What Determines Whether a Manufacturing Firm Locates and Remains in California (Or Any State)?

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Robert W. Wassmer
(Corresponding Author)
Professor and Chairperson
Department of Public Policy and Administration
California State University, Sacramento
(916) 278-6304
rwassme@csus.edu
www.csus.edu/indiv/w/wassmerr

Katherine Chalmers
Assistant Professor
Department of Economics
California State University, Sacramento
(916) 278-7080
chalmers@csus.edu

and

Walter Schwarm
Research Analyst
Demographic Research Unit
California Department of Finance
(916) 323-4086
walter.schwarm@dof.ca.gov

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Abstract

Manufacturing currently provides high paying jobs for nearly 10 percent of working Californians. Thus, it is not surprising that policymakers in the state are concerned that between 1990 and 2003, California lost almost 400,000 manufacturing jobs. We use "shift-share" analysis to show the strong tie between national and international trends in manufacturing and these job losses in California. Nevertheless, some believe that a significant portion of California's loss in manufacturing base is attributable to statewide public policies that raise the cost of doing business in the state. In this paper, we offer a "perspective" on this issue by examining: whether it is in California's best interest to pursue manufacturing jobs, factors cited by non-academics as important to California's manufacturing losses, what previous academic studies found important in determing manufacturing location, and the likely effect of California's business climate on its manufacturing investment. We conclude with suggested policies that could help retain or increase manufacturing investment in the state. Though this perspective focuses on a particular state, the findings are relevant for policymakers grappling with similar issues in any state.

1. Introduction

Perhaps a surprise to some, the State of California is a manufacturing powerhouse. In early 2007, over 1.6 million Californians worked in manufacturing at over 27 thousand different firms. This raw employment number is far above the next highest state, Texas, that employs less than one million of its residents in manufacturing. Interestingly, if the five-county Los Angeles area and San Diego County were a state, its manufacturing employment would be just behind Texas. California's manufacturing employment comprises nearly nine percent of national manufacturing employment, and over 60 percent of this industry's sector in the American West (Business News Press Release, 2007).

Manufacturing is therefore an important element in California's economy. It provides high paying jobs for nearly 10 percent of working Californians and generates about $150 billion in value added (final sales less intermediate input purchases). Compared to the 2004 California median income of slightly more than $37,000, the average annual income earned in manufacturing was $57,000 (Keystone Group, 2004, p. 10). Manufacturing employment offers an economic base for California's economy as well as many regional and/or local economies within the state. Economic impact studies estimate that manufacturing in California supports more than four million jobs and close to one third of the state's total employment (*Los Angeles Business Journal*, 2006).

Understanding the contribution of manufacturing to California's economy, it is reasonable that state policymakers are concerned about some rather dismal trends related to it. California lost almost 400,000 manufacturing jobs between 1990 and 2003. In 1990, nearly 16 percent of employed Californians worked in manufacturing; thirteen years later, this figure fell below 11 percent. The *Directory of California Manufacturers* recorded that in 2008 the state entered its fifth straight year of overall factory losses.

When interpreting this doom and gloom it is important to recognize that the cause of much of these losses in California's manufacturing activity are tied to national and international economic trends that are beyond the control of the state's policymakers. We reach this conclusion based upon a "shift-share" analysis for the periods 1999 to 2001 and 2002 to 2005 described in the appendix. Shift-share analysis separates the overall trend in activity in different California manufacturing sectors between the portion due to a national trend, and the portion due to a state-specific trend. For most of the manufacturing sectors examined, forces unique to California have actually resulted in positive statewide trends as compared to the negative national trends. A likely reason for this is the comparative advantage the state offers to manufacturing over other national locations.

Nevertheless, some believe that a significant portion of California's loss in manufacturing base is attributable to statewide public policies that raise the cost of doing business in the state. The California Manufacturers and Technology Association (2008) reports that state business costs are 24.2 percent higher than the national average and thus contribute to the greater loss in manufacturing employment experienced in California than the rest of the United States.

Furthermore, a study commissioned by the Bay Area Economic Forum (2005, pp. 7 - 8) notes the competitive challenges imposed by state policy upon California's manufacturing firms include: (1) unit labor costs that are 9.1 percent higher than national average – despite direct wages that are below, (2) worker's compensation premiums that are near the highest in the United States, (3) energy costs that are over 60 percent higher than rest of United States, (4) a corporate tax rate of

8.8% that is topped nationally only by Pennsylvania, and (5) California's regulatory environment being far more stringent than other states. Policy and business circles also mention the burden placed on high tech manufacturing in California by the state's scarcity of skilled workers (*USA Today*, 2006).

The previous information offers the necessary background as to why we chose to offer a "perspective" on the future of manufacturing activity in California. This perspective uses a multi-pronged approach. The next section explores whether it is in California's best interest to encourage manufacturing activity. Section 3 describes the factors most often cited in non-academic business discussions as factors explaining why California is losing manufacturing. In Section 4, we summarize the findings of academic empirical studies on what actually drives differences across state manufacturing activity. Section 5 summarizes the academic consensus of the "true" effects of variables often cited in business climate studies on manufacturing activity in California. We conclude the paper with our own suggestions, based on the material presented here, for public policy changes that are likely to increase (or at least maintain or slow the decrease) of manufacturing activity in California (or any state).

2. Should California Continue to Pursue Manufacturing Jobs?

Manufacturing clearly matters to California just because of the scale of this activity in the state. However, the importance of this activity goes beyond sheer magnitude. The economic benefits of manufacturing spill over the entire state to a larger degree than those benefits generated in other sectors. These economic benefits include: (1) stronger multiplier effects, (2) greater research and development capacity, (3) high productivity, (4) high income and fringe benefits, and (5) greater state and local tax revenue. Brief discussions of each of these follow.

Multiplier Effects

Differences in multiplier effects arise because economic activity in a state consists of "basic" and "non-basic" sectors (or "export-based" and "non-export-based" sectors). Basic sectors, of which

manufacturing is a part, sell a large percentage of their output outside the state being considered. By selling output produced in a state to consumers outside the state, new dollars flow into the state's economy. Outside dollars become payments to factors of production in the export-based industry. Money spent in the state is again spent on in-state and out-of-state items. This process continues and the progressive stream of in-state spending produces a multiplier effect whereas a given change in earnings or employment in a specific industry produces a greater change in the same variable in the state's economy. Multipliers are higher for export-based sectors and they are also higher for industries that make greater use of materials from within California.

The U.S. Department of Commerce has created a Regional Input-Output Modeling System (RIMS II) that illustrates the expected eventual effect of a one unit increase in either earnings or employment on these measures for the entire state (based upon 2002 data). Table 1 lists some of these multipliers.[1]

Table 1: RIMS II Multipliers for State Of California

Industry	**Earnings Multiplier**	**Employment Multiplier**
Non-Manufacturing		
Agricultural, Forestry, and Fishing Services	2.1	1.6
Construction	2.1	2.1
Retail Trade	1.8	1.6
Insurance	2.5	2.8
Hotel, Amusement, Rec Services, Motion Pictures	2.2	2.0
Health Services	1.8	2.0
Manufacturing		
Food and Kindred Products and Tobacco Products	3.6	4.0
Apparel and Other Textile Products	2.6	2.1
Chemicals, Allied Products, Petroleum and Coal	2.8	4.4
Primary Metal Industries	2.3	2.5
Industrial Machinery and Equipment	2.7	4.2
Electronic and Other Electric Equipment	2.6	3.9
Motor Vehicles and Equipment	2.9	3.5
Instruments and Related Products	2.0	2.9

[1]A full list of multipliers is at *http://www.labor.ca.gov/panel/pdf/Multipliers.pdf* .

Multiplier values for manufacturing industries are generally larger than for non-manufacturing industries. Nevertheless, policymakers need to be aware that not all manufacturing multipliers are equally potent. An additional manufacturing job in a textile mill, printer, or plastic producer generates a total of two jobs in the state, or an increase very similar in magnitude to the multiplier predicted for many non-manufacturing sectors.

Research and Development Capacity

The purpose of spending on research and development (R&D) is the discovery of more efficient production processes that benefit a state's economy. One benefit is the use of fewer resources to produce a good or service. This translates into a combination of a lower price for the product, greater wages paid to workers producing the product, and/or higher returns for the owner of the production process. Not to be ignored are the secondary "spillover" benefits whereby innovation by one firm or industry benefits others firms or industries. Often times these spillover benefits are geographically specific and stay within a state (e.g., Silicon Valley). The importance of manufacturing industries to generating these R&D benefits in California is obvious given that about two-thirds of total domestic private-sector R&D activities in the United States occur in manufacturing (Popkin, 2003). A decline in California manufacturing activity, compared to a different economic sector's similar decline, results in a greater decrease in R&D and the subsequent benefits it offers.

High Productivity

Active R&D spending by manufacturing has paid off in the form of greater productivity increases in this sector than in others. Productivity increases guarantee more things produced with fewer resources. This increases the "value added" (the differences between the cost of material inputs and what the final output can be sold for) of a worker in manufacturing and subsequently what workers are paid. Between 1995 and 2001, labor productivity in U.S. manufacturing grew at annual rate of

4.2 percent, while the same productivity in the private non-farm economy only grew at 2.4 percent annually (Hersh and Weller, 2003, p. 65).

High Income and Benefits

The high value added generated by the typical worker in the manufacturing sector allows the payment of relatively high wages and benefits. Table 2 offers information from the U.S Bureau of Labor Statistics on the average wage earned by all workers employed in a selection of non-manufacturing industries and different categories of manufacturing industries.[2] The overall mean annual wage earned in manufacturing of $40,320 is relatively high in comparison to the mean annual wages listed for non-manufacturing industries. Noteworthy to the issue of whether California policymakers should pursue/retain manufacturing jobs, the far lower mean annual wages listed are for many of the sectors in which Californians are likely to find a job if they lose their manufacturing job: Agriculture, Forestry, Fishing, and Hunting ($22,960), Retail ($27,040), Real Estate and Rental ($36,020); Arts, Entertainment, and Recreation ($29,260).

Table 2: Mean Annual 2006 California Wage for all Occupations in Listed Industry

Industry	**Mean Annual Wage**
Non-Manufacturing	
Agriculture, Forestry, Fishing and Hunting	$22,960
Mining	$46,310
Utilities	$55,750
Construction	$41,950
Wholesale	$44,930
Retail	$27,040
Transportation and Warehousing	$40,340
Information	$51,860
Finance and Insurance	$51,150
Real Estate and Rental	$36,020
Professional, Scientific, and Technical Services	$60,590
Health Care and Social Assistance	$41,050
Art, Entertainment, and Recreation	$29,260
Accommodation and Food Services	$19,650
Other Services	$31,680
Manufacturing	

[2] See *http://www.bls.gov/oes/current/oessrci.htm* for the source of information in Table 2.

Overall	$40,320
Food	$29,870
Beverage and Tobacco Products	$38,940
Textile Mills	$30,310
Wood Products	$30,660
Paper	$40,430
Printing	$37,510
Petroleum and Coal Products	$53,380
Chemical Products	$48,650
Plastic and Rubber Products	$34,390
Non-Metallic Mineral Products	$35,370
Primary Metal	$39,390
Fabricated Metal	$37,370
Machinery	$42,340
Computer and Electronic Product	$59,390
Electrical Equipment, Appliance, and Components	$39,230
Transportation Equipment	$47,450
Furniture	$32,220
Miscellaneous	$38,910

Furthermore, as recognized by Hersh and Weller (2003) and Popkin (2003), the non-wage fringe benefits offered to manufacturing employees are typically greater. Table 3 offers evidence for this conclusion from an August 2006 Bureau of Labor Statistics publication on *National Compensation Survey: Employee Benefits in Private Industry in the United States*.[3]

Table 3: Percentage of Workers in Goods or Service Producing Types of Industrial Sectors Receiving a Particular Non-Wage Benefit in United States

Non-Wage Benefit	**Goods Producing Industry**	**Service Producing Industry**
Life Insurance	62%	49%
Short-Term Disability	53%	35%
Retirement	88%	83%
Medical Care	81%	72%
Dental Care	86%	75%
Vision Care	83%	72%
Paid Holidays	85%	74%
Non-Production Related Bonuses	55%	44%

State and Local Tax Revenue

[3] See *http://www.bls.gov/ncs/ebs/sp/ebsm0004.pdf* for the source of information in Table 3.

A final benefit from the continued presence of manufacturing activity comes from the relatively high valued added generated by the sector. This translates into higher wages paid and higher corporate profits earned in the manufacturing sector. Popkin (2003, p. 23) reports that in the last decade, manufacturers have paid about one-third of all state and local taxes, social security and payroll taxes, excise taxes, import and tariff duties, environmental taxes, and license taxes collected in the country. Though no specific estimates exist in regard to the percentage of California's sub-national tax revenue originating from the manufacturing sector, it is very likely higher than in other states where the reliance on the personal income tax and corporate income tax as sources of state general revenue is not as great. According to the California Legislative Analyst's Office, these two sources of revenue respectively account for about 53 and 11 percent of the state's 2005-2006 general revenue.[4]

Though many forms of manufacturing activity offer heightened benefits to California's economy, it would be remiss if we failed to mention that many forms of manufacturing activity also impose heightened costs on California's natural environment. We do not mean to imply that the state's policymakers should embrace the expansion of all forms of manufacturing activity without careful consideration of its economic benefits weighed against the environmental costs. That being said, and the need for it being carefully considered when looking at the desirability to the state of encouraging a specific manufacturing plant or industry, our conclusion is that it is in California's general interest to try and retain/attract many forms of manufacturing.

3. Factors Often Cited By Non-Academics as Important to Manufacturing Loss

Reports generated by business groups (see the Keystone Group (2004), Bay Area Economic Forum (2005), and Silicon Valley Leadership Group (2005, 2006, and 2007) as examples) point to the higher cost of doing business in California as the reason that manufacturing has left. Policymakers have all heard that California's above average labor cost, worker's compensation cost, energy cost,

[4] See *http://www.lao.ca.gov/2006/cal_facts/2006_calfacts_pdf_toc.htm* .

corporate tax rate, and a more stringent regulatory environment are the primary drivers of this higher cost of doing business. We extend this discussion further by an examination of three "business climate" studies that place California in the bottom half of states in regard to desirability. In doing so, we uncover the variables and methodology that earned California this designation. In the next section, we then look to a review of academic studies to determine if these variables influence differences in manufacturing activity across the United States.

The three representative business climate studies discussed here are the Tax Foundation's (2007) *State Business Tax Climate Index*, Pacific Research Institute's (2004) *U.S. Economic Freedom Index*, and CNBC's (2007) *America's Top States for Business.* Below the top state listed as most "business friendly," California is respectively ranked 45th, 49th, and 28th in these three studies. A brief description of the business location variables used in these rankings follows.

State Business Tax Climate Index

Created by the Tax Foundation, it is not a surprise that this analysis uses 113 different tax variables to come up with its ranking of the 50 state business climates. All tax variables are placed into component indices by scaling them each from zero (worst) to ten (best) based on how they contribute to the "competitiveness" of each state's tax system in regard to the corporate income tax, individual income tax, sales tax, unemployment insurance tax, and property tax. Across these five component indexes, California did best on the property tax (16th) and worst on the individual income tax (46th). On unemployment insurance it was ranked 18th, while on the corporate income tax and sales tax it was respectively ranked 40th and 39th.

As an example of how this index is calculated, consider that the corporate tax rate index is created by looking at the top marginal rate (lower is better), taxable income level at which the highest rate kicks in (higher is better), number of tax brackets (less is better), and the average width of brackets (narrower is better). In a critical evaluation, Fisher (2005, p. 18) points out that the Tax Foundation's interpretation of competitiveness is really about "low taxes, and not neutral taxes." In

addition, he points out that nowhere are the multitude of tax preferences (investment and job tax credits, R&D tax credits, enterprise zones, foreign-source income, etc.) accounted for in this index. Fisher concludes (p. 28): "As a tool for assessing public policy, it is fatally flawed…"

U.S. Economic Freedom Index

The Pacific Research Institute (PRI) believes that they designed their Economic Freedom Index to measure how friendly a state government is toward free enterprise and consumer choice. To calculate this overall index, the generation of scores for each state occurs through the use of 47 different variables spread over five different categories (fiscal, regulatory, judicial, government size, and welfare spending) that PRI considers to best capture the degree of "economic oppression" in a state. For each variable, each state is given a rank of one for the "most free" and 50 for the "least free." The five sector scores for a state are simple averages of the ranks of variables included in the score. As an example, four of the eight variables included in the judicial sector measure are number of attorneys (fewer are better), compensation of judges (higher is better), terms of judges (shorter is better), and medical liability reform (caps on damages is good).

PRI chooses not to report the specific rank of a state in regard to a sector, but instead lists whether a state was in the first group of 10 states from the top, second group, third group, fourth group, or fifth group. In the fiscal, regulatory, and welfare categories, California finished in the fifth or lowest group. In government size, it finished in the second group. In the judicial category, it finished in the first group. In a somewhat biased weighting scheme that has been criticized by Fisher (2005, p. 55), PRI counts a state's score in the fiscal, regulatory, and welfare spending categories much higher than the two categories in which California did well. This arbitrary weighting largely determines California's 49th ranking.

America's Top States for Business

Two members of the CNBC newsgroup designed a mid-2007 study that they believe captures which states are better at attracting new business. They began by designating 10 broad categories that they

felt described the "competitiveness" of a state for business including: Cost of Doing Business (22%), Workforce (17%), Economy (16%), Education (12%), Quality of Life (12%), Technology and Innovation (7%), Transportation (5%), Cost of Living (3%), Business Friendliness (3%), and Access to Capital (3%). They then chose a total of 40 different variables (4 for each of the 10 categories) that they believe offer a measure of how states compared across these categories. Choosing not to weigh each of the 10 categories equally in the final calculation of their state ranking, the CNBC researchers decided to anonymously request a packet of economic development marketing materials from all 50 states and count the number of times each of the 10 categories are cited. This led to the relative weights listed in the parentheses next to each of the categories above.

California's overall ranking of 28th was the result of applying the weights derived from the business marketing tools to the ranks given to California of 48th for business cost, 33rd for workforce, 6th for economy, 31st for education, 9th for quality of life, 1st for technology, 19th for transportation, 49th for cost of living, 48th for business friendly, and 1st for capital access. The methods used in the derivation of this middling ranking for California exhibit a greater balance than in the other two studies. CNBC captured in its choice of 40 variables all of the elements that could attract or repel a business (including a manufacturer) from a state. A potential flaw in the CNBC methodology is the exclusive use of the literature used by the states to promote their own economic development in developing the relative importance of the 10 categories. A state will emphasize in such literature what it hears business people say is important to economic development. Thus, it is no surprise that business cost and regulation categories drive about two-thirds of the determination of where a state ranks.

Academics completing statistical studies trying to determine what drives a business to locate in one place as opposed to another, have long been skeptical of only soliciting the personal opinions of business people on this issue (see Anderson and Wassmer (2000, pp. 32-35); Bittlingmayer, Hall, and Orazem (2005), Courant and Fulton (1985), and Fisher (2005) as examples). Business people

may view the opportunity to answer such a question not as an exercise in the truth, but as an opportunity to lobby for a public policy change that increases their bottom line. Thus, the preferred method of determining what really drives a manufacturing firm to locate in one state as opposed to another, and what public policies could be used to alter these decisions, is to examine studies of real world data that correlate the observed relationship between explanatory variables thought to cause differences in business location to real world measure of differences in manufacturing activity across the states.[5] We offer a brief review of such studies next.

4. Determinants of Manufacturing Location

We begin this section with an overview of economic thinking on the location decision of a manufacturing firm. Next, we offer a review of the variables that policymakers have some control over and theory indicates can influence a manufacturing firm's location decision. Finally, we offer a review of selected empirical studies that have examined the actual influence of these variables.

A Manufacturing Firm's Location Decision

A business is most likely to locate in the jurisdiction where it earns the largest profit. As noted by Schmenner (1982), differences in profit across jurisdictions are determined by differences in the market for the good or service the firm sells, differences in the availability and quality of inputs needed to produce the firm's output, and differences in state and local government activities across jurisdictions that influence the firm's profitability. State policymakers possess little ability to affect the market (either increase the number of demanders or reduce the number of alternate suppliers) for a firm's product, limited ability to improve the input markets needed by a firm, and the greatest ability to alter the sub-national government provision of goods/services that benefit a business and the tax/regulatory policies that cost a business.

When holding sales constant, profit maximization by a firm is the same as cost minimization. Thus, businesses prefer lower taxes, lower labor costs, and less regulation that would

[5] Dardia and Luk (1999) make some of the same points.

force them to alter their production methods from the least costly method. Everything else equal, firms also prefer high labor productivity and access to government provided infrastructure, goods, and services they use in production. Government provided inputs used in production allow a firm to produce the same amount of goods and services with less purchased inputs, thereby lowering costs and raising profits.

Most data driven studies that assess what variables influence where a manufacturing firm locates, and whether variables influenced by state public policy can exert an influence, rely upon this model of profit maximization to determine which variables to examine. Next, we discuss several categories of the variables widely cited as likely to influence the location choice of a firm, limiting our consideration to those that possibly influenced by the decisions of state policymakers.

Labor Costs

The relationship between the observed cost of labor in a state and the interstate location decision of manufacturing firms is not clear-cut. Lower wages and benefits are not attractive to a firm's bottom line if they are the result of less skilled/educated workers. Using regression analysis, Bartik (1985) tested this question and found (holding other location factors constant) that higher wages were a negative influence on the probability of locating a new branch plant in a state. Little (1978) deduced through a sound empirical study that foreign investors were more likely to be influenced by state wage differentials than domestic investors. Lugar and Shetty (1985) report similar results for foreign manufacturing firms. These findings contrast with Glickman and Woodward (1987) who observed that wage differentials across states did not affect the observed differences in the employment growth of foreign-owned firms. Unfortunately, because these studies have varyingly controlled for the positive (higher skills, higher education, healthier, etc.) and negative (lack of labor supply, unionization, etc.) factors that can drive higher labor costs in a state, little consensus has been reached on the influence of high wages on the degree of manufacturing activity in a state.

Unionization

Empirical studies have tried to isolate the independent influence of statewide unionization on intrastate manufacturing location decisions. Carlton (1979, 1983) was one of the first to examine whether the presence of state "right to work" laws restricting union activity affected business location decisions between states. Later researchers improved upon Carlton's analysis by isolating the unionized percentage of the private workforce as a separate variable in their regressions. Bartik (1985) found that high unionization levels within a state serve as a strong deterrent to the formation of new branch plants. These results mirror those reported earlier by Newman (1983) and Plaut and Pluta (1983) who reported an average union elasticity of about -0.4.[6] Similarly, Woodward (1992) argues that foreign manufacturing firms perceive the presence of unions as an impediment to their own corporate "culture" and discourage foreign direct investment.[7] Likewise, Glickman and Woodward (1987) discovered that the presence of state right-to-work legislation negatively affected the growth of foreign firms in a state.

In contrast, Coughlin, *et al.* (1991) finds a positive relationship between higher rates of unionization and foreign direct investment in a state. They note that this positive effect may be the result of an interaction between unionization and lower rates of unemployment. Beeson and Husted (1989) also report a correlation between higher rates of unionization and greater productive efficiency in manufacturing at the state level. Dalenberg and Partridge (1995) find a very small, but positive and statistically significant, effect for unionization on state business activity.

As described, there exists a mix of empirical findings regarding the influence of unionization in a state on industrial activity in that state, with a slightly greater number of studies finding a negative influence.

Unemployment

[6] This elasticity is the percentage effect in state and/or local business activity expected to occur after a one percent increase in state and/or local unionization rates in the labor force.
[7] See Nakabayashi (1987) for anecdotal evidence.

Given that the desired level of employment in a manufacturing firm fluctuates over the business cycle and manufacturing employees who worked in good times may find themselves let go, it is perhaps surprising that more studies have not assessed the influence of statewide requirements on unemployment insurance benefits on manufacturing activity. Feldstein (1976) did find that the amount a firm pays in unemployment premiums is related to the frequency with which its employees claim benefits, observing that firms with a high turnover rate of employees are subsidized by less volatile firms. Coughlin, Terza, and Arromdee (1991) note that Feldstein's argument discourages firms with low turnover rates from locating in states where they would subsidize the unemployed former workers of other firms.[8] Tannenwald (1997) reports on only two previous empirical studies that include workers compensation as an explanatory variable in a model predicting firm location. Bartik (1985) found a positive relationship between the probability of a plant being located in a state and the state's average workers compensation rate. Alternatively, Schmenner, Huber, and Cook (1987) found that high workers' compensation rates were a significant deterrent to firm location.

Several studies have also examined unemployment rates to see if manufacturing firms are attracted or repelled by areas with a pool of available labor. Coughlin, *et al.* (1991) argues that states with high levels of unemployment are likely to see higher levels of foreign direct investment (FDI) to the extent that this unemployment represents a pool of potential workers. However, as pointed out in Ehrenberg and Oaxaca (1976), the unemployment insurance benefits paid to unemployed workers tend to increase unemployment rates by increasing the average duration of time spent unemployed and encouraging workers to seek higher paying employment.

[8] Unemployment insurance is rarely used as an independent variable in empirical studies examining firm location decisions. Coughlin, *et al*. (1991) mentions unemployment insurance to explain why the unemployment rate is not a good measure of labor availability across states and why underlying factors behind a high unemployment rate may actually deter foreign direct investment.

Using regression analysis, Coughlin, *et al.* (1991) finds that foreign direct investors do look to the unemployment rate as a positive signal for available labor. However, Woodward (1992) and Dalenberg and Partridge (1995) find a significant and large negative effect of state unemployment rates on state business activity. Such conflicting results confirm the ambiguous theoretical predictions of the effect (positive/negative) of statewide unemployment on statewide business activity and suggest that the nature of firm ownership (domestic/foreign) plays a significant factor in whether a large unemployment rate is a positive spatial characteristic.

Transportation Networks

By facilitating the movement of inputs from suppliers and goods to consumers, the transportation infrastructure of a state or region can significantly affect a manufacturing firm's profit margins and hence its location decision (see California Infrastructure Coalition (2005) and California Performance Review (2004b)). Woodward (1992) argues that a measure of firms' accessibility to regional and national markets is the presence of transportation linkages and finds evidence that greater linkages of this form correlated with greater manufacturing activity. Interstate highways are especially attractive for firms, given their role in connecting non-urban counties to larger markets. Moriarity (1983) earlier found a similar role for transportation access in the location decision of foreign firms at the sub-state level. Bartik (1985) included a transportation variable in his study as a proxy for public services and found it exerted a positive influence on a measure of business activity.

Fisher (1997) reviewed the literature on transportation's effects on economic growth, controlling for other public services such as highways, education, and public safety and found that nearly 70 percent yielded a statistically significant and positive influence for transportation. Of the 15 studies reviewed by Fisher, eight reported a statistically significant positive relationship between the presence of transportation/highways in a state and the state's economic development.

In marked contrast, Dalenberg and Partridge (1995) observed that highway and other public spending over a 15-year period had a negative effect on economic growth. Their work is of interest

because it contradicts the majority of other empirical research which found uniformly positive (although not always statistically significant) relationships between economic growth/development and transportation. Dalenberg and Partridge's research examines the effects of highway and other public spending on employment both in the aggregate as well as for specific industries among metropolitan areas over a 15-year period. Their research addresses common problems among this area of research by including measures of all taxing and spending categories, correcting for unobserved area-specific factors, exploring disaggregated effects for particular sectors, and exploring the potential influence of public capital stock separate from marginal changes to that stock. Even with these theoretical and econometric cautions, they still find a significant negative relationship between highway spending and economic development. They attempt to explain their finding in three ways: perhaps the average effect of highways is positive but the marginal effect of highways is negative, or greater highway spending is a response to deteriorating highway stock and thus represents declining transportation services, or finally, highway service may only influence economic development at the state-level, not the metropolitan level.

With the exception of the findings recorded by Dalenberg and Partridge (1995), transportation networks in previous empirical studies exert a near uniform positive effect on a state's economic development. However, this is not true of other types of public spending, such as education or public safety, where the empirical results are mixed.

Sub-National Taxes

As discussed by many previous reviewers (Anderson and Wassmer, 2000; Bartik, 1991, 1992; Fisher and Peters, 1997; Papke, 1993; and Wasylenko, 1997) of the extensive economic literature that have tried to assess the impact of sub-national taxes on business, the interpretation of tax findings for policy purposes related to business location must be done carefully. Many of these studies look at the impact of state and local taxes on economic activity or economic growth (as measured by employment or income growth), rather than specifically on business creation or

location. These studies report findings using the concept of elasticity, or the percentage effect in state and/or local business activity expected to occur after a one percent change in state and/or local taxes. As noted by Netzer (1997), elasticity represents an expected effect given only a very small change in the explanatory variable. Similarly, Papke (1991) warns that policymakers only consider as relevant the casual variables that exert a "statistically significant" influence and pay close attention to the magnitude of the influence.

As noted by Luger and Shetty (1985), the importance that taxes exert upon business location decisions depends upon the type of industry studied. Wasylenko (1997) observes that manufacturing industries are not as tied to locating in one region or state because they typically sell their products in national and international markets. Such firms are naturally more migratory and thus responsive to differences in cost factors influenced by sub-national government choices (such as taxes). This theoretical argument concurs with the findings of other researchers that manufacturing location decisions are more sensitive to taxes than non-manufacturing location decisions (Anderson and Wassmer, 2000; Fisher, 1997; Testa, 1989; Wasylenko and McGuire, 1985).

Research that studies the effect of taxes on economic growth focuses on detecting their influence at the intraregional (within a state or metropolitan area) or interregional level (between states or metropolitan areas). The consensus among empirical researchers is that differences in the rate of taxation across potential locations within a given region or state are much more likely to exert an influence on business location choices than differences between regions or states. As argued by Bartik (1991) and Anderson and Wassmer (2000), the reason is that other factors that influence where a firm locates are more likely to be held constant across possible interregional or interstate locations. Differences in taxes paid are more likely to be the swing factor in determining whether a firm chooses a location in one city as opposed to another in the same metropolitan area or same state. In support of this belief, Papke (1995) found that for six Great Lake Region states, net

of tax returns on investment for various types of manufacturing were similar enough that one state could not be preferred over another.

Wasylenko (1981) finds that taxes have a significant negative effect on business formation at the intrastate level. Newman (1983) also observed state corporate income taxes also had an effect on business location decisions at the interstate level. Further studies by Newman and Sullivan (1988) tentatively concluded that there also was a negative tax effect, but only under certain model specifications at the interstate level. Bartik (1985) argued that state taxes on corporate profit had a negative and significant effect on manufacturing branch plant formation at the intrastate level. Helms (1985) observed that a state's tax pattern would have a significant effect upon its ability to attract and retain businesses, particularly if the tax revenue funds transfer payments. Papke and Papke (1986) find that tax differentials may play an important role in business location decisions with higher taxes consistently deterring business activity. Bartik (1989) examines the effect of taxes on start-up firms and also finds a statistically significant negative effect, particularly for property taxes.

Wasylenko (1997) identified 74 interregional and/or interstate tax studies with most studies showing a negative tax elasticity of economic activity (i.e., lowering the tax rate would result in an increase in economic activity). Studies that found statistically significant negative elasticities include: Bartik (1989), Brown, Mieszkoki, and Syron (1980), McConnell and Schwab (1990), Munnell (1990), Papke (1991), and Wasylenko and McGuire (1985). Phillips and Goss (1995) performed one of the only formal meta-analyses found in the literature on the effects of taxation on business location. This meta-analysis consisted of gathering the tax elasticities reported as results in a wide variety of empirical studies and using them as dependent variables in a statistical regression analysis that uses measurable differences in the studies as explanatory variables. Phillips and Goss performed this meta-analysis on the 81 studies that Bartik (1991) reviewed to understand the relationship between sub-national taxes and economic development. Their results generally

confirm the previously discussed conclusions that the influence of taxes on business location is greater at the intrastate than interstate level, and that taxes are more likely to influence the location of manufacturing than commercial activity. Therefore, a review of the empirical literature reveals that, in certain instances, the level of sub-national taxation influences the location decision of a manufacturing firm.

When surveyed, it is unsurprising that firms reflexively respond that lower taxes are a key variable in their location decision without explicitly acknowledging the benefits that also accrue to them from the programs those taxes finance. It is for this reason that Wasylenko (1997) examines over 70 previous studies to ascertain the role taxes play in stimulating economic development by attempting to explain why the estimates of tax effects vary so widely across those studies. After discussing the non-fiscal variables (such as labor costs, energy costs, unions, and agglomeration economies) that previous studies have included in their analysis of what influences a firm's location decision, Wasylenko then dissects how previous studies have included fiscal policy variables. He notes how the quality/quantity of public services is measured, as well as the fact that certain industries may value some services and not others, complicates the interpretation of different analyses. For example, most surveys report that firms value transportation infrastructure and high-quality primary and secondary education for their ability to move inputs and goods and attract workers, respectively, while firms do not value government spending on welfare and prisons. An additional complication is whether the measurement of fiscal policy variables is as nominal rates or by the ratio of revenue collected to personal income or population. He concludes that "the imprecision with which most explanatory variables are measured" is an on-going problem in this area of research.

Wasylenko also notes that the range of reported tax elasticities of business location is fairly wide. There is an important lesson that emerges from the data, however. Intraregional studies consistently report higher elasticity values than interregional studies. Studies which analyze a

smaller geographical area are likely to see less variation in non-fiscal variables since suburbs of a city will have access to the same labor force or transportation infrastructure and must distinguish themselves from potential competitors using fiscal policy measures.

As seen below in summary Table 4, the preceding review of the literature reveals that high levels of transportation networks and regional markets act as attracters of manufacturing activity to a state. The problem with putting this information to use in crafting manufacturing friendly policies in a state is the difficulty and/or expense in manipulating these statewide variables in a manner that attracts addition, or retains existing, manufacturing activity. It has also been revealed that the level of taxation imposed upon a manufacturing entity within a state may exert a negative influence (albeit relatively small) on the amount of industrial activity observed in a state. The next section discusses the previous empirical findings in regard to the efficacy of such efforts at the state and local level.

Table 4: Variables Affecting Firm Location Decisions
(As Predicted by Empirical Literature)

Policy Variable	**Predicted Effect**
Labor Costs	*Generally negative*, though complicated by positive correlation between high wages and high labor productivity
Unionization	*Mixed results*, though leaning to negative
Unemployment Rates	*Mixed results*, though leaning to negative
Transportation	*Almost uniformly positive*
Regional Markets	*Positive*
Sub-National Taxes	*Negative but likely small influence*

State- and Locally-Granted Economic Development Incentives

An additional factor that can influence the location of business activity, and one that state policymakers can control, is the offering of incentive packages and preferential tax programs to selected firms. Buss (2001) notes that there are political and economic justifications for such incentives. Chief among the political justifications is the pressure put on politicians by both corporate and labor interests to protect a state from losing existing business activity by either

shielding current businesses from interstate competition or rescuing failing firms (see Ambrosius, 1989; Burnier, 1992; Noto, 1991; and Wolman, 1988), as well as the need to attract new firms and hence jobs and tax revenue to a state (see Clingmayer and Feiock, 1995; Ledebur and Woodward, 1990; Spindler and Forrester, 1993; Wolman, 1988). Furthermore, many citizens, politicians, and economic development decision makers perceive tax incentive programs as essentially costless since funding comes from tax revenue foregone, not tax revenue collected and then spent.

Economic justifications for the use of incentives include addressing unemployment and industrial underinvestment. In their study of publicly funded sports stadiums, Noll and Zimbalist (1997) argue that incentives may direct resources to more productive employment in slack markets. Similarly, Bartik (1991) argues that incentives tend to redistribute income by redirecting economic activity to areas with a greater number of low-income individuals and thereby giving them employment experiences they would not have otherwise had and enhancing their lifetime economic prospects. Similarly, Noto (1991) argues that when property values and wages decline during economic downturns, but displaced workers do not out migrate, incentives can stimulate reinvestment.

Interestingly, most states never evaluate the benefits against the costs of their tax incentive programs (Barnekov and Hart, 1993; Bartik, 1994; Buss and Yancer, 1999, Hartzheim, 1997). The National Conference of State Legislators (NCSL, 1997) found that "few states know the exact amount they spend on economic development initiatives." This relative ignorance is widespread as Milward and Newman (1989) discovered in their study of the impact of state tax incentives on determining the ultimate location of six new high-profile automotive plants in the 1980s. Likewise, Wiewel, Persky, and Felsenstein (1995) discovered few examples of cities in the Chicago area evaluating the type and amount of incentives offered to firms. In addition, a Council of State Governments study by Chi and Leatherby (1997) concludes that states were copying each other's state tax incentive programs, without understanding the efficacy or effectiveness of such programs.

Woodward (1992) empirically tested whether state efforts had a significant effect in influencing firm location decisions. In both specifications of his model (excluding and including regional dummy variables), Woodward found that state incentive programs had no significant effect on the location decision of foreign manufacturing firms.

As described earlier, economic theory indicates that the expected effect of economic development incentives on sub-national economic activity depends on the degree of mobility of the business offered the incentive.[9] In the empirical work reviewed, there is a clear difference in findings depending upon both the unit of analysis and type of business examined. Because of the greater likelihood of intraregional mobility than interregional mobility, a greater response to economic development incentives have been found in data sets drawn from localities within a region than from data sets drawn from jurisdictions across different states/regions. Empirical analysis also shows that manufacturing activity is more responsive to public incentives than commercial (and residential) because it is more "footloose" in its ability to chose alternate locations. Therefore, if advising a sub-national policymaker on what to expect in regard to influencing economic activity through the offering of tax incentives in their jurisdiction, we would first need to know whether it was a state policymaker considering the effect of these incentives on the interstate location of large manufacturing firms, or whether it was a state or local policymaker considering the effect of incentives on the interstate or inter-metropolitan location of commercial firms (or small manufacturing firms or housing that were very unlikely to leave the state even if an abatement is not offered).

Realize that the advice that follows is not about whether granting abatement to one firm will make the difference in its location decision. Advice along these lines is best made on a case-by-case basis and accomplished in the manner offered in Bartik *et al.* (1987) that involves modeling the cost factors important to a representative firm like it. The advice we offer to the administrator

[9] See Wassmer (2007) for a more detailed presentation of these points.

concerns the expected long-term aggregate effect on economic development in their jurisdiction, provided incentives cut jurisdictional business taxes below the existing level before the incentive program began. Though policymakers do not like it, honest advice is within wide margins of possibility due to the range of findings derived from both representative firm and regression analyses.

To a state policymaker asking whether an incentive program, in and of itself, can attract new manufacturing or stem the flow of existing manufacturing within a jurisdiction, we would answer that the existing evidence requires our response to be in the range of "absolutely not" to "if pursued greatly enough, and in conjunction with other statewide industrial incentives, then perhaps only slightly." If pressed on a more exact response to the upper-end possibility, we would add that a statewide economic development incentive program resulting in an 10 percent decrease in overall business taxation is likely to increase manufacturing activity in the state by only 1.5 to 3.5 percent. Most importantly, a response of even this magnitude occurs only if other states competing for this new manufacturing activity keep their business taxes and incentives constant and not match this state's offers. The expected effect of an incentive program targeted at commercial or residential activity in the state would unequivocally be none.

To a sub-national policymaker asking whether an incentive program can reallocate manufacturing or commercial activity between localities within their state or within a metropolitan area in their state, we would answer that the chances of this happening are far greater than this program attracting new or retaining existing state business activity. Holding other factors constant, the evidence indicates that a ten percent reduction in overall local business taxation accomplished through incentives is likely to result in a long-term 15 to 20 percent increase in the local economic activity generated by firms that are mobile between communities. But in accepting these numbers, the policymaker must also realize: (1) that the change is very likely "zero-sum" – one locality's gain comes at the expense of another locality-within-the-state's loss, (2) that the forecast change will

only occur if state policymakers are diligent in restricting business incentives to localities at a comparative advantage, and (3) a response of the magnitude predicted is for most manufacturing firms and only some commercial firms (such as regional retail malls, auto malls, or large "big-box" stores whose markets consist of most of the region).

The benefits from a sub-national jurisdiction offering incentives arise due to an increase in economic activity that in turn could create more jobs for existing residents in the jurisdiction, more tax revenue for the jurisdiction, and greater agglomeration economies for existing firms in the jurisdiction. The potential costs of a jurisdiction offering an incentive that generates greater economic activity is that it can also generate further public service needs greater than the additional revenue available after abatement to provide for them (thereby resulting in fiscal stress) and a reduction in the physical environment of a community. Understanding this, the final bit of advice we offer a policymaker considering undertaking a new incentive program designed to attract and/or retain manufacturing activity (or the expansion of a given one) is to fully and rationally weigh the likely benefits of the offered incentives against the likely costs.

5. Suggested Policies to Retain/Increase Manufacturing Investment

This report has shown that manufacturing firms choose a location based largely upon where they expect the highest return (profit) on their investment. This return varies between locations across the states due to factors out of the control of state policymakers, and in a smaller part, due to factors that state policymakers can conceivably control. While California may face a relative disadvantage in the form of its higher regulation and taxation, our shift-share comparison of the state-specific manufacturing job changes between 2002 and 2005 reveals that all but two of California's manufacturing sectors gained employment across this period compared to any of the same manufacturing sectors gaining employment at the national level. The shift-share analysis shown in Table 5 offers further evidence for the differing nature of California manufacturing results. Many manufacturing sectors in the state have outpaced the rest of the United States for purely California-

specific reasons.[10] This is most evident in the Transportation, Apparel, and Textile; and Computer/Electronics industries that struggled nationally, but posted strong gains in California between 2002 and 2005. Additionally, Transportation and Fabricated Metal products stand out as industries with both strong state factors and increased national factors causing employment growth. One should note that the relative strength of manufacturing in California found in our shift-share analysis even allows for states with significantly lower taxes, such as found in Nevada; or a more favorable regulatory environment, such as found in Arizona or Idaho.

Table 5: 2002-2005 California Manufacturing Sector Employment Changes Due to National and State Factors

Industry Sector	National Job Change	National % Change	California Job Change	California % Change
Manufacturing	-1012000	-7.21%	192500	11.71%
Food, Beverage, and Tobacco Products	-75000	-4.61%	-2300	-1.20%
Textile Product Mills	-98000	-26.06%	5100	15.84%
Apparel	-107000	-35.55%	30800	30.34%
Wood Products	-2000	-0.35%	3600	8.91%
Paper Mfg.	-59000	-12.58%	4700	14.92%
Printing and Related Support Activities	-61000	-9.47%	13500	19.45%
Petroleum and Coal Products Mfg.	-7000	-6.42%	2000	12.99%
Chemical Mfg.	-51000	-5.92%	-300	-0.38%
Plastics and Rubber Products Mfg.	-44000	-5.56%	8500	13.39%
Nonmetallic Mineral Product Mfg.	-15000	-3.02%	500	1.09%
Primary Metal Mfg.	-39000	-8.50%	3400	12.64%
Fabricated Metal Product Mfg.	-23000	-1.53%	20800	14.15%
Machinery Mfg.	-61000	-5.31%	11500	12.41%
Computer and Electronic Product Mfg.	-183000	-14.12%	53200	14.52%
Electrical Equipment and Appliance Mfg.	-62000	-14.45%	2300	5.76%
Transportation Equipment Mfg.	-54000	-3.06%	21600	15.70%
Furniture and Related Product Mfg.	-37000	-6.65%	6800	9.94%
Miscellaneous Mfg.	-34000	-5.22%	6800	7.20%
Durable Goods	-510000	-5.75%	130400	12.31%
Nondurable Goods	-501000	-9.67%	62100	10.62%

Even after considering California's relatively educated labor force, its favorable geographic location and weather, its proximity to large input and output markets, and its overall "business

[10] A detailed explanation of our shift-share analysis is in the appendix of this report.

climate" (which as shown earlier by shift-share analysis is no worse than half the other states), there are still policy reforms that we believe policymakers could consider to encourage the retention/attraction of manufacturing to California. These reforms require emphasizing the state's advantages, while strategically targeting certain business policies that are particularly detrimental.

The rate of business taxation is an obvious target for policymakers and firms alike. For firms, higher rates of taxation mean less profit and taxes represent a single and highly visible complaint to the state's legislators. According to Garrett and Wall (2006), of all the 50 states, California ranks fifth highest in its rate of corporate income taxation (behind Connecticut, Rhode Island, Minnesota, and Massachusetts) with a maximum rate of 9.3 percent. There are five states that have no corporate income tax (including neighboring Nevada). While this number may seem insignificant initially, our review of the empirical literature of the effect of taxes on business location discussed earlier indicates that it does likely exert some influence on interstate business location decisions, though not as large an influence as representatives in the business community are quick to claim.

We would advise a state policymaker interested in pursuing this issue to consider industry specific tax incentives such as the recently expired Manufacturers Investment Credit. Rossi (2003) and the California Performance Review (2004a) make a strong case for this. Nevertheless, a cautionary tale from even doing this comes from Buss (2001). He cites a 1996 Washington State Department of Revenue (1996) study that analyzed the predicted and actual effects of a manufacturing sales tax deferral much like the expired California program. The manufacturing industry predicted over 23,000 new jobs created from $3.2 billion of new investment. Accordingly, Washington deferred approximately $129 million in sales taxes over the course of a decade. A later analysis of this tax credit indicated only about 6,000 new jobs created and economically distressed areas saw negligible job growth.

While business lobbyists argue strongly for industry-specific tax credits and public spending programs, it is our opinion that state monies designed to retain/attract manufacturing activity go to alternate statewide programs such as vocational skill building or transportation. Manufacturing firms in California are increasingly finding it difficult to hire the workers they need. For example, Jack Stewart (2005), President of the California Manufacturers and Technology Association (CMTA) argues that California needs workers who possess the skills necessary to enter the labor force. As noted in Deitz and Orr (2006), and reports from the Public Policy Institute of California and the California Postsecondary Education Commission, these skills are often not obtained in a traditional college-prep high school program or with the attainment of a four-year degree.[11] Such skills are better fostered through state training programs, stronger support of vocational education, and targeted spending on vocationally related higher education.

Empirical studies on intrastate personal migration also shed light on this issue for policymakers. While California enjoys economic advantages for manufacturing relative to other states – as borne out by the results of our shift-share analysis – empirical research has shown that non-economic factors are also significant in determining overall personal migration rates. According to research like that found in Ferguson, *et al.* (1994) and Glaeser and Shapiro (2003), beyond economic variables (like relative wages, employment strength and overall job opportunities), the primary amenities that attract labor to a state are lower crime rates, better educational opportunities, and strong social networks. Shaped in part by statewide public policy, it is wise for a state's policymakers to remember them when considering a policy to attract/retain manufacturing (or any type of economic) activity.

California is in a unique position to chart its future. Its manufacturing industry has weathered recent economic downturns more effectively than other states across the nation. This

[11] These reports are online at the following respective websites: http://www.ppic.org/main/publication.asp?i=750 and http://www.cpec.ca.gov/completereports/2006reports/06-19.pdf.

relative success is attributable to local competitive factors such as its skilled, highly educated labor force and its favorable geographical location and climate. This relative success could be short-lived, however, if steps are not taken soon to shore up the manufacturing sector. These steps will make it advantageous to do business in California by making the state an attractive destination for firms that want to re-locate, in addition to retaining the manufacturing firms already located in state. Successful policies will work with a firm's profit motive by minimizing its cost of doing business and focusing on variables that will help to increase its productivity.

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Appendix

Shift-Share Analysis

Shift-share analysis focuses on separating the overall growth or decline in an economic variable for a region into a region-specific (or in this case, state-specific) component and a national component. Shift-share analysis is not a behavioral model. It does not explain why a state grows or declines

differently than the nation. It merely develops a framework for identifying these two components of growth or decline. Shift-share analysis uses set of identity equations, each of which depicts some aspect of economic growth (Andrikopolous *et al.*, 1990).

Shift-share analysis does provide insights in evaluating the performance of a state economy. By identifying the industries that exhibit a positive comparative advantage (or whose state-specific growth component is positive), economic development practitioners can target these industries for retention or expansion[12]. The components of growth in California subject to comparison with national growth are:

(1) the effect of the national overall growth rate component, or "national share" (N);

(2) the difference in the industrial structure or composition of California and the nation, or the "industrial mix component" (IM);

(3) the amount of growth not due to nationwide growth or industry wide growth or the "competitive effect" (C).

The retrospectively decomposed growth components are examined based on their relative importance using the following reference framework.

National Growth

The national growth component reflects expected growth in the state, had it grown at the same rate as the nation. The national growth component is calculated by multiplying the base year employment in each economic sector by the growth rate of total national employment between the base year and terminal year.

Industrial Mix Component

Industry mix refers to the initial industrial structure of a given state. The industrial mix component measures the influence of fast or slow growing industries within a state economy. If a

[12] Three criticisms are leveled against shift-share analysis: (1) calculation of the structural component takes no account of linkages between the industries of a state and that, for example a fast growing industry may promote growth in other industries which supply it, (2) industrial classifications are to some degree arbitrary, and (3) it offers no explanation of the residual or unexplained growth.

state is growing faster than the national average, it may be due in part to a concentration of rapid growth industries. For example, the service sector of the national economy has been growing faster than all other national economic sectors. Given that a large proportionate share of California's economy is in service related industries, it would not be too surprising to see California's rate of economic growth far exceeding national growth. However, this might not be a sign of a healthy economy, because a reversal in this one economic sector could cause overall state economic reversal. By isolating the industry mix component, it becomes clearer when positive and diversified growth is occurring.

Competitive Component

This competitive component at the economic sector level is the most important component in terms of state development. A positive sector component (sometimes called the state share) is an indicator of a state's competitiveness with other states for a particular economic sector. Many economists therefore consider the competitive component as the dynamic element in state employment increases and the main component in any economic development plan (Andrikopoulos *et al.*, (1990); Curtis (1972); Kalbacher (1979); and Petrulis (1979)).

We employed shift-share analysis to examine the recent performance of California's economy. We analyzed two periods, 1998-2001 and 2002-2005. The 2001 break is used to account for the economic difficulties and recessionary pressures the nation and California was experiencing at the time. The end point of 2005 is necessitated by the lack of more current data. In the analysis, the industry mix (IM) effect will be positive for industries that grew above the overall national average during the periods.[13] The local factors (LF) effect will be positive if the industry in California out-performed the industry at the national level. Overall, when comparing California to the U.S. during the periods California benefited from competitive local factors that fought against

[13] The national share (NS) concept simply measures the growth of an industry if it grew at the overall national rate. It is not particularly instructive for analyzing a state's performance, but is necessary for the calculations.

dampened employment growth in national manufacturing sectors. This will become clearer as we further examine the tables below.

Table A1 decomposes California's job growth in comparison to that of the nation's employment as a whole. If California's manufacturing sector grew at the same rate as national employment (which was positive in both periods) then jobs would have been created in all manufacturing sub-sectors across both time periods. National manufacturing growth however was significantly less than overall national employment growth in the rest of the nation's sectors. This manifests itself in the industry mix columns during both periods, which reveal the downward decline of manufacturing industries relative to the economy as a whole in the nation. With rare exceptions, California's unique competitiveness reverses the downward trend in manufacturing in both periods and one observes overall manufacturing increases for most sub-sectors in California across the two periods. The exceptions to the employment growth pattern in the most recent 2002-2005 period being Food, Beverage and Tobacco Products and Chemical Manufacturing. Also of note from our shift-share analysis that:

- Manufacturing grows more slowly at the national level than the California average, and employment concentrations in these industries in California were hurt by U.S. trends. In the case of manufacturing, positive state factors helped these industries grow.

- Durable Goods manufacture experiences the greatest decline nationally, however strong state factors help those sub-sectors outperform Non-Durable Goods manufacture.

- Computer, Transportation, and Apparel have the greatest percentage of employment growth between 2002-2005 in actual workers and in growth attributable to state factors.

Table A2 uses shift-share to examine the effect of the within manufacturing differences in employment attributable to either California or the sector itself. The national trend towards loss in manufacturing employment which manifested itself in the Industrial Mix columns in the previous tables is seen here in the national columns in this table. If employment in the manufacturing sectors in California grew at the same rate as the national manufacturing sectors did, then California would have lost jobs in all sub-sectors across both periods. Since California mostly gains manufacturing

jobs during these two periods, additional factors must be in play. The industry mix column provides evidence for the relative strength of weakness of each sub-sector versus manufacturing in general. As can be seen there are a number of sectors (i.e., Textiles; Apparel, Printing and Paper) that lose employment nationally at a faster rate than the manufacturing sector as a whole. There are other sectors such as Food, and Printing and Furniture that do better than the overall manufacturing rate. Thus, the industry mix column reveals California employment changes resulting from changes in the relative importance of each particular sub-sector nationally. The largest and most notable value here is the large employment loss component in 2002-2005 within the Computer and Electronics sector attributable to the increasing national off-shoring of such manufacturing.

The state share column in Table A2 shows unique state factors at work. Here, similar to the first table, it is the state's comparative advantage, which ultimately yields mostly positive employment growth within these manufacturing sub-sectors in California. This is particularly true in the Computer and Electronics, Transportation, and Printing sectors. Chemical Manufacturing is notable for being one of the few sectors to have negative local factors work against it in the 1998-2001 series and negative national factors in the 2002-2005 series. Though the Transportation, Apparel, Textile, and Computer/Electronics industries struggled nationally, they posted strong gains in California. Transportation and Fabricated Metal products stand out as industries with both strong local factors and increased national pressure for employment growth. The greatest changes in state share factors between the two periods occur in the Food/Beverage sector (negative), Fabricated Metal Sector, Printing sector, Computer/Electronics sector, and the Miscellaneous Manufacturing sector. This indicates a strengthening of these sectors versus the others with the exception of the Food/Beverage sector.

Table A1: California Shift-Share Calculated Against U.S. Employment

Using National Employment		National	Industry Mix	State Share	Total CA	National	Industry Mix	State Share	Total CA
		1998-2001	1998-2001	1998-2001	1998-2001	2002-2005	2002-2005	2002-2005	2002-2005
30000000	Manufacturing	69624	-160025	140401	50000	38588	-149124	303036	192500
311000	Food and beverage and tobacco products	8918	-7562	-1955	-599	4496	-12939	6143	-2300
313000	Textile Product Mills	1236	-7049	9313	3500	756	-7413	11757	5100
315000	Apparel Manufacturing	3795	-24672	35277	14400	2382	-29001	57419	30800
321000	Wood Product Manufacturing	1740	-3063	3123	1800	948	-1091	3743	3600
322000	Paper Manufacturing	1282	-3620	4338	2000	739	-4259	8220	4700
323000	Printing and Related Support Activities	2744	-3510	5466	4700	1628	-7633	19505	13500
324000	Petroleum and Coal Products Mfg.	676	-1921	2145	900	361	-1291	2929	1999
325000	Chemical Manufacturing	3934	-5693	-4540	-6299	1872	-6330	4158	-300
326000	Plastics and Rubber Products Mfg.	2592	-6054	6963	3501	1490	-4836	11846	8500
327000	Nonmetallic Mineral Product Mfg.	2194	-1836	-2757	-2399	1079	-2430	1850	499
331000	Primary Metal Manufacturing	1171	-3802	2531	-100	631	-2738	5507	3400
332000	Fabricated Metal Product Mfg	6581	-13411	3930	-2900	3449	-5663	23014	20800
333000	Machinery Manufacturing	3735	-10882	13048	5901	2175	-6852	16177	11500
334000	Computer and Electronic Product Mfg.	14827	-32851	30624	12600	8595	-53918	98523	53200
335000	Electrical Equipment and Appliance Mfg.	1486	-2451	4466	3501	936	-5975	7338	2299
336000	Transportation Equipment Mfg.	5919	-15165	10747	1501	3229	-7320	25692	21601
337000	Furniture and Related Product Mfg.	2656	-3287	6731	6100	1605	-5873	11068	6800
339000	Miscellaneous Manufacturing	4142	-5870	3628	1900	2215	-6901	11486	6800
31000000	Durable Goods	44440	-96647	80407	28200	24863	-82512	188048	130399
32000000	Nondurable Goods	25184	-63091	59707	21800	13725	-65306	113682	62101

Table A2: California Shift-Share Calculated Against U.S. Mfg. Employment

National Mfg. Employment		National	Industry Mix	State Share	Total CA	National	Industry Mix	State Share	Total CA
		1998-2001	1998-2001	1998-2001	1998-2001	2002-2005	2002-2005	2002-2005	2002-2005
30000000	Manufacturing	-90401	0	140401	50000	-110536	0	303036	192500
311000	Food and beverage and tobacco products	-11579	12934	-1954	-599	-12879	4436	6143	-2300
313000	Textile Product Mills	-1604	-4209	9313	3500	-2164	-4493	11757	5100
315000	Apparel Manufacturing	-4927	-15950	35277	14400	-6822	-19796	57418	30800
321000	Wood Product Manufacturing	-2259	937	3122	1800	-2716	2573	3743	3600
322000	Paper Manufacturing	-1664	-674	4338	2000	-2117	-1403	8220	4700
323000	Printing and Related Support Activities	-3563	2797	5466	4700	-4665	-1340	19505	13500
324000	Petroleum and Coal Products Mfg.	-877	-368	2145	900	-1035	106	2928	1999
325000	Chemical Manufacturing	-5107	3348	-4540	-6299	-5364	906	4158	-300
326000	Plastics and Rubber Products Mfg.	-3365	-98	6963	3500	-4268	922	11846	8500
327000	Nonmetallic Mineral Product Mfg.	-2848	3205	-2756	-2399	-3092	1742	1849	499
331000	Primary Metal Manufacturing	-1520	-1111	2531	-100	-1808	-299	5507	3400
332000	Fabricated Metal Product Mfg	-8544	1714	3930	-2900	-9881	7667	23014	20800
333000	Machinery Manufacturing	-4849	-2299	13049	5901	-6231	1554	16177	11500
334000	Computer and Electronic Product Mfg.	-19252	1228	30624	12600	-24621	-20702	98523	53200
335000	Electrical Equipment and Appliance Mfg.	-1929	963	4467	3501	-2682	-2356	7337	2299
336000	Transportation Equipment Mfg.	-7685	-1561	10747	1501	-9249	5157	25693	21601
337000	Furniture and Related Product Mfg.	-3449	2818	6731	6100	-4598	330	11068	6800
339000	Miscellaneous Manufacturing	-5378	3650	3628	1900	-6345	1660	11485	6800
31000000	Durable Goods	-57702	5495	80407	28200	-71222	13573	188048	130399
32000000	Nondurable Goods	-32699	-5207	59706	21800	-39314	-12267	113682	62101