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California's Occupational Advantage

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By Ann Markusen and Elisa Barbour

Abstract: To focus on the contribution of labor to regional economic development, we propose an occupational approach. Contrasting an occupational with an industrial approach, we present the case for the former. We then show, using highly disaggregated occupational data for eleven California metro areas, how remarkably specialized each region is and how each diverges from the nation. We also present the concept of occupational advantage, which tracks over time the extent to which metro occupations outpace the growth rate of their national counterparts. We show that occupational profiles are not destiny – many metros have disproportionately added jobs in occupations that were previously under-represented, while some highly concentrated occupations have lost ground. We further demonstrate that occupational specializations are not dictated by size of metropolitan area and are not synonymous with industrial mix. In closing, we make the case for occupational profiling and analysis as economic development tools at the state and regional level.

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1. Occupational Advantage in California: An Introduction

Heightened competitive pressures in an increasingly integrated world economy force states and cities everywhere to specialize more than ever before (Howes and Markusen, 1993). Products and services once made ubiquitously are now produced most efficiently in concentrated locales around the globe, undercutting traditional activities in many local economies.

California is no exception. As new low-cost sites for everything from apparel to semiconductors to back office banking come on line and as fresh imported produce displaces canned fruits and vegetables, Californians must find new work. In the past, California has successfully risen to this challenge. Indeed, California's sustained growth over the past century and a half has been driven by a series of unique productive specialties: gold, lumber, and oil early on; agriculture, apparel and aerospace mid-century; and computers, semiconductors, entertainment and the internet in recent decades.

The responsibility for thinking strategically about what Californians do and where they work has increasingly fallen on state and local governments. Since the 1980s, economic development activities have burgeoned, especially since the federal government has retreated from regional and industrial policy (Markusen, 2002). Industrial targeting – the identification of key sectors where interventions might be tailored to specific projects of recruitment or retention – has formed one centerpiece of such strategies. In the 1980s, policy addressed distressed California auto, lumber and steel sectors. In the 1990s, shuttered aerospace plants and military bases became candidates for conversion strategies. Even where targeting has not been implemented, policymakers and economic development

specialists base their understanding of their regional economies on inherited industrial structures and pressures therein.

Industrial targeting has, however, turned out to be a mixed bag. Although some interventions have been salutary, others have not. Industrial targeting sets it sights on particular industries and bundles together incentives to attract, retrain or home-grow businesses in them. Such packages can run into the hundreds of millions for a single new plant and often contain no quid-pro-quos or performance criteria. Most are never evaluated to see if they justify the public investments made in them.

Furthermore, industrial targeting is heavily biased towards physical capital. It subsidizes chiefly plant, capital equipment and infrastructure. Very small amounts are committed to worker training and retention. Yet economic theory increasingly emphasizes the pivotal role of human capital in regional development (Mathur, 1999). For California, as for the US as a whole, competitive advantage lies in the state's skilled labor, its least mobile factor of production.

This report probes a new framework for looking at California's state and local economies. It proposes that economic development officials understand and analyze the occupational structure of their economy as well as industrial structure. Occupations capture the type of work people actually do in the economy as opposed to the products and services they generate (Thompson and Thompson, 1985). Occupational choices relate closely to education and training opportunities, which politicians understand as key to the long-term viability of their economies. An occupational approach can bridge between two distinctive and poorly joined service delivery systems – economic development and workforce development.

In this report, we show that California's occupational structure is distinct from that of the nation. More important, we find that metropolitan occupational structures vary dramatically within the state. We track the detailed occupational structure of eleven California metros, diverse in size and location, from San Diego, Los Angeles, Orange County, Riverside/San Bernardino and Bakersfield to Fresno, San Jose, San Francisco, Oakland, Sacramento and Redding. We show how their occupational profiles have specialized and changed over the decade of the 1990s. Occupational profiles are not rigid – many metros have disproportionately added jobs in occupations that were previously under-represented, while some highly concentrated occupations have lost ground. We demonstrate that occupational specializations are not dictated by size of metropolitan area. We also show that occupational specialization is not synonymous with industrial mix.

In closing, we make the case for occupational profiles as an economic development tool at the state and regional level. We suggest some criteria that state and local economic development practitioners might use in targeting occupations for further analysis. We make the case that working with occupation-based organizations (professional associations, trade unions, education and training institutions) is likely to be less expensive and more effective than targeting firms and industries alone.

2. Conceptualizing Occupations and Why They Matter

Industries dominate the regional economic mental map of academics, planners and policymakers. In this chapter, we contrast the concept of occupation to that of industry as a framework for depicting regional economies. We offer a number of reasons why an occupational approach might be a powerful addition to the economic development planner's toolkit.

The Industry Frame

No citizen or policymaker ever "sees" a regional economy. Instead, we have mental maps of it, based on conceptual categories that frame its spatial, structural and organization dimensions. Such mental maps showcase certain decision-makers, or actors, as key to economic development. Most Californians, including daily newspaper readers, think of California's economy as big and diverse, and as characterized by productive activities such as forestry, fruit and nut farming, winemaking, electronics, software, aerospace, biotech, shipping and so on. Generically, we call such sectors "industries." They are conceptual groupings of organizations (firms, trade associations), establishments, and decision-makers (owners, managers) who are bundled together by what they make and produce – by their goods and services. Since the mid-18th century, federal and state governments have delineated these groupings in industrial codes and collected data on a few metrics such as output and employment (Rhode, 2001). Until the 1940s, the Census Bureau did not classify occupations on the basis of what workers did but rather on the basis of industry, as in "forestry workers," "bank workers," and so on.

Scholars of regional science, economic geography and economic development work with industry groupings to map regional economic activity and analyze past and projected change. In doing so, they model the behavior of key decision-makers within each industry, introducing the notions of "firm" and "establishment" into the framework. A firm is a legally-constituted business organization with a decision-making structure – a board of Directors, CEOs and other key managers – that decides what and how much to produce, how to market it, whom to hire and fire and train and where to locate its operations. It may operate in several industries and in multiple locations. An establishment is a spatial unit of production that may comprise an entire firm or form only one unit in a far-flung empire. Managers of establishments make decisions within the hierarchy of the larger firm to which they belong.

In rural northern California, for instance, a regional analysis might highlight the lumber industry and probe the behavior and economic viability of firms (for example, Georgia Pacific) and establishments (a particular Georgia Pacific mill, small family-run sawmills, small firms in the woodworking business). In Silicon Valley, it would focus on the electronics, computing, aerospace and software sectors, including large firms such as Sun, Lockheed Martin, and IBM, and the many small and oft-mutating entrepreneurial firms ((Gray, Golob, Markusen and Park, 1999; Saxenian, 1994). In the Los Angeles area, it might center on a set of disparate industries – filmmaking, apparel, and aerospace among them – with their mixes of large and small, locally and externally owned firms. Such intelligence has led to economic development interventions, such as incentives and regulatory changes to attract new establishments (for example, design firms to Los Angeles), engender new firm start-ups (for example, biotech in Silicon Valley), or forestall closings or relocations away from a region (for example, lumber in northern counties).

Our conceptions of a regional economy, its components and its key actors constrain our vision of possible economic development initiatives. Industries are not real entities but are conceptualizations made operational through the coding and data collections efforts of the US Department of Commerce and its state-level equivalents. Industries are useful groupings. Firms within industries often do share information and exercise political power in the guise of trade associations. But industry definitions do not map neatly onto firms, and not all firms join relevant trade associations or actively shape their priorities. Furthermore, firms routinely migrate into new product offerings that may shift the identification of plants and labs into unrelated industries.

Economic development practice is muddied by the tendency to conflate firms, which are the key decision-making unit in place-indifferent economic theory, with establishments, which are the key locational target for economic developers. Firms are non-spatial legal entities, while establishments are site-based operations of individual firms. Entire bodies of theory have emerged to explain the locational calculus of firms (Losch, 1954; Isard, 1956). Excellent studies have been done of the relative strength and significance of causal factors such as resources, labor quality, wages, infrastructure, taxes, and so on in explaining the distribution of employment, often disaggregated by industry (see for instance the studies in Herzog and Schlottmann, 1991). But as firm headquarters increasingly locate separately from other firm functions, state and local economic developers may be left with weaker tools to increase good jobs and expand the tax base.

Establishments within the same industry and especially within the same firm often perform starkly different functions. Some conduct only R&D, while others engage in management, production or distribution. A large California coastal city, for instance, might host a firm's food scientists, market researchers and managers, while its agricultural

product is grown, processed and packaged in smaller Central Valley towns. The industry to which an establishment belongs may thus be a weak indicator of the functional strengths of its host community.

Accepting the industry/firm/establishment framework as the skeleton of a regional economy means shaping economic development practice around firm priorities. Implicit in this approach is a vision of economic growth that favors physical capital as the key input, rather than technology or human ingenuity and labor. A great deal of state and local economic development effort, as a consequence, has gone into facilitating the acquisition, building, maintenance and refurbishing of physical capital, including land and infrastructure. Very modest amounts, in contrast, have gone to train workers or encourage entrepreneurs. But underwriting physical capital is an expensive proposition. Increasingly, local governments are feeling indentured to paying off bonds and foregoing tax base with funds that might better be used elsewhere. And, too, communities have a tough time holding recipients of economic development incentives to performance criteria.

The Occupational Frame

Think now of a regional economy as consisting predominantly of people as decision-makers and workers. They are starting up and closing down firms, buying and using resources, building plants and equipment, hiring others and configuring work to generate marketable goods and services. In this conception, we visualize and characterize economies by "what workers do, not what they make" (Thompson and Thompson, 1985). These activities are captured in the notion of "occupation." Some workers manage entire chains of conceptualization, production and marketing processes (managers). Some create, implement and monitor technologies (scientists and engineers). Some develop, write,

adapt and trouble-shoot information systems (systems analysts and software programmers). Some educate (teachers, trainers, parents, coaches). Some adjudicate, advocate and make law (judges, lawyers, legislators). Some run, interact with and maintain machines (assembly line workers). Others build structures and repair them (craft workers). Others move commodities and services across space and out to consumers and other users (longshoremen, truckers, retail and wholesale and warehousing clerks). Yet others care for the sick, elderly, children (nurses, home care and child care workers). Yet others entertain us (musicians, athletes). And so on.

Imagine a mental map of a regional economy based primarily on occupation. Each occupation – like industry, a conceptual category - is distinguished by its skill, educational content and work tasks. Individual workers are key decision-makers in an occupational framework, because they decide whether to acquire skills and how to deploy them, given their options in labor markets (another conceptualization). But other decision-makers are also important – those who supply skills and training, including schools and colleges and private sector firms. As an analogue to firm location theory, we might imagine a whole body of occupational location theory that explores why certain occupational groups migrate more frequently than others and why they choose to enter, leave or remain in specific regions.

With the occupational lens, we could picture northern California as a region of foresters, sawyers, truckers, farmers, and B&B operators, among others. Silicon Valley would emerge as a region of technology managers, venture capitalists, aeronautical and electrical engineers, inspectors and testers, and commercial artists. Los Angeles would be a showcase of aircraft assemblers and engineers, sewing machine operators, broadcast technicians, camera operators, and musical instrument repairers.

The occupational frame helps us to see the relatively unique pools of talent possessed by a region. Not all such regional occupational specializations can neatly mapped onto a single or set of industries. Some are dispersed across a broad number of industries, and this dispersion appears to be modestly increasing (Markusen and Schrock, 2001).

Approaching economic development as an occupational rather than an industrial phenomenon offers alternatives paths for economic developers. For instance, when an industry is in structural decline because it is just simply cheaper to produce elsewhere or because substitutes are destroying its market, working with occupational groups offers an alternative to simply trying to prevent plant closings. Rather than approach the problem of huge layoffs among aerospace workers as synonymous with an imploding aerospace industry, as southern Californians did in the 1990s, an occupational approach might have enabled a more creative and less expensive economic development approach. Engineers exiting aerospace, for instance, brought exotic substances developed with military research dollars into sports and sportswear lines like golfing and athletic clothing.

Given their evolved industry orientation, economic development practitioners in the past few decades have worked extensively with firms, industries and business associations, seeing them as their customers. In contrast, a practice re-oriented around occupations would seek occupational and occupation-shaping partners. Prominent among these would be membership associations based on occupational lines, from trade and craft unions (electricians, machinists, writers, musicians, operating engineers, nurses, actors, janitors) to professional associations (mechanical engineers, economists, doctors, accountants). Strong ties would also be forged with institutions and organizations that recruit, educate, train, and retrain workers.

The occupational frame gives priority to labor rather than physical capital as the key to regional development. We avoid the term "human capital" here because we find it both conceptually confusing and easily confused with investments in higher education. The generic unitary actor in our analysis is the worker, meaning the individual who exchanges his or her time and skills for a wage or salary, whether he or she is a manager, scientist, blue collar or home care worker. How regions might improve their fortunes by better understanding and shaping their occupational structures is the subject of this monograph.

Why an Occupational Approach?

Several arguments can be made in favor an occupational approach for California in the coming decades.[1] First, as California competes in a vigorous and open international market, the state's ability to specialize and export is based ever more deeply on talents and synergy in the local economy rather than natural resources or physical capital. In the 1950s, Leontieff demonstrated in his famous paradox that the American economy as a whole relies upon skilled labor, not physical capital, for its success (Leamer, 1995). Human capital is now widely believed to be essential for urban and regional economies, which must compete with even less leverage over developmental contexts than nations possess (Clarke and Gaile, 1998; Mather, 1999; Reich, 1991). Focusing on establishments and industries may not reveal much about skill content, while an occupational framework would more directly reveal the quality of labor engaged in the economy.

Second, job commitment on the part of both workers and employers has waned (Christopherson, 1990). Firms are less willing to train workers internally, because this is an

[1] This section draws on Markusen (2002).

expensive process and because increasingly efficient and cyclically tight labor markets enable workers to shift among employers on short notice. Subsidizing firms and industries is less likely to automatically translate into heightened skill formation now than in the past. This phenomenon mirrors a tendency in the economy for wage and employment-security conditions of work to be increasingly linked to occupational groupings rather than industrial sector, oligopolistic status or size of firm (Noyelle, 1990; Harrington, 1999). Firms are thus increasingly dependent on regional labor pools, and training is becoming increasingly externalized in regional institutions (Fitzgerald, 1998; Parker and Rogers, 1999). Such training is best organized by occupation.

Third, occupations are less apt to map neatly onto industries now than they were a quarter century ago. Many clerical and sales workers are employed by manufacturing firms, while many engineers and construction workers labor in the service sector (Walker, 1985). As outsourcing and subcontracting proliferate, occupational talent is shared even more liberally – actors and directors create videos for medical instrument companies, while software engineers program for film companies and arts organizations. Function, skill and connections become more important than organizations (i.e. firms), and these are best studied via occupational groupings.

Fourth, the digital revolution has made it easier to work from remote job sites. The explosive growth of relatively small cities in the intermountain west — Albuquerque, Boulder, Boise — is symptomatic of this potential, as is the clustering of key groups of professionals in Manhattan, Toronto and San Francisco (Zook, 2000; Wheeler, Aoyama, and Warf, 1999). Workers are more likely to be committed to the region and neighborhood than to the firm or industry (Markusen, 1996a) and will decide where they want to work based in part on amenities (Florida, 2001) and "lovability" (Markusen, 1996b).

Paradoxically, this places a new emphasis in economic development theory on the environment, once viewed as important only for its natural resource exploitability. Skilled labor, while less mobile than capital, is drawn to particular natural environments, but in a new and fascinating way – workers with choice opt for livable environments rather than exploited ones. A much greater priority is now placed on protecting environmental assets rather than spending them down. Cities and regions must decide whether their economic development dollars should go to increasing amenities, as a way of attracting and holding skilled workers, rather than subsidizing firm location.

Fifth, the fast-paced and flexible economy places a premium on new firm formation. Entrepreneurial activity may entail significant costs and high rates of failure (Neff, Wissinger and Zukin, 2000), but it generates new local specializations and job growth. It is cumbersome to identify entrepreneurship potential by studying industries and much easier to work with occupations. Certain occupations may show higher rates of new firm formation, greater crossover with other sectors, and/or faster maturation from local-serving to exporting activities. Geographers have confirmed a strong tendency for new firms to be located where founders are already living.

Sixth, planners working to stem inner city decline and/or concerned with minority participation and jobs for underemployed groups may find occupational groupings easier to distinguish and target than industries. Significant segregation of regional and sub-regional space by occupation as well as race and gender has been documented by Hanson and Pratt (1995), Wyly (1996), McCall (1998) and Wright and Ellis (2000) among others. Designing economic development strategies to specifically redress socio-economic imbalances is far easier when occupations and individuals in them are used as targets rather than industries and the firms that populate them.

Finally, working occupationally also permits planners to draw upon more information when analyzing regional economies and labor markets – residence-based occupational data from the decennial Census and Current Population Survey and workplace-based occupational data from state-level Occupational Employment Statistics and other survey programs. Economic censuses and other data sources based on industry and firm units suppress socio-economic detail and are frequently only accessible at the level of the county or higher. Occupational data from the population census and current population surveys allow us to map the changing residential choices of highly disaggregated groups of workers over time and to match other socio-economic characteristics with occupation. In this study, we have not pursued this level of analysis but hope to do so in future research.

Thinking in Stereo Vision

We are proposing an occupational lens as a complement to industrial structure and policy, not a substitute. It is clearly useful to know what a regional economy produces, especially because the structure of output suggests who the region's competitors are. Firms are important decision-makers in the regional economy, and it is instructive to treat them as belonging to industries, where their competitors and suppliers may also be lodged.

But firms are not the only decision-makers. They decide how much and where to produce, but workers decide where to live and for whom to work. Regional economists have tended to assume that workers follow jobs rather than vice-versa. But in recent years, the gravitation of "footloose" workers to attractive locations (Boulder, Boise, Albuquerque) has exerted a powerful influence on firms as well, drawing them along in their wake. In addition, some new firms are started by workers who decide first where they want to live.

Our proposal, then, is to build stereo vision into economic development policy and planning, with industry and occupational lenses both trained on the regional economy. Strategies would be built around a vision of a desirable long-term occupational composition of the workforce, and projects assessed on their congruence with the vision. The biotech industry, for instance, would be assessed not just on the basis of the number of firm start-ups but by the numbers and types of jobs created, whether the region has an appropriate labor force and how good the jobs will be. Through the 1990s, for instance, dozens of new biotech firms in California generated few local jobs beyond those of scientists and engineers, because most of the testing, FDA approval, marketing, production and packaging took place in older pharmaceutical regions (Gray, 1998).

An economic development practice that builds upon both industry and occupation will create the potential for more efficient use of public funds. In what Thompson and Thompson (1993) call "cross-hair targeting," planners and policymakers can use occupational analysis to gauge the types of jobs that economic development projects are likely to generate, judging them on their pay and benefits, stability, potential for career mobility, fit with local target populations, and other criteria important to the state or locality. They will be able to take advantage of considerable existing expertise in workforce development that often lies under-consulted in different agencies and departments within the same government. The development of an occupational component to regional economic analysis and development policy is the subject of this study, which ends with several concrete suggestions for its implementation.

3. California Urban Occupational Advantage

California's metropolitan areas collectively exhibit occupational structures that are distinct from the nation's labor force as a whole. In this chapter, we scrutinize the occupational specializations of eleven California metropolitan areas, including all of the state's largest, as a group. We showcase the "occupational advantage" of urban California – the occupations that have added significant numbers of new employees in the decade of the 1990s beyond what would be expected given initial occupational structure. Those that have lost ground unexpectedly, too, are discussed.

We use two key indicators to profile metro strengths: occupational specialization and occupational advantage. To gauge a metro's occupational specialization, we use what regional scientists call a location quotient, the ratio of an occupation's presence in the regional workforce to its presence in the national workforce. An index, the location quotient is larger than 1.0 if an occupation's share of the California metro workforce exceeds its share of the national workforce and below 1.0 if not. This is a method of gauging the evolved strength of the metro economy at any period of time as evinced by occupational prominence in the area workforce.

But we also want to know how these specializations have changed in recent years. We could gauge this by looking at the rise or decline in the location quotient over time. However, this measure is potentially biased by what has happened elsewhere in the regional workforce. For instance, if a huge area of work activity, such as aerospace in Los Angeles, largely evaporated in the last decade, thus disappearing from the denominator used to compute location quotients, the share of every other occupation in the Los Angeles workforce would increase proportionally without any expansion it its ranks. To look more

purely at the unexpected generation or loss of new jobs in an occupation over the period – what we call "occupational advantage," we use the residual, or "competitive shift," factor of a computation. This measure captures unexpected job growth/decline - the numbers of metro jobs in each occupation that were added or lost beyond what we'd expect given the occupation's initial presence in the region and its national growth experience over the interim period.

We profile here occupations on the basis of where people work, not their residence. Thus people who work in Oakland but live in San Jose are registered in Oakland metro occupations, not in their home county. The data we rely on for this exercise come from the State of California's Occupational Projections series, produced by the state's Employment Development Department, and from the US Bureau of Labor Statistics' National Industry-Occupation Employment Matrix Time Series. Formidable data problems, arising from disparate purposes for the original data, variance in practices between state and national projections techniques, the need to suppress data at high levels of dis-aggregation, changes in occupational coding in the late 1990s, and incomplete spatial coverage were tackled along the way and are the subject of the Appendix. These problems made it impossible to produce a full set of consistent detailed California metropolitan occupational profiles, observable over a decade, for a culminating year more recent than 1997. Our priority was to construct a data set in which we have high levels of confidence regarding consistency in occupational definitions and data aggregations across the time period and the metropolitan areas we studied. The eleven metro areas in our analysis are listed in Table 3.1. In some cases, data for individual metros do not include peripheral, newly urbanized or chiefly residential counties encompassed within the MSA definition, because the State of California did not produce the data (for example, Marin County in the case of the San

Francisco metropolitan area, Placer County in the case of the Sacramento metropolitan area).

Readers should view the occupational profiles that follow as good snapshots of overall occupational structures rather than as definitive. Certain occupations are maddeningly not broken out in our national data; definitional consistency was achieved at the price of loss of detail in the data. An example is doctors -- a group we suspect has grown dramatically over the period -- who are lumped into the residual category "professionals, not elsewhere classified." Our data also do not encompass the self-employed, and thus certain occupations with high levels of self-employment, such as farmers, veterinarians, and loggers, are undercounted. However, this may not affect their spatial differentials. Those interested in these data nuances should read the Appendix.

California's Top Metro Occupational Specializations

Compared to the nation as a whole, occupations over-represented in metropolitan California in 1997 spanned the gamut (Table 3.2). Across our set of California metros, engineers stood out among the professions, notably electrical and civil engineers. Other professions with high concentrations included inspectors, purchasing agents, and administrative services managers. Health professionals, such as clinical lab technicians and medical assistants were well-represented. Firefighters and recreation workers were prominent, features perhaps of California's unique climate and topography. Clerks and messengers were also found in greater than average numbers. Several blue collar occupations – subway, streetcar and bus operators, garment worker and aircraft assemblers – were over-represented in certain California metros but are not included in these totals

because data is missing for some of the metros in the set. The same is true for computer professionals. We shall probe their presence in individual metros below.

Occupations that exhibited average or below average shares in California metros – and thus are not shown in the table – tended to be concentrated in larger occupational groupings such as sales workers, maintenance and cleaning, administrative, home care, and health services. Under-represented, too, were the blue collar workers associated with motor vehicles, machinery, metals and related industries, whose ranks are concentrated in the northeast of the US.

The occupations highlighted here are those that emerged as major California strengths. In 1988, California's metropolitan occupational structure appeared poised for success in the 1990s. It possessed an occupational portfolio weighted slightly in favor of nationally faster-growing occupations. However, this initial apparent structural advantage did not guarantee the state's metropolitan success. Between 1988 and 1997, these eleven California metros added just over 722,000 jobs. But if jobs in the California areas studied had grown at the same rate as they did nationally, they would have increased more than twice as rapidly as they actually did, adding another 918,000 jobs.

Many occupations lost ground relatively in California metros over the decade, as their ranks grew more rapidly elsewhere. Such recomposition may be attributable to, among other factors: 1) the relatively high cost of doing business and living in California that has encouraged migration to other western cities, 2) technological changes where California may lead the nation (information technology replacing clerical workers, for instance), and 3) the relatively deep defense-related recession in the early 1990s that hit California disproportionately hard and from which it had not fully recovered by 1997. In future work, we plan to test each of these causal propositions.

Unexpected Occupational Gains and Losses

Some occupations enhanced their metropolitan presence in California and grew at unexpected rates, faster than in the nation as a whole. Surprisingly, this was not primarily a high tech story but one of blue collar, service, and educational occupations. Table 3.3 shows those occupations that added more than 1800 unexpected jobs during the decade. The largest absolute increments in unexpected jobs were found among teachers, blue-collar assembly workers, fire fighters, lab technicians and building cleaners. The case of teachers shows how important public policy initiatives are to the occupational structure of the state. In the 1990s, the State of California lowered the maximum class size allowed for all schools in the state, greatly expanding the demand for teachers.

Did California's metros exceed national growth rates in professional and high tech occupations in the 1990s? In many cases, yes. Electrical and operating engineers gained ground relative to national share during the decade, while civil engineers lost ground. Nationally, the ranks of engineers declined dramatically over the decade, linked to a 30% implosion of defense spending. But California metros' engineers appear to have held their ground at least relatively speaking.

Computer professionals expanded their ranks in the 1990s nationally and in the six largest California metros as well. Their growth rate in the largest California metros exceeded the national rate slightly. However, financial managers and lawyers failed to keep pace with their peers nationally.

Table 3.4 shows the occupations that lost the most ground in California metros during the decade. About 150,000 fewer jobs than expected were created in professional workers "not elsewhere classified," a large and diverse group that does not contain the

professions in the rest of the table. Losses were also registered in clerical and sales occupations. Registered and practical nurses as well as nursing aides also shrank during a period when these occupations grew dramatically nationally.

In summary, metropolitan California's occupational structure was quite diversified by the late 1980s. The state's metro occupational specializations were particularly notable in engineering, affirming California's urban high tech reputation. During the 1990s, California metros maintained a high-tech edge, but unexpected job gains were registered overwhelmingly in mid to low-skilled jobs. The overview just presented suffers from the suppression of data in certain occupations that were not reported for each of the eleven metros. In what follows, we look more carefully at individual California metros, showing their remarkable occupational diversity, even when compared against others of similar size. Following discussions of metros grouped by size, we explicitly probe the extent to which occupational profiles reflect a metro's place in the national urban hierarchy and/or its industry mix.

4. Occupational Advantage in California's Largest Metro Areas

California's urban areas are very different from each other in their occupational profiles. Stand-alone metros such as Sacramento, Bakersfield, Fresno, and Redding host specialized occupational pools. Large metropolitan areas such as San Diego, Los Angeles, San Francisco and Oakland share some specialties but are relatively distinctive in many others. New, largely post-World War II suburban metros embedded in larger conurbations – Orange County, San Jose, and Riverside-San Bernardino – are remarkably distinguished in their occupational profiles. In our analysis of specialization and occupational shifts – what we call emerging occupational advantage -- we show that California's metros are not moving in lock step. They are increasingly specializing in response to intense competitive pressures, and they are competing with each other as well as with metros across the US and elsewhere.

In our exposition, we group the metros into three sets (Table 3.1): the largest in the state (Los Angeles, Oakland, San Diego, San Francisco); medium-sized stand-alone metro areas and core counties thereof (Bakersfield, Fresno, Sacramento, Redding); and suburban metros which are part of larger conurbations (San Jose, Orange, Riverside/San Bernardino). Each set offers opportunities to contrast the occupational gains of each county with those of counties of the same type. In Chapter 6, we compare the larger metros with their national peer groups to see the extent to which specializations merely reflect the place of each in the urban hierarchy. In Chapter 7, we probe the degree to which occupational profiles reflect industrial profiles or differ across the metro set.

In this chapter, we profile the occupational specializations and advantages of the largest and historically oldest metropolitan areas in California. The three conurbations of

the Bay Area, the Los Angeles basin and San Diego stand out in California for the sheer size of their economies. Los Angeles MSA hosted nearly 4 million jobs in 1997, the ending period for our analysis. The Bay Area has spawned "sister" metropolitan areas (San Francisco and Oakland MSAs) that are treated separately in statistics yet are interconnected in various ways. Each is, along with San Diego, near to the 1 million mark in terms of jobs. We examine here the larger occupations that showed high degrees of specialization in 1997 – all those with more than 1000 people working in the occupation and where the incidence in the region's workforce exceeded the nations by 30% (LQ>1.3). A number of less heavily populated occupations were also highly specialized in each metro. Other, smaller occupations were often close relatives to those that we profile. Plasterers and carpet installers, for instance, were often found clustered with drywall installers and finishers.

For each of California's major metros, we investigate occupational specialization – those occupations over-represented in the regional economy in 1997 – and occupational advantage – those occupations posting unusually high numbers of new or retained jobs in the 1990s, compared to their growth performance nationally. We also profile for these largest metros the occupations in which they unexpectedly lost ground. We show that occupational structure is not destiny – considerable occupational ferment and turnover occurred in each metro, even within single industries. Some occupations with modest degrees of specialization at the outset of the decade dramatically increased their incidence over the period, as did some with already high concentrations. Other initial strengths were considerably eroded over the period.

Los Angeles Occupational Advantage

Los Angeles/Long Beach Metropolitan Statistical Area, consisting of Los Angeles County, is the largest MSA in California, with about 3,850,000 jobs in 1997, almost four times the size of the other three large MSAs covered in this set. It is also the core metro in a larger conurbation that encompasses millions of additional jobs. Its occupational strengths in 1997, shown in Table 4.1, included aircraft assemblers and other blue collar workers in metals and plastics, garment workers, artists, ushers and broadcast workers, aeronautical and industrial engineers, physical scientists, flight attendants and aircraft mechanics, and workers in the warm weather construction trades, among others.

Going into the decade of the 1990s, Los Angeles possessed an occupation mix that was only slightly skewed towards occupations that grew more slowly nationally. But the metro lost ground both absolutely and relatively in stunning numbers. Overall, the LA metro hosted about 168,000 fewer jobs in 1997 than it had a decade earlier. Furthermore, it did not maintain its specializations in the face of competition from other regions. If jobs had grown at national rates, some 664,000 new jobs would have been generated. The metro was shielded from worse losses by its strengths in the garment and entertainment sectors.

Some occupations posted surprising gains, few of them in high tech occupations (Table 4.2). Los Angeles' occupational advantages were chiefly confined to skilled and unskilled blue-collar jobs, personal service jobs and educational occupations. Physical scientists, a declining group nationally, enjoyed unexpected gains – the only arguably high tech occupation in the set. Garment workers, teachers and cleaning service workers added the greatest number of unexpected jobs. Gains in garment work, cleaners and personal care attendants are related to immigration and the availability of cheap labor. Because of

amnesty programs put in place in the 1990s and redoubled efforts by the State of California to extend coverage to low wage workers, some members of these occupations may only have come to be counted in this period, leading to an overstatement of expansion in their ranks. Without these gains, however, the Los Angeles story would be much gloomier. Surprisingly, aircraft assemblers, although jobs fell by 321, resisted the huge implosion in their ranks that occurred nationally and thus increased their relative specialization.

Dozens of occupations lost ground in the 1990s in Los Angeles. Unexpected losses were spread across the board – sales, clerical, managerial and assembly jobs ended the decade tens of thousands of jobs below their expected level (Table 4.2). The high tech story is particular discouraging for LA. Computer programmers declined in absolute numbers and far in excess of national rates, while computer scientists and analysts (not shown in table) added jobs much more slowly than nationally. Although LA gained nearly 19,000 jobs in computer science and systems analysts, it would have added another 26,000 jobs had this occupation grown at the same rate as it did nationally. Electrical engineers also lost ground relatively as well as absolutely – their ranks fell by more than 14,000 in the region, and more than 8100 of these job losses were unexpected. Aeronautical engineers' losses, not shown, were similar. Heavy losses in engineering and computing distinguish the Los Angeles case from the other Californian metros in its cohort – San Francisco, Oakland and San Diego.

The marked decline in defense-related engineering occupations (aeronautical and electrical), when contrasted with the relative resilience of aircraft assemblers noted above, reveals an internal occupational remaking of the aircraft industry in Los Angeles. In the wake of big defense cuts, Los Angeles' aircraft and space manufacturing sector has become

more blue-collar intensive, losing the design, marketing and R&D functions, especially of military-related systems, to other regions (Oden et al, 1996).

San Francisco's Occupational Advantage

As an ensemble of employers, the San Francisco metro, here defined as San Francisco and San Mateo counties, accounted for 876,000 jobs in 1997.[2] People working in the San Francisco metro reflected strong core city and central business district specializations: law, finance, architecture and arts expertise, messengers, file clerks and management support occupations, and hotel and skilled restaurant workers (Table 4.3). San Francisco also possessed marked specializations among computer professionals and physical and life scientists. In contrast to its neighbor metro Oakland but a pale shadow of Los Angeles, the metro hosted relatively high concentrations of garment workers.

San Francisco's job growth was constrained in the 1990s, particularly by simply having little room to grow and strong residential opposition to higher density. It possessed an occupational mix in 1988 skewed towards occupations that grew more rapidly in the 1990s than the nation economy as a whole. But over the ensuing decade, it added only about 45,000 new jobs, about half the number of neighboring Oakland (see below). Had jobs grown at national rates, San Francisco would have added over 92,000 more jobs than it did.

Yet the peninsula metro hosted its share of occupations that out-shined their national counterparts in the 1990s, and these were remarkably spread across the skill spectrum. The ranks of managers, computer professionals, garment workers and teachers

[2] The unavailability of employment data by occupation for Marin County, a largely residential segment of the official MSA, means that resident-related occupations such as retail sales, personal services, and K-12 education are likely modestly under-represented in the SF metro totals.

contributed the greatest increment to unexpected job growth, together adding 38,000 more jobs than expected (Table 4.4). This experience predated the dot.com bust of the turn of the century, so it is difficult to know for certain whether the information technology increment has been sustained. We return to this question in Chapter 7. Other, less vulnerable high tech occupations such as life and physical scientists (not shown) also added hundreds of jobs in excess of their expansion rates nationally.

The San Francisco metro workforce exhibited considerable turmoil, with many occupations losing ground absolutely as well as relatively, including some that had been traditional strengths. Large absolute and relative job losses, running into the thousands for each occupation, were sustained among clerical workers, nurses, and food preparation workers. Some of this may be accounted for by technological change (e.g. clerical work being displaced by information technology) and by the movement of activity to more suburban sites and other regions (retail, clerical back-office functions, health care). Except for managers and managerial support workers, the financial, law and business service occupations in the San Francisco metro did not post job growth in excess of national norms over this period.

Outside of the information technology occupations, vulnerable to the continued dot.com and telecommunications bust, few occupations demonstrated a strong and robust comparative advantage in San Francisco. Perhaps the metro is becoming more of a higher income bedroom community to neighboring metro San Jose (Silicon Valley). The gentrification of residential activity is revealed in large and unexpected increases in bartending and restaurant chefs coupled with the decline of food preparation and waitressing jobs. We draw these conclusions with caution, however, because it is quite

possible that the city hosts a robust self-employment economy, linked to the internet, which does not show up in our database.

Oakland Occupational Advantage

The Oakland metro, which in our study consists of Alameda and Contra Costa counties, employed over 941,000 workers in 1997 in covered industries. Its evolved workforce possessed concentrated talent in engineering, science and computer occupations; recreation, urban public servants such as fire fighters, utility workers and bus drivers, and skilled crafts such as carpentry and selected health-related occupations (Table 4.5). The influence of the University of California, Berkeley, in this metro is reflected in clusters of life scientists, physical scientists and science and mathematics technicians. Although science and engineering professors are classified as teachers, researchers at University-related institutes (Lawrence-Berkeley Labs, for instance) and at spin-off non-profit and private firms are registered in these occupations. High concentrations of residential construction trades reflect unusual activity in both new (suburban) and refurbished housing.

Over the decade of the 1990s, despite a mix balanced between slow and fast-growing occupations, jobs in the Oakland metro grew more slowly than they did nationally. The metro added almost 90,000 jobs but would have added 50,000 more if jobs had kept pace with their national growth rates. Oakland experienced less turmoil than did neighboring San Francisco, where a number of long-time occupational specializations lost ground dramatically in the 1990s. Many of Oakland's unexpected job gains occurred in sectors where it was already favored, and almost all its losses occurred in sectors where it never had a particularly strong showing.

The occupations that generated the greatest number of unexpected new jobs in the Oakland metro are listed in Table 4.6. Blue-collar assembly workers and laborers account for the single largest unexpected increment. Educators, with shares 10% in excess of the national average, added the greatest number of unexpected new jobs, a function of the presence of the University of California Berkeley and other colleges, small businesses offering adult education, and new elementary classroom size standards for the state. Their strength may reflect the success of local firms in marketing educational services on the internet as well.

High tech jobs for computer professionals, civil engineers and life scientists grew more rapidly in Oakland than in the nation. Occupations associated with management, machining, and policing posted higher than expected job gains also. The above average growth of recreation workers and childcare workers may reflect a rise in urban amenities associated with urban revitalization.

The Oakland MSA's occupational structure shows considerable breadth and resilience for an "inner city" metropolitan area. Its disproportionate job losses came in occupations such as clerical work, retail sales, food preparers, transportation equipment operators, bookkeepers, waitresses and janitors. With the exception of clerical work, these are occupations where the metro did not possess concentrations in the past. One worrisome feature is that some of Oakland's key occupations– civil engineer, teacher, police officer, utility worker, bus driver – rely heavily on public sector employment. However, the robust educational sector in this region appears to be generating additional jobs outside public institutions per se, and the metro's high tech capabilities are strong and growing.

San Diego Occupational Advantage

San Diego, a metro whose growth spurt post-dated that of the other three metros discussed in this chapter, possessed a workforce heavily skewed towards high tech professionals and skilled production workers, on the one hand, and residentiary occupations on the other, with a dearth of traditional blue collar assembly work (Table 4.7). After shipfitters -- the most concentrated occupation (LQ = 9.10) but with fewer than 1000 jobs -- machinists were the second most specialized production occupation. The metro hosted disproportionate concentrations of life scientists, electrical and aeronautical engineers, and computer and IT professionals. Designers and artists also made a strong showing. Garment workers (0.59), so prominent in Los Angeles and the Bay areas, were substantially under-represented in San Diego's workforce.

San Diego, with a workforce of 1.04 million in covered jobs in 1997, added more than 151,000 jobs over the decade studied. Its rate of overall job growth exceeded the nation's. At the outset of the decade, its job mix contained a preponderance of occupations growing relatively rapidly nationally. By the end of the decade the metro had added an increment of 329 jobs above what could have been expected given its initial occupational composition. This relative economic health is perhaps the result of the youthfulness of the metro, whose suburban job growth is still contained within the original MSA boundaries.

San Diego's teachers, managers, clerks and life scientists all added more than 1000 jobs in excess of expectations (Table 4.8). The rest of the gains were registered in resident-related occupations. San Diego's draw as a retirement community is manifest in the unexpected expansion of jobs in home health care.

Despite its high tech prowess, substantial unexpected job gains in San Diego were not, with the exception of life scientists, in the high tech professional occupations.

Electrical engineers lost jobs in absolute numbers, down more than 15000 jobs, but fared slightly better than they did nationally (Table 4.9). Aeronautical engineers, on the other hand, lost jobs at higher rates than they did nationally. Although computer professionals added almost 12,000 jobs in the 1990s, their growth rate barely outpaced the nation's. This mediocre performance is likely related to San Diego's considerable defense dependency, which it shares with its coastal neighbor Los Angeles and therefore to its vulnerability to large defense procurement cuts in the 1990s.

The bulk of the metro's unexpected losses were also in resident-related and clerical occupations. Growth appears to have slowed in San Diego in this decade, with unexpectedly poor performance in occupations such as carpentry, drywall installers, sales clerks and restaurant cooks. Yet the region retains an enviable mix of high tech talent that could potentially seed new activities for its future.

Comparing the Four Metros

During the period studied, California's larger metros indeed appeared to be finding new missions in the increasingly competitive and global economy. We find remarkable divergence across the group in many key occupations. These differentials are not explained simply by the metros' disparate growth experiences, which range from losses of 4% in Los Angeles to gains of 17% for San Diego. The metros appear to be competing with each other as well as with large metros elsewhere. Six trends in emerging occupational advantage are discernible among the group. We include in this comparison San Jose, although we leave a fuller discussion of its occupational re-composition to the next chapter.

The most striking change in occupational composition in the set is in the sheer numbers (more than 27,000) of unexpected new jobs among low skilled garment workers in Los Angeles despite the region's total job decline of 4% during the decade (Table 4.9). This trend was not shared among the other cities with the exception of a modest increase in San Francisco. Other categories of unskilled labor – laborers, for instance - also increased in the older core cities. The oldest metros, in other words, are showing some recomposition toward low wage jobs compared with more youthful metros.

A second stark contrast lies in huge unexpected gains in computing occupations in northern California (over 22,000 in San Francisco, Oakland and San Jose metros combined) compared with an even larger unexpected loss in Los Angeles metro (a shortfall of more than 33,000) and a static share in San Diego, despite its prowess in engineering and life science. This north/south divide complements findings from Milkman and Dwyer's (2002) "tale of two cities" that chart diverging sources of income inequality between the Bay Area and LA basin economies. In both economies, the income distribution has worsened. But while in LA the source is unprecedented growth in low wage jobs, in the Bay area it is also a function of exceptional growth in high wage jobs associated with the high tech revolution.

A third specialization is detectable in the teaching profession, where San Diego, Oakland and Los Angeles far outpaced San Francisco and San Jose. The teaching occupation consists of K-12 teachers, whose ranks expanded dramatically everywhere in California due to legislated changes in classroom size, and college teachers. Expansion of the UC system, in particular, may explain the gains in the three metros that host the flagship research campuses (Berkeley, UCLA and San Diego). San Diego, with the highest

number of unexpected new jobs, benefits from both phenomena, as the fastest growing economy in the set.

A fourth divergence is found in the differential ability of the large metros to hold onto their traditional urban core finance and legal functions. San Francisco and Oakland posted modest unexpected job gains in finance (financial manager occupations), holding their own vis-à-vis the nation. San Jose and San Diego lost ground in finance, and Los Angeles lost more than 8200 jobs, accounting for the lion's share of unexpected losses. Interestingly, all the metros except San Jose lost ground in the legal profession; here, San Jose may be benefiting from the explosion of interest in intellectual property law, of great interest to the high tech complex.

The flight of skilled manufacturing jobs from the older inner city metros is a fifth trend detectable in the unexpected relative losses of Los Angeles and Oakland (and only modest gains for San Francisco and San Diego) in electrical engineering, while machinists jobs fell disproportionately in San Francisco and Los Angeles compared with unexpected gains in San Diego, Oakland and San Jose.

A final trend is related to residential shifts in favor of higher income households. Gentrification – the recomposition of metro residential demand towards higher income tastes and preferences - is evident in San Francisco's unexpected gains in artistic, table waiting and carpentry occupations. San Jose's table-waiting jobs also grew disproportionately, but not as much as one might expect given its overall job growth. Although Oakland and San Diego increased their shares of artists modestly, they both lost ground among waitresses. Los Angeles, with its overall job implosion, hosted unexpected losses in all of these.

Chapter 5. Occupational Advantage in Suburban and Stand-Alone Metros

The large metros covered in the last chapter share a century-long history as urban centers. They carry with them the marks of traditional specializations, with both positive and negative legacies, such as seasoned skill pools, robust educational institutions, struggling small firms in shrinking industries, and brownfield sites. Their economies exhibit the layering of newer on top of older activities. In this chapter, we examine a set of three postwar "suburban" metros (San Jose, Orange County, Riverside-San Bernardino) that grew largely as overflow sites for economic activity from Los Angeles and the anchor metros of the Bay Area. We than contrast both groups to a set of "stand-alone" metros (Bakersfield, Fresno, Sacramento, Redding) that blend past with new economic functions.[3]

In these comparisons, we portray only large, selected occupations that mark the regional economy from others both in specialization and in emerging (or eroding) comparative advantage. All of these metros devote sizeable portions of their workforce to residentiary activity. We are more interested in the ways that each can find unique strengths to export out of the region so that it can afford the large quantities of consumer goods that flow in from specializers elsewhere.

Suburban Metros: San Jose, Orange County, and Riverside-San Bernardino

Despite their origins as workplace and residential satellites of older metros, the three post World War II metros investigated in this section exhibit dramatic differences from each other in occupational mix. Our analysis underscores that suburbanization is not a homogenous process (Orfield, 1997). Unique initial conditions result in path-dependent

[3] We attempted to add San Luis Obispo, as a coastal stand-alone metro, to this set. However, we determined that the quality of occupational data was too problematic to include it in this analysis.

economies with considerable occupational specialization, not just vis-à-vis their contiguous metro neighbors, but also vis-à-vis each other.

San Jose Occupational Advantage

San Jose has been the most admired and emulated metro in the US for the past decade. The metro added jobs at a rate of 15.3% between 1988 and 1997, 1.2% percentage points below the national norm. Its occupational structure confirms its high tech reputation. We portray this structure here in a shorthand manner. In the top portion of Table 5.1, we include those occupations that accounted for at least 1000 jobs in 1997 and hosted jobs at double or more the national norm. In the second group, we show less concentrated occupations that added 1000 or more unexpected jobs between 1988-97. In the lowest group, we tally those occupations that posted in excess of 5000 fewer jobs than expected. The Valley economy demonstrated continued high tech prominence, some recomposition of skilled manufacturing labor and maturation in terms of unexpectedly high growth in low wages service occupations.

The envy that Silicon Valley inspires in other "wannabe" metro economies is justified by its extraordinary and growing concentrations of electrical, industrial, chemical and mechanical engineers and computer professionals. Together, these occupations exceeded the US norm by 2.3 to 9 times in 1997. Electrical engineers and computer professionals added more than 20,000 jobs beyond what would have been expected, given their initial occupational structure in 1988. Managers and administrators added more than 6000 unexpected jobs. The Valley lagged expected growth rates, however, in the occupations of industrial and mechanical engineers, inspectors and testers, purchasing agents and production clerks, but exceeded them for machine operators and assemblers, suggesting turbulence in manufacturing functions, possibly the achievement of

greater scale economies in larger plants with less oversight. Residence-related moderate to low-skilled occupations also grew at unexpectedly rapid rates, especially since Silicon Valley's growth fell short of national employment growth. Notable among these are carpenters, auto mechanics, janitors and housekeepers, and waitresses. The Valley's biggest unexpected losses came in the clerical, sales and varied professional occupations, which together accounted for over 32,000 unexpected job losses.

It is important to keep in mind that the San Jose economy is in part an artificial economy in a statistical sense, since it is not really a self-contained metro and is strongly dependent upon its Bay Area neighbors. Much of the financial, accounting, legal, marketing and shipping activity for Valley firms is carried out by workers and professionals in San Francisco and Oakland. Were the three metros combined as a single metro, the high tech character of Silicon Valley would appear far less singular.

As with San Francisco, this portrait predates the dot.com and telecommunications bust of the late 1990s. If the downturn in these sectors constitutes a permanent structural change rather than a shakeout needed in overly optimistic new service sectors, the current decade's occupational portrait may look both less effervescent and more diversified. There is informal evidence that new hikes in defense spending and homeland security are resulting in new and reconfigured business activity in the Valley – this will undoubtedly alter the occupational structure to some extent while it also provides opportunities for skilled computing and engineering professionals to switch gears.

Orange County Occupational Advantage

Orange County, long stereotyped as a suburban, conservative Los Angeles outpost and home to Disney Land, is a remarkably diversified economy with a strong residential component

and toeholds in other sectors. Its workforce is barely high tech by San Jose standards and more blue-collar in character. We include here all those occupations which accounted for at least 1000 jobs in 1997 and either hosted jobs at 1.5 times the national norm, added more than 1500 unexpected jobs in the period or posted over 5000 fewer jobs than expected (Table 5.2).

Most of Orange County's highly specialized occupations, a diverse set, gained ground in the decade. The single exception here is electrical engineers, whose ranks fell almost twice the rate as they did nationally. This reflects Orange County's ties to the imploding Los Angeles defense sector, especially aerospace, shown in the previous chapter. Topping the list of highly specialized occupations that enhanced their comparative advantage in the 1990s are clinical lab technicians, a group that is not over-represented in any of the other of the California metros studied. Already specialized garment workers added large numbers of unexpected jobs, as did computer professionals, non-school bus drivers, fire fighters, bill collectors and industrial inspectors. Teachers, janitors, and blue collar supervisors added jobs unexpectedly from low levels of incidence. Food and clerical workers, teachers' aides, nurses, carpenters, sales and professional workers posted the largest unexpected losses.

Despite its heft as a resident-serving economy, the Orange County economy appears to be having difficulty fashioning a specialized role for itself in the larger southern California economy. It added jobs at a rate of 6.7% over the decade, less than half the national rate. At the outset of this period, its occupational mix was skewed towards occupations which subsequently grew slowly nationally, but it lost jobs disproportionately even in these occupations. Its resiliency lies in its relatively diversified economy, which protected it fairly well against the deep losses of its closely related neighbor, Los Angeles, in the early 1990s aerospace implosion.

Riverside / San Bernardino Occupational Advantage

The ex-urban counties of Riverside and San Bernardino comprise a fairly youthful metro area to the east of Los Angeles County. Of all the metros profiled so far, this one posted the highest growth rates in the 1990s, 25.9%, considerably above the national job growth rate of 13.6% from 1989 to 1988. Its occupational profile, covering those occupations with more than 1000 workers in 1997 and either exceeding the national norm by 1.6, or adding or losing in excess of 1500 jobs from expectations, shows it to be heavily resident-oriented in its work functions, with the highest specialization rates found among drywallers, firefighters, recreation workers and carpenters (Table 5.3). Few occupations were highly concentrated, i.e. with location quotients over 2.0. Because of its position as a suburban outpost of the Los Angeles conurbation, most of its occupations added unexpected job growth in the period, though drywallers and carpenters lost ground compared with the US, connoting a slow-down in new construction over the prior decade.

The most interesting feature of the Riverside-San Bernardino economy was the rapid growth of blue collar manufacturing occupations, some of which remained under-represented. Machine operators and assemblers, truck drivers, and blue-collar supervisors added jobs far in excess of their initial presence in the workforce, given national trends. These findings may reveal the suburbanization of manufacturing from other areas within the Los Angeles conurbation.

The Suburban Metros Summarized

The three metros profiled under the suburban rubric show tremendous divergence in occupational character. Orange County is revealed to be a diversified lower-skilled export occupational pool with a strong residentiary component. Riverside-San Bernardino exhibits a

fast-growing largely residential economy with growing blue-collar manufacturing activity. San Jose proves its high tech character by exhibiting extraordinary computer and engineering prowess that continued to accumulate talent in the 1990s. While it also possesses a residential economy, high costs of housing appear to be driving out lower income residents and the occupations serving them.

These three cases show how inappropriate it is to characterize large conurbations, like the LA basin and the Bay Area, as central city/suburban dualities. Just as the core metros themselves show widening differences in occupational specialization and growth, two largely post World War II suburban areas surrounding LA possess markedly different employment profiles. None of these should be treated as entire labor market areas and thus as relatively autonomous economies from the point of view of daily commuting sheds, the way San Diego and those that follow are. It is important to acknowledge that resident-related work in Orange County and Riverside-San Bernardino, for instance, may be supported by the incomes of commuters that work in Los Angeles County. Yet viewing them as separate metro areas, especially given that our data is based on workplace rather than residence, is highly instructive and useful for dramatizing the significant differences among them. Furthermore, local and county economic development officials are concerned with generating and retaining jobs inside their jurisdictions, and these profiles show what the existing labor pool looks like and how they are changing.

Stand Alone Metros: Bakersfield, Fresno, Sacramento, Redding

Having moved from south to north and back again in our visits to the larger metros in California, we move here from south to north again, probing the occupational character of four Central Valley and interior California metros. The significance of natural resources shows

strongly in these metro areas' occupational mix and advantage, as does government-related employment.

Bakersfield

At the southern and desert-like end of the Central Valley, Bakersfield's most highly specialized occupations in 1997 were bunched among well-paid blue collar workers (roustabouts, waste water treatment plant operators, corrections officers, farm and aircraft mechanics, firefighters) and engineers (petroleum, aeronautical) and physical scientists (Table 5.4, which shows all occupations exceeding twice the national norm and employing more than 200 workers, plus those adding 200 jobs or losing 500 jobs beyond expectations). Many of these were tied to the metro's agricultural and forestry missions, but others were associated with government-supported facilities such as Edwards Air Force Base and prisons. Residence-related occupations, especially those in construction, were well represented.

At 9.5%, the Bakersfield metro grew more slowly than the nation in the period from 1989-97. Lower than expected gains were spread through the ranks of management, sales, food preparation, clerical, craft and production workers, mostly occupations with low levels of representation to begin with. Surprising gains were registered by teachers, corrections officers, truck drivers, registered nurses, and janitors, among others.

Bakersfield did not benefit from the high rates of growth of ex-urban California locations, but it did add jobs at a modest to healthy rate in the 1990s. Its labor force is diversifying away from natural resource activities in oil, agriculture and forestry and toward recreation, corrections and education and health care occupations. Its longer-term potential is difficult to read from its occupational structure, however, and it does remain dependent on large airfields and prison facilities for significant chunks of employment.

Fresno

Fresno, squarely in the San Joaquin Valley, hosted high concentrations of occupations in agriculture-related activity in 1997: meat cutters, dieticians and nutritionists, inspectors, agricultural workers, and packaging machine operators. Also, as a metro exceeding national job growth rates in the 1990s (20.6%), Fresno hosted high concentrations of workers in the building trades (Table 5.5 shows all occupations in excess 1.9 times the national norm and with more than 200 jobs, as well as those occupations adding or losing more than 500 jobs given national growth rates.)

Fresno, which at the outset of the decade enjoyed an occupational mix skewed towards subsequently fast-growing occupations, added more than 5,000 jobs in excess of expectations. Its largest unexpected gains were among blue-collar workers, teachers, and professional workers. Truck drivers, carpenters, wastewater treatment plant workers, and correction officers also posted gains in excess of national growth rates. Unexpected losses were largest among clerical and management support, teachers' aides, sales and food preparation workers.

Skills in agriculture-related inputs, production, packaging, distribution and finance thus appear to have formed the core of the Fresno export-oriented occupational base. Heightened trade in agricultural products, along with the extraordinary productivity of the Valley's farms, undoubtedly contributed to these patterns.

Sacramento

Sacramento, the state's capitol city, hosted one of the more unique occupational structures in California in 1997. A metro with half a million jobs, its most marked specializations included forest and conservation workers, management analysts, civil engineers, typists, and

urban and regional planners, all found in concentrations in excess of triple the national average. Insurance, utility and labor relations specialists also were highly clustered here (Table 5.6 shows all occupations with concentration rates double the national norm and more than 400 jobs, as well as those occupations adding 1000 more or losing more than 1000 jobs given national growth rates). Conspicuously absent are blue-collar occupations associated with manufacturing, construction and agriculture.

Sacramento's job growth lagged the nation's in the 1990s, at 12.7%. (The reader should keep in mind that these data do not include neighboring El Dorado and Placer Counties, which are now included in the official MSA definition of the metropolitan area and for which no occupational data were compiled by the state of California during the 1980s.) Although the metro added 56,000 jobs, it fell more than nearly 5,000 short of expectations given its initial occupational mix. The largest unexpected gains came in police, service, management support, computer/IT professionals, utility representatives, teachers, and managers. Many of these are relatively high-paying jobs, and many of them were occupations in which Sacramento already specialized. The largest unexpected losses came in sales occupations, bookkeeping and clerical jobs, and factory workers, none of which were notable Sacramento specializations to begin with. Sacramento was the only Central Valley metro to lose ground among corrections officers.

Sacramento's large government-related complex, shown in its heavy concentrations of management and budget analysts, mail clerks and typists, was its strongest export sector. Considerable ferment appears to have worked its way through government agencies, as clerical occupations lost thousands of jobs (despite small unexpected gains for typists) while computer-related and analyst jobs soared. Dramatic changes in welfare reform gutted jobs among welfare eligibility and social workers. These processes happened in other California metros, also, but they were clearest in this heavily white-collar city.

Redding

At the far northern end of the Central Valley, Redding hosted a workforce marked by natural resource skills in 1997. Relatively remote and spread over a large land area, the Redding metro is tiny by the standards of the rest of our metro set, with 54,800 jobs in 1997. Its outstanding specializations included forestry-related occupations: fallers and buckers, forest and conservation workers, logging and other heavy equipment operators, fire fighters, and recreation workers (Table 5.1 shows all occupations double or more the national norm and with 50 or more jobs, plus all occupations posting more than 200 additional jobs or losing 200 or more jobs beyond expectations.) Selected residence-related workers – childcare workers, dental assistants, and physical therapists – were also found in concentrations double or more the national average.

Redding grew rapidly in the 1990s, by 22%, just short of Riverside-San Bernardino's rate. It added more than 2500 jobs in excess of what would have been expected, given its initial occupational mix. The more specialized forestry-related occupations seem to have held their ground vis-à-vis their numbers elsewhere in the US, although these data cover only those working for employers or for themselves if incorporated, not self-employed loggers. The largest unexpected gains were predominantly in resident-related activities: service and food workers, teachers, registered nurses, sales, clerical, and child care workers. Blue-collar occupations, never a Redding strong point (outside of forestry-related activities), lost the greatest ground over the decade.

Redding, long a forestry-related community, appears to have diversified into a more complex, chiefly residential community. Although traditional logging activities were under duress as an export employment core, employment was growing rapidly around tourism, retirement and wood products (cabinetmakers).

Suburban and Stand-Alone Metros Summed Up

This review of the occupational strengths and changing occupational advantage of the seven California metros studied here reveals remarkable specialization across the set. With the exception of forest and conservation workers, among the top four most concentrated occupations in both the Sacramento and Redding metro areas, none of the others overlap (Table 5.8). Management, engineering, science, computing and blue collar occupations were among the most highly skewed in this set. Some metros, like San Jose and Redding, were very specialized within a narrow range of occupations, while Orange County was the most diversified. The smaller metros exhibited some unusually high location quotients – forestry workers in Redding, petroleum engineers and roustabouts in Bakersfield - but San Jose, too, stands out for its extraordinary concentration of electrical engineers at nine times the national norm.

With some exceptions, notably the high tech occupations of San Jose, these specializations are not the source of the largest unexpected occupational gains for metros in this set (Table 5.9).[4] Managerial, engineering and computer occupations played this role in San Jose and Sacramento. Teachers, whose ranks were amplified by the new smaller classroom policy in California, were among the top four occupations creating unexpected job gains in Orange, Riverside/San Bernardino, Bakersfield and Fresno metro areas. Service workers posted large unexpected gains in four of the metros – Riverside/San Bernardino and three of the stand-alones. Blue-collar machine operators, assemblers, and laborers added unexpected new jobs in San Jose, Riverside/San Bernardino and Fresno.

[4] The occupations listed in Table 5.9 include many "residual" occupations, denoted by nec (not elsewhere classified), often the largest component of a higher level of aggregation. These would naturally weigh in in this table because of their generally large size. It is of interest that despite their being proxies for higher levels of aggregation, there is still very substantial variation across the metros.

Our work at a relatively highly disaggregated occupational level appears justified by these results. An occupational group such as engineers contains within it many quite starkly different skill sets, and these turn out to be differentially clustered across California metros. The six engineering professions listed in Table 5.8 were each found to be highly concentrated in only one metro and spread out over three very diverse settings – San Jose, Bakersfield and Sacramento. The same is true of the four skilled crafts occupations – carpenters through roustabouts - in Table 5.8. Each was found in only one of the seven metros, all in the Central Valley.

Chapter 6. Does Size Explain Metro Specialization?

A metro's occupational specialization may not reflect its unique competitive position but merely its place in the national urban hierarchy. To explore this possibility, we compare here the occupational specializations of larger California metros in our set to those of US metros of similar size. We show that to some extent, especially for the more highly skilled and high tech occupations, urban hierarchy does account for some degree of metro specialization. But in many cases, California metros still outperformed their national size counterparts. We compare first the six California metros whose workforces numbered between 900,000 and 1.4 million in 2000 with their similarly sized counterparts elsewhere in the nation. We then take up the special case of Los Angeles, comparing it to the two other "world cities," New York and Chicago.

For this exercise, we employ a different data set – the 2000 Occupational Employment Statistics produced by the Bureau of Labor Statistics. Because occupational codes changed in the late 1990s, the occupations listed here do not correspond one-on-one to those we use in prior discussion, but they are close. We use here the official occupational title in the OES.

Second Tier Cities

If economic activity simply sorts itself out by city size, as hierarchical and central place theories have long contended, then we might find that California metros' occupational specializations largely disappear when compared against similarly sized metros nationally. An apparent strength in computer programming in Oakland or San Diego, for instance, might turn out to normal for regional economies of their size – these

metros might even fall below their national counterparts. On the other hand, they might exhibit an edge in these occupations beyond what is explained simply by the tendency of this occupation to cluster in larger cities nationally. To what extent is this the case?

Six of our California MSAs fall in the set of eighteen US metros with workforces between 0.9 and 1.4 million (Table 5.1). They belong to a larger group of what we have analyzed elsewhere as second tier cities to distinguish them from the "world cities" of New York, Chicago and Los Angeles (Markusen, DiGiovanna and Lee, 1999). Our comparative set ranges from Newark with a workforce of 960,000 to Seattle with a workforce of almost 1.4 million in 2000. Among the full set of eighteen, computer professionals, lawyers, and architects and engineers, in that order, were significantly concentrated, followed by business operations, scientific and management occupations (Table 5.2).

Holding California metros to these standards, the apparent strengths of San Diego and Orange County metros as computing talent agglomerations turn out to be normal for the size of their economies. Oakland's prowess turns out to exceed all second tier cities only modestly, while both San Francisco and San Jose demonstrate exceptional specialization. For activity associated with the practice of law, San Diego, San Jose, and Orange County's concentrations fall behind those of their peer group – San Francisco appears to providing these functions for its neighboring metros Oakland and San Jose. In architecture and engineering, the expertise of all metros but San Jose turn out to be just above normal or well below it, and in business and financial operations, only San Francisco and San Jose exceeded the second tier city norm with a comfortable margin. However, in the science and management occupations, California metros maintained their margins.

Where do these six metros outshine their peers? They were remarkably

differentiated from each other, even at this level of aggregation.[5] Table 5.3, where location quotients are recalculated using second tier cities rather than the nation as the denominator and shown only for those occupations above the norm, shows that Riverside/San Bernardino and San Jose were the outliers in the set. The former, an ex-urban outpost of Los Angeles, showed strong concentrations in resource, production and transportation occupations as well residence-related occupations (food preparation, construction). San Jose, as the opposite end, possessed outstanding strengths in the highly skilled business and high tech occupations, plus a remarkable showing in production jobs. Orange County, with the exception blue-collar production jobs, did not outpace its second tier city counterparts substantially elsewhere in the occupational scale. The Oakland metro stands out only in the scientific occupations, a tribute to the strength of University of California-related institutes and spin-offs, and in construction, related to both urban upgrading and suburban building. San Diego exhibited a surprising mix of strengths in resource-related sectors, food preparation, the arts/sports/media complex and, only modestly, in the scientific occupations – it turns out not to have been very high tech in comparison with its second tier city counterparts. San Francisco's enviable specializations in most of the higher skilled occupations were robust and not explained by its place in the urban hierarchy.

Los Angeles as a World City

How did Los Angeles compare with its two counterpart "world cities" – New York

[5] The reader should keep in mind that these figures include only those working for pay and do not include self-employment, so they underestimate the actual workforce by as much as seven percent (self-employment) plus the regionally unemployed (another 3-8 %). In this data set, each metro includes all counties in the MSA definition, so that these figures for San Francisco include Marin county, not included in the analysis of California data in previous chapters. The occupations are arrayed in Table 5.3 by their SOC codes, which roughly, though not precisely, reflect levels of education and training.

and Chicago? Does their size dictate their occupational structures? Each of these MSAs supported more than 4 million covered jobs in 2000. They are often grouped together in analyses of top tier (world, global) cities (Hall, 1966; Friedman and Wolff, 1982). They can also be thought of as competing with each other, as well as with cities such as London, Tokyo, and Frankfurt, for world city functions, each of them developing distinctive specializations, often the product of distinctive histories and cultures (Markusen and Gwiasda, 1993; Abu-Lughod, 1995, 1999). Which characterization is more apt?

We find that the competitive, or specialization, view fits the set best. For all the hypothesized world city functions, i.e. those in which the three together exhibit location quotients above average, none but office and administrative services occupations show relative convergence (Table 5.4). Of the occupational groups in which the three cities together exceed the national norm by 20%, Los Angeles held its own only in the arts, law and protective services, and in each of these it lagged New York considerably. Size, in other words, did not dictate specialization even at this highly aggregated occupational level.

The three mega-metros were most alike in their relative deficiencies, as shown in the occupations towards the bottom of the table. Even here, though, it is dangerous to generalize. Although New York showed very low levels of production and transportation occupations, Los Angeles outpaced the nation and all metros in transportation, while both Los Angeles and Chicago posted high concentrations in production occupations.

At finer levels of occupational specification, this non-correspondence between Los Angeles and its world city peer group was even more striking (Table 5.5). In the twenty nine detailed occupations where Los Angeles supported workers at twice the national

norm, it was out-performed by New York in only in a few – fashion designers, broadcast technicians, multi-media artists and medical scientists. Los Angeles' specializations in acting and make-up art, garment work, aerospace engineering, and certain other skilled blue collar jobs were uncontested and could not be predicted with any certainty by its presence in the 4 million plus size class.

Conclusion

From these comparisons, we conclude that size is not destiny. It is important to take size into account. By doing so, we show that some metros do not out-pace their similarly sized competitors in occupations that appeared to be concentrated within them when compared only with the national workforce. Professional occupational specializations in computing, the practice of law, finance and architecture and engineering, for instance, disappear for some of the metros in our set when size is taken into account, while not in others. Los Angeles' occupational strengths do not resemble its peer world cities – New York and Chicago – closely. The occupational mix of any of these cities would be poorly projected by using size class alone.

The comparative size lens is important for policymakers and planners and can be included in a kit of occupational tools. It reveals the extent to which certain occupations do appear to array themselves simply by metro size and scale – these are occupations that policymakers need not try hard to attract and retain. It also permits identification of those occupations whose distribution is not closely related to metro workforce size. These are the occupations that are "capturable" – amenable to the building of clusters that in turn may attract additional firms or generate new firms. It is important to recognize that these are not confined to professional and managerial occupations – many of California's metros

host blue collar and service occupations in excess of their peers.

Chapter 7. Does Occupational Mix Dovetail with Industry Mix?

Most analysts and policymakers still think of a regional economy as sets of establishments grouped by industry. Indeed, in our discussion of various occupational clusters, we have alluded to industry specialization as a companion to occupational concentrations – aerospace in Los Angeles, computers and semiconductors in San Jose, oil in Bakersfield, lumber in Redding. In this chapter, we explore the extent to which occupational mix maps neatly onto industrial mix. We show where the two are coterminant and where they are not. In the latter case, it means that the occupational mix within a specific metro industry is dissimilar to the mix found for that same industry in other locales. In such cases, pursuing industrial targeting will not achieve the same consequence as pursing occupational targeting. We find that estimating a metro's occupational mix by assuming that its industries mirror the national occupational structure for those industries often yields a good approximation. However, this does not hold for a number of important occupations in metropolitan California, where industrial presence does not connote a fixed occupational structure.

How Industry and Occupation Relate in Theory

Firm managers and workers comprise the demand and supply sides of labor markets, respectively. Managers hire workers in a particular locale when their business plans call for it and lay them off when they are no longer able to make an adequate return on the activities of those workers. Managers choose from among different candidates in hiring. They also decide on the mix of manpower and capital used in production; when workers are scarce or expensive, they may opt to substitute capital for labor. Managers

sometimes make decisions to change locales in order to produce more cheaply, find better-qualified workers or reach markets more easily. These decisions lie behind the observed employment levels by occupation by metro captured in the data used in this study.

Workers, too, make decisions that affect a metro's occupational profiles. They decide to take jobs when the wages and working conditions are satisfactory, and they try to choose among several jobs so that they can compare desirability of working conditions, pay, benefits, job security and locational attributes such as amenities and journey-to-work. They may decide to change occupations in response to better offers, return to school for more education and training, or retreat from the labor market altogether. They may decide to start their own businesses or become self-employed consultants and contractors. They may decide to change locales in order to find better work, or they may switch occupations and accept jobs of inferior quality to stay in their current region for personal and quality of life reasons.

The metropolitan distribution of jobs results from both managers' and workers' decisions. Regional economists use two conventions for summarizing over the complexity of work in a metro area. Jobs may be reported by industry, grouped according to similarities in their product or service outcomes. Or they may be reported by occupation, grouped by the similarity of workers' skills and activities on the job. Neither of these is in any way theoretically prior to the other. In practice, economic development planners tend to rely on industry depictions while workforce development planners rely primarily on occupational summaries. As our efforts here reveal, data on industry is more user-friendly than data on occupations, especially if comparability over regions and time is desired.

If occupations map neatly onto industries – if all steelworkers work for steel industry establishments and all computer software programmers work for the computer

software industry and so on – then it is not particularly important to analyze regional occupational composition in its own right. Industrial employment could be used as a proxy for occupations – a planner would simply assume that the national or state occupational mix for an industry holds in his/her local economy and estimate occupational structure in this manner. In this case, the opposite would also be plausible – the industry structure of a region could be inferred from its occupation mix.

Why might occupation not map neatly onto industry across regions? One reason is the increasing interregional and international division of labor (Frobel, Heinrichs and Kreye, 1979). A firm operating in a single industry, let's say electronics, may spatially segregate its functions (what workers do) across several types of regions. It may run its corporate operations out of a city of superior financial expertise, place semiconductor research and development in a high-cost center of innovation like Silicon Valley where talent is rife, locate advanced manufacturing and testing in a second tier city like Colorado Springs, Portland or Albuquerque, and fabricate semiconductors off-shore in Singapore, Taiwan or China (Saxenian, 1980). While the corporate headquarters would be classified as manufacturing administration, the rest of these establishments would be classified in the electronics industry. But the occupational composition of each would be very different from the others. A planner could not assume an occupational composition simply by knowing that a particular establishment is classified in the electronics industry.

Occupational agglomeration effects form a second and complementary cause of mismatch. The advantages of industry agglomeration effects have long been noted – by locating in close proximity, similar firms often gain advantages in terms of access to skilled workers and/or supplier networks. As the different functions of firms become more mobile and easily disconnected in geographic terms, agglomeration effects may come to be

associated more closely with specific functional components of firms, rather than with the entire range of the production processes. Agglomeration economies based on occupational characteristics of workers will thus attract selective establishments across a large number of firms, and their occupational structures may not correspond closely to that of their parent industries. An example is the gravitation of Japanese, Korean, Taiwanese and Indian software, electronics and computing firms to Silicon Valley; drawn by the talent and information flows in the Valley, they set up engineer-rich offices that are detached from the larger managerial, design and production complexes at their home base (Gray, Golob, Markusen and Park, 1999).

Industries and occupations, then are conceptual artifacts that we use to benchmark and comprehend what are enormously complex and changing regional economies. Neither "causes" or "explains" the other. We expect there to be strong correspondence, especially because the classification schemes themselves evolve over time. Indeed, it may increasingly be the case that new industries, as statistical categories, are created by the Department of Commerce by grouping together what are essentially occupationally-based worker activities. For instance, business services as an industry grouping emerged after accountants and software engineers and programmers moved out of larger manufacturing and finance firms and established their own firms around an occupational core. Since every establishment must be assigned to an industry, these became the accounting and software services industries respectively. The belated creation of new industry categories, then, corrects for discrepancies and introduces more dovetailing between the two sets of categories.

Testing for Coherence Between Occupation and Industry

To what extent does metropolitan industry structure, matched to occupational structures at the national level, serve as a good estimator of employment by occupation or vice versa? We compare here employment by occupation within California metropolitan areas in 1997 to the national average, holding industry structure constant. More specifically, we simulated what employment for California metropolitan areas would have been if the breakdown by occupation within local industries matched the national average for the same industries. We then summed total employment by occupation across all industries and compared expected employment based on this measure to actual employment. Our summary measure is the sum across occupational categories of the absolute value of the difference between actual and expected employment by occupation, divided by two to avoid double-counting (unexpected employment deficits in one occupational category appear as unexpected surpluses in others), as a share of total employment.[6] Wide disparities would indicate that occupational distributions within industries are dissimilar for different areas, and/or that they differ in California metropolitan areas as a group when compared to the nation as a whole. This could suggest that industry structure – at least on its own – is not a reliable estimator of employment by occupation.

The Relationship of Employment by Occupation and Industry

Our results (shown in Table 7.1) show that in general, industry structure weighted by each industry's national occupational profile did yield a close estimate of metropolitan

[6] Data constraints limit our ability to employ this measure at a highly disaggregated occupational level, since data are not consistently published for all occupations for each metro – if the numbers in an occupation are too small or if they are all accounted for by just a few employers, they are not reported (see Appendix). The aggregation level

occupational structure for our eleven California metropolitan areas in 1997. Even at the most disaggregated level of occupational analysis possible, the share of employment by occupation not predicted by industry structure for our entire sample was fairly small, at 5% of total employment. Nevertheless, this represented a substantial number of jobs -- 585,000. At a broader level of aggregation – using only the seven occupational categories shown in Table 7.1 – the discrepancy between actual and expected employment was even smaller, at 3%.[7] However, results varied by occupational category. The widest disparity between actual and expected employment occurred for workers in agricultural, forestry, and fishing occupations. Disparities were also high for manual workers, professional workers, and service workers. They were especially low for sales-related workers.

California's metropolitan areas differed substantially in the degree to which their occupational structures could be gauged by their industry mix (Table 7.2). At the most detailed level of occupational breakdown – with 93 categories employed – the disparity between expected and actual employment ranged from a high of 9% in Santa Clara County to a low of 4% in Los Angeles County. This discrepancy between a region of new economic activities and a more mature regional economy offers some fuel for our suggestion above that in more innovative portions of the economy, industrial structure will be less congruent with occupational structure.

Differences by occupational category were even more pronounced. Disparities among metropolitan areas were especially large for professional workers and agricultural, forestry, and fishing workers. For example, Santa Clara County employed one-sixth (17%)

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that we constructed to be consistent across all eleven California metro areas for the data used in this report contains 93 occupational categories.

[7] We also tested the relationship just for the six largest metropolitan areas, to determine if the greater level of occupational detail afforded in this comparison would influence the results. For the six largest metropolitan areas, data for 125 occupational categories was available for all areas. The outcome was similar, however, with the unexplained share at 6% of total employment.

more professional workers than would be suggested by its industry structure alone. Neighboring San Francisco Bay Area metropolitan areas – Alameda/Contra Counties, and San Francisco/San Mateo Counties – showed similar propensities, as did Sacramento County. However, other metropolitan areas – specifically Riverside/San Bernardino Counties, Shasta County, and Fresno County, employed substantially lower numbers of professional workers than would have been expected based on their industry structures alone. These findings offer some evidence for the spatial division of labor hypothesis.

These results suggest that California's metropolitan economies can be characterized by certain occupational propensities that operate somewhat independently of industry structure. For example, the economy in the San Francisco metro was skewed toward professional employment, had expected shares of clerical and sales employment, and lower-than-average shares of service, manual and precision workers than its industrial structure would suggest. The San Jose metro economy was especially skewed toward professional employment, with lower-than-average shares of employment in all other occupational groups.

Smaller metropolitan areas were more likely to host more clerical jobs than their industrial mix would call for, although the Los Angeles and Orange County metros also showed the same propensity. Smaller areas – in particular Fresno, Kern, Riverside/San Bernardino, and metros – hosted more precision and manual workers than would be expected given their industry mix. These metros may be beneficiaries of employers moving to lower cost locations for production and back-office work, again a manifestation of a spatial division of labor.

High Technology Occupations

Given the significance of high tech to economic development and our findings reported above, we chose to explore the high tech cluster of occupations in greater depth. In this section, we compare measures of "occupational advantage" employed elsewhere in this study with measures of the relationship between industry structure and occupation for three occupational categories related to the high-tech sector – computer/information technology professionals, selected engineers, and scientists.[8] Results are presented for the six largest metropolitan areas in the state (Table 7.3).

The San Francisco Bay Area's dominance in high-tech is evident in the findings. Location quotients – our primary measure of "occupational specialization" -- were quite high in 1997 for each of these sectors in each of the three Bay Area metros – San Francisco, San Jose and Oakland. In this section we add a new dimension to the concept of "occupational advantage" by probing the degree to which the observed over-representation in high tech-related occupations can be viewed merely as a function of high-tech establishments' greater likelihood of being located in these counties.

The results are striking. The presence of one-third or more of computer professionals in each of the three San Francisco Bay Area metropolitan areas cannot be attributed to each region's industry structure alone (the "unexplained share"), based on national averages for occupational composition by industry. Unexplained shares were also very high for scientists and engineers. In the three Bay Area metros in 1997, about 35,750

[8] "Selected engineers" includes chemical engineers, civil engineers, electrical and electronics engineers, and mechanical engineers. Due to data limitations, aeronautical and astronautical engineers, industrial engineers, metallurgists, mining, and petroleum engineers are excluded. "Computer/information technology professionals" includes computer engineers, systems analysts, database administrators, computer support specialists, computer programmers, computer programmer aides, programmers, (numerical, tool, and process control) and all other computer scientists. Natural scientists include agricultural and food scientists, biological scientists, conservation scientists and foresters, medical scientists, all other life scientists, geologists, geophysicists, and oceanographers, physicists and astronomers, chemists, atmospheric scientists, and all other physical scientists

additional computer professionals were employed than one would expect if Bay Area high-tech industrial establishments' occupational composition conformed to national norms. For the three occupational sectors studied, over 53,000 jobs were similarly unexplained. These findings provide strong evidence that employment in the region is skewed, relative to national averages, in favor of *certain* high-tech industry *occupations* – those associated with research and development. This same phenomenon does not hold for Los Angeles or Orange Counties. The San Diego metro economy shows a slight propensity toward higher employment in the same occupations but not nearly as dramatic as in the Bay Area.

What if we examine information technology industries exclusively? For this purpose, we use a definition of information technology industries employed by Mary Daly in "Information Technology and Growth in the Twelfth District," *Federal Reserve Bank of San Francisco Economic Letter*, Number 2001-32, November 9, 2001, to capture "the vast majority of the District's technology firms" (p.2). However, because data limitations prevented us from distinguishing one component of the information technology sector – computer and data processing services, or SIC code 737, which includes software development – from its larger category, business services, we have computed the results for the business services industry separately.[9]

We find even stronger confirmation here that industry presence does not dictate occupational composition (Table 7.4). Information technology employment in the three Bay Area metros is highly skewed toward professional employment and away from employment in other occupational categories – notably service, precision, and manual

[9] In this analysis, the information technology sector consists of the following categories from the Standard Industrial Codes: all employment in SIC 357 (computer and office equipment), SIC 36 (electronic equipment), SIC 38 (instruments and related products), SIC 871 (engineering and architectural services), and SIC 873 (research and testing services).

workers. In business services in the Bay Area, unexplained shares generally range from a third to half of all workers in the occupational categories listed. This discrepancy is less evident in other metropolitan areas. These findings suggest that a spatial division of labor has emerged in which high tech occupational agglomerations – based on certain functional components of firms' production processes – are operating in certain regions and do not closely dovetail with industrial composition.

Conclusion

Our findings provide strong confirmation that industry structure cannot be used as a proxy to estimate occupational structure for individual metropolitan areas in California. Although overall, we have confirmed that the relationship between industry structure and occupational composition is relatively strong, certain occupations diverged markedly from expected outcomes. Using high-tech occupations and industries as a test case, we show that the occupational mix in an industry for a given region may diverge quite dramatically from national averages. This suggests that a spatial division of labor within industries has emerged and that occupational agglomerations – based on certain functional components of firms' production processes – are operating in certain industries and certain regions.

Chapter 8. Economic Development Planning and Policy Implications

In this study, we have demonstrated the feasibility and power of envisioning regional economies as ensembles of occupations not just industries. We have shown how the occupational mixes of eleven California metropolitan areas differ from each other, each with large occupational groups that are unique to its labor force and with others that are strikingly under-represented. Developing and applying our concept of "occupational advantage," we find that a metro's occupational strengths in one era do not dictate those of the next. We have also demonstrated that occupational profiles are not simply a function of metropolitan size or industrial mix.

How might California's economic development planners and policymakers use our results to create stereo vision? We offer three possibilities here. First, we recommend the development and maintenance of occupational profiles for the state and its localities, if possible over time and in comparison to cohorts elsewhere in the US. Given the power of an occupational approach in a world where work activity may be increasingly more important than the end product, we stress the need for better and more user-friendly occupational data sets from state and national governments. Second, we show how these profiles could be used to identify key occupations and emerging occupational advantages for regions. These could be emphasized in economic development and workforce development planning, much as certain key industries are targeted in current practice. Third, we suggest that planners and policymakers work closely with groups that train, educate and represent key occupations just as they now work with industry associations and business organizations.

Developing Occupational Profiles

Our work demonstrates the insight possible from detailed descriptive portrait of a regional economy as an ensemble of occupations. Economic development planners generally cast their rationales for projects and initiatives in terms of job generation, but often the occupational composition of these jobs is unknown or under-examined. Do the jobs to be generated match those of the existing workforce? Do they pay well and offer job stability? Do they offer skills training and career mobility for citizens? Economic developers generally do not explore these dimensions of a tax increment financing project or an industrial retention plan, even though planners in workforce development, who do work with an occupational lens, have some of the answers. Asking them is a means of adding stereo vision to the economic development project.

California's economic development planners can develop profiles of the occupational structure of their area workforce relatively easily. The state (for counties) and the federal government (for metro areas) each generate annual data sets that tabulate employment by occupation. While these omit some forms of employment and present minor problems of interpretation (see Appendix), the coverage is excellent. Planners can fairly easily compare their locality's occupational profile with those of the state and nation, and in some cases, with comparably-sized locales. Such exercise will help to give planners, citizens and local leaders a good feel for the comparative strengths of their economies vis-à-vis neighbors and competitors elsewhere.

Creating an occupational profile can help planners break out of the industry mind-set. It is fairly easy to compare a local occupation by industry profile to that for the nation. Planners can then see the extent to which their set of establishments in an industry offer more or less skilled than the industry does nationally. If the local profile is generally less

skilled, this may serve as a warning signal and a case to be made for extension services and technical assistance.

Unfortunately, it is difficult at present for planners and policymakers to generate the indicators of occupational advantage we use here. Current data formats and accessibility make it very difficult to compare detailed occupational profiles over time. Major coding change in the late 1990s forced us to work with 1997 as an end point. As the coming decade unfolds, it will be easier to develop data sets that enable the charting of occupational change over time. Seeing how occupational mix is changing is important for economic development practitioners because past occupational specialization is not a particularly good guide to future gains and losses.

The data sets we use here were not constructed with economic development in mind but for forecasting occupational shortages and projecting employment over time. Several improvements in coverage, reporting, coding and continuity over time could be made to help planners and policymakers build profiles for their regions and compare them over space and time. We strongly recommend undertaking them.

Identifying Key Occupations

Occupational profiles can be used to identify key occupations and emerging occupational advantages for regions. These could be emphasized in economic development and workforce development planning, much as certain key industries are targeted in current practice. A stereo vision development strategy would give priority to a set of occupations with characteristics that match the community or region's development goals as well as to industrial strengths. Several important characteristics might be used: high levels of "capturability" (proxied by uneven distributions across regions and

localities), high levels of absolute and expected growth, high levels of connectivity and cross-fertilization across industries, and high levels of self-employment and entrepreneurship. These characteristics are elaborated upon in Markusen, 2002.

In choosing occupations to target, planners will confront some of the same challenges that they do in targeting industries. Reversals of fortune can occur at any time as technologies change, new skill sets supplant old ones and labor supply adjusts to demand. Additional criteria may be added to these four, depending on the welfare function and goals of the locality, and planners might decide to jettison one or more of the four set out here. An under-represented occupation, for instance, might be considered ripe for expansion, parallel to an import-substituting industrial strategy. An occupation centered in a single industry might be targeted if shortages in that occupation pose a constraint on the industry's growth.

Planners might also want to assess pay levels, job security and longer-term career mobility associated with candidate occupations. Some localities might want to stress occupations that pay living wages, but others with large pools of unskilled labor might want to target occupations such as home care worker that provide a first work experience for the difficult to employ (Howes, 2002; Howes et al, 2002). A stable or slowly declining well-paid occupation might be targeted for its contributions to living standards and to diversification, as in the efforts the Wisconsin Regional Training Partnership has made to retain and create a new generation of metalworkers in Milwaukee (Parker and Rogers, 1999). Just as with industry targeting, planners would begin by positing explicit normative goals for an occupational targeting exercise and use common sense in creating an occupational portfolio for development.

Bringing occupational targeting into economic development planning would encourage integration of workforce development programs, generally conducted in a completely separate bureaucracy, with economic development planning. Workforce

development has always operated on an occupational basis, and adequate data to distinguish the size, growth trajectory and demand for individual occupations does exist at the county and metropolitan levels. An economic development focus would help workforce developers overcome a tendency to think short term and train workers for high demand occupations without regard to longer term growth potential, job quality and pay, or career mobility.

It is important that planners not simply focus only on their own backyards in this exercise. Many mistakes were made in industrial targeting when economic development planners simply followed the leader elsewhere, imagining that any place could become a biotech haven or a software enclave. Understanding the draw of a region's competitors — other cities, other neighborhoods, the suburbs — is essential for a hardheaded strategy. Planners must have some verifiable reasons to believe that their local economy has a real or potential comparative advantage for the given occupations.

Partnering with Organizations that Train and Represent Occupations

Economic and workforce development planners and policy-makers already have a number of tools that can be used to enhance key occupation presence, and therefore firm attraction, in a region – tax incentives, zoning changes, provision of physical or financial capital, technical assistance. Stereo vision, our view, means adding the occupational lens to the current industrial lens in shepherding these resources and allocating them among competing priorities. Key to this exercise is the need to partner with organizations that prepare members of key occupations and provide networking among them.

Planners and policy-makers could work with occupation-oriented organizations to develop occupational initiatives much the way economic developers now work with business and trade

associations. One set of these will consist of educational and training institutions that prepare and retrain people for occupational roles. Professional associations and unions that are run by members of occupations form another set of partners. Entrepreneurship could be encouraged through networking by occupation and by offering classes to key occupational on how to start a business. Another important partner would be the new Workforce Investment Boards created by the Workforce Investment Act of the late 1990s.

Understanding why members of key occupations are attracted to and stay in a region is a worthy exercise, much the way that understanding firms' location calculus has been important in designing good industrial attraction programs. Partnering with occupational organizations affords researchers a channel for investigating these location factors.

Planners and policymakers might also consider ways of marketing collectively for key occupations, an analog to the way states and cities now market internationally for firms. Internet training and websites focused on certain key occupations and their products and services could be launched. Artwork, for instance, can now be sold over the web with new Internet-friendly visual techniques. Soliciting ideas and needs from members of key occupations would be central to such marketing.

Finally, just as regions and localities invest in physical capital (land clearance, tax forgiveness on buildings, incentives for equipment) for industrial development projects, planners and policy-makers practicing stereo vision would invest in human capital on the occupational side. The institutions for doing this are largely in place, although improvements in vocational education and worker retraining and re-education have been called for. But they are not well integrated into the economic development agenda. In addition, the interface between education and work could be vastly improved. These topics are beyond the territory covered in this study. We believe that

an occupational focus would further the integrative project required to help regions effectively pursue growth, diversity, stability and good jobs.

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Appendix A: Charting California Metropolitan Occupational Structure over Time

In this study we evaluate occupational specializations and recent structural shifts therein for a set of California metropolitan areas. Our main data objective was to create a decade-long consistent dataset permitting a contrast of California's substate occupational profiles with that of the nation over time. Occupational code changes and differences in national and state level data gathering conventions made it tedious but still possible to assemble such a data set. However, to achieve the desired consistency between substate and national data over time, sacrifices were required in terms of loss of occupational detail and timeliness. In this section, we describe the data sets we used, choices about occupational categories, spatial scales and time periods, and data adjustments we made to correct for various limitations.

Our research goals and the constraints imposed by data availability prompted us to use data from two sources. For gauging employment by occupation for California jurisdictions, we turned to county-level data generated by the Employment Projections by Occupation program of the California Employment Development Department (EDD) for 1988, 1989, and 1997. For 1988 and 1989, data on current ("base") year employment by occupation was obtained from printed reports by county entitled *Projections of Employment by Industry and Occupation*, published by EDD. For 1997, equivalent data, renamed "Occupational Employment Projections" data, was obtained in electronic format from EDD. These reports provide employment breakdowns for hundreds of detailed occupational categories annually.

For national employment by occupation, we relied on data from the U.S. Bureau of Labor Statistics' (BLS's) *National Historical Industry-Occupation Matrix Time Series (NTS),*

1983-1998, for the same years. The national time series data was produced by BLS's Occupational Employment Projections (OEP) Program and is available from that program's office. It details employment for 295 detailed occupations and 186 industries during the period covered.

Although these datasets are produced by different organizations, they employ similar methods as part of a joint set of programs to produce national information on occupation by industry. Specifically, both sources use data from the Occupational Employment Statistics (OES) Survey, administered by BLS in cooperation with state employment departments, including EDD. The survey is designed to obtain information on occupational staffing patterns over a three-year cycle from a representative sample of 1.2 million employers by industry. Second, both sources then "benchmark" the OES information to estimates of employment by industry obtained from the Current Employment Statistics (CES) survey, also administered nationally by BLS in cooperation with state employment departments. The CES surveys a monthly sample of nearly 350,000 non-farm establishments nationwide, which employ nearly 40 percent of the total non-farm population, to obtain information on employment by industry. CES data form the basis of numerous BLS reports on trends in employment by industry, just as (benchmarked) OES data form the basis of BLS analyses of employment trends by occupation.[10]

As part of the OES program, EDD surveys 35,000-36,000 employers annually in California, so the total over the three-year cycle comes to about 100,000. EDD attempts to survey every employer with 250 or more employees, and a random sample of all other employers, over the three-year cycle. The response rate to the EDD OES surveys is 75%,

[10] A second source of BLS data on employment estimates by occupation is available in addition to the Occupational Employment Projections (OEP) data we used; the OES program also produces its own employment estimates. We used OEP estimates instead because a) benchmarking methods are more comparable

extraordinarily high for business surveys. Because of the effort to survey all large employers, EDD estimates that the three-year results actually cover 70% of all employment in the state. Thus, EDD's Projections data provides excellent coverage of detailed occupations by place of work at the metropolitan level.

A time period of one decade is conventional for gauging changes in economic structure longitudinally. We sought to analyze employment changes over a time period representing similar points in the business cycle, in other words a period that would permit a comparison of employment shifts not clouded by cyclical changes. Because of massive occupational code changes in 1999 at the national level, we could only use data up through 1998. We employed data from 1997 because California data was unavailable for 1998. For initial years, we had to use data from two years --1988 and 1989 -- because California Projections data were produced only for subsets of counties each year. Our 1988-97 time period nicely fits the national business cycle in this era and frames the prolonged California recession of the early 1990s, associated with the national defense build-down. The stock market, dot.com and telecommunications implosions post-date our time span.

The BLS national time series provided certain strong advantages in relation to our goal of comparing data over time. In particular, it was constructed in a manner to afford consistency over time between occupational categories. In cases where new categories were developed from older ones, or definitions were altered, BLS aggregated occupational line items. This provided reassurance that our data comparisons would be valid ones.

The BLS national time series provides data for all industries. In contrast, the California Employment Projections data excludes farm employment (except agricultural services), forestry and fishing employment, unpaid family workers, private household

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for the state- and nationally-produced data, and b) the matrix time series is the best national data available with

workers, and the self-employed. To achieve consistency, we excluded these categories from the BLS national time series data. Employment in Agriculture, Forestry, and Fishing occupations presented a particular concern. The BLS national time series includes this employment as a single category, with no subdivision. However, a component of employment in this category – non-farm Agricultural Services – is included in the California Projections data. To achieve consistency, we determined employment in this category using the California Employment Development Department's Industry-Occupation Matrix data for 1997 (described in more detail later in this account), for each metropolitan area. We subtracted this employment from the 1997 Projections data. We used the same data to estimate employment to subtract from the 1988-89 Projections data by adjusting the data based on total employment growth for each metropolitan area over the period.

We conducted our analysis for eleven California metropolitan areas (or substantial portions thereof) that we believe represent a fair cross-section of the state in terms of economic and social factors as well as size and geographical dispersion. We conducted the analysis by metropolitan area (or the closest possible approximation), rather than by county, because of data constraints and because we preferred evaluating results in relation to coherent regional or sub-regional labor markets. However, the choice to conduct the analysis by metropolitan area also necessitated certain adjustments to correct for data limitations.

Our basic challenges in relation to spatial scale arose from two facts. First, EDD's Employment Projections data are produced at the county level, and until the mid-1990s, county coverage was incomplete. Second, the OES staffing patterns survey (upon which

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consistent measures across all years.

the employment projections data are based) has been conducted to be fully representative only at the state, or more recently, at the metropolitan level. We attempted to produce the most consistent data possible in terms of geographic coverage and data validity, given these constraints.

More specifically, until 1993, EDD did not produce estimates for all counties in the state, and until 1995, it produced estimates for only about half of all covered counties each year. This posed a problem for metropolitan-level analysis in cases in which data for component counties comprising a metropolitan area was either not produced for the same year, or was missing altogether. Specifically, this was a problem for the Sacramento metropolitan area, for which data for two counties (Placer and El Dorado) was missing altogether, and for the Oakland and San Francisco metropolitan areas, for which data for component counties was not present for the same years and was missing for one county (Marin). This situation might have prompted us to conduct county-level analysis only, if not for the issue of validity of OES survey data.

During the late 1980s and early 1990s, the OES staffing patterns survey was conducted to be fully representative at the state level only. Although this represents a deficiency in the validity of the data for occupational analysis at the substate level during those years, county-level estimates were not merely "read" from state-level survey patterns. EDD strived for validity in its county-level estimates by using local OES survey responses whenever possible, and by making further corrections to final county estimates to reflect known differences among county labor markets.[11] In other words, county estimates of employment by occupation were not merely the product of state-level staffing patterns benchmarked to county employment estimates by industry.

By the late 1990s, the OES staffing patterns survey was constructed so as to produce data representative at the metropolitan level. For this reason, we decided to aggregate county data whenever possible within multi-county metropolitan areas. Thus, we aggregated data for Riverside and San Bernardino counties, for Alameda and Contra Costa counties, and for San Francisco and San Mateo counties. In the latter two cases, this required aggregating data that was produced for different years during the late 1980s. We did this by applying an adjustment factor to employment by occupation in the county with a smaller workforce (namely, Contra Costa and San Mateo Counties) before summing the employment with that of the larger county. The adjustment factor was the annual percent change in total employment between 1988 and 1989 for that county, based on CES data from EDD (the official state employment estimates).

Further adjustment was required because of an across-the-board revision undertaken by EDD in 1992 of the CES employment by industry data used to "benchmark" the occupational employment projections data. Employment figures were adjusted downward in EDD's CES time series for all years before 1992 by factors of approximately 2% in each county. The adjustment was considered consistent (proportional) across all industries and occupations, and therefore we revised occupational projections data from 1988 and 1989 by the adjustment factor pertaining in each county.[12]

Other data adjustments were required in order to achieve consistency in comparisons among occupational categories. Certain limitations were the product of selecting the BLS national time series as one of our sources. The great advantage of the BLS time series – its consistency in occupational categories over time – also comes at a

[11] Information obtained from appendices to the *Projections of Employment by Industry and Occupation* reports, and conversations with Mr. Carl Hedlind and Mr. Tom Stassi at EDD.
[12] Information from David Dahlberg, California Employment Development Department

high price. Numerous individual occupational line items are aggregated in the data, in cases where new categories were developed from older ones, or definitions were altered over time.

Other limitations were the product of coding conventions in the California Employment Projections data. The published California Employment Projections data tables omit occupational line items when insufficient numbers of workers were present (generally less than 100) and in some cases for purposes of confidentiality. In such cases, employment was aggregated into residual categories. We had to establish consistent coding schemes to ensure valid comparisons across metropolitan areas and over time. Again, this required the loss of considerable detail in the data.

Still more detail was lost as the result of differences between coding conventions in the BLS national time series and the California data. In some cases, differences in coding conventions for residual categories (for example, "All Other Health Professionals") made it impossible to achieve consistency within these categories (and also, as a result, the entire mid-level category). In such cases, we were able only to compare local and national data for individual line items for which data was present in all cases, but residual categories had to be aggregated even further (into "All Other Professionals", for example).

To achieve consistency in all these aspects, it was necessary to reduce the number of occupational categories employed to 93. In certain instances, we also employed a coding scheme consistent only for the six largest metropolitan areas in the state (and consistent with the nation). This afforded a higher level of detail, with 125 categories. Additionally, for analysis of single metropolitan areas only, we used data consistent only across years for the metropolitan area itself, and with the national data.

In Chapter 7 we analyze the relationship of employment by occupation to employment by industry. Data for this analysis was obtained from two sources: the BLS national times series and the California Employment Development Department's Industry-Occupation Matrix data. The EDD matrix data is the principal source data for the final published Occupational Projections reports. We obtained matrix data for each metropolitan area in our sample, and for the State of California, for 1997.

It was necessary to impute certain data in the metropolitan area matrix tables that was suppressed, and thus missing, for purposes of confidentiality. By comparing Projections data, with no suppression at higher aggregate levels, to the matrix data, we were able to determine the suppressed share of employment in each metropolitan area. It ranged from a low of 0.5% in Los Angeles County to 6.5% in Shasta County. We imputed employment in suppressed industries based on the occupational breakdown in these industries for the state as a whole, applied to the missing employment share for each metropolitan area. In the few cases in which data was suppressed in the statewide matrix table, we imputed data based on the occupational breakdown in the metropolitan counties for which the data was not suppressed.

This imputation introduced an element of error into our data. After imputation, the sum of absolute values of divergences in employment between the matrix and Projections data, using the 93-category coding scheme consistent across all metropolitan areas and years, was 1.3% or below for nine metropolitan areas. Kern and Shasta Counties were more problematic, with errors at 2.2% and 3.7%, respectively.

Appendix B. Data Tables

Table 3.1 California Metropolitan Areas Covered in this Study

Metropolitan Area	Counties Included	Employment 1997	% Job Growth 1988/89-1997
Major Metros			
Los Angeles/Long Beach	Los Angeles	3,849,966	-4.2%
San Francisco	San Francisco, San Mateo	875,969	5.4%
Oakland	Alameda, Contra Costa	941,195	10.6%
San Diego	San Diego	1,044,149	16.9%
Suburban Metros in Large Conurbations			
Orange County	Orange	1,218,492	6.7%
San Jose	Santa Clara	921,357	15.3%
Riverside/San Bernardino	Riverside, San Bernardino	833,630	25.9%
Stand-Alone Metros			
Bakersfield	Kern	178,152	9.5%
Fresno	Fresno	247,589	20.6%
Sacramento	Sacramento	498,106	12.7%
Redding	Shasta	54,763	22.3%
US Economy		121,839,796	16.5%

Table 3.2 Heavily Specialized Metro Occupations in California

Occupation	LQ 97 for all Cal metros	Employment Cal metros 1997
Electrical and electronics engineers	1.9	54,760
Messengers	1.5	14,229
Clinical lab technologists and technicians	1.4	38,690
Personnel clerks, except payroll and timekeeping	1.4	17,178
Production, planning, and expediting clerks	1.4	29,367
Civil engineers, including traffic engineers	1.4	21,050
Fire fighting and prevention supervisors	1.3	6,880
Medical assistants	1.3	28,330
Fire fighters	1.3	27,270
Inspectors and compliance officers, except construction	1.3	19,190
Typists, including word processing	1.3	46,013
File clerks	1.3	28,119
Dental assistants	1.2	24,140
Legal secretaries	1.2	29,820
Dentists	1.2	8,690
Purchasing agents, except wholesale, retail, and farm products	1.2	23,376
Recreation workers	1.2	24,850
Order clerks, materials, merchandise and service	1.2	37,120
Administrative service managers	1.2	36,757

Table 3.3 Unexpected Occupational Job Gains, California Metros, 1988-97

	Unexpected Job Gains 1988-97	Total CA Metro Jobs 1997	Unexpected as % of new jobs created 1988-97
Teachers	50,178	519,260	35%
Machine operators, assemblers, helpers, laborers, transportation workers and material movers, hand, nec	44,529	1,356,149	29%
Fire fighters	11,250	27,270	99%
Clinical lab technologists and technicians	8,793	38,690	60%
Cleaning and building service workers, nec	8,329	36,424	103%
Blue collar worker supervisors	7,635	151,043	28%
Police patrol officers	5,221	38,310	49%
Automotive mechanics	3,715	24,850	89%
Recreation workers	3,154	56,817	41%
Pharmacists	2,521	13,390	62%
Order fillers, wholesale and retail sales	2,423	23,510	52%
Counselors	1,833	10,090	33%
Operating engineers	1,812	14,330	*

*The number of operating engineers in the set of California metros actually declined over the period. But given a huge decline nationally in this occupation, one would have expected a larger decline than actually occurred. These figures thus represent the jobs unexpectedly retained.

Table 3.4 Unexpected Occupational Job Losses, California Metros, 1988-97

	Unexpected Job Loss	Total Job Loss/Gain	Total Jobs 1997
Professional workers, nec	-148,128	256,212	1,884,729
Sales and related workers, nec	-123,089	69,482	559,053
Clerical and administrative support, nec	-122,593	-16,719	869,800
Teacher aides and educational assistants	-72,292	3,612	109,370
Precision workers, nec	-57,060	-55,921	384,207
General office clerks	-55,765	-7,313	278,430
Cashiers	-51,602	26,479	233,068
Registered nurses	-41,474	1,658	140,240
Service workers, nec	-39,206	134,649	658,983
Secretaries, except legal and medical	-38,362	-63,827	187,102
Bookkeeping, accounting, and auditing clerks	-27,670	-54,627	154,480
Clerical supervisors and managers	-26,514	16,626	153,161
Salespersons, retail	-26,036	-10,402	322,520
Carpenters	-15,467	-15,606	69,257
Nursing aides, orderlies, and attendants	-13,892	-704	66,350
Dining room and cafeteria attendants and bar helpers	-13,807	-20,427	38,090
Social workers	-13,378	2,866	34,670
Cooks, restaurant	-13,185	9,681	64,970
Bill and account collectors	-12,213	7,658	25,890
Electricians	-11,393	-4,967	38,166
Food preparation workers	-10,828	9,953	108,740

Table 4.1. Los Angeles/Long Beach Metro Occupational Specialization

Occupation	Location Quotient 1997	Change 1988-1997	Employment 1997
Aircraft assemblers, precision	6.1	3.2	3,080
Sewing machine operators, garment	4.7	2.7	57,200
Aeronautical and astronautical engineers	3.2	-1.5	5,200
Jewelers and silversmiths	3.1	1.5	1,880
Broadcast technicians	2.8	-0.5	2,940
Artists and commercial artists	2.5	-0.1	9,800
Textile bleaching, dyeing machine operators	2.4	2.1	1,850
Flight attendants	2.2	0.1	6,620
Pressing machine operators: textile, garment	2.2	1.1	4,970
Furniture finishers	1.8	0.2	1,520
Personnel clerks, exc payroll, timekeeping	1.8	0.7	7,949
Manicurists	1.8	0.8	1,570
Carpet installers	1.8	0.7	1,630
Upholsterers	1.8	-0.2	2,300
Plasterers	1.7	0.3	1,720
Production, planning, and expediting clerks	1.7	-0.3	12,740
Aircraft mechanics	1.6	0.4	5,570
Forest and conservation workers	1.6	1.2	1,030
Ushers, lobby attendants, and ticket takers	1.6	-1.2	4,040
Medical assistants	1.6	0.3	12,060
Brokers, real estate	1.5	0.4	1,020
Legal secretaries	1.5	-0.1	13,370
Punching machine operators, metal, plastic	1.5	0.4	2,200
Messengers	1.5	-0.3	4,999
Bus drivers, except school	1.5	0.2	8,700
Electrolytic plating machine operators	1.4	-0.5	1,980
Medical record technicians	1.4	0.4	4,010
Cleaning and building service workers, nec	1.4	0.7	15,617
Order fillers, wholesale and retail sales	1.4	0.2	10,210
Claims examiners, insurance	1.3	0.1	2,000
Physical scientists	1.3	0.6	7,830
Inspectors, testers, and graders, precision	1.3	0.1	28,180
Industrial engineers, except safety engineers	1.3	-0.8	4,950

Table 4.2 Los Angeles/Long Beach Metro Occupational Advantage

	Unexpected Job Gain/Loss 1988-97	Location Quotient 1997	Employment Change 1988-1997
Sewing machine operators, garment	27,090	4.7	9,701
Teachers	9,086	0.9	43,528
Cleaning and building service workers, nec	6,442	1.4	6,200
Textile draw-out and winding machine operators	3,337	1.0	2,899
Physical scientists	2,738	1.3	2,546
Pressing machine operators, textile, garment	1,990	2.2	1,332
Personnel clerks, except payroll and timekeeping	1,941	1.8	2,330
Textile bleaching and dyeing machine operators	1,555	2.4	1,544
Personal and home care aides	1,378	0.4	2,349
Aircraft assemblers, precision	1,300	6.1	(321)
Total Employment	(826,853)		(168,249)
Electrical and electronics engineers	(8,161)	1.0	(14,007)
Financial managers	(8,250)	1.0	(8,334)
Cooks, restaurant	(8,425)	0.9	158
Computer programmers	(8,467)	0.9	(5,246)
Dining room and cafeteria attendants and bar helpers	(9,781)	0.9	(12,531)
Nursing aides, orderlies, and attendants	(10,469)	0.6	(4,721)
Waiters and waitresses	(12,534)	0.8	(6,303)
Janitors and cleaners, including maids and housekeeping	(13,689)	0.8	(5,280)
Truck drivers light and heavy	(16,281)	0.8	(1,853)
Bookkeeping, accounting, and auditing clerks	(18,479)	0.9	(28,936)
Clerical supervisors and managers	(19,058)	1.1	(1,342)
Management support workers, nec	(20,422)	1.1	2,561
Precision workers, nec	(21,310)	0.9	(18,328)
Secretaries, except legal and medical	(21,799)	0.8	(31,655)
Registered nurses	(22,808)	0.8	(5,503)
Salespersons, retail	(24,361)	0.9	(18,553)
Computer engineers, scientists, and systems analysts	(26,466)	0.9	18,930
Managers and administrators, nec	(27,736)	1.1	(5,293)
Cashiers	(28,630)	0.8	1,264
Teacher aides and educational assistants	(31,673)	1.2	(660)
General office clerks	(34,139)	1.1	(14,874)
Professional workers, nec	(54,789)	1.2	5,547
Clerical and administrative support, nec	(68,597)	1.2	(24,387)
All other sales and related workers	(72,052)	1.1	5,715

Table 4.3. San Francisco Metro Occupational Specialization

Occupation	Location Quotient 1997	Change 1988-1997	Employment 1997
Architects, except landscape and marine	3.5	1.3	1,690
Messengers	3.2	0.5	2,430
Lawyers	2.7	-0.2	8,120
Sewing machine operators, garment	2.5	1.0	6,940
Paralegals	2.5	-1.2	2,290
Biological scientists	2.4	1.2	1,330
Legal secretaries	2.3	-0.7	4,470
Physical scientists	2.2	0.6	2,890
Artists and commercial artists	2.2	0.7	1,930
Computer/IT Professionals	2.0	0.5	27,917
Life scientists, nec	1.9	0.1	1,100
Civil engineers, including traffic engineers	1.9	-0.6	2,400
Management support workers, nec	1.9	0.3	31,582
Hotel desk clerks	1.7	0.4	1,900
File clerks	1.7	0.0	3,079
Administrative service managers	1.7	0.5	4,200
Personnel clerks, except payroll and timekeeping	1.7	0.1	1,639
Medical secretaries	1.6	1.0	2,428
Management analysts	1.6	-0.7	1,780
Dining room, cafeteria attendants, bar helpers	1.6	0.4	4,550
Financial managers	1.6	0.2	7,557
Designers	1.6	0.2	2,360
Personnel, training, and labor relations specialists	1.4	-0.3	3,552
Painters, paperhangers, construction, maintenance	1.4	0.4	2,580
Cooks, restaurant	1.4	0.2	7,220
Customer service representatives, utilities	1.4	0.7	1,830
Bartenders	1.3	0.3	3,700
Inspectors, compliance officers, not construction	1.3	-0.5	1,600
Managers and administrators, nec	1.3	0.3	56,043

Table 4.4. San Francisco Metro Occupational Advantage

Occupation	Unexpected Job Gain/Loss 1988-97	Location Quotient 1997	Employment Change 1988-97
Managers and administrators, nec	6,297	1.0	11,269
Computer/IT Professionals	4,724	1.5	17,302
Teachers	2,668	0.7	9,147
Sewing machine operators, garment	2,256	1.5	(449)
Management support workers, nec	1,906	1.6	8,555
Waiters and waitresses	1,354	0.9	2,789
Medical secretaries	1,334	0.7	1,355
Total employment	(97,736)		44,858
Lawyers	(1,546)	2.9	2
Typists, including word processing	(1,574)	1.5	(8,031)
Legal secretaries	(2,056)	3.0	(1,658)
Nursing aides, orderlies, and attendants	(2,343)	0.7	(1,234)
Bill and account collectors	(2,718)	1.7	(675)
Food counter, fountain, and related workers	(2,911)	1.0	31
Clerical supervisors and managers	(3,409)	1.4	854
Service workers, nec	(3,619)	1.0	6,116
Secretaries, except legal and medical	(3,623)	1.1	(6,153)
Cashiers	(4,222)	0.8	1,280
Food preparation workers	(4,327)	1.2	(2,263)
General office clerks	(4,352)	1.3	119
Teacher aides and educational assistants	(4,803)	1.1	(578)
Precision workers, nec	(5,309)	0.9	(5,642)
Professional workers, nec	(5,323)	1.1	7,430
Machine operators, assemblers, transportation workers, helpers, laborers, and material movers, hand, nec	(6,728)	0.6	357
Registered nurses	(6,849)	1.0	(2,952)
Sales and related workers, nec	(15,503)	1.4	3,923
Clerical and administrative support, nec	(17,243)	1.3	(7,150)

Table 4.5. Oakland Metro Occupational Specialization

Occupation	Location Quotient 1997	Change 1989-1997	Employment 1997
Civil engineers, including traffic engineers	2.9	1.4	3,910
Life scientists	2.3	1.3	2,840
Operating engineers	2.0	0.9	1,710
Recreation workers	2.0	0.8	3,560
Science and mathematics technicians	1.9	0.0	3,220
Carpenters	1.9	0.1	10,088
Physical scientists	1.9	0.0	2,710
Psychologists	1.8	0.8	1,120
Computer/IT Professionals	1.7	0.4	25,760
Inspectors and compliance officers, except construction	1.7	0.9	2,170
Water and liquid waste treatment plant and system operators	1.6	0.8	1,220
Wholesale and retail buyers, except farm products	1.6	0.2	1,220
Dental assistants	1.6	0.1	2,720
Drywall installers and finishers	1.6	-0.7	1,380
Postal mail carriers	1.5	0.3	3,870
Fire fighters	1.5	0.3	2,720
Bus drivers, except school	1.5	-0.1	2,180
Police patrol officers	1.5	0.6	4,950
Medical assistants	1.4	-0.1	2,650
Order clerks, materials, merchandise and service	1.4	-0.1	3,740
Dental hygienists	1.4	-0.1	1,460
Administrative service managers	1.4	0.3	3,670
Electrical and electronics engineers	1.3	0.0	3,340
Automotive mechanics	1.3	0.3	6,075
Personnel, training, and labor relations managers	1.3	0.1	2,224
Structural and reinforcing metal workers	1.3	-0.3	760

Table 4.6. Oakland Metro Occupational Advantage

Occupation	Unexpected Job Gain/Loss 1989-97	Location Quotient 1997	Employment Change 1989-97
Machine operators, assemblers, laborers, nec	9,896	0.9	14,582
Teachers	6,930	1.1	15,093
Computer/IT Professionals	5,209	1.7	14,943
Management support workers, nec	3,316	1.2	8,603
Managers and administrators, nec	2,816	1.1	6,556
Police patrol officers	1,965	1.5	2,415
Civil engineers, including traffic engineers	1,889	2.9	1,791
Life scientists	1,551	2.3	1,600
Automotive mechanics	1,473	1.3	1,554
Recreation workers	1,313	2.0	1,780
Child care workers	1,279	1.1	2,138
Inspectors and compliance officers, not construction	1,161	1.7	1,294
Total employment	(25,427)		89,912
Nursing aides, orderlies, and attendants	(1,110)	0.6	(229)
Professional workers, nec	(1,111)	1.0	7,641
Home health aides	(1,123)	0.3	(133)
Messengers	(1,170)	0.5	(1,507)
Registered nurses	(1,205)	0.8	1,511
Bus and truck mechanics and diesel engine specialists	(1,222)	0.6	(1,358)
Food counter, fountain, and related workers	(1,230)	0.8	1,791
Dining room and cafeteria attendants and bar helpers	(1,231)	0.7	(1,661)
Electricians	(1,236)	0.9	(594)
Maintenance repairers, general utility	(1,410)	0.8	(762)
Packaging and filling machine operators and tenders	(1,524)	0.8	(1,016)
Social workers	(1,583)	0.8	(140)
Janitors and cleaners, including maids and housekeeping	(1,585)	0.8	382
Licensed practical nurses	(1,586)	0.6	(1,089)
Waiters and waitresses	(1,800)	0.7	58
Bookkeeping, accounting, and auditing clerks	(3,221)	1.0	(5,563)
Food preparation workers	(3,519)	0.8	(2,458)
Cashiers	(3,990)	0.9	626
Clerical supervisors and managers	(4,508)	1.1	(546)
Teacher aides and educational assistants	(4,602)	0.9	(454)
General office clerks	(5,046)	1.1	(2,402)
Salespersons, retail	(5,920)	1.0	(2,287)
Clerical and administrative support, nec	(10,990)	1.1	(3,851)

Table 4.7. San Diego Occupational Specialization

Occupation	Location Quotient 1997	Change 1989-1997	Employment 1997
Life scientists, nec	3.4	2.0	1,910
Aeronautical and astronautical engineers	3.2	-1.2	1,400
Drywall installers and finishers	2.5	-1.2	2,480
Electrical and electronics engineers	2.4	0.2	6,700
Sales agents, real estate	1.9	0.7	1,290
Inspectors, compliance officers, not construction	1.8	0.2	2,570
Concrete and terrazzo finishers	1.7	-0.7	1,860
Biological scientists	1.7	0.1	1,160
Designers	1.7	0.5	3,040
Dentists	1.6	0.4	1,100
Purchasing agents, wholesale, retail, farm	1.5	0.0	2,748
Medical assistants	1.5	0.0	3,060
Automotive mechanics	1.4	0.3	7,362
Production, planning, and expediting clerks	1.4	-0.1	2,900
Cost estimators	1.4	0.0	1,747
Plumbers, pipefitters, and steamfitters	1.4	0.2	3,970
Machinists	1.4	0.2	4,860
Artists and commercial artists	1.4	0.2	1,480
Food service and lodging managers	1.4	0.2	4,490
Personnel clerks, not payroll and timekeeping	1.4	0.2	1,620
Sheriffs and deputy sheriffs	1.4	-1.3	1,050
Food preparation workers	1.4	0.1	14,360
Carpenters	1.3	-0.3	7,972
Dental assistants	1.3	0.1	2,520
Hotel desk clerks	1.3	-1.2	1,740
File clerks	1.3	0.2	2,880
Computer/IT Professionals	1.3	0.0	21,510
Cabinetmakers and bench carpenters	1.3	0.0	1,070

Table 4.8. San Diego Metro Occupational Advantage

Occupation	Unexpected Job Gain/Loss 1988-97	Location Quotient 1997	Employment Change 1988-97
Teachers	8,635	1.1	18,456
Managers and administrators, nec	4,630	1.0	9,399
Home health aides	2,786	1.0	3,450
Truck drivers light and heavy	2,775	0.7	5,235
Service workers, nec	2,351	1.1	11,570
Police patrol officers	2,281	1.2	2,629
General office clerks	2,000	1.2	5,995
Automotive mechanics	1,657	1.4	1,708
Life scientists, nec	1,119	3.4	1,024
Total employment	329		151,176
Sheriffs and deputy sheriffs	(1,000)	1.4	(396)
Ushers, lobby attendants, and ticket takers	(1,003)	1.4	(113)
All other sales and related workers	(1,016)	1.0	13,735
Clerical supervisors and managers	(1,092)	1.1	2,586
Social workers	(1,143)	0.7	430
Legal secretaries	(1,166)	0.8	(984)
Drywall installers and finishers	(1,192)	2.5	(1,229)
Welfare eligibility workers and interviewers	(1,261)	0.5	(1,006)
Bookkeeping, accounting, and auditing clerks	(1,399)	1.0	(3,841)
Registered nurses	(1,508)	0.9	2,553
Aircraft mechanics	(1,520)	0.5	(1,438)
Hotel desk clerks	(1,578)	1.3	(621)
Precision workers, nec	(1,644)	0.8	(1,106)
Carpenters	(1,675)	1.3	(1,690)
Cooks, restaurant	(1,939)	1.0	413
Professional workers, nec	(2,174)	0.8	12,126
Secretaries, except legal and medical	(2,200)	1.1	(4,521)
Cashiers	(5,564)	1.2	2,770
Teacher aides and educational assistants	(5,890)	0.9	1,242

Table 4.9 Unexpected Job Gains/Losses in Selected Occupations, California's Largest Metros, 1988/89-1997

	San Francisco	Oakland	San Jose	San Diego	Los Angeles
Total Employment, 1997	875,369	939,375	921,357	1,044,149	3,844,926
Percent Job Change 1988/89 to 1997	5.4%	10.6%	15.3%	16.9%	-4.2%
Financial managers	267	433	(428)	(703)	(8,250)
Civil engineers, including traffic engineers	(1,057)	1,889	(1,126)	(506)	(2,802)
Electrical and electronics engineers	173	(174)	7,665	487	(8,161)
Architects, except landscape and marine	531	325	(184)	(185)	48
Physical scientists	653	(16)	(229)	221	2,738
Life scientists	525	1,551	764	1,094	(1,958)
Computer, information technology professionals	4,724	5,209	12,765	291	(33,179)
Lawyers	(1,546)	(39)	308	(374)	(7,452)
Teachers	2,668	6,930	1,585	8,635	9,086
Artists and commercial artists	470	90	182	168	(2,799)
Waiters and waitresses	1,354	(1,800)	1,778	(361)	(12,534)
Carpenters	147	83	1,142	(1,675)	(7,323)
Machinists	(310)	671	497	844	(3,822)
Sewing machine operators, garment	2,256		87	686	27,090

Table 5.1 San Jose Specializations and Emerging Occupational Advantage

	Specialization Rate	Unexpected Job Change 1988-97	Total Employment 1997
Total metro area		(16,099)	921,357
Employment Growth, 1988-97			122,136
Electrical and electronics engineers	9.0	7,665	22,240
Industrial engineers, except safety engineers	5.2	(2,324)	4,680
Computer/IT Professionals, nec	3.5	12,667	50,060
Chemical engineers	2.9	304	1,000
Purchasing agents, not wholesale, retail, farm	2.5	(254)	4,068
Mechanical engineers	2.3	(232)	3,740
Production, planning, and expediting clerks	2.3	(222)	4,110
Biological scientists	2.0	333	1,210
Inspectors, testers, and graders, precision	2.0	(1,580)	10,330
Science and mathematics technicians	2.0	580	3,270
Machine operators, assemblers, transportation workers, helpers, laborers, and material movers, hand, nec	1.1	13,115	112,061
Computer/IT Professionals, nec	3.5	12,667	50,060
Electrical and electronics engineers	9.0	7,665	22,240
Managers and administrators, nec	1.3	6,072	59,846
Janitors and cleaners, including maids and housekeeping	0.8	3,524	18,569
Waiters and waitresses	0.8	1,778	12,210
Teachers	0.8	1,585	37,010
Fire fighters	1.5	1,478	2,690
Automotive mechanics	1.0	1,364	4,669
Plumbers, pipefitters, and steamfitters	1.2	1,145	3,080
Carpenters	1.2	1,142	6,010
Truck drivers light and heavy	0.6	1,125	12,575
Management support workers, nec	1.2	1,013	22,220
Secretaries, except legal and medical	0.8	(5,399)	14,968
Clerical and administrative support, nec	0.9	(6,687)	54,430
All other sales and related workers	1.0	(9,036)	44,811
Professional workers, nec	1.6	(11,258)	70,947

Table 5.2 Orange County Specializations and Emerging Occupational Advantage

	Specialization Rate	Unexpected Job Change 1989-97	Total Employment 1997
Total metro area		(71,118)	1,218,492
Employment Growth, 1989-97			76,005
Clinical lab technologists and technicians	6.1	15,705	18,670
Electrolytic plating machine operators	4.1	799	1,800
Claims examiners, property and casualty insurance	2.6	113	1,220
Messengers	2.3	979	2,470
Employment interviewers, private, public	2.0	593	1,220
Fire fighters	1.9	2,942	4,470
Machine assemblers	1.9	680	1,250
Electrical and electronics engineers	1.9	(4,248)	6,120
Bill and account collectors	1.8	1,278	5,380
Underwriters	1.8	538	1,620
Bus drivers, except school	1.7	1,251	3,150
File clerks	1.6	420	4,150
Numerical control machine tool operators, metal, plastic	1.6	(622)	1,390
Drywall installers and finishers	1.6	(2,488)	1,800
Ushers, lobby attendants, and ticket takers	1.6	(452)	1,280
Sewing machine operators, garment	1.6	4,333	5,970
Painters and paperhangers, construction, maintenance	1.5	505	3,990
Inspectors, testers, and graders, precision	1.5	1,178	10,340
Clinical lab technologists and technicians	6.1	15,705	18,670
Teachers	0.8	4,532	50,600
Sewing machine operators, garment	1.6	4,333	5,970
Janitors and cleaners, including maids and housekeeping	1.0	3,606	28,516
Fire fighters	1.9	2,942	4,470
Clerical supervisors and managers	1.4	2,199	21,644
Computer/IT Professionals, nec	1.3	2,167	24,400
Blue collar worker supervisors	0.9	1,964	17,513
Food preparation workers	1.1	1,615	13,650
Clerical and administrative support, nec	1.2	1,310	96,530
Bill and account collectors	1.8	1,278	5,380
Bus drivers, except school	1.7	1,251	3,150
Inspectors, testers, and graders, precision	1.5	1,178	10,340
Cleaning and building service workers, nec	0.9	1,011	3,140
Secretaries, except legal and medical	0.8	(5,543)	20,864
Teacher aides and educational assistants	0.8	(5,705)	9,210
Registered nurses	0.6	(5,835)	12,180
All other sales and related workers	1.2	(5,878)	68,759
Carpenters	1.1	(6,398)	7,430
Professional workers, nec	0.9	(12,542)	51,086
Food counter, fountain, and related workers	1.0	(12,834)	19,160

Table 5.3 Riverside-San Bernardino Specializations, Emerging Occupational Adv

	Specialization Rate	Unexpected Job Change 1989-97
Total metro area		83,266
Employment Growth, 1989-97		
Drywall installers and finishers	3.9	(2,498)
Fire fighters	3.1	3,076
Recreation workers	2.0	1,011
Carpenters	2.0	(2,808)
Medical assistants	1.9	890
Concrete and terrazzo finishers	1.9	(1,291)
Operating engineers	1.8	38
Mobile heavy equipment mechanics	1.8	193
Electrical powerline installers and repairers	1.7	(114)
Plastic molding machine operators and tenders, setters and set-up operators	1.6	837
Bus and truck mechanics and diesel engine specialists	1.6	967
Machine operators, assemblers, transportation workers, helpers, laborers, and material movers, hand, nec	1.0	24,834
Service workers, nec	1.2	10,575
Teachers	1.2	8,965
Truck drivers light and heavy	1.2	6,099
Cashiers	1.2	5,264
Sales and related workers, nec	0.9	4,175
Salespersons, retail	1.2	3,467
Fire fighters	3.1	3,076
Food counter, fountain, and related workers	1.3	2,830
Blue collar worker supervisors	1.0	2,645
Nursing aides, orderlies, and attendants	1.0	2,489
Police patrol officers	1.5	2,135
Professional workers, nec	0.8	1,792
Child care workers	1.3	1,507
Waiters and waitresses	1.0	(1,756)
Dining room and cafeteria attendants and bar helpers	1.1	(1,759)
Drywall installers and finishers	3.9	(2,498)
Carpenters	2.0	(2,808)
Teacher aides and educational assistants	1.5	(4,178)

Table 5.4 Bakersfield Metro Specializations and Emerging Occupational Advantage

	Specialization Rate	Unexpected Job Change 1989-97	Total Employment 1997
Total metro area		(6,119)	178,152
Employment Growth, 1989-97			15,526
Roustabouts	22.2	347	940
Petroleum engineers	14.8	(272)	220
Aeronautical and astronautical engineers	6.9	(7)	520
Geologists, geophysicists, and oceanographers	6.1	(77)	330
Water and liquid waste treatment plant and system operators	5.0	360	710
Correction officers	4.7	1,073	2,580
Farm equipment mechanics	4.2	94	210
Aircraft mechanics	3.5	222	550
Fire fighters	2.9	255	1,010
Dispatchers, police, fire, and ambulance	2.5	131	300
Teacher aides and educational assistants	2.3	(878)	3,930
Recreation workers	2.2	550	760
Paving, surfacing, and tamping equipment operators	2.2	19	220
Concrete and terrazzo finishers	2.1	152	380
Teachers	1.3	2,255	11,650
Service workers, nec	1.1	1,711	11,360
General office clerks	1.3	1,163	5,632
Correction officers	4.7	1,073	2,580
Truck drivers light and heavy	1.5	952	5,530
Registered nurses	1.1	599	3,220
Recreation workers	2.2	550	760
Clerical supervisors and managers	1.2	490	2,667
Janitors and cleaners, including maids and housekeeping	0.8	454	3,646
Secretaries, except legal and medical	0.8	(609)	2,993
Managers and administrators, nec	0.9	(625)	7,515
Food preparation workers	0.9	(677)	1,580
Electricians	0.7	(686)	540
Teacher aides and educational assistants	2.3	(762)	3,930
Maintenance repairers, general utility	1.2	(878)	2,018
Agricultural, forestry, fishing, and related workers	1.2	(922)	1,598
Salespersons, retail	0.9	(1,126)	4,800
Professional workers, nec	1.0	(2,283)	10,198
Precision workers, nec	1.1	(2,421)	6,370

Table 5.5 Fresno Specializations and Emerging Occupational Advantage

	Specialization Rate	Unexpected Job Change 1989-97	Total Employment 1997
Total metro area		5,062	247,589
Employment Growth, 1989-97			42,315
Water and liquid waste treatment plant and system operators	3.7	632	720
Plasterers	3.3	(95)	210
Mail clerks, except mail machine operators and postal service	2.8	99	690
Meat, poultry, and fish cutters and trimmers, hand	2.7	448	780
Medical assistants	2.7	383	1,350
Concrete and terrazzo finishers	2.6	41	660
Drywall installers and finishers	2.2	(469)	520
Dietitians and nutritionists	2.2	97	210
Inspectors and compliance officers, except construction	2.1	(53)	720
Teacher aides and educational assistants	2.0	(2,190)	4,810
Insurance adjusters, examiners, and investigators	2.0	347	670
Agricultural, forestry, fishing, and related workers, nec	1.9	29	3,375
Fire fighters	1.9	490	920
Packaging and filling machine operators and tenders	1.9	804	1,440
Machine operators, assemblers, transportation workers, helpers, laborers, and material movers, hand, nec	0.8	3,288	23,330
Teachers	1.3	2,162	16,010
Professional workers, nec	0.9	1,969	15,137
Blue collar worker supervisors	1.0	1,173	3,920
Truck drivers light and heavy	1.2	984	6,327
Food counter, fountain, and related workers	1.2	974	4,740
Maintenance repairers, general utility	1.4	926	3,228
Packaging and filling machine operators and tenders	1.9	804	1,440
Bartenders	1.7	723	1,350
Carpenters	1.5	678	2,080
Water and liquid waste treatment plant and system operators	3.7	632	720
Correction officers	1.3	609	1,030
Managers and administrators, nec	0.9	570	10,622
Nursing aides, orderlies, and attendants	1.1	537	2,940
Bookkeeping, accounting, and auditing clerks	1.0	(609)	3,446
Registered nurses	0.9	(662)	3,800
Cashiers	1.0	(775)	6,640
Salespersons, retail	1.0	(821)	7,920
Sales and related workers, nec	0.9	(993)	11,115
Food preparation workers	0.9	(1,040)	2,300
Management support workers, nec	1.1	(1,119)	5,431
Teacher aides and educational assistants	2.0	(2,190)	4,810
General office clerks	1.0	(2,567)	6,005

Table 5.6 Sacramento Metro Specializations and Emerging Occupational Advantage

	Specialization Rate	Unexpected Job Change 1989-97	Total Employment 1997
Total metro area		(4,985)	498,106
Employment Growth, 1989-97			56,319
Forest and conservation workers	7.6	490	630
Management analysts	5.8	(503)	3,670
Civil engineers, including traffic engineers	4.4	384	3,210
Typists, including word processing	3.5	1,030	6,020
Urban and regional planners	3.3	(21)	450
Inspectors and compliance officers, except construction	2.9	408	1,980
Customer service representatives, utilities	2.8	1,651	2,170
Insurance adjusters, examiners, and investigators	2.5	337	1,670
Pest controllers and assistants	2.4	286	450
Budget analysts	2.4	97	560
Dietitians and nutritionists	2.2	221	430
Insurance claims clerks	2.2	(122)	1,400
Electronics repairers, commercial and industrial equipment	2.2	(1,568)	550
Underwriters	2.1	274	810
Mail clerks, except mail machine operators and postal service	2.1	647	1,050
Personnel, training, and labor relations specialists	2.1	(166)	2,950
Management support workers, nec	2.0	2,474	19,404
Recreation workers	2.0	1,239	1,920
Management support workers, nec	2.0	2,474	19,404
Service workers, nec	1.0	2,142	19,870
Police patrol officers	1.5	1,980	2,650
Computer/IT Professionals	1.6	1,820	12,450
Customer service representatives, utilities	2.8	1,651	2,170
Teachers	1.0	1,456	24,430
Managers and administrators, nec	1.1	1,427	26,908
Professional workers, nec	1.4	1,425	33,356
Registered nurses	1.0	1,332	8,700
Recreation workers	2.0	1,239	1,920
Typists, including word processing	3.5	1,030	6,020
Welfare eligibility workers and interviewers	0.4	(1,056)	170
Social workers	0.7	(1,291)	1,700
Food counter, fountain, and related workers	1.1	(1,308)	9,200
Cashiers	0.8	(1,373)	10,620
Clerical supervisors and managers	1.2	(1,381)	7,836
Correction officers	1.0	(1,417)	1,560
Electronics repairers, commercial and industrial equipment	2.2	(1,568)	550
Bookkeeping, accounting, and auditing clerks	1.1	(1,649)	7,857
Teacher aides and educational assistants	1.1	(2,657)	5,100
Machine operators, assemblers, transportation workers, helpers, laborers, and material movers, hand, nec	0.5	(2,786)	28,570
Clerical and administrative support, nec	1.1	(3,422)	37,446
Salespersons, retail	1.0	(3,502)	14,820

Table 5.7 Redding Metro Specializations and Emerging Occupational Advantage

	Specialization Rate	Unexpected Job Change 1988-97	Total Employment 1997
Total metro area		2,564	54,763
Employment Growth, 1988-97			9,994
Fallers and buckers	30.7	71	160
Forest and conservation workers	16.5	3	150
Log handling equipment operators	7.3	(90)	60
Fire fighting and prevention supervisors	6.1	73	160
Paving, surfacing, and tamping equipment operators	4.8	(5)	150
Dispatchers, police, fire, and ambulance	3.2	62	120
Mobile heavy equipment mechanics	3.0	62	130
Pest controllers and assistants	2.9	26	60
Recreation workers	2.9	190	310
Civil engineers, including traffic engineers	2.8	26	220
Water and liquid waste treatment plant and system operators	2.5	47	110
Messengers	2.3	69	110
Child care workers	2.3	226	410
Cabinetmakers and bench carpenters	2.3	54	100
Bus and truck mechanics and diesel engine specialists	2.3	101	240
Dental assistants	2.3	22	230
Physical therapists	2.2	36	110
Fire fighters	2.2	59	230
Service workers, nec	1.0	592	2,487
Food counter, fountain, and related workers	1.6	570	1,410
Truck drivers light and heavy	1.7	512	2,040
Professional workers, nec	0.9	321	3,804
Teachers	1.0	307	2,650
Registered nurses	1.2	255	1,110
Sales and related workers, nec	1.0	253	2,610
Precision workers, nec	1.1	226	2,160
Child care workers	2.3	226	410
Clerical supervisors and managers	1.1	216	757
Secretaries, except legal and medical	0.9	212	1,077
Food preparation workers	1.1	(211)	620
General office clerks	1.4	(321)	524
Carpenters	0.9	(341)	1,147
Teacher aides and educational assistants	0.7	(544)	220
Machine operators, assemblers, transportation workers,	1.8		960
helpers, laborers, and material movers, hand, nec	0.7	(768)	3,790

Table 5.8 Top Four Specialized Occupations for all Suburban and Stand-Alone Metros, 1997

	San Jose	Orange County	Riverside/San Bernardino	Bakersfield	Fresno	Sacramento	Redding
Management analysts						5.8	
Claims examiners, property and casualty insurance		2.6					
Aeronautical and astronautical engineers				6.9			
Petroleum engineers				14.8			
Chemical engineers	2.9						
Civil engineers, including traffic engineers						4.4	
Electrical and electronics engineers	9.0						
Industrial engineers, exc safety	5.2						
Geologists, geophysicists, and oceanographers				6.1			
Computer/IT Professionals, nec	3.5						
Recreation workers			2.0				
Clinical lab technologists and technicians		6.1					
Typists, including word processing						3.5	
Mail clerks, except mail machine operators, postal service					2.8		
Messengers		2.3					
Fire fighting and prevention supervisors							6.1
Fire fighters			3.1				
Fallers and buckers							30.7
Log handling equipment operators							7.3
Forest and conservation workers						7.6	16.5
Carpenters			2.0				
Drywall installers and finishers			3.9				
Plasterers					3.3		
Roustabouts				22.2			
Electrolytic plating machine operators		4.1					
Meat, poultry, and fish cutters and trimmers, hand					2.7		
Water and liquid waste treatment plant operators					3.7		

Table 5.9 Top Four Occupations with Unexpected Gains for all Suburban and Stand-Alone Metros, 1997

	San Jose	Orange County	Riverside-San Bernar-dino	Bakers-field	Fresno	Sacra-mento	Redding
Managers and administrators, nec	6,072						
Management support workers, nec						2,474	
Electrical and electronics engineers	7,665						
Computer/IT Professionals, nec	12,667					1,820	
Teachers		4,532	8,965	2,255	2,162		
Clinical lab technologists and technicians		15,705					
Professional workers, nec					1,969		321
Customer service representatives, utilities							
General office clerks				1,163			
Police patrol officers						1,980	
Correction officers				1,073			
Food counter, fountain, and related workers							570
Janitors, cleaners, maids, housekeepers		3,606					
Service workers, nec			10,575	1,711		2,142	592
Blue collar worker supervisors					1,173		
Sewing machine operators, garment		4,333					
Truck drivers light and heavy			6,099				512
Machine operators, assemblers nec	13,115		24,834		3,288		

Table 6.1 Metro Areas in 900,000-1,400,000 Employment Category, 2000

Metropolitan Area	Total Employment
Seattle-Bellevue-Everett, WA PMSA	1,396,380
Orange County, CA PMSA	1,383,500
St. Louis, MO-IL MSA	1,312,660
Baltimore, MD PMSA	1,228,770
San Diego, CA MSA	1,220,590
Tampa-St. Petersburg-Clearwater, FL MSA	1,206,950
Nassau-Suffolk, NY PMSA	1,206,050
Denver, CO PMSA	1,190,590
Cleveland-Lorain-Elyria, OH PMSA	1,151,890
San Francisco, CA PMSA	1,112,970
Pittsburgh, PA MSA	1,098,260
San Jose, CA PMSA	1,089,220
Oakland, CA PMSA	1,038,960
Riverside-San Bernardino, CA PMSA	1,009,220
Portland-Vancouver, OR-WA PMSA	973,850
Miami, FL PMSA	967,730
Kansas City, MO-KS MSA	964,360
Newark, NJ PMSA	961,930

Source: Occupational Employment Statistics, US Bureau of Labor Statistics, 2000

Table 6.2. California Second Tier Metro LQ Comparisons with US Second Tier Cities and All Metros, 2000

Occupational Group	Orange County	Riverside-San Bernar-dino	Oakland	San Diego	San Francisco	San Jose	Second Tier Metros	All MSAs LQ
Computer and Mathematical	1.14	0.25	1.49	1.32	2.89	4.04	1.43	1.17
Legal	1.20	0.56	1.02	1.19	2.20	1.20	1.29	1.15
Architecture and Engineering	1.29	0.54	1.27	1.24	1.02	3.79	1.22	1.09
Business and Financial Operations	1.08	0.65	1.16	1.12	1.68	1.27	1.14	1.12
Life, Physical, and Social Science	0.75	0.65	1.60	1.37	1.64	2.11	1.13	1.05
Management	1.08	0.72	1.07	0.97	1.22	1.27	1.02	1.04

Source: Occupational Employment Statistics, US Bureau of Labor Statistics, 2000

Table 6.3 California Second Tier Metro Specialization vis-à-vis Other US Second Tier Cities

Occupational Group	Riverside-San Bernar-dino	Orange County	San Diego	Oakland	San Francisco	San Jose
Management		1.06		1.05	1.20	1.25
Business and Financial Operations				1.01	1.47	1.11
Computer and Mathematical				1.04	2.02	2.83
Architecture and Engineering		1.05	1.01	1.04		3.11
Life, Physical, and Social Science			1.21	1.41	1.45	1.87
Community and Social Services	1.07					
Legal					1.70	
Education, Training, and Library	1.33		1.16	1.06		
Arts, Design, Entertainment, Sports, and Media			1.27		1.83	
Healthcare Practitioners and Technical	1.08		1.00			
Healthcare Support	1.04		1.06			
Protective Service	1.15		1.19	1.02		
Food Preparation and Serving Related	1.27	1.15	1.28		1.13	
Building and Grounds Cleaning, Maintenance	1.16	1.15	1.17		1.02	
Personal Care and Service						
Sales and Related		1.08			1.04	
Office and Administrative Support		1.02			1.04	
Farming, Fishing, and Forestry	4.87		1.88			
Construction and Extraction	1.49	1.02	1.08	1.22		
Installation, Maintenance, and Repair	1.02			1.10		
Production	1.14	1.38		1.03		1.48
Transportation and Material Moving	1.30			1.06		

Source: Occupational Employment Statistics, US Bureau of Labor Statistics, 2000.
Only occupational groups with LQ greater than 1 (Second-Tier City average) displayed.

Table 6.4 Occupational Specializations, by Group, US World Cities and All Metros, 2000

Occupational Group	World Cities	Los Angeles	New York	Chicago	All MSAs
Arts, Design, Entertainment, Sports, and Media	1.87	2.20	2.37	1.04	1.09
Legal	1.47	1.26	2.03	1.11	1.15
Protective Service	1.30	1.29	1.72	0.88	1.02
Business and Financial Operations	1.26	1.08	1.40	1.30	1.12
Community and Social Services	1.20	1.09	1.57	0.94	0.98
Office and Administrative Support	1.14	1.15	1.20	1.07	1.04
Personal Care and Service	1.13	0.82	1.64	0.94	1.00
Management	1.09	1.00	0.99	1.26	1.04
Computer and Mathematical	1.05	0.91	1.08	1.14	1.17
Education, Training, and Library	1.01	0.94	1.27	0.84	0.96
Healthcare Support	1.00	0.80	1.49	0.70	0.96
Healthcare Practitioners and Technical	0.98	0.97	1.01	0.96	1.01
Building and Grounds Cleaning, Maintenance	0.98	0.88	1.07	1.00	0.99
Life, Physical, and Social Science	0.96	0.94	1.02	0.92	1.05
Production	0.95	1.19	0.53	1.15	0.91
Transportation and Material Moving	0.95	1.16	0.60	1.08	0.95
Sales and Related	0.92	0.89	0.92	0.93	1.00
Installation, Maintenance, and Repair	0.79	0.84	0.70	0.83	0.96
Architecture and Engineering	0.79	0.93	0.53	0.90	1.09
Food Preparation and Serving Related	0.75	0.68	0.73	0.83	0.96
Construction and Extraction	0.74	0.66	0.73	0.84	0.97
Farming, Fishing, and Forestry	0.17	0.28	0.07	0.17	0.68

Source: Occupational Employment Statistics, US Bureau of Labor Statistics, 2000

Table 6.5 Occupational Specializations by Title, US World Cities and All Metros, 2000

Occupation	Los Angeles	World City*	New York	Chicago	All MSAs
Actors	8.95			0.67	1.99
Sewers, Hand	6.54	3.81	3.21	1.73	1.65
Fashion Designers	5.94	6.78	13.59	0.81	2.95
Makeup Artists, Theatrical and Performance	5.31		4.51		4.53
Fabric and Apparel Patternmakers	5.00	3.19	4.20	0.40	1.54
Machine Feeders and Offbearers	4.91	1.98	0.36	0.71	0.86
Sewing Machine Operators	4.69	2.48	2.37	0.42	0.93
Aerospace Engineering and Operations Technicians	3.96		1.76		2.09
Aerospace Engineers	3.63				2.13
Eligibility Interviewers, Government Programs	3.61				1.15
Conveyor Operators and Tenders	3.53	1.49	0.23	0.73	0.75
Textile Bleaching and Dyeing Machine Operators	3.44		0.36		2.17
Production, Planning, and Expediting Clerks	3.35	1.78	0.84	1.18	1.06
Court Reporters	3.12		1.52		1.38
Sociologists	3.04				4.85
Parking Lot Attendants	2.86	2.56	2.98	1.85	1.39
Arbitrators, Mediators, and Conciliators	2.76	1.98	1.22		1.75
Cutters and Trimmers, Hand	2.68			0.66	0.91
Shoe and Leather Workers and Repairers	2.56			0.51	0.99
Word Processors and Typists	2.47	1.65	1.56	0.95	1.10
Broadcast Technicians	2.34	2.44	3.95	1.03	1.29
Cargo and Freight Agents	2.29	1.75	1.78	1.19	1.14
Textile Cutting Machine Setters, Operators, and Tenders	2.20	1.25	1.27	0.29	1.01
Painting, Coating, and Decorating Workers	2.17	1.09	0.46	0.67	1.00
Geoscientists, Except Hydrologists and Geographers	2.16		0.20		1.36
Multi-Media Artists and Animators	2.14	2.48	2.78	2.53	1.32
Medical Scientists, Except Epidemiologists	2.13	2.43	4.52	0.62	1.53
Medical Equipment Repairers	2.04	1.09	0.62	0.62	0.98
Electronics Installers, Repairers, Transportation Equipment	2.04	0.99	0.37	0.59	1.27
Probation Officers and Correctional Treatment Specialists	2.01		0.81		0.98

Source: Occupational Employment Statistics, US Bureau of Labor Statistics, 2000. * World city group rates are computed only where the occupational data is available for all three metros.

Table 7.1 Differences between Actual Employment and Industry-Based Estimates of Occupational Employment Across Eleven California Metropolitan Areas, 1997

	Difference Between Actual and Expected Employment as Share of Total Employment	Standard Deviation of Unexplained Share Across Metro Areas
Total Employment*		
Disaggregated Level (93 categories)	5%	
Aggregate Level (7 categories)	3%	
Aggregate Level:**		
Professional workers	7%	0.10
Sales and related workers	2%	0.02
Clerical and administrative support workers	5%	0.04
Service workers	7%	0.08
Agricultural, forestry, and fishing workers	15%	0.20
Precision workers	4%	0.06
Manual workers	8%	0.12

Sources: Authors' calculations based on data from California Employment Development Department, Industry-Occupation Matrix, 1997, and Bureau of Labor Statistics, National Historical Industry-Occupation Matrix Time Series, 1983-1998

* The measure for total employment is calculated as the sum across occupational categories and metropolitan areas of the absolute values of differences between actual and expected employment, as share of total employment, divided by two.

** The measures for separate occupational categories are calculated as the sum across metropolitan areas of the absolute values of differences between actual and estimated employment, as a share of total employment within each occupational category.

Table 7.2 Differences Between Actual and Industry-Based Estimates of Occupational Employment as Share of Total Employment, for Eleven California Metropolitan Areas, 1997

Occupation	Total Across MSAs	Alameda / Contra Costa	Fresno	Bakersfield	Los Angeles	Orange	Riverside / San Bernardino	Sacramento	San Diego	Santa Clara	San Francisco / San Mateo	Redding
Summary Measure for Total Employment*												
Disaggregated Level	5	6	5	7	4	6	5	8	5	9	7	8
Aggregate Level	3	3	2	2	2	3	3	6	1	6	5	3
Aggregate Level:**												
Professional workers	4	9	-7	-5	-2	4	-11	14	4	17	14	-9
Sales and related workers	-2	1	0	-4	-4	-1	1	0	0	-6	0	2
Clerical, admin support	4	0	3	2	8	7	4	6	0	-5	0	5
Service workers	-7	-14	-3	2	-8	-3	0	-24	-3	-13	-8	2
Agriculture, forestry, fish	7	-13	45	27	13	-15	19	-1	11	-7	-15	27
Precision workers	-2	-1	4	3	-2	-7	4	-5	2	-6	-10	9
Manual workers	-4	-6	4	4	3	-9	7	-25	-8	-20	-25	-5

Source: Authors' calculations based on data from California Employment Development Department, Industry-Occupation Matrix, 1997, and Bureau of Labor Statistics, National Historical Industry-Occupation Matrix Time Series, 1983-1998

* The summary measures for total employment are calculated as in Table 7.1.

** The measures for separate occupational categories are calculated as the difference between actual and expected employment by occupational category as a share of total employment in the category.

Table 7.3 Occupational Specialization and Industry Structure in Three High-Tech Related Occupations for Six California Metropolitan Areas, 1997

	San Francisco/ San Mateo	Santa Clara	Alameda/Contra Costa	Los Angeles	Orange	San Diego
Computer/IT Professionals						
Location Quotient, 1997	2.0	3.5	1.7	0.9	1.3	1.3
Employment Share Unexplained by Industry, 1997	32%	38%	33%	-25%	2%	11%
Jobs Unexplained by Industry, 1997	8,961	18,348	8,448	-13,433	572	2,277
Selected Engineers						
Location Quotient, 1997	1.2	4.9	1.6	0.9	1.5	1.7
Employment Share Unexplained by Industry, 1997	10%	37%	28%	-6%	10%	21%
Jobs Unexplained by Industry, 1997	623	9,888	2,755	-1,383	1,104	2,274
Natural Scientists						
Location Quotient, 1997	2.1	1.6	1.7	0.6	0.8	1.7
Employment Share Unexplained by Industry, 1997	33%	18%	37%	-12%	-4%	3%
Jobs Unexplained by Industry, 1997	1,504	756	1,872	-1,023	-125	142

Source: Authors' calculations based on data from California Employment Development Department, Industry-Occupation Matrix, 1997, and Bureau of Labor Statistics, National Historical Industry-Occupation Matrix Time Series, 1983-1998

Table 7.4 Share of Employment by Occupation Unexplained by Industry Structure in Information Technology and Business Services, for Six California Metropolitan Areas, 1997

	San Francisco/ San Mateo	Santa Clara	Alameda/ Contra Costa	Los Angeles	Orange	San Diego
Information Technology Industries, Excluding Computer and Data Processing Services						
Total Employment	35,532	214,907	50,089	153,605	87,690	74,513
Professional Workers	10%	21%	15%	12%	5%	8%
Computer/IT Professionals	-11%	21%	1%	11%	-6%	17%
Selected Engineers	4%	36%	19%	3%	7%	-3%
Natural Scientists	48%	12%	35%	7%	19%	6%
Sales and related workers	3%	-8%	27%	-22%	24%	-47%
Clerical and administrative support	-18%	-4%	-2%	8%	11%	-13%
Service workers	-45%	-43%	-29%	9%	-24%	-36%
Precision workers	-21%	-29%	-8%	-8%	8%	-16%
Manual workers	-25%	-34%	-41%	-25%	-20%	-1%
Business Services (Includes Computer and Data Processing Services)						
Total Employment	111,411	128,230	93,027	353,245	123,314	90,357
Professional Workers	35%	38%	28%	-8%	2%	17%
Computer/IT Professionals	39%	57%	40%	-51%	1%	9%
Selected Engineers	43%	61%	34%	-167%	-35%	52%
Natural Scientists	-30%	-89%	55%	-32%	-8%	14%
Sales and related workers	7%	-44%	-18%	16%	-33%	-19%
Clerical and administrative support	-3%	-33%	-14%	-6%	20%	4%
Service workers	-42%	-56%	-48%	6%	-5%	-5%
Precision workers	-118%	28%	-45%	1%	0%	-18%
Manual workers	-68%	-15%	14%	1%	-30%	-28%

Source: Authors' calculations based on data from California Employment Development Department, Industry-Occupation Matrix, 1997, and Bureau of Labor Statistics, National Historical Industry-Occupation Matrix Time Series, 1983-1998