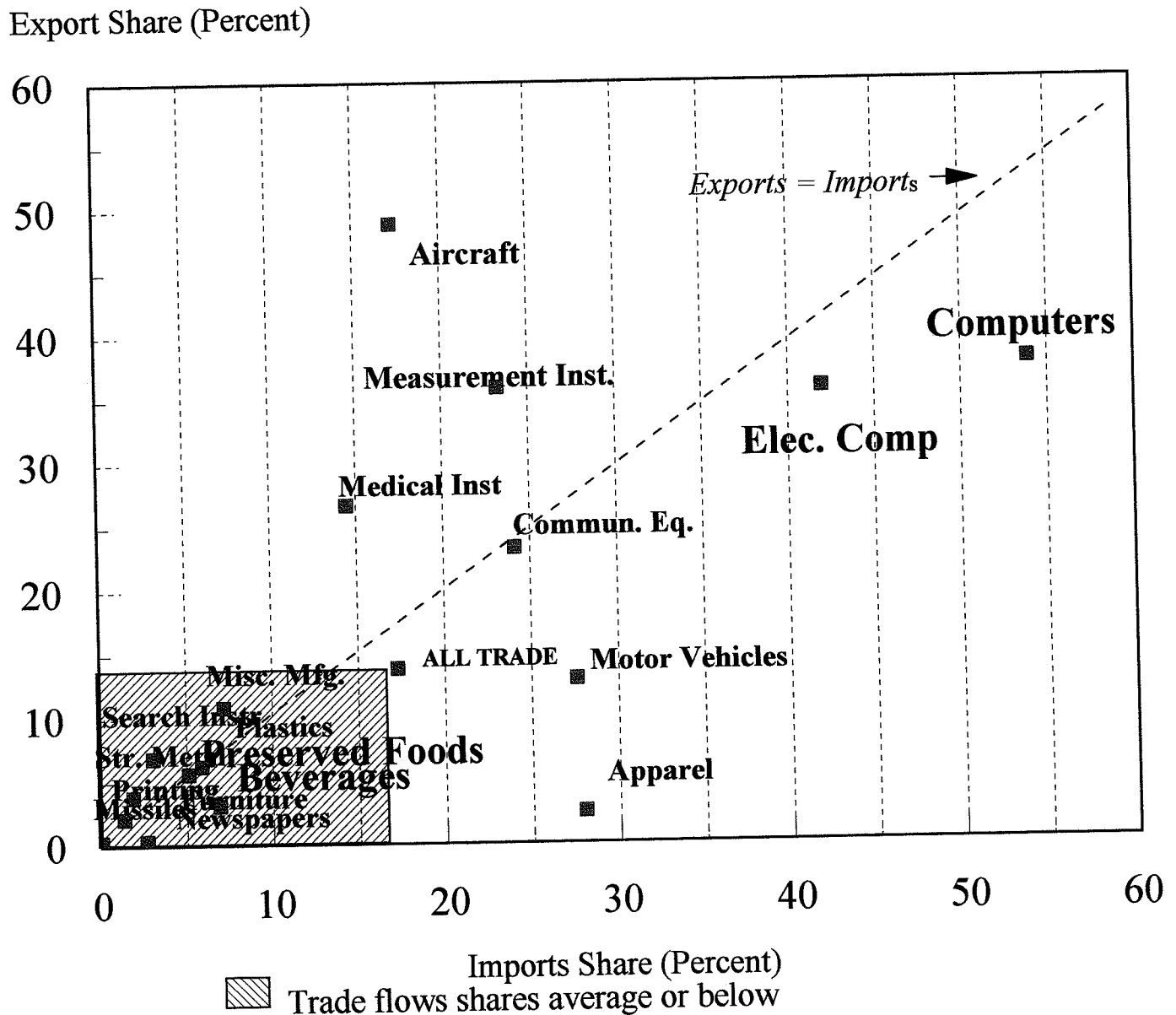
Our discussion of each industry starts with a definition of the industry and descriptive statistics. We then describe the results of interviews with the largest firms in the industry (identified for each industry subsector) and, for the computer cluster, the

Table 4  
Wages in California 2-Digit and Selected 3-Digit Manufacturing Sectors  
(Average Hourly Wage , 1994)

Sector	SIC Code	Wage
Petroleum and Coal Products	29	21.59
Transportation Equipment	37	17.50
Computer and Office Equipment	357	16.98
Beverages	208	15.81
Instruments	38	15.45
Industrial Machinery and Equipment	35	13.93
Stone, Clay and Glass	32	13.55
Paper and Allied Products	26	13.35
Primary Metal Industries	33	13.33
Chemicals and Allied Products	28	13.25
Printing and Publishing	27	12.65
Fabricated Metal Products	34	12.62
<b>Manufacturing</b>		<b>12.14</b>
Food and Kindred Products	20	11.89
Electronic Equipment	36	11.71
Preserved Fruits and Vegetables	203	10.92
Lumber and Wood Products	24	10.17
Rubber and Plastics	30	10.07
Furniture and Fixtures	25	8.92
Miscellaneous Manufacturing	39	8.73
Textile Mill Products	22	7.69
Leather Products	31	7.39
Apparel and Other Textile Products	23	7.08
<b>Related Services Sectors--US Wages</b>		
Computer and Data Processing Services	737	17.17
Computer Programming Services	7371	19.83
Computer Integrated Systems Design	7373	18.09

Source: Manufacturing--Computed from Annual Survey of Manufacturers Data, 1994;  
Related services sectors--from BLS web page

Figure 5  
 US Gross Export and Import Shares, 1995  
 Sectors with 25,000+ Employment in California



Source: US International Trade Admin., author's analysis

fastest growing firms. A detailed description of our firm selection and interview process, including copies of the questionnaires used in the interviews, is provided in Appendix A.

### **Computer Businesses Leapfrog into the International Arena**

California accounts for about one fourth of US employment in computer and office equipment manufacturing (SIC 357), giving the state a location quotient of 2.34 (a location quotient of 1 would give the state an equal share of activity compared to the US; California has more than twice its “expected” level of employment in this sector).<sup>5</sup> As reported by the Annual Survey of Manufacturers, the value of shipments has grown sharply in California, with sales rising by 89% between 1987 and 1995.<sup>6</sup> (See Figure 6.) This is an industry where productivity gains have also been large. Value added per employee grew from \$102,000 to \$226,000 over the 87-95 period. With the growth in productivity, despite revenue gains, total employed shrank between 1987 and 1994, dropping from 103,000 to 83,000, according to California Employment Development Department data.<sup>7</sup> Employment has grown since 1994, by 2.4% in 1995 and 5.2% in 1996.

Less data is available for the segment of the computer cluster classified as services (SIC 737). At the US level, sales in 737 almost tripled between 1987 and 1995, while employment grew by close to 75%. California employment grew more rapidly than US

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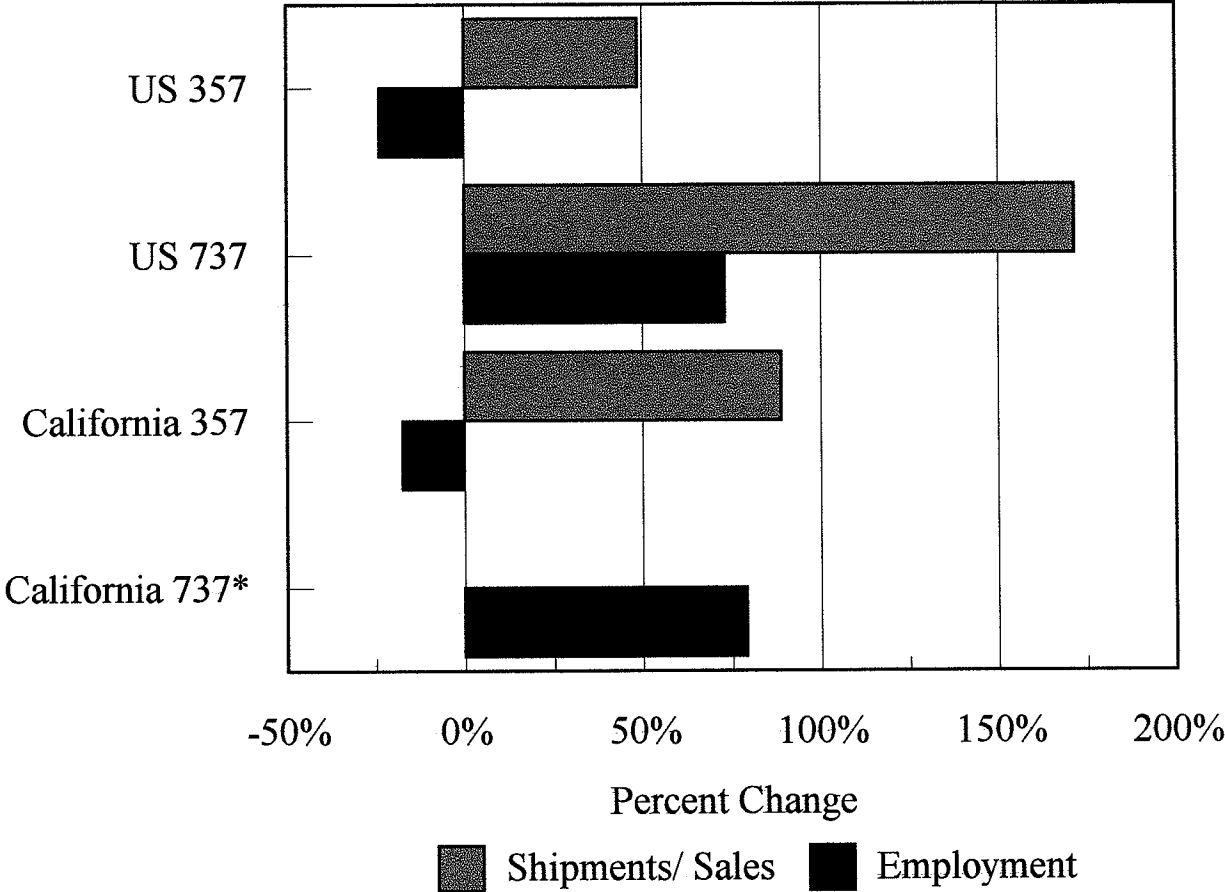
<sup>5</sup> Location quotients are discussed in more detail in a companion working paper, Jaffee 1998a.

<sup>6</sup> These figures are in current dollars. Because costs of production have been dropping in the computer industry, the increase is greater in real terms, probably close to double the nominal rate.

<sup>7</sup> These numbers do not correspond with the County Business Patterns numbers shown in Table 3.1. Because of different reporting mechanisms, EDD and CBP data can differ by 20% or more for individual sectors. The EDD data collection method appears to be more comprehensive and more consistent from year to year (numbers are rebenchmarked over time), but CBP reports information in much more detail, and is used in this study when necessary to obtain the necessary level of detail.



Figure 6  
**Sales and Employment Growth, 1990 - 1995**  
**Computer Equipment and Data Processing**



\* Sales not reported at the state level for SIC 737.

Source: Annual Survey of Manufacturers, County Business Patterns.

employment. Based on County Business Patterns data, California had over 160,000 employed in this sector in 1994 and by our estimates over 180,000 in 1995. Sales data for California is available only from the Census of Services, for 1987 and 1992. For that period, sales in SIC 737 grew by 91%.

The trade balance picture is quite different for computer hardware and software. While detailed data is not available for computer exports and imports at the statewide level, it is clear that foreign trade plays a major role in the industry. Nationwide, computer and office equipment exports (SIC 357) was 45% of the value of shipments in 1995. In California, industrial equipment, including computers, is the state's second largest export category, after electronic equipment. California accounted for 23% of US exports in this industrial category in 1995. Despite the large export base of the computer industry, it is also an industry that has seen sales erosion to imports and to foreign competition abroad. The computer industry went from a positive trade balance of \$2.2 billion in 1989 (SIC 357) to a negative balance of \$17.2 billion in 1995 (see Figure 7), equal to 19% of the industries shipments (see Figure 8). Computer and data processing, in contrast, has maintained a growing positive net trade balance, but this is still too small to offset the negative balance of the computer hardware sector and appears to be a smaller proportion of total sales.<sup>8</sup>

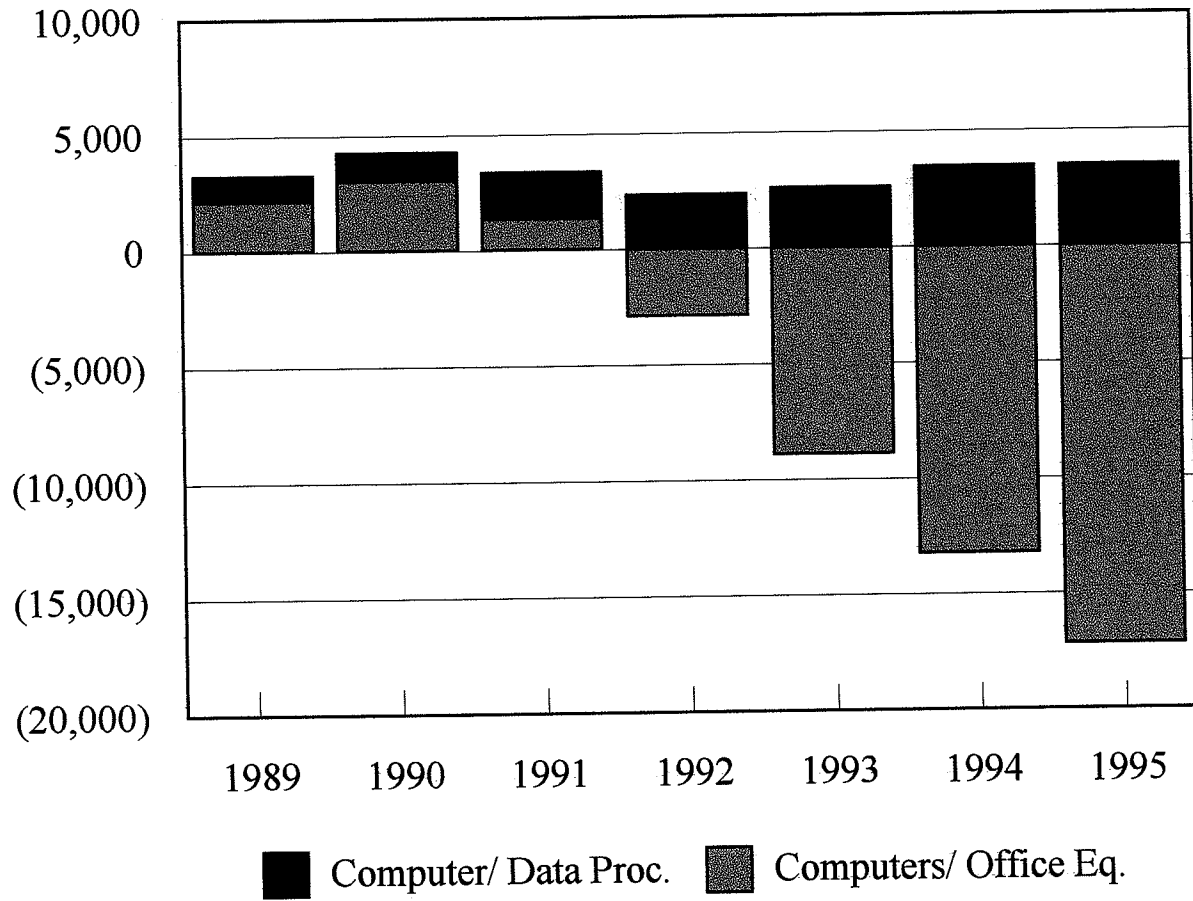
Foreign imports can play an important role in the production of computer and office equipment. Our estimates for 1992 (the latest date for which data is available) show

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<sup>8</sup> Because the accounting of services imports and exports is not done using the same SIC definitions as the accounting of jobs and sales, it is possible that the trade figures underestimate the role of trade in SIC 737. Some proportion of overseas sales may occur in the form of royalties, which are reported separately under services exports and imports.

Figure 7  
**Net Exports in Computer Hardware and Services  
 1989-1995**

Net Exports\*, Millions

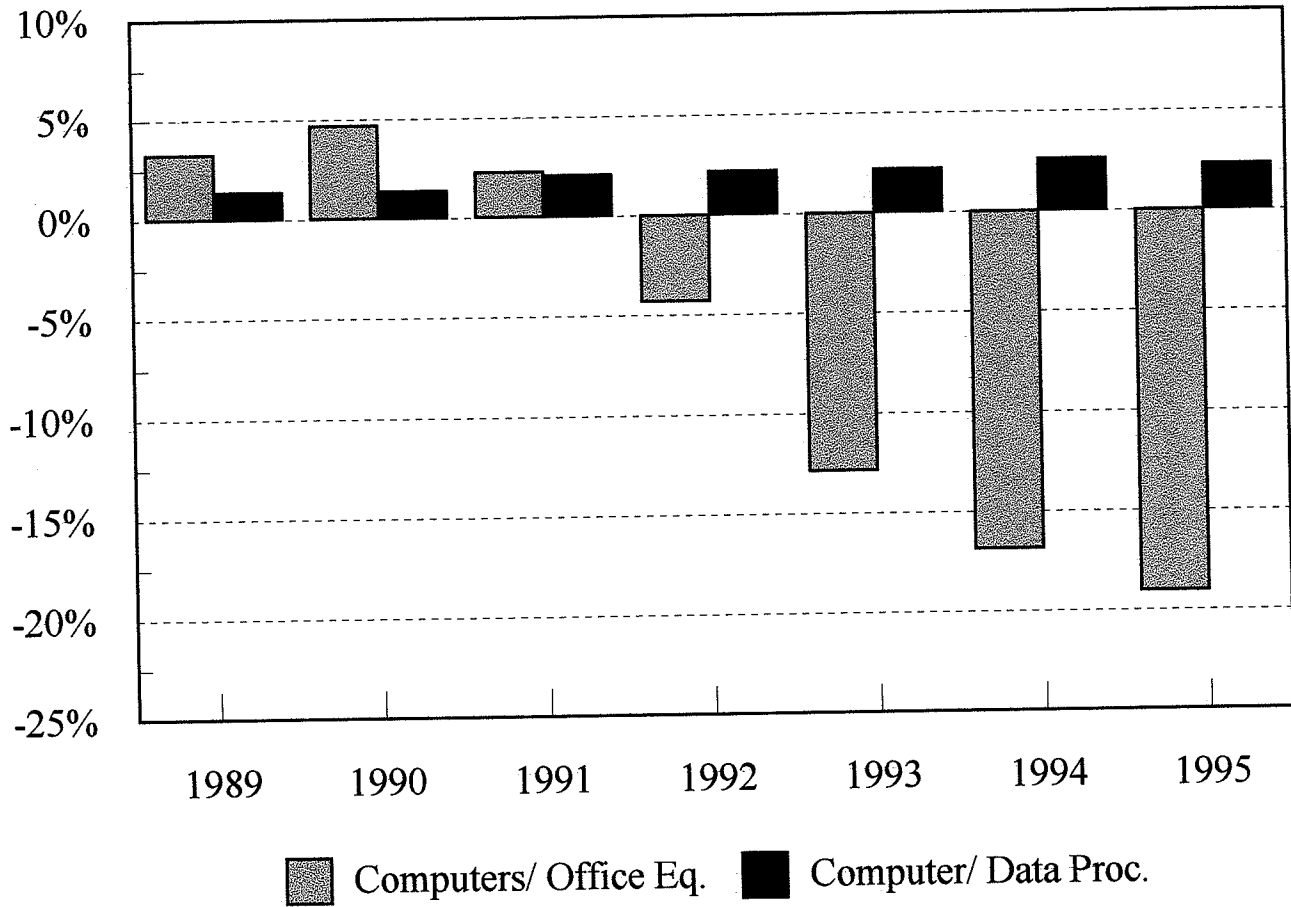


\* Net exports = Exports - Imports

Source: Annual Surveys of Manufacturing and Services,  
 U.S. trade data.

Figure 8  
**Net Exports as Share of Revenues, 1989-1995**  
**Computer Hardware and Software**

Net Exports\* as Percent of Revenues



\* Net exports = Exports - Imports  
 Source: Annual Surveys of Manufacturing and Services,  
 U.S. trade data.

that in the computer sector (SIC 3571), for example, 18 percent of inputs are imported.<sup>9</sup>

### *The Computer Cluster Sample*

By our definition, the core of the computer cluster in California is composed of eight sectors defined at the 4-digit level. These include computer manufacturing (SIC 3571, electronic computers), computer storage devices (SIC 3572), computer peripheral equipment (SIC 3577), printed circuit boards (SIC 3672), semiconductors (SIC 3674), and computer software (SIC 7371, computer programming services, SIC 7372, prepackaged software, and SIC 7373, computer integrated systems design).<sup>10</sup> The software component of this cluster accounts for almost half of the employment in these eight sectors, as shown in Table 5. Our interviews draw from all elements of the cluster except for semiconductor firms, which have been well-studied in other contexts.<sup>11</sup>

Each of these sectors individually has many complexities and merits case study attention on its own. We focused on several sectors within the cluster rather than on a single sector for two main reasons. First, we were interested in different aspects of the production process and the interactions among firms involved in different elements of production (from component suppliers to computer hardware manufacturers to software programming). Second, many of the large companies interviewed are involved in more than one aspect of production and overlap the sector categories.

We interviewed a sample of the largest and fastest growing computer cluster firms headquartered in California. As described in more detail in Appendix A, the sample

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<sup>9</sup> Our estimates of imported inputs are described in Bardhan and Howe 1998a.

<sup>10</sup> Other 4-digit sectors of 357 were not included because they are very small employment sectors, with less than 5,000 employees, each. Other 4-digit sectors of 737 were excluded because they are data processing rather than computer programming sectors.

Table 5  
4-Digit Sectors Associated with the Computer Cluster

Sector	SIC	Employment 1994
Electronic Computers	3571	29,411
Computer Storage Devices	3572	13,312
Computer Peripheral Equipment	3577	12,674
Printed Circuit Boards	3672	18,591
Semiconductors	3674	50,501
Computer Programming Services	7371	42,867
Prepackaged Software	7372	45,003
Computer Integrated Design Systems	7373	13,217

Source: County Business Patterns CD-ROM, 1994.

includes computer manufacturers (personal computers and mainframes), manufacturers of peripherals (printers, disk drives), software companies, and networking companies (hardware and/or software). The sample is drawn primarily from the largest firms in the cluster. Firms with 500 or more employees account for only 3% of California firms manufacturing computers and storage devices and for less than 1% of computer software firms, but for more than half of employment in computer hardware sectors and for about one fifth of employment in software companies, as shown in Table 6. Changes in where products of these firms are sold and where they are manufactured will have a significant impact on the employment base in this sector in California. We also looked at rapidly growing firms (often smaller firms) to understand any differences in the importance of global linkages to newly emerging firms, as compared to more established firms and to understand how trade patterns may change over the life cycle of the firm.

Major elements of the interviews included the role of foreign sales in company revenues, the role of imported inputs in production activity, the characteristics of the company's labor force (including the extent to which overseas subcontracting occurs), and the advantages and disadvantages of a California location to the firm.<sup>11</sup> The initial sample of firms included 35 firms (see Table 7). Of these, interviews (most in great detail) were completed with 14 firms. Information on employment, revenues, foreign sales and location characteristics of other firms in the sample was obtained from annual reports and from the *Hoover's Guide to Computer Companies*.<sup>12</sup>

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<sup>11</sup> See Appendix B for a full copy of the sample interview form and related documents.

<sup>12</sup> *Hoover's Guide to Computer Companies* 1996.

Table 6  
Firm Size Characteristics of Computer Cluster

Sector	SIC Code	Percent of Firms		Percent of Sector Employees in firms with	
		with 1000 or more employees	with 500 or more employees	1000 or more employees	500 or more employees
Computer and Office Equipment	357	1.4%	3.2%	42.0%	56.5%
Electronic Computers	3571	2.7%	5.8%	55.1%	73.2%
Computer Storage Devices	3572*	2.9%	7.4%	60.1%	72.3%
Computer Peripheral Equipment	3577*	0.4%	1.2%	13.5%	21.9%
Electronic Components	367	0.9%	2.5%	23.1%	38.8%
Printed Circuit Boards	3672	0.2%	0.7%	8.5%	14.2%
Semiconductors	3674	2.9%	8.0%	36.7%	60.7%
Computer and Data Processing Services	737	0.1%	0.3%	8.4%	19.2%
Computer Programming Services	7371	0.0%	0.1%	0.0%	6.7%
Prepackaged Software	7372	0.3%	0.8%	17.5%	28.8%
Computer Integrated Design Systems	7373*	0.1%	0.4%	19.3%	28.7%

Source: Computed from County Business Patterns CD-Rom data

\* Estimates made by the authors where data withheld.



Table 7  
 Characteristics of Computer Sample and Firms Interviewed

Sector	Firms in Sample	Completed Interview	Annual Report Data or Partial Response
Computers/Printers	10	5	1
Components	7	2	1
Networking*	5	4	1
Software	13	3	3
<b>Total</b>	<b>35</b>	<b>14</b>	<b>6</b>

Source: Authors

\* We define a company as "networking" if it produces both the hardware and software of network communications.

### *Basic Structural Characteristics of the Firms*

The computer firms included in the study were for the most part very large, with annual sales ranging from \$53 million for the smallest firm to \$38 billion for the largest. Half of the firms identified had annual revenues of over \$1 billion. The great majority of the firms were public companies, and many had used stock ownership as a means of providing capital for further growth. The firms were relatively young (most had been in business for less than twenty years, and several were less than 10 years old) and had expanded rapidly since their initial years. Table 8 compares some of the key characteristics of firms by large firm versus fast growing categories and by industry subsector.

### *Foreign Sales and Exports*

A simple model of export activity does not apply to these firms. For most of these firms, sales generated outside of the US are a significant proportion of the income earned. While some firms report only 10-15% of revenues from foreign sales, many of the largest firms report between one-third and two-thirds of sales abroad. These sales, however, are not necessarily of products produced in California, and may not be counted as exports. It is common for the largest firms to do much of their production outside the US, generally to serve overseas customers. Figure 9 shows the distribution of international production sites of the industry's largest firms.

Table 8  
 Characteristics of Largest and Fastest Growing Computer Cluster Firms

	<u>Largest Firms</u>	<u>Fastest Growing</u>	<u>Hardware</u>	<u>Software</u>	<u>Networking</u>
Sector					
Computer/Printers	45.0%				
Components	15.0%				
Software	25.0%	40.0%			
Networking*	15.0%	40.0%			
Age of Firm	10 - 60 years	3 - 17 years	10 - 60 years	3 - 15 years	6 - 18 years
Total Revenues	\$5B - \$40B	\$50M - \$660M	\$160M - \$40B	\$350M - \$800M	\$50M - \$4B
% from Foreign Sales	10% - 60%	0% - 56%	18% - 55%	0% - 60%	25% - 60%
Employment Size, CA	900 - 20,000	50 - 1600	2500 - 20,000	50 - 2500	100 - 8000

Source: Firm interviews, annual reports, Hoover's Guide

\* We define a company as "networking" if it produces both the hardware and software of network communications.

**Figure 9**  
**Location of Overseas Production Facilities,**  
**Largest California Computer Firms**



The configuration of firms with regard to the location of production and amount of foreign sales is not predictable from simple measures of firm age or size. Some variation is apparent in market size and location. The three firms identified with no overseas production were from the "fastest growing" group, relatively small (sales under \$500 million) and young (less than 10 years old), and of these, one had no overseas sales. All of the firms with at least half of sales from foreign revenues (6 of the firms interviewed in detail) had production locations overseas.

There was a great deal of variation in firm structure among but also within subsectors of the industry. Software firms, for example, were most likely to be at *Stage I* but also had firms at *Stage III*. Small, fast growing software firms rely primarily on interaction of the labor force in their California location. However, as they gain in foreign sales, it becomes increasingly attractive to locate disk duplicating and manual printing close to the market. Limited technical work, primarily associated with translation of programs and manuals for the foreign market, may also be done close to market. While the smaller, younger software firms maintained the large share of employment in California, larger, older firms, with broader market areas, had close to half of employment out-of-state (although not necessarily overseas). This changing configuration often relates to how the firms grow. Acquisition of other firms, either competitors in the firm's existing product line or producers of related products, is a common method of expansion for the larger software firms. There have been some major acquisitions of US firms located out-of-state, as well as acquisitions of foreign firms.

Computer manufacturers similarly showed great variety in their location patterns. Some very large firms with highly specialized or customized products and market dominance continue to locate the bulk of their production in Silicon Valley, despite costs. In contrast, firms in highly competitive sectors, such as personal computers, are well established in a *Stage II* or *Stage III* pattern of production. Indeed, the firm may be engaged in both stages of production. For example, personal computer manufacturers take advantage of the agglomeration of technical infrastructure in places like Taiwan and Singapore to assemble products while also located production facilities more broadly worldwide to meet demands of global markets.

### *Imported Inputs*

Not surprisingly, imported inputs are a much larger component of computer manufacturing than for software firms. Memory chips were the most common product directly imported from Asia. Other chips, circuits and components were also imported from Asia. Those firms able to estimate the import proportion in inputs gave a range of 10 to 20%. However, a number of respondents commented that many of their inputs were obtained from local suppliers, but that a portion of the material from the suppliers may be imported.

Transshipments also occur within firms from and to their foreign operations, so that a PC produced in California may contain components produced by the firm in one of its foreign locations, and a California plant may provide components to the firm's overseas manufacturing site. Review of figures in the annual reports of 20 firms shows that the use of transshipments varies widely among firms and among sectors within the computer

cluster, as shown in Figure 10. At one extreme, one manufacturer of components reported transshipments from foreign (company owned) production facilities equal to over 70 percent of the value of shipments. Most component manufacturers report foreign transshipments equal to 50 percent of shipments or higher. At the other extreme, none of the software firms whose annual reports we reviewed reported foreign transshipments. Computer manufacturers also showed significant levels of within-company foreign production of inputs, while network manufacturers, like software producers, showed very low levels of foreign transshipments.

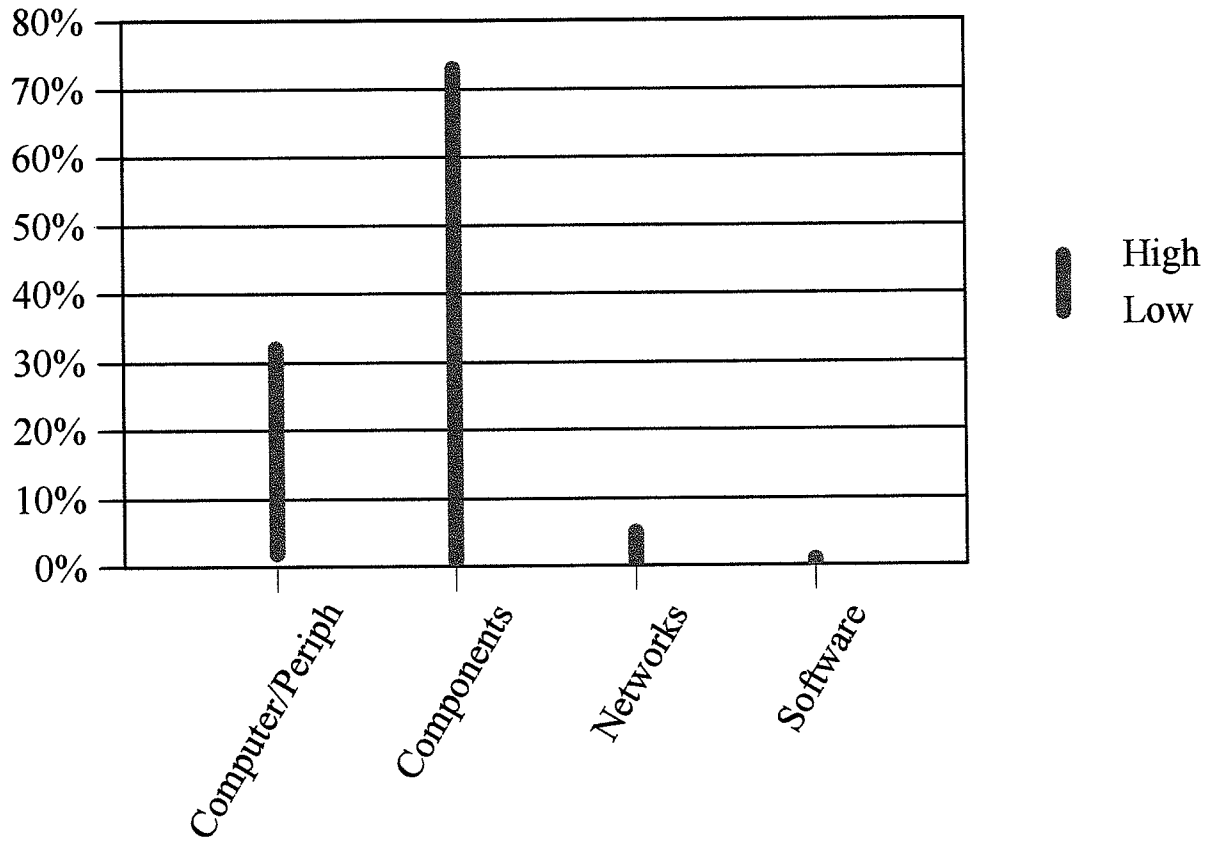
The use of “imported” human capital (for example, software produced at an overseas site for inclusion in a product sold by a US firm) was quite limited. A number of firms hired programmers in overseas markets, but in most cases these were involved in customizing the product for the particular market.

### *Foreign Competition*

Firms in all sectors of the industry (although not all firms) were concerned with foreign competition (as well as with competition from other California and US firms). For software, firms, the main foreign competition faced was in foreign markets, rather than domestically. Much of the competition came from firms producing products more specialized for the needs of the foreign market in terms of standards or language. Producers of high-end software products faced competition both domestically and abroad from firms seeking to produce lower cost alternatives, with US firms being the major competitors in US markets. One strategy for dealing with this competition (as well as for expanding into related areas) was the acquisition or merger of competitor firms.

Figure 10  
**Sales to Foreign Subsidiaries or Affiliates as Percent of  
 Sales to Unaffiliated Customers**

Range among Firms within Sectors (Percent)



Source: Computed from data in annual reports.



For component and PC manufacturers, foreign competition is much more significant in US markets as well as world wide, but a subset of firms in these subsectors saw US competition as more significant than foreign competition. For firms with strong market dominance (including some mainframe, specific component and network manufacturers), foreign competition might be unimportant for some products but significant for a subset of products. All computer cluster firms were concerned about US limits on the export of encryption technology and the opening given to foreign competitors in the worldwide market by these limitations. Software firms and some hardware firms were concerned about piracy and counterfeiting.

#### *Effects of Firm Structure on the Computer Cluster Labor Force*

Firms reported between 25% and 100% of their worldwide labor force located in California. Only two young software firms had no employees outside of California. The great majority of firms had significant sales operations, production and some technical assistance employees located overseas. In most cases, the profile of employees at California locations was quite different from employees out-of-state or overseas. California locations of most firms had a much larger share of professional and technical employees than overseas locations. Only a small number of firms gave detailed breakdowns of their employee profiles. Of these, most reported between 30 and 40% of employees in professional and technical (or R&D) occupations at their California locations. These shares were generally much smaller outside of California, where sites were more likely to be primarily devoted to production or sales.

While overseas operations tended to have higher proportions of production workers, many California firms maintain a production presence within the state. California producers tend to focus on high end products, but again, strategies vary widely. At one extreme are firms that produce high cost, complex equipment and maintain the bulk of their production within Silicon Valley. Firms that can afford this strategy are those facing little competition for their product, and where customized aspects of their production are important to their customers.<sup>13</sup> At the other extreme are firms that do almost all of their production at low cost sites outside of California. Most computer and software firms lie somewhere in the middle, maintaining at least one production site in California but also establishing at least one production site overseas. Within California, a few firms have moved some or all of their domestic production to lower cost California sites, such as Sacramento.

Because of the high share of professional and technical workers and the lower share of production workers, computer firms require a highly trained labor force in California. Advanced degrees (masters or Ph.D. level) are required of virtually all professional and technical employees, and of many management and administrative employees. A minimum of a four-year degree is required of many sales employees as well. Where products are customized, a significant share of the production workforce may also require 4-year or advanced degrees, while community college or other training may suffice for the production workforce for more standardized products.

Most firms recruited their workforce from universities throughout the US and beyond. However, a small proportion drew mainly from California universities, either

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<sup>13</sup> This finding is similar to that reported by Saxenian 1994.

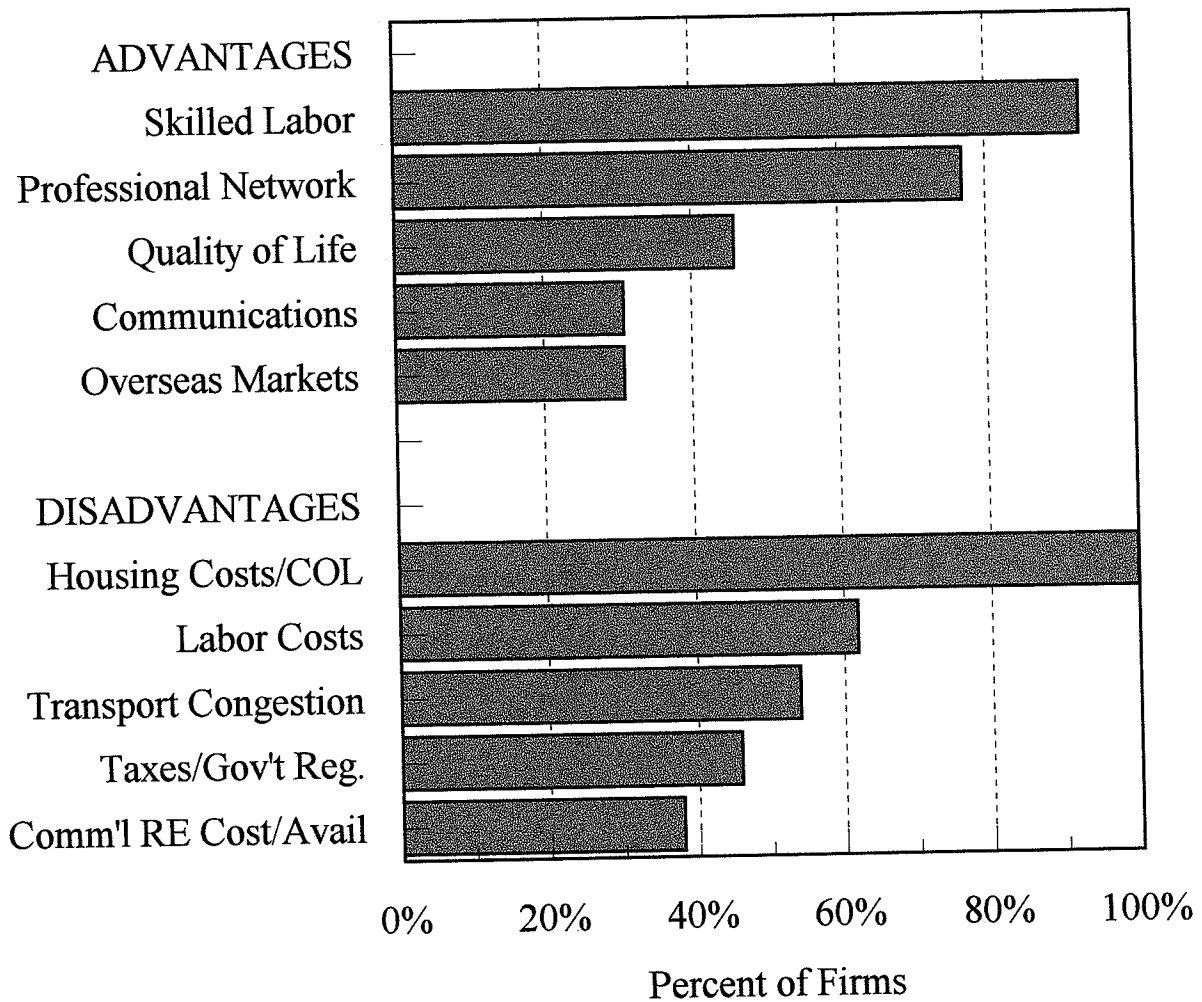
because of the common approach this gave their staff or because this avoided relocating new employees to a high cost setting. A significant proportion of the workforce of most firms is foreign born, although the absolute level varies widely and is not accurately reported. Estimates range from over 10% in some software firms to as high as 60% in one computer/peripheral production operation.

### *Location Decisions and Policy Issues*

The quality of California's workforce is key to the continued presence of computer-related firms in Silicon Valley and other locations throughout the state. All but one firm referred to skilled labor as a primary reason for remaining in California. The synergy provided by the proximity of many firms involved in computer-related activities also keeps many firms in the state. Specifically, firms mentioned the flow of information, proximity to investors, the flow of new ideas and the opportunity to acquire start-ups as advantages of being part of the California computer network. Related to this, communications infrastructure was seen by several firms as particularly strong in California. Other proximity advantages--to west coast markets and suppliers and overseas markets and suppliers--are also seen as advantages for a number of firms, as shown in Figure 11. The California quality of life was cited by about half of the firms interviewed.

Despite these advantages, firms have several concerns about a California location. Housing and other living costs, and as a result labor costs, were the most frequently mentioned disadvantages. Many firms felt the state income tax made labor cost problems more severe. While California labor was seen as skilled, it was not always easy to hire skilled labor in a competitive growth environment. About one third of firms also

Figure 11  
 Advantages and Disadvantages of California Location  
 Computer Firms



Source: Interviews by Authors

mentioned commercial real estate cost and/or availability as problems with California locations. Beyond labor related issues, transportation congestion also troubled many firms. Government regulations, in the areas of workers compensation and land development, were seen as an issue by several firms, although a few also mentioned local and state programs to ease the effects of regulation as a plus.

Of firms expecting to expand, the majority were considering sites outside of California, either elsewhere in the US or overseas. They cited both “push” and “pull” reasons for this trend. California costs and regulations were the major push factors (although the “push” acted only for expansion, and was not leading to relocation). Firms were drawn to out-of-state locations by land and labor costs, ease of transportation, location of foreign markets, and the many incentives offered by other states and nations.

Most firms were unaware of any programs offered by the state that made it easier to do business in California. Only one firm mentioned the California Council for International Trade, while another made use of trade related programs when smaller, but has no need for them as a large firm. One other large firm mentioned both the governor’s Red Team and efforts of a local organization--Joint Venture Silicon Valley--as being instrumental in allowing the firm to keep some production in Silicon Valley.

Government regulations and taxes were the most frequently cited state government programs that made it harder to remain competitive while located in California. Often it was the cumbersomeness of the process, rather than the absolute standard, that was most problematic for the firm. One firm gave the example of an overall environmental standard that could be met by the firm, but had become costly and cumbersome because the firm must repeatedly file for permits related to that standard with each minor facility change.

The major computer firms saw only a narrow scope for state action with respect to global operations of the firms. Concerns where the state could help, primarily through trying to influence federal level policy, were in the area of encryption controls and policy towards software piracy. These were also the areas of most concern at the US policy level. The firms universally felt that encryption controls were a significant limitation in the area of foreign sales. Most firms also sought protection for intellectual property rights.

Firms also mentioned a number of statewide programs that could help them in general with competitiveness, although not specifically in the international arena. Many mentioned the general need for changes in the regulatory process, especially in the areas of environmental controls, land development, and human resources. The need to maintain a strong education system was also emphasized. For example, one firm pointed to education as important not just as a means of producing the required skilled labor force but also as an element in the recruitment of new employees, who seek good school districts for their families. Finally, a number of firms pointed to the incentives provided by other states and other nations as a significant factor in drawing expansion out of California. At least one firm had production facilities in a high cost European location chosen because of the generous concessions offered by the local government.

### **Food Processing Industry Thrives Off California's Agriculture Base**

The food processing industry contrasts sharply with the computer industry, both in its domestic operations and in the approach to overseas sales. The strength of California agriculture is key to the presence of this industry in the state. California is home to the most diversified agricultural economy in the world. With nearly one-third of California's

total land acres devoted to agricultural production, the state produces more than 250 crop and livestock commodities. California produces 55 percent of the nation's fruits, nuts and vegetables and 12 U.S. crops are grown exclusively in California. In 1996 annual revenues for non-processed agricultural products were \$24.5 billion which was almost twice as great as Texas, the second ranking state, with \$13.3 billion in 1995.<sup>14</sup>

The food processing cluster has been fostered by the large portion of the California economy devoted to the agricultural industry. In 1996, food processing receipts totaled \$48 billion in annual revenue. The state's operations accounted for 10.4 percent of the country's 1995 employment in food processing. The state is strongly dominant in subsectors of food processing, with location quotients for preserved fruits and vegetables and beverages for 1995 of 2.14 and 1.70 respectively. The industry is the fourth largest manufacturing employer in the state with over 170,000 employees in 1995, according to Employment Development Department data.<sup>15</sup>

There are nine three digit standard industrial codes in the food processing cluster (SIC Code 20). These sectors are meat products (SIC 201), dairy products (SIC 202), preserved fruits and vegetables (SIC 203), grain mill products (SIC 204), bakery products (SIC 205), sugar products (SIC 206), fats and oils (SIC 207), beverages (SIC 208) and miscellaneous food products (SIC 209). Our discussion focuses on two components: preserved fruits and vegetables (SIC 203), and beverages<sup>16</sup> (SIC 208). These two sectors represent a large share of the overall sales and employment and are primary export

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<sup>14</sup> California Department of Food and Agriculture, "California Agriculture (1996 Production Numbers)," Web page of the California Department of Food and Agriculture.

<sup>15</sup> The full data upon which these paragraphs are based is described in Jaffee 1998a.

<sup>16</sup> The beverage component includes wine producers, which contribute significantly to California's export sales. In fact, soft drink producers which also contribute to the beverage sales were not included in the

production sectors within the 2-digit food processing industry in California. In 1995, sales for the entire two digit sector were \$47.9 billion, with \$10.6 billion in sales from preserved fruits and vegetables and \$10.2 billion beverages, in combination almost 45 percent of the entire industry's sales. The remaining sectors within SIC 20 are producing products for state or domestic consumption and are much less significant sources of California's food processing export revenues. (See Table 9.)

As described earlier, food processing is a significant contributor to California's export sales revenues, with \$5.1 billion in overseas sales in 1995. This would account for about 10.6% of the reported \$47.9 billion in industry sales for the year. At the US level, food processing is one of the strongest sectors in terms of net export share.<sup>17</sup> Only tobacco, chemicals and instruments have larger net export shares within the nation's manufacturing sector<sup>18</sup>. At the US level, food products exports have been growing faster than imports in all sectors affecting California, as shown in Table 10. However, export growth appears to be relatively less important in the food processing sectors most significant to California. The largest increase in net exports has been in meat processing, mainly from the Midwest, rather than from California, while net exports in preserved fruits and vegetables has grown more slowly. Although exports have grown faster than imports in beverages, because imports were much higher than exports, the net exports in beverages are still negative.

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interview case studies, because there were very little exports associated with these sales and because the larger firms had branches, rather than headquarters, in California.

<sup>17</sup> Net export share is defined as  $(\text{Exports} - \text{Imports}) / (\text{Output} + \text{Imports} - \text{Exports})$ . See Jaffee 1998a and 1998b for further discussion and data.

<sup>18</sup> See Jaffee 1998a.



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<sup>18</sup> See Jaffee 1998a.

Table 9  
Employment and Sales in California Food Processing Sectors (1994)

Sector	SIC Code	Employment	Sales (\$1000)	Percent of Sector		Percent of US Processed food exports
				Employment	Sales	
Food and kindred products	20	157,899	46,772,000	100.0%	100.0%	100.0%
<b>Meat products</b>	<b>201</b>	<b>16,290</b>	<b>3,989,100</b>	<b>10.3%</b>	<b>8.5%</b>	<b>32.0%</b>
Dairy products	202	12,424	6,633,300	7.9%	14.2%	3.4%
<b>Preserved fruits and vegetables</b>	<b>203</b>	<b>40,361</b>	<b>10,438,500</b>	<b>25.6%</b>	<b>22.3%</b>	<b>10.9%</b>
Canned specialties	2032	3,795	#N/A	2.4%	#N/A	0.3%
Canned fruits and vegetables	2033	12,992	#N/A	8.2%	#N/A	2.7%
Dehydrated fruits, vegetables, soups	2034	6,375	#N/A	4.0%	#N/A	2.4%
Pickles, sauces, salad dressing	2035	2,194	#N/A	1.4%	#N/A	1.0%
Frozen fruits and vegetables	2037	7,649	#N/A	4.8%	#N/A	4.6%
Frozen specialties	2038	7,353	#N/A	4.7%	#N/A	
Grain mill products	204	7,209	3,999,900	4.6%	8.6%	15.5%
Bakery products	205	23,955	3,047,600	15.2%	6.5%	1.4%
Sugar and confectionary products	206	9,686	3,206,300	6.1%	6.9%	7.3%
Fats and oils	207	1,972	923,600	1.2%	2.0%	14.4%
<b>Beverages</b>	<b>208</b>	<b>23,993</b>	<b>9,812,200</b>	<b>15.2%</b>	<b>21.0%</b>	<b>7.9%</b>
Malt beverages	2082	3,261	#N/A	2.1%	#N/A	2.0%
Malt	2083	#N/A	#N/A	#N/A	#N/A	0.2%
Wines, brandy and spirits	2084	12,345	#N/A	7.8%	#N/A	1.0%
Distilled and blended liquor	2085	264	#N/A	0.2%	#N/A	1.9%
Bottled and canned soft drinks	2086	6,657	#N/A	4.2%	#N/A	1.2%
Flavoring extracts and syrups, nec	2087	1,403	#N/A	0.9%	#N/A	1.7%
Miscellaneous food and kindred products	209	21,767	4,721,500	13.8%	10.1%	7.2%

Source: County Business Patterns 1994 CD-ROM (employment), Annual Survey of Manufacturers 1994 CD-ROM (sales), ITA (export data).

Note: Bold lettering denotes sectors originally chosen as significant export sectors with employment in California.

Table 10  
 US Trade and California Exports in Food Processing Industry  
 (Billions of Dollars)

Sector	SIC	1991	1995	Change 1990-95	% Change 1990-95
<b>US Exports</b>					
Food and Kindred Products	20	\$ 18	\$ 26	\$ 9	48.6%
Meat Products	201	\$ 5.3	\$ 8.4	\$ 3.2	60.3%
Preserved Fruits and Vegetables	203	\$ 2.0	\$ 2.9	\$ 0.9	42.6%
Beverages	208	\$ 1.3	\$ 2.1	\$ 0.8	65.9%
<b>US Imports</b>					
Food and Kindred Products	20	\$ 15.7	\$ 18.7	\$ 3.0	19.1%
Meat Products	201	\$ 3.2	\$ 2.7	\$ (0.5)	-15.6%
Preserved Fruits and Vegetables	203	\$ 2.3	\$ 2.6	\$ 0.3	13.0%
Beverages	208	\$ 3.3	\$ 4.6	\$ 1.3	39.4%
<b>US Balance (Exports-Imports)</b>					
Food and Kindred Products	20	\$ 2.0	\$ 7.7		
Meat Products	201	\$ 2.1	\$ 5.7		
Preserved Fruits and Vegetables	203	\$ (0.3)	\$ 0.3		
Beverages	208	\$ (2.0)	\$ (2.5)		
<b>California Exports</b>					
Food and Kindred Products	20	\$ 3.7	\$ 5.1	\$ 1.4	36.8%
SIC 20--California Share of US		20.9%	19.2%	15.8%	

Source: Computed from data taken from US Department of Commerce, International Trade Administration CD-ROM.

### *The Food Processing Sample*

We interviewed a sample of the largest food processing firms from the meat, canned goods and beverage sectors. Firms were selected that were: 1) headquartered in California or a branch operation of a nonstate firm with a significant food processing operation in California and 2) had an annual revenue of \$100 million or more, as identified from the American Business Disk CD-ROM directory.<sup>19</sup> The initial sample included 50 firms, with a majority in the preserved fruits and vegetables or beverage business. Of these, 5 were quickly eliminated because they had no food processing activity in California (e.g. Clorox<sup>20</sup>) or because they had moved. We completed interviews with 31 of the targeted firms, as summarized in Table 11. Information obtained from annual reports from the firms augmented the interview material.

The interviews suggest that processed meat products were not a significant contributor to the state's export revenues from food products. The large number of meat exports reported in California Agricultural Export Program data apparently are derived from meat products exported from California's ports that were largely grown and processed out of state (in the Midwest, according to our meat company respondents). California's meat industry is primarily local serving, or is exporting a small segment of production to specialized customers elsewhere in the US or overseas. For this reason, the case study discussion focuses primarily on preserved foods and beverages.

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<sup>19</sup> This is a computer data base put out by American Business Information, Omaha. Version used was the 1996/97 data base.

<sup>20</sup> Clorox, a chemical firm, owns two out-of-state food processing firms.

Table 11  
 Characteristics of Food Processing Sample Firms

Sector	Sample		Interviewed	
	Headquarters	Branch	Headquarters	Branch
Meat Products	7	2	4	2
Canned and Frozen Foods				
Tomatoes/Sauces	4	4	3	2
Fruits and Other Vegetables	8		6	
Olives	2		2	
Other Packaged Foods				
Dried Fruits and Nuts	3		3	
Packaged Fresh Vegetables	3		2	
Beverages				
Wine	6	2	3	2
Other	2		1	
Distributors	2		1	
Firms in initial sample later eliminated <sup>1</sup>	5			
Total Sample and Respondents	42	8	25	6

\* Food products not primary activity or no longer in business.

At first glance, it might appear that by using a similar method for selecting food processing firms as for computer firms for detailed industries, the consequences in terms of comprehensive coverage are different. Food processing industry employment is less heavily concentrated in the largest firms than is employment in computer firms. Only 10.5 percent of employment is in establishments of 1000 employees or more and 29 percent in establishments of 500 employees or more, as shown in Table 12. However, the food processing production process often involves the location of several processing establishments throughout the state, many of which fall below 500 in employment levels. Based on responses regarding their employment levels, firms interviewed (about 2/3 of the initial sample) accounted for about one third of all food processing in California and for 2/3 to 3/4 of employment in the preserved foods and beverages sectors. By covering only the large firms, it is possible that we have missed some export growth in smaller firms, but it is unlikely that this would affect a significant share of California employment.

### *Structural Characteristics of Food Processing Firms*

In contrast to the computer cluster, a majority of the food processing firms in California are privately owned. Many are family run businesses or operate as grower cooperatives. The firms have significant business histories in the state with most of the firms boasting over 50 years of business. This mature segment of the manufacturing industry has enjoyed moderate to flat revenue increases over the last five years. Only two firms in the interview pool had revenues over \$1 billion, with most firms between \$100 million and \$500 million in annual revenue. Family run businesses dominated the canned

Table 12  
Firm Size Characteristics of Food Processing Firms

Sector	SIC Code	<u>Percent of Firms</u>		<u>Percent of Employees</u>	
		With 1000+ employees	With 500+ employees	In firms with 1000+ employees	In firms with 500+ employees
Food and kindred products	20	0.4%	2.1%	10.5%	29.1%
<b>Meat products</b>	<b>201*</b>	<b>0.8%</b>	<b>3.0%</b>	<b>24.5%</b>	<b>42.3%</b>
Dairy products	202	0.0%	2.5%	0.0%	22.7%
<b>Preserved fruits and vegetables</b>	<b>203</b>	<b>1.0%</b>	<b>5.3%</b>	<b>10.9%</b>	<b>38.3%</b>
Canned specialties	2032*	3.1%	6.3%	45.6%	66.9%
Canned fruits and vegetables	2033*	0.8%	4.9%	8.2%	29.7%
Dehydrated fruits, vegetables, soups	2034*	0.0%	2.7%	0.0%	24.6%
Pickles, sauces, salad dressing	2035*	0.0%	0.0%	0.0%	0.0%
Frozen fruits and vegetables	2037*	2.0%	14.3%	11.6%	64.6%
Frozen specialties	2038*	1.6%	6.5%	14.9%	36.4%
Grain mill products	204*	0.0%	0.5%	0.0%	13.1%
Bakery products	205*	0.2%	2.0%	5.0%	28.1%
Sugar and confectionary products	206*	0.8%	3.8%	15.3%	36.3%
Fats and oils	207	0.0%	0.0%	0.0%	0.0%
<b>Beverages</b>	<b>208*</b>	<b>0.6%</b>	<b>0.9%</b>	<b>20.1%</b>	<b>24.8%</b>
Malt beverages	2082	2.9%	8.6%	43.9%	81.3%
Malt	2083	0.0%	0.0%	#N/A	#N/A
Wines, brandy and spirits	2084	0.3%	0.3%	19.4%	19.4%
Distilled and blended liquor	2085	0.0%	0.0%	#N/A	#N/A
Bottled and canned soft drinks	2086	0.0%	0.0%	0.0%	0.0%
Flavoring extracts and syrups, nec	2087	2.0%	2.0%	43.3%	43.3%
Miscellaneous food and kindred products	209	0.2%	0.9%	8.0%	17.5%

Source: Computed from County Business Patterns CD-Rom data

\* Estimates made by the authors where data withheld.

foods and beverages sectors, while a majority of the operations for almonds, citrus, raisins, walnuts and prunes were grower cooperatives (as well as one company that canned fruit cocktail, tomatoes and olives). Only four of the firms interviewed were public companies, two fresh produce packing operations and two wineries.

Food processing establishments have a much greater fluctuation in employment than do the computer firms. It is rare for more than 1000 permanent employees to be found at a single processing establishment (although company-wide employment may be larger), but employment may be augmented seasonally by several thousand more production workers, and additional jobs are linked to food processing through agricultural production.

#### *Foreign Sales and Exports*

In contrast to the computer cluster, California food processing firms are primarily at the export base stage (Stage I), with the majority of foreign sales occurring through exports, rather than foreign production. Crops are grown and processed in California and exported out of the state through ports, airports, rail hubs and road systems. Almost all of the firms' foreign sales are generated from California based operations.

Except for some of the larger cooperative ventures, very few California headquartered firms have established foreign operations. There is much less incentive in food production (compared to computers) to spread the production process beyond US borders. This results from the strong connection of California's food processing industry to the state's agricultural base. The quality, variety and quantity of California's harvest serve as the foundation of the food processing industry. The international demand for



California's processed food products comes from the reputation for quality of the agricultural products and processing. Because most food products travel better processed than raw, processing will remain in California as long as products are grown in the state.

Unlike the computer cluster where California firms have transferred production operations to foreign countries for less expensive labor and to be closer to markets, the food processing industry has made few moves closer to foreign labor or customers. A few firms have ventured into global markets as producers for limited types of operations. In most cases, these moves represent an interest in access to the produce of a specific part of the globe, rather than access to lower cost labor or foreign markets. In the case of wine, a shortage of California grapes led producers to seek wine grapes from overseas sources, and to begin considering some production overseas.<sup>21</sup> In the case of olive production, the quality and reputation of Spanish olives has led at least one canning firm to set up an operation in Spain. In both examples, the great majority of production remains in California. The third example, broccoli, is a move to less expensive production conditions. In this case, virtually all frozen broccoli production has moved from California to Mexico, where quality product can be grown and labor costs are much lower.

All three of these examples are modest cases of *Stage II* production, with a focus more on finding the resources and cost structure to meet domestic demand. There is little evidence of California food processing firms moving towards international production to meet the needs of foreign markets. One firm interviewed that historically had a multinational production structure had divested itself of foreign holdings. That firm and at least one other maintained a foreign presence by franchising the label name, but this did

not involve foreign ownership of operations. Only one firm, with branches in California but headquartered elsewhere, was at Stage III, with production sites in many international locations, serving foreign markets. That firm was structured with a holding company, the production in each country done by a separate company. The US firm with branches in California had no overseas production, although it did export some products.

### *A Closer Look at Exports*

Even though there is a world demand for California food products, not all of the products produced in California are exported. A select group of each food area are exported. In addition to the variation of products exported versus the products consumed domestically, there is a difference in the type of product exported to Asia versus that exported to Europe and Canada. The Asian market is currently being developed where the European and Canadian markets are more established.

For most food processing firms, exports are about 10 percent of the firms' annual revenues. Even in the tomato industry where California grows over 90 percent of the nation's crop only about 10 percent is exported. This is attributed to the size of the domestic market for tomatoes and tomato-based products. The wine component (part of SIC 208) of California's food processing industry exported about 10 percent of its product. Meat products showed the greatest variability in export levels, with one byproduct firm exporting 40 percent of product and two packing plants exporting less than 5 percent of product.

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<sup>21</sup> Grape shortages resulted from temporary shortages due to problems with phylloxera leading to a need to replant rootstock) and more importantly to decreased 1995 and 1996 harvests.

Almonds, citrus, walnuts, prunes and raisins have export levels well above 10 percent of shipments. The almond industry represented by the Blue Diamond cooperative led the food processing industry in export sales with approximately 70 percent of its product exported. The citrus industry, represented by the Sunkist cooperative has the second highest exports of approximately 40 percent of its product. Walnuts, prunes and raisins followed citrus with 30 percent of each product being exported from California. Each of these product based industries fall within the larger preserved fruits and vegetables (SIC 203) market sector. A closer examination of the preserved foods and wine industry highlights some of the variations in production and exports with these sectors.

*Almonds:*

The almond industry enjoys the greatest exports of any food product produced in California. As noted in the Almond Almanac, California almond production has increased by almost 500 million pounds over the last 20 years, to a 1996 farm value of total product of almost 900 million. California produces 65 percent of the worlds almonds and the state's growers command over 80 percent of the worlds exports. Export trade is a major component of the industry's success. The California almond industry is the only food products industry where foreign production is decreasing. In 1996 Europe constituted the major market for foreign sales with about two-thirds of exports consumed by European countries. About 20 percent of 1996 sales were to Asian countries, about half to Japan. Canada and the Middle East consumed a majority of the remaining exports for the same year. China is a major target for future expansion in the Asian market.

*Citrus:*

The citrus industry is also a major exporter of California produce. Two thirds of the citrus crop is not processed, rather it is packaged and shipped to domestic or foreign consumers. The significant amount of non-processed citrus is unique to California. For example, Florida, the state's greatest domestic competitor, processes a majority of its citrus for concentrate and juice. The Sunkist cooperative represents a large share of California's citrus operations. The farmer-members produce 90 percent of their crop in California and the remaining 10 percent in Arizona. Worldwide revenue for 1996 was \$1.25 billion. Approximately 40 percent of these revenues were obtained from export sales. Unlike the almond industry which exported a majority of its product to Europe, California's citrus is sold in the Pacific Rim, primarily in Asia and Canada.

California citrus producers compete at the high end of the market, in terms of both cost and quality. They cannot compete with the lower cost (and lower quality) product that is grown in every country to which they export, with the exception of Canada. California producers dominate the high end of the export market. Even in this niche, they face foreign competition from southern Europe, South America, Australia and South Africa, but competition would be much greater in lower and middle segments of the market.

*Tomatoes:*

Tomato products are the segment of the canned and preserved food processing industry with the greatest amount of outside ownership. California produces 90 percent of the domestic tomato crop and this crop is processed by a variety of firms. Except for the Tri-Valley cooperative (which also processes other vegetables and fruits) there is not a

cooperative devoted to tomato production. Two major national food processing firms headquartered out of California (including the one Stage III firm in the sample), process a considerable amount of the state's tomatoes. Tomato products are distributed rather evenly in Europe and in Asia.

*Wine:*

The Wine Institute, a California based organization, maintains significant research and information on the industry, including exports. Ninety percent of U.S. wine exports are from California and in 1996 the value of these revenues were \$327 million. Europe constituted the primary market for California wines in 1996 with over half of export sales in this region. Canada followed with a consumption of almost twenty-five percent of the state's wine exports. Japan leads the Pacific Rim market. Future growth is predicted for the export wine market in the Pacific Rim market. Wine makers are targeting the large young Asian markets with their quality products.

Similar to the food industry, the California's wine industry is based on the superior wine grapes grown in fertile soil of the Napa and coastal regions and the California Central Valley. Even though the industry has imported wine stock from South America, the industry is tied to the California grape harvest. With the increased international demand for California wines, California producers are developing foreign operations under the California name, as a way of meeting a wider range of demand in terms of price level. California wine production is not expected to decrease with the production of foreign wine. Rather, wineries are searching for new regions to grow grapes. Wineries are expanding growing areas within California as well, for example to coastal regions from Mendocino to Santa Barbara.

### *Imported Inputs*

There are few foreign inputs to the California food processing industry. Almost all of the raw materials are grown in California. In some rare cases did we find the importing of raw materials. For example, some of the tomato paste is imported from Mexico. Also, when grape crops have fallen short, some of the wineries are importing bulk wine from South America and Europe, bottling it under separate labels showing the place of origin of the grapes. In addition to raw materials, some processing equipment is imported (for example, tomato processing equipment from Italy), and the wine industry imports all of their corks and some barrels.

### *Foreign Competition*

Even though California maintains a competitive edge on quality of many of its products, the state is not insulated from foreign competition. The growing international agriculture industry is developing higher quality and larger yields that are competing with California-based firms. If a foreign country is able to grow a quality crop on a reliable basis, then California production becomes vulnerable. For example, Mexico has recently been able to grown competitive crops of broccoli and cauliflower and has taken a large share of the world market from California operations. Additionally, China's agricultural base has been expanding and food processing firms are approaching California businesses for assistance in developing their processing operations. These two examples demonstrated that the processing technology is ubiquitous and can be transferred around the world if there are quality crops to process.

Respondents cited other examples of foreign produce which was increasingly becoming competitive with US produce in either domestic or foreign markets. Greek production of peaches was mentioned as a case where quality improvements made the product more competitive with California firms. Olive production in Spain has long been a competitor to California olives, but other Mediterranean countries were also seen as competitors in the long term.

Most firms considered foreign competition from a position of strength, confident in the quality of California products and their ability to market the product. To the extent that competition was a concern, it came from two directions. Firms expected some increase in competition as foreign producers improve products. In addition, many of the firms interviewed were concerned with the pricing of foreign products. Foreign tariffs on US products and subsidies for growing food products in foreign countries affect both the ability of California producers to compete in many foreign markets and the price of products imported into the United States. However, many of the firms facing these issues of competition were producers of a variety of food products and found in this diversity of products further insulation against foreign competition.

### *Labor Force*

Without the pressures of overseas competition and the complexities of overseas branch production experienced in the computer industry, the labor market of the food processing industry is fairly straightforward. About 1/3 to 1/2 of the industry is comprised of an administrative management level. A majority of these employees have four year university degrees and some have advance degrees. These employees are recruited

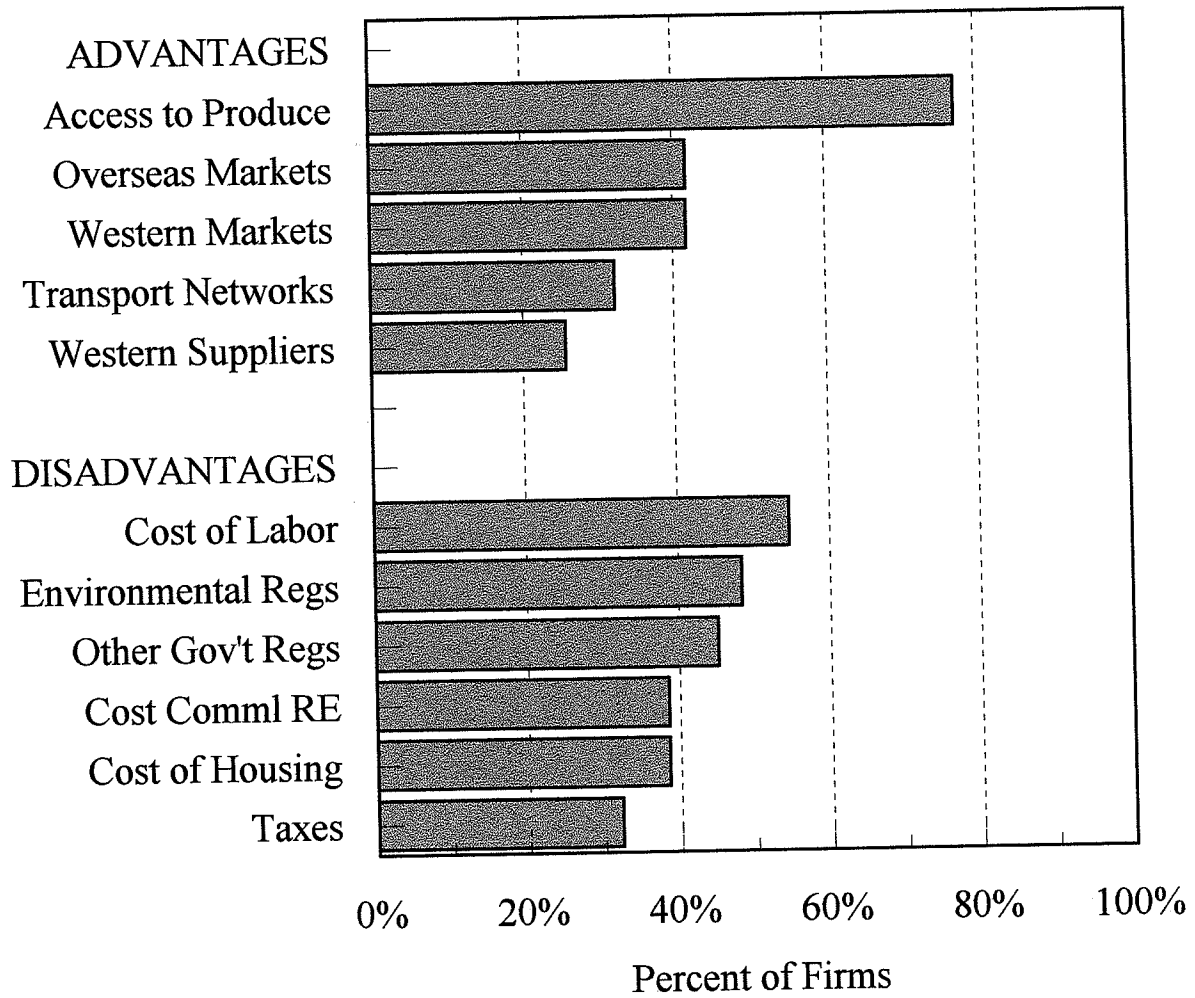
nationwide. The remaining production work force has less education requirements and many of the skills can be learned on the job. Seasonal variations in the labor force are high, with the main fluctuations occurring in the production workforce. Even though the industry is not as tightly linked to the university system as the computer industry, university research, especially at UC Davis, is important for maintaining California's competitiveness in the agriculture and food processing business.

### *Location Decisions/Policy Issues*

The quality and reliability of California's agricultural harvests are key to the continued success of the food processing industry throughout the state. With the exception of some of the meat processing firms, every firm that uses California's agricultural products stated that the availability of raw materials was central to their location in the state, as shown in Figure 12. Another critical ingredient to the success of the state's food processing industry is the elaborate infrastructure of road and water systems. California extensive transportation system has provided easy access to crops and to markets for the food processors. In addition the comprehensive water delivery system developed over 100 years ago continues to bolster the food processing industry. This system permits desert farming and allows many farmers to farm arid lands that would be impossible without water. One tomato processor stated that his firm could accurately estimate sales of processed tomatoes when the seeds were planted given the state's climate and guaranteed water. Also, access to west coast markets and the proximity of foreign markets in Asia and Canada were seen as an advantage to the California location.



Figure 12  
**Advantages and Disadvantages of California Location  
 Food Processing Firms**



Source: Interviews by Authors

Finally, the agricultural programs at UC Davis are a major attribute to the state's infrastructure.

Even though there are many advantages, there are several disadvantages for a California location. Leading the list of disadvantages include labor costs and environmental and government regulations. Most firms said that the extensive environmental and business regulations in the state drive up the cost of their products so that they are not competitive in the world market. Housing and real estate costs were also noted as disadvantages. The cost of labor was also a negative factor for many firms. Unlike the computer industry where congestion was a major negative attribute, the food processing firms were not too concerned about congestion as they were not located in the congested urban areas. Finally, access to European markets was noted as a concern for some of the processors. The travel time to Europe is almost twice as long as that to Asia by sea.

Based on the previous discussion it is clear that California's food processing industry is fairly secure in the world economy and its location in the state. Almost all of the firms interviewed have no plans to leave the state. Firms expanding out of state in most cases were following opportunities to gain access to raw materials at least as much as to lower labor costs.

The food processing industry does not rely on state programs to enhance its competitiveness. Very few of the state's food processing firms used California's export promotion programs to enhance their export revenues. Most of the firms that used these

programs did so several years ago when they were much smaller operations.<sup>22</sup> A majority of the state's export programs are targeted to smaller firms, so there is little demand on behalf of the firms included in our study. Some firms took advantage of state employment and agricultural training programs.

To the extent that firms made use of marketing programs, the large firms tended to rely on federal level assistance from the USDA. Some of the firms interviewed also participated on product specific advisory boards. These advisory boards such as the peach, almond and tomato boards have offered marketing assistance to some processing operations. Finally, all of the wineries took advantage of resources and promotion activities sponsored by the Wine Institute.

Many firms cited the state's stringent environmental policies and regulations as impediments to being competitive. For example, waste-water disposal is a large burden on many companies. High workers compensation and liability insurance costs were also concerns voiced by many firms. At the federal level, foreign quotas and tariffs were seen as major restraints to California operations expanding into foreign markets. In addition, subsidies for agricultural products in foreign countries hurt the competitiveness of California products in markets abroad.

Recommendations for improving California's processed food revenues were offered by the firms we interviewed. Many of the firms admitted that little could be done about the environmental and business climate, and attention should focus on foreign trade programs. These suggestions focused on negotiations around trade barriers inhibiting

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<sup>22</sup> This finding suggests that further study of export activity and growth by smaller firms would be important in evaluating the effectiveness of state programs.

California's competitiveness. Increased product awareness of California's food products would also be welcomed by the industry.

State and federal foreign trade policy was on the top of many of the interviewed firms' agendas. Of major concern was the US trade policy with many foreign partners including China. Trade barriers must be reduced in order to facilitate open trade programs. Firms were also concerned with deficiencies in NAFTA. A number of firms mentioned that thus far, few NAFTA programs have helped the industry, although more progress has been made with Canada than with Mexico.

Any export promotion policy developed around the food processing industry must address the industry's connection to the agricultural industry in addition to the concerns noted above. The security of the food processing industry lies in this base. Without it, there would be no food processing industry in California. In a state with a growing demand for more land, there is no guarantee the agricultural base will remain. Foreign countries are improving quality and reliability of harvests and will increasingly be able to compete with California's agricultural base. Lower labor and production cost combined with the ability to grow quality products in foreign locations will challenge the competitiveness of California's food processing's industry. The state must consider this scenario along with foreign trade programs when developing a comprehensive trade policy for the food processing industry.

## **Conclusions**

Both of these case studies suggest that foreign trade must be evaluated in a broader context of increasing globalization. Growth in exports or foreign sales are likely

to be accompanied by a variety of other trends that imply this is not a simple job producer for California. Several key points arise from examining these two industries:

- 1) Exports versus Foreign Sales: A growing market for products from California companies will not necessarily be met through export growth from California establishments. The two industries studied represent two important variants on this theme. For the computer cluster, in an intensely competitive foreign environment, foreign sales were likely to be met by foreign production, with only a small proportion of the job growth (although perhaps a larger share of income growth) occurring within California. For the food processing firms, many were already working with a fixed or slow-to-expand amount of production area in California. Growth in foreign demand had to be balanced against growing or shifting domestic demand. Few firms pursued a strategy of seeking rapid growth in foreign sales, and the few that did seek this growth also seemed more oriented to expanding selected aspects of production abroad (e.g. wine, olives).
- 2) Job growth was tempered in the export area by the move to foreign production and also by import competition. The two industries studied had strong ties to California, either in the area of knowledge or primary resources, but also were highly aware of the high cost environment of the state. In the computer industry, to the extent that export growth allowed firms to produce overseas, this could even divert some employment growth that would otherwise have occurred in the US (although not necessarily in California). In both cases, the conditions allowing for increased export growth also could foster increased imports by foreign producers to compete in domestic markets.

- 3) Increasing globalization appeared to affect employment mix in California, especially in the computer cluster. As more production occurs overseas, the R&D activities and much of administration appear closely tied to California. An increasing proportion of California jobs in these sectors are high paying and technically demanding. This pressure may be felt to a smaller degree even in food processing in California, to the extent that food processing firms must compete with low wage labor abroad in imported products. Rather than moving production abroad, these firms may look to other means of reducing labor costs, such as increased mechanization. This, too, could affect the level and distribution (by wage and occupation) of jobs in California.
- 4) Imported intermediate inputs and overseas production have complex effects on California's economy. Global trade has the potential to strengthen California firms, allowing opportunity for finding inputs that help to maintain lower production costs and to diversify markets for products, perhaps cushioning fluctuations in demand. The ability to lower costs through imported inputs and overseas production has a negative effect on job production levels in the state but also improves the competitiveness of firms against other producers. This was particularly apparent in the computer sector. For selected food processors (e.g. wine) imported inputs also offer the opportunity to decrease some fluctuations in production due to crop failure.
- 5) Globalization may strengthen the advantages of service sector firms in California over manufacturing. In the computer cluster, for example, the software firms

maintained nonmanufacturing activities primarily within the US, while moving manufacturing activities abroad.

6) More broadly, foreign trade is a factor towards the restructuring of production and jobs in California. In the computer sector, the drop in manufacturing jobs during a period of sales expansion was counteracted by a rise in services jobs in computer-related sectors. The share of production jobs in food processing, where foreign competition is much lower in US markets, has remained constant.

7) Responses from both computer and food processing firms show that land use and infrastructure issues play an important role in the firms' competitiveness in international markets and their long-term future in California. The state offers strong advantages to both industries, but the factors underlying these advantages (skilled labor, underlying educational institutions, fertile land, adequate water supplies) need continued attention if the sectors are to remain competitive.

The case studies suggest that many California firms have strengths and strategies that will allow them to compete in global markets, but that strong global competitors may also quickly become global producers. California economic development policy with regards to foreign trade must look at the topic in terms of its effects beyond the immediate sales levels in export areas to the broader impacts on firm structure, net job levels and occupational distribution.<sup>23</sup>

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<sup>23</sup> Policy implications of changing global conditions are discussed in Kroll 1998b.

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## **Appendix A**

### **Sample Selection and Interview Protocol for Case Study Industries**

Interviews of appropriate industry representatives were one component of the case studies of the computer and food processing industries. We selected 35 computer companies and 50 food processing companies from multiple sources including primary and secondary indexes of computer and food processing firms. We conducted interviews with executive officers of the selected companies to gain a greater understanding of the global linkages in both of these industry clusters relative to their growth in the California economy.

#### ***Industry Definitions***

Prior to selecting the potential firms for the interview process, we developed cluster definitions for both industries. The cluster concept was used to provide manageable parameters for analyzing the industries, since each of the industries are comprised of numerous subcomponents. In order to obtain a comprehensive understanding of the industries' subcomponents, we used aggregate industry data from County Business Patterns, the Census of Manufacturers and Annual Survey of Manufacturers, and the International Trade Administration to determine the size, growth and location patterns of the two industries. We focused our case studies on sectors that have a significant presence in California and are also significant export or import sectors.

The computer cluster included firms from the following manufacturing and services sectors: computer equipment (SIC 3571), peripherals (SIC 3577), circuit boards

(SIC 3672), storage devices (SIC 3572) and software (SIC 7371 through 7373). We also consider electronic components (SIC 3674) to be part of the computer cluster, but we excluded these firms from the sample to allow for more complete coverage of the other sectors and because there are already many existing sources on the semiconductor industry.

The food processing cluster was comprised of companies processing meat products (SIC 201), preserving fruits and vegetables (SIC 203) and producing beverages (SIC 208). We excluded segments of food processing which were either very small in California (e.g. grain mills, SIC 204) or which were not significant exporters (for example, dairy products, SIC 202, and baked goods, SIC 205).

### ***Sample Selection***

With the clusters established for the study, selecting the firms was the next step in the interview process. The selection criteria for the type of firms included in the study varied for each cluster. For both clusters we targeted the largest firms (as defined by annual revenue) that were headquartered in California or had significant operations in California. For the computer cluster, we also selected the fastest growing firms.

For the computer cluster all of the firms were headquartered in California or were California-headquartered subsidiaries of foreign companies. *Manufacturing USA* (1994) and *Ward's Business Directory of US Private and Public Companies* were used to select the largest computer firms for each of the sectors except for software. The software component was derived from the *Computer Industry Almanac's* (1994) listing of fastest

growing US software companies. We also used *Hoover's Guide to Computer Companies* (1996 edition) as a secondary source, to ensure that our coverage was complete.

In addition to selecting the largest firms, we broadened our criteria for the computer cluster to include the fastest growing firms in the same sectors to examine the rapid growth that many of the computer companies have experienced over the last decade. These firms were selected using INC. 100's 1995 list of fastest-growing small public US companies. We also augmented the software list from the *Soft-Letter* 1996 100 list. Of the 35 firms selected for interviews, 6 were among the fastest growing.

All of the firms selected for the food processing cluster were among the largest in California and had annual revenues over \$100 million in 1996 as reported by *American Business Information*, a CD-ROM data base. The listing was verified for SIC 203 with the *Membership Directory* of the California League of Food Processors. We included primarily California headquartered firms. Since some of the largest food processing operations in California are headquartered out of the state, we also included those companies whose branches appeared in the *American Business Information* listing of firms with \$100 million annual revenues or higher. Our initial sample included 50 firms, but we eliminated five of these after initial phone calls revealed that they had no food processing activities within the state (e.g. Clorox), that the firm was a subsidiary of another firm on the list, or that the firm had closed operations at the location.

From the list of firms included in the interview pool for both industries, we were able to interview 45 firms. For the computer cluster, we interviewed 40 percent of the firms in detail and augmented information for an additional 17 percent of firms from much briefer conversations and from annual reports. Figure A-1 gives the response results by

computer sector. (Note that the firms are reported by broad activity rather than SIC code. This is because a number of firms fall into more than one SIC code). Coverage is best for networking firms, where we obtained detailed interviews or partial data on all five firms in the sample. Coverage was also fairly strong on computer equipment manufacturing firms, where half participated in detailed interviews, and partial information augmented the findings for one other firm. Responses were weakest for component manufacturers and software firms. A number of component manufacturers were reluctant to participate because of concerns with proprietary information, while the software firms were growing rapidly and did not have staff available to respond to questionnaires.

We interviewed 69 percent of the firms in the food processing cluster. Figure A-2 summarizes the response characteristics of this cluster. More than half of the firms responded in all of the primary sectors, with the strongest coverage in the preserved foods sections (canned and frozen foods and packaged foods, as shown in the figure). Two of the firms on the list turned out to be distributors rather than processors. We interviewed one of the two distributors.

### ***Interview Protocol***

Our interview process required several steps:

- 1) We began with an initial phone call or set of calls to identify the person (or persons) best able to answer questions about the company's general conditions (revenues, payrolls), foreign sales, use of imported inputs, foreign competition, labor force, location decisions, and policy concerns.

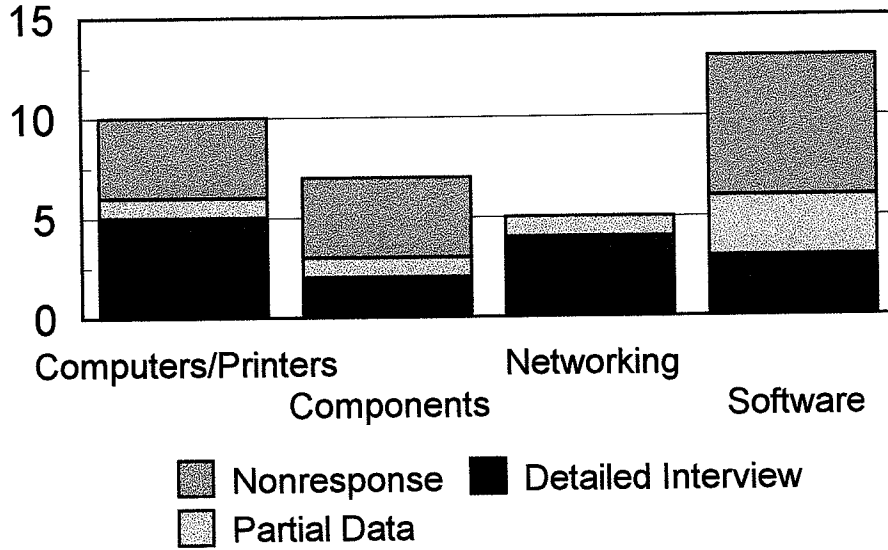
- 2) We then sent an introductory letter to each of the individuals identified at each company, as well as to the company CEO. The letter included a description of the questions to be addressed, the choices as to form and length of interview, and the arrangements made to ensure confidentiality for respondents.
- 3) We followed the letter with a telephone call to make an appointment for an interview. If requested, we sent further informational material or a copy of the prototype questionnaire. At this time, we also sent or faxed each respondent a “consent” form that informed them of the voluntary nature of their participation.
- 4) After arranging a time with the potential respondent (or respondents), we proceeded with the interview (or interviews). We based the interviews on a printed questionnaire, which we administered in person, by phone, or in writing, if requested by the respondent.

Questionnaires for both the computer and food processing clusters that we used as interview guides are included in Appendix B. Samples of the introductory letter, information sheet, and consent form are also in Appendix B. The questionnaires served as a guide. Respondents were encouraged to answer in as much detail as possible, but to skip sections where the data was unavailable or of a confidential nature. We modified the list of questions where necessary to better reflect a company’s structure.

We conducted the computer cluster interviews from February 1997 through May 1997. We began the food processing interviews later, in April 1997, and completed them in May 1997.

Figure A--1  
**Computer Sample and Responses**

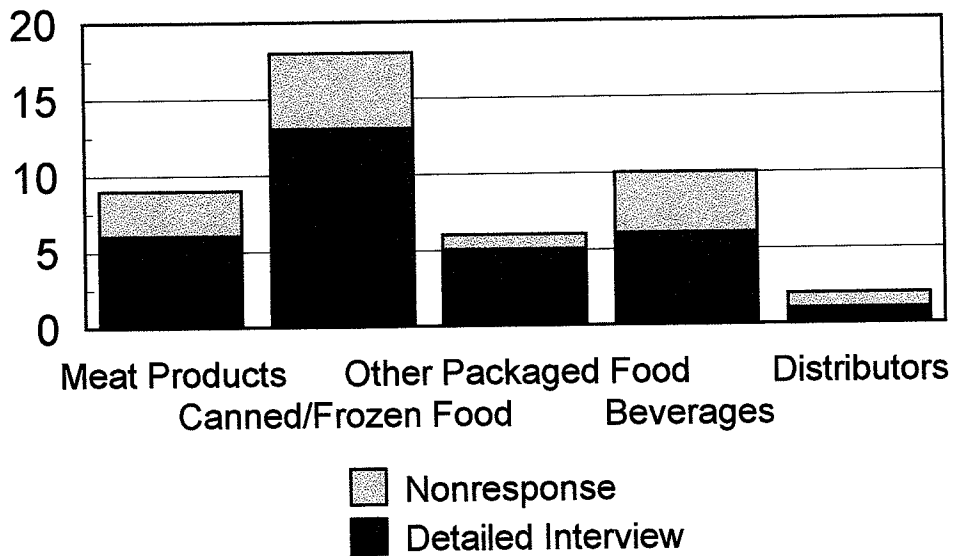
Number of Firms



Source: Interviews by authors.

Figure A-2  
**Food Processing Sample and Responses**

Number of Firms



Source: Interviews by authors.

## **APPENDIX B**

### **Sample Questionnaires, Letters, and Other Informational Material**



**The Global Component of California's Growth Industries**

**QUESTIONNAIRE: Computer Cluster**

Company Name \_\_\_\_\_  
 Address \_\_\_\_\_  
 \_\_\_\_\_  
 CEO Name \_\_\_\_\_  
 Contact Name, \_\_\_\_\_  
 Title \_\_\_\_\_  
 Contact Phone \_\_\_\_\_ FAX \_\_\_\_\_  
 e-mail \_\_\_\_\_

**Introduction:**

As shown in the introductory letter and consent form we sent to you, the Fisher Center for Real Estate and Urban Economics is studying the impacts of foreign trade and global linkages on California's economy. To augment the data we have collected, we are conducting interviews of selected computer, peripherals and software firms. Thank you for agreeing to participate. Please answer as fully as you are able. Of course, you may choose not to answer specific questions, or to keep some information "off the record."

**I. Company Background**

To help us interpret and organize responses from different firms, it would help to have some detailed information on your firm and its recent growth history.

1. Number of employees 1996  
*world-wide* \_\_\_\_\_; *US* \_\_\_\_\_; *California* \_\_\_\_\_;
  2. Revenues 1996  
*world-wide* \_\_\_\_\_; *US* \_\_\_\_\_; *California* \_\_\_\_\_;
  3. Payroll 1996  
*world-wide* \_\_\_\_\_; *US* \_\_\_\_\_; *California* \_\_\_\_\_;
  4. Ownership  
 a. *public*  *private*  *other (explain)*  
 b. *parent corporation*  *affiliate*  *division*  *other (explain)*
  5. How long has the firm been in business? \_\_\_\_\_ years
  6. Can you give us historic figures on employment, revenues and payroll back to 1993. If not, can you tell us generally, have employment and revenues grown since 1993? (gain in jobs/revenue/payroll, no change, loss)
- |                   | <i>in California</i> | <i>in US</i>        | <i>Worldwide</i>    |
|-------------------|----------------------|---------------------|---------------------|
| <i>Employment</i> | gain / no ch / loss  | gain / no ch / loss | gain / no ch / loss |
| <i>Revenues</i>   | gain / no ch / loss  | gain / no ch / loss | gain / no ch / loss |
| <i>Payroll</i>    | gain / no ch / loss  | gain / no ch / loss | gain / no ch / loss |

**II. Trade Flows**

**A: EXPORTS**

1. What are the major products produced by your firm's California locations
- | <i>product</i> | <i>share of California revenues</i> |
|----------------|-------------------------------------|
| 1. _____       | _____                               |
| 2. _____       | _____                               |
| 3. _____       | _____                               |
| 4. _____       | _____                               |
| 5. _____       | _____                               |

2. What proportion of this revenue came from sales outside of the US in 1996? \_\_\_\_\_%

3. Variations in revenues from exports since 1990:  
 Lowest export revenues: year \_\_\_\_\_ total revenues \$ \_\_\_\_\_ exports \$ \_\_\_\_\_  
 Highest export revenues: year \_\_\_\_\_ total revenues \$ \_\_\_\_\_ exports \$ \_\_\_\_\_

Factors behind export variation:  
 exchange rates  strength of overseas economies  changes in competitor firms   
 other (explain)

4. Please let us know which of your products are most heavily exported and where the markets for those products are located:

<i>product</i>	<i>share of revenues exported</i>	<i>country(ies) of major customers</i>
1. _____	_____	_____
2. _____	_____	_____
3. _____	_____	_____
4. _____	_____	_____
5. _____	_____	_____

**B. IMPORTS**

1. What are the major inputs to your products produced in California?
- | <i>input</i> | <i>to product</i> |
|--------------|-------------------|
| 1. _____     | _____             |
| 2. _____     | _____             |
| 3. _____     | _____             |
| 4. _____     | _____             |
| 5. _____     | _____             |

2. Overall, what proportion of inputs are imported from outside the US? \_\_\_\_\_%

3. What were the (geographic) sources of your major inputs (other than labor) in 1996?

<i>Input</i>	<i>California</i>	<i>Other US</i>	<i>Other countries (name)</i>
1. _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> _____
2. _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> _____
3. _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> _____
4. _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> _____
5. _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> _____

4. For inputs imported from abroad, from what type of firm?  
*a subsidiary of your firm*     *other producer*     *parts distributor*   
*other (explain)*

5. Do the countries/state of origins of inputs vary over time? *yes / no*  
 If yes, explain, examples?

C. CALIFORNIA LINKAGES to exporting or importing activity elsewhere in US

Even if there is little foreign exporting or importing involving your firm operations in California, other out-of-state branches of your firm may be heavily involved in importing inputs or exporting final product. If this is the case, please explain to what extent the firm operations in California are linked to this activity.

Specifically:

- Does more extensive exporting of output or importing of inputs occur at your US facilities outside of California? *yes/no* If so, please elaborate.
- How closely are California operations linked to these other US operations? Would a change in the market for exports or the cost of imported inputs affect the level of activity of California operations indirectly, through their impacts on other US facilities?
- Are there other ways that imports and exports affect your firm, which we have not already addressed (e.g. cost of inputs to a supplier or overseas markets for products of a customer)? Please elaborate.

D. FOREIGN COMPETITION

1. Are your major competitors?  
*Other California firms*       *Other US firms*       *Foreign firms*   
*country(ies):* \_\_\_\_\_
  
2. Do you expect competition to increase in the next 5 years? *yes / no*      From whom?  
*Other California firms*       *Other US firms*       *Foreign firms*   
*country(ies):* \_\_\_\_\_
  
3. Which products are most vulnerable to foreign competition? Why?

III. Labor Force

We have information on the occupational characteristics of the industry and on wage ranges of production workers/nonsupervisory workers in your industry. It would be helpful, to set the context and understand the implications of your responses, to have some specifics from you as to the characteristics of your labor force, particularly in California.

1. What is the occupational distribution of your employees (% of total)  

	<i>in California</i>	<i>nationwide</i>	<i>worldwide</i>
<i>manager/supervis</i>	_____	_____	_____
<i>professional/tech</i>	_____	_____	_____
<i>admin/clerical</i>	_____	_____	_____
<i>production</i>	_____	_____	_____
<i>service</i>	_____	_____	_____
<i>sales</i>	_____	_____	_____
  
2. What type of training do your employees require? (check 1 per occupation or give percents where appropriate)  

	<i>advanced degree</i>	<i>BA</i>	<i>community col.</i>	<i>other</i>
<i>manager/supervis</i>	_____	_____	_____	_____
<i>professional/tech</i>	_____	_____	_____	_____
<i>admin/clerical</i>	_____	_____	_____	_____
<i>production</i>	_____	_____	_____	_____
<i>service</i>	_____	_____	_____	_____
<i>sales</i>	_____	_____	_____	_____
  
3. Where are most of them trained?  
*California: universities*       *community colleges*       *other*  (*explain*)  
*Other US/outside California*   
*Overseas*
  
4. What proportion of your employees are *foreign born*? \_\_\_\_\_
  
5. What proportion of your labor force is hired on a *subcontract basis*? \_\_\_\_\_
  
6. What share of subcontracting occurs *outside the US*? \_\_\_\_\_

#### IV. Policy Issues

Because we hope to provide direction for state policy makers, we would like your impressions of the types of programs and policies that are needed to help your firm compete.

1. What are the major advantages to your firm of a California location?

- access to customers/markets in California/the western US
- access to customers/markets overseas
- access to suppliers in California/the western US
- access to overseas suppliers
- access to skilled labor
- cost of labor
- cost of housing/other living costs
- commercial real estate costs
- commercial real estate availability
- professional and social networks
- communications and information infrastructure
- transportation networks
- quality of life
  
- other (note)

2. What are the major disadvantages?

- access to customers/markets in the US
- access to customers/markets overseas
- access to suppliers in the US
- access to overseas suppliers
- access to skilled labor
- cost of labor
- cost of housing/other living costs
- commercial real estate costs
- commercial real estate availability
- professional and social networks
- communications and information infrastructure
- transportation congestion
- quality of life
  
- other (note)

3. If you expand in the near future, are you more likely to expand:  
in California  elsewhere in US  Out of US

What would be the main reasons for this choice?

4. What California programs/policies help your firm to remain competitive compared to other US or foreign firms?



**The Global Component of California's Growth Industries**

**QUESTIONNAIRE: Food Processing Cluster**

Company Name \_\_\_\_\_  
 Address \_\_\_\_\_  
 \_\_\_\_\_  
 CEO Name \_\_\_\_\_  
 Contact Name, \_\_\_\_\_  
 Title \_\_\_\_\_  
 Contact Phone \_\_\_\_\_ FAX \_\_\_\_\_

**Introduction:**

As shown in the introductory letter and consent form we sent to you, the Fisher Center for Real Estate and Urban Economics is studying the impacts of foreign trade and global linkages on California's economy. To augment the data we have collected, we are conducting interviews of selected food processing firms. Thank you for agreeing to participate. Please answer as fully as you are able. Of course, you may choose not to answer specific questions, or to keep some information "off the record."

**I. Company Background**

To help us interpret and organize responses from different firms, it would help to have some detailed information on your firm and its recent growth history.

1. Number of employees 1996  
*world-wide* \_\_\_\_\_; *US* \_\_\_\_\_; *California* \_\_\_\_\_;
2. Revenues 1996  
*world-wide* \_\_\_\_\_; *US* \_\_\_\_\_; *California* \_\_\_\_\_;
3. Payroll 1996  
*world-wide* \_\_\_\_\_; *US* \_\_\_\_\_; *California* \_\_\_\_\_;
4. Ownership  
 a. *public*  *private*  *other (explain)*   
 b. *parent corporation*  *affiliate*  *division*  *other (explain)*
5. How long has the firm been in business? \_\_\_ years
6. Can you give us historic figures on employment, revenues and payroll back to 1993. If not, can you tell us generally, have employment and revenues grown since 1993? (gain in jobs/revenue/payroll, no change, loss)  

	<i>in California</i>	<i>in US</i>	<i>Worldwide</i>
<i>Employment</i>	gain / no ch / loss	gain / no ch / loss	gain / no ch / loss
<i>Revenues</i>	gain / no ch / loss	gain / no ch / loss	gain / no ch / loss
<i>Payroll</i>	gain / no ch / loss	gain / no ch / loss	gain / no ch / loss

**I. Trade Flows**

**A: EXPORTS**

1. What products does your firm produce at your California processing locations?

<i>product</i>	<i>share of California revenues</i>
1. _____	_____
2. _____	_____
3. _____	_____
4. _____	_____
5. _____	_____

2. What proportion of this revenue came from sales outside of the US in 1996?

3.

3. How have revenues from exports varied since 1990?

Factors behind export variation:

trade agreements  exchange rates  strength of overseas economies

agriculture conditions in California  agriculture conditions elsewhere

other (explain)

4. Please let us know which of your products are most heavily sold outside of the United States and where the markets for those products are located:

<i>product</i>	<i>share of revenues exported</i>	<i>country(ies) of major customers</i>
1. _____	_____	_____
2. _____	_____	_____
3. _____	_____	_____
4. _____	_____	_____
5. _____	_____	_____

**B. IMPORTS**

1. What are the raw materials and equipment used in your California food processing operations?

*Raw Materials/Equipment*

1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_
4. \_\_\_\_\_
5. \_\_\_\_\_

2. Overall, what proportion of these inputs are imported from outside the US? \_\_\_\_\_ %  
 Raw Materials \_\_\_\_\_ %  
 Equipment \_\_\_\_\_ %

3. What were the (geographic) sources of your raw materials and equipment in 1996?  
 Other Other



<i>Input</i>	<i>California</i>	<i>US</i>	<i>countries (name)</i>
1. _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> _____
2. _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> _____
3. _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> _____
4. _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> _____
5. _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> _____

4. For raw materials imported from abroad, from what type of firm?  
*a subsidiary of your firm*     *other producer*     *wholesale importer*   
*other (explain)*

**C. CALIFORNIA LINKAGES to exporting or importing activity elsewhere in US**

Even if there is little foreign exporting or importing involving your firm operations in California, other out-of-state branches of your firm may be heavily involved in importing inputs or exporting final product. If this is the case, please explain to what extent the firm operations in California are linked to this activity.

Specifically:

- Does more extensive exporting of output or importing of inputs occur at your US facilities outside of California? yes/no If so, please elaborate.
- Does your firm produce a significant amount of product overseas? yes/no If so, please elaborate.
- How closely are California operations linked to these other US or overseas operations? Would a change in the market for exports or the cost of imported inputs affect the level of activity of California operations indirectly, through their impacts on other US facilities?
- Are there other ways that imports and exports affect your firm, which we have not already addressed (e.g. cost of inputs to a supplier or overseas markets for products of a customer)? Please elaborate.

**D. FOREIGN COMPETITION**

1. Are your major competitors?  
*Other California firms*     *Other US firms*     *Foreign firms*   
*country(ies):* \_\_\_\_\_

2. Please describe your competition?
3. Do you expect competition to increase in the next 5 years? *yes / no* From whom?  
*Other California firms*  *Other US firms*  *Foreign firms*   
*country(ies):* \_\_\_\_\_
4. Which products are most vulnerable to foreign competition? Why?

**III. Labor Force**

We have information on the occupational characteristics of the industry and on wage ranges of production workers/nonsupervisory workers in your industry. It would be helpful, to set the context and understand the implications of your responses, to have some specifics from you as to the characteristics of your labor force, particularly in California.

1. What is the occupational distribution of your employees (% of total)
- |                      | <i>in California</i> | <i>nationwide</i> | <i>worldwide</i> |
|----------------------|----------------------|-------------------|------------------|
| <i>admin/manager</i> | _____                | _____             | _____            |
| <i>production</i>    | _____                | _____             | _____            |
| <i>service/sales</i> | _____                | _____             | _____            |
2. What type of education do you require of your employees? (check 1 per occupation or give percents where appropriate)
- |                      | <i>advanced degree</i> | <i>BA</i> | <i>community col.</i> | <i>other</i> |
|----------------------|------------------------|-----------|-----------------------|--------------|
| <i>admin/manager</i> | _____                  | _____     | _____                 | _____        |
| <i>production</i>    | _____                  | _____     | _____                 | _____        |
| <i>service/sales</i> | _____                  | _____     | _____                 | _____        |
3. Where are most of them educated?
- California: universities*  *community colleges*  *other*  (explain)  
*Other US/outside California*   
*Overseas*
4. Is any of your labor force hired on a *subcontract basis*? \_\_\_\_\_  
 yes/no Approximately what share?
6. Are there seasonal fluctuations in your labor force? \_\_\_\_\_

**IV. Policy Issues**

Because we hope to provide direction for state policy makers, we would like your impressions of the types of programs and policies that are needed to help your firm compete.

1. What are the major advantages to your firm of a California location?

- access to agricultural produce*
- access to customers/markets in California/the western US*
- access to customers/markets overseas*
- access to suppliers in California/the western US*
- access to overseas suppliers*
- access to labor*
- cost of labor*
- cost of housing/other living costs*
- commercial real estate costs*
- commercial real estate availability*
- professional and social networks*
- communications and information infrastructure*
- transportation networks*
- quality of life*
- cost of infrastructure (e.g. electricity/water)*
- tax incentives*
  
- other (note)*

2. What are the major disadvantages?

- access to customers/markets in the US*
- access to customers/markets overseas*
- access to suppliers in the US*
- access to overseas suppliers*
- access to labor*
- cost of labor*
- cost of housing/other living costs*
- commercial real estate costs*
- commercial real estate availability*
- professional and social networks*
- communications and information infrastructure*
- transportation congestion*
- quality of life*
- cost of infrastructure (e.g. electricity/water)*
- environmental regulations*
- other government regulations*
- taxes*
  
- other (note)*

3. If you expand in the near future, are you more likely to expand:  
*in California*       *elsewhere in US*       *Out of US*

What would be the main reasons for this choice?

4. Are there any California programs/policies that help your firm to remain competitive compared to other US or foreign firms? yes/no If so, please specify.

5. Should California have other programs/policies to improve your firm's competitiveness?
  
6. Does California have any programs/policies that make it harder for your firm to remain competitive compared to other US or foreign firms?
  
7. What are your major concerns with regard to US foreign trade policy?



FISHER CENTER FOR REAL ESTATE & URBAN ECONOMICS

Haas School of Business  
602 Faculty Bldg. # 6105  
Berkeley, CA 94720-6105  
(510) 643-6105  
FAX: (510) 643-7357

**[Introductory Letter to Computer Firms]**

March 7, 1997

Dear :

Under funding by the California Policy Seminar, a University of California program that applies university research to state policy, the Fisher Center for Real Estate and Urban Economics at the University of California at Berkeley is conducting a study of the role of foreign trade in California's economy. As part of this work, we are completing a case study of the global linkages within the computer industry. Interviews of computer firms are a key element of the case study work. Because [firm name] is one of the largest [fastest growing] firms in the US and because the headquarters is located in California, we would appreciate the opportunity to speak with people in your firm who are knowledgeable about revenues from foreign exports, the role of foreign imports as inputs, the educational and occupational characteristics of your worldwide labor force, and the effect of global trade on location decisions and production decisions in the firm.

I am enclosing a 1 page summary of the project and a description of what the interview process would entail. One of the members of our research team will call your office within the next week, to obtain your permission to include [firm name] in our study and to find out who in your firm is best able to answer our questions. (Besides myself, other research team members are Josh Kirschenbaum, Ashok Bardhan, and David Howe).

The inclusion of your firm in the study is, of course, voluntary, but we hope you will be able to assist us. The goal of this research is to understand the overall level of importance of foreign trade in the computer industry and to identify the ways in which global links may be changing the industry, rather than to measure in detail the flows in any one firm. Most of the material gained from our interviews will be presented in our publications in a general way, without reference to specific firms. All individual responses will be kept confidential. Any examples included our report that name or describe your firm would be used only with your written permission or that of your designated staff.

We look forward to speaking with you and others in your firm soon.

Sincerely,

Cynthia A. Kroll  
Project Coordinator and Regional Economist



FISHER CENTER FOR REAL ESTATE & URBAN ECONOMICS  
Haas School of Business  
602 Faculty Bldg. # 6105  
Berkeley, CA 94720-6105  
(510) 643-6105  
FAX: (510) 643-7357

**[Sample Letter, Food Processing Firms]**

April 1, 1997

Dear :

Under funding by the California Policy Seminar, a University of California program that applies university research to state policy, the Fisher Center for Real Estate and Urban Economics at the University of California at Berkeley is conducting a study of the role of foreign trade in California's economy. As part of this work, we are completing a case study of the impacts of the global economy on the food processing industry. Interviews of food processing firms are a key element of the case study work. Because [firm name] is a significant food processor in California, we would appreciate the opportunity to speak with people in your firm who are knowledgeable about revenues from foreign exports and products exported, the role of foreign imports as inputs, the educational and occupational characteristics of your California labor force, and the effect of global trade on the firm's location decisions and the market for your products.

This research is being conducted in close cooperation with the California Trade and Commerce Agency and the California Department of Food and Agriculture. I am enclosing a 1 page summary of the project and a description of what the interview process would entail. One of the members of our research team will call your office within the next week, to obtain your permission to include [firm name] in our study and to find out who in your firm is best able to answer our questions. (Besides myself, other research team members are Josh Kirschenbaum, Ashok Bardhan, David Howe and Jesse Kerns).

The inclusion of your firm in the study is, of course, voluntary, but we hope you will be able to assist us. The goal of this research is to understand the overall level of importance of foreign trade and changing markets in the food processing industry and to identify the ways in which global links and competition may be changing the industry, rather than to measure in detail the flows in any one firm. Most of the material gained from our interviews will be presented in our publications in a general way, without reference to specific firms. All individual responses will be kept confidential. Any examples included our report that name or describe your firm would be used only with your written permission or that of your designated staff.

We look forward to speaking with you and others in your firm soon.

Sincerely,

Cynthia A. Kroll  
Project Coordinator and Senior Economist



## DEPARTMENT OF FOOD AND AGRICULTURE

1220 N Street, Rm. 409  
Sacramento, CA 95814  
(916) 654-0433

**[Letter of Support, California Secretary of Food and Agriculture]**

March 14, 1997

To California Food Processing Firms:

The Fisher Center for Real Estate and Urban Economics at the University of California at Berkeley has been awarded a grant to study the role of foreign trade and other global linkages in the California economy. As a part of that study, the Center is conducting case studies of selected California industry sectors, including the food processing sector. The Center has selected your firm as one of the largest producers in the state. We hope you will be able to assist the Center in this research.

The results of the Center's study will be very helpful for the Department of Food and Agriculture in its efforts to promote exports of California food and agricultural products. The global marketplace is providing the fastest growing source of new market opportunities for California products. This study will help us better understand the global marketplace and how to assist California exporters to take advantage of these exciting opportunities. We encourage you to assist the Center in its research efforts.

Sincerely,

A handwritten signature in black ink, appearing to read "Ann M. Veneman", with a long horizontal line extending to the right.

Ann M. Veneman  
Secretary



FISHER CENTER FOR REAL ESTATE & URBAN ECONOMICS

Haas School of Business  
602 Faculty Bldg. # 6105  
Berkeley, CA 94720-6105  
(510) 643-6105  
FAX: (510) 643-7357

***The Global Component of California's Growth Industries: Understanding Regional Employment Growth In an International Context -- Abstract***

***Fisher Center for Real Estate and Urban Economics  
University of California at Berkeley  
Professor Dwight Jaffee, Dr. Cynthia Kroll, Ashok Bardhan  
Josh Kirschenbaum, David Howe, Jesse Kerns***

***Funded by the California Policy Seminar, a University of California Program that Applies University Research to State Policy***

The purpose of this study is to analyze the impacts of global linkages, including foreign trade flows and multi-national production activity, on growth of the "new" California economy. Primary research objectives include describing California's comparative advantage in the international economy, identifying the foreign export component of the market for primary industry clusters in California, and identifying import dependence and import displacement occurring in these industries. The study will also look at firm structure and occupational structure, as they are influenced by the demands of foreign trade or of production activity that crosses international boundaries. Detailed analysis will focus on case studies of the computer industry cluster and the processed food industry. Research methods will include a literature review, development of a theoretical model, empirical work (including analytic statistical techniques), interviews, analysis and interpretation, and a discussion of state policy alternatives.

The proposed study is of great relevance to current discussions on economic strategies for California. Foreign trade appears to be playing a growing role in California's economy, but much of the discussion of economic strategies is based on a general understanding, rather than a detailed picture of how foreign trade and other types of global linkages affect the state's economic activity. The findings will have implications for programs of state agencies and organizations such as the California Trade and Commerce Agency, the Employment Development Department, the California Employment Training Panel, the World Trade Council, and the California Department of Food and Agriculture.





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**The Global Component of California's Growth Industries**  
**Fisher Center for Real Estate and Urban Economics**  
**Dr. Cynthia Kroll, Professor Dwight Jaffee,**  
**Ashok Bardhan, Josh Kirschenbaum, David Howe, Jesse Kerns**

**Description of Interviews**

Under funding by the California Policy Seminar, a University of California program that applies university research to state policy, the Fisher Center for Real Estate and Urban Economics, University of California at Berkeley, is conducting research on the role of foreign trade in California's economy. While much of our research is based on published data, we recognize that this data does not fully illustrate the complexities of global linkages on California businesses. To broaden our understanding of the role that global linkages play in the output, growth, and employment base of California industries, we are conducting a case study of the food processing industry, including interviews of individuals in selected firms. In these interviews, we will seek information on revenues from exports and specific products exported, on the use of imported inputs in the production process, and on competition for markets from foreign producers. We will also ask questions about the location and general operations of the firm (e.g. number of sites, location of headquarters, number of employees, output).

Depending on the time available of the respondents and the degree to which global linkages affect the company, this may involve one or more of the following:

- a) A telephone interview, of between 15 and 45 minutes.
- b) A site visit by Center research staff, involving meetings with one or more respondents, with individual meetings lasting between 15 and 45 minutes, and the entire visit lasting approximately one hour.
- c) Responses to a brief written form addressing the types of international exchanges occurring in the company (e.g. imports of inputs, sales abroad, employment of foreign labor).
- d) Respondents may choose to review portions of draft papers referring to the company. This could involve between 10 minutes and one hour of time, depending on how much of the paper you wish to review (any portions referring specifically to the firm would be quite short).

Topics to be covered in the interviews include the following:

1. *Company Structure*: As background, and to help us interpret and organize responses from different firms, it would help to have some detailed information on the structure of the firm and its recent growth history. This would include, for example, information on:
  - a. The number of employees company-wide and in California.
  - b. Revenues company-wide and from California establishments (if separable).
  - c. Date of incorporation.
  - d. Recent history of employment and revenue growth.

2. **Trade Flows:** Our primary purpose in this set of interviews is to understand the role of foreign trade global linkages in company revenues and operations in California. This would include:
  - a. Products exported and revenues from those products.
  - b. Imports used as inputs in the production process in California.
  - c. Imports that compete with the products sold by the company in US markets.
3. **Geographic Characteristics:** For comparative purposes, we would like to know the geographic distribution of the firm's activities. Helpful information would include:
  - a. The location of firm headquarters and branches within California, elsewhere in the US, and overseas.
  - b. Advantages and disadvantages of a California location.
  - c. Any changes that increased foreign trade links might make in the location of production, sales, research and development, and administrative activity.
4. **Labor Force Characteristics:** We have some information on the occupational characteristics and wage ranges in the computer industry. In order to interpret your responses, it would be helpful to have specific information on your firm's labor force including:
  - a. Occupational distribution of employees within and outside of California.
  - b. Educational and training background.
5. **Policy Concerns:** We will be seeking information on the impact of state and federal policy on the firm's competitiveness in domestic and international markets.

The results of the study will be published in working paper format by the Fisher Center and possibly as a monograph by the California Policy Seminar, the organization funding the research.

The purpose of this project is to provide California policy-makers with an understanding on how the increasingly global nature of California's economy affects operations and opportunities for California firms. The research will provide background for considering special programs that may be needed at the statewide level to support firms in a global economy and for determining if California legislators should take a position on US foreign trade policy. We hope the information developed in this study will allow the state to help firms in your industry maintain competitiveness vis-à-vis foreign markets.