Jobs Without Borders:

Employment, Industry Concentrations, and Comparative Advantage in the CaliBaja Region

CALI BAJA
BI-NATIONAL MEGA-REGION

Center for U S-Mexican Studies
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El Colegio de la Frontera Norte

ABOUT THIS REPORT

This report is the result of an on-going collaboration between the CaliBaja Mega-Region Initiative, UC San Diego's Center for U.S.-Mexican Studies at the School of International Relations and Pacific Studies, the Colegio de la Frontera Norte which was initiated with the encouragement of the United States and Mexican Consulates based, respectively, in Tijuana and San Diego. This initiative consists of a series of collaborative workshops and studies intended to inform investment, planning, and policy decisions in the region.

This report summarizes the findings of a specific research initiative intended to identify the economic strengths of the CaliBaja region. The report was co-authored by the report's technical committee, supported generously by each of the sponsoring organizations, and informed by insights, suggestions, and criticisms from the advisory committee of experts and stakeholders representing both sides of the border. Any findings, views, and opinions expressed in this report reflect only those of the authors and do not necessarily reflect those of the sponsoring institutions or members of the advisory committee, some of whom raised useful criticisms and opposing views to the findings of this report.

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Employment Concentrations and Comparative Advantage by Industry in the CaliBaja Region

SPECIAL REPORT

CaliBaja Region Initiative
Center for U.S.-Mexican Studies, UC San Diego
Colegio de la Frontera Norte

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

EXECUTIVE SUMMARY

Understanding the industry concentrations and comparative advantages of our regional economy is of central importance to ensuring long-term, sustainable economic growth. This study, conducted by a bi-national team of experts from both sides of the border, is the first to analyze industry-specific employment concentrations within the CaliBaja Bi-National Mega-Region as a whole. Overall results from this analysis provide evidence of the region's importance as a hub for manufacturing, with particular strengths in industry sectors like audio and video equipment manufacturing and medical device and supplies manufacturing.

This study offers new insights on employment concentration in the U.S.-Mexico border region by employing a technique economists, urban planners, and economic developers call location quotient analysis. Location quotient (abbreviated as "LQ") analysis allows us to calculate the total employment by industry for the combined economies of CaliBaja as a single region, and then compare the bi-national region's employment concentrations to the larger U.S. and Mexican economies. Using LQ analysis provides an effective measure of a region's employment relative to a larger area—in this case, the combined national economies of the United States and Mexico—providing useful insight about which industries are most concentrated in the region and a point of reference that helps to identify which industries are most export-oriented. By analyzing employment data from the U.S. Department of Labor, Mexico's National Institute for Statistics and Geography (INEGI), and Statistics Canada, this study helps to illustrate the strengths and diversity of the bi-national region's three sub-economies: the combination of high-tech research and development capability in San Diego, agricultural production in Imperial Valley, and manufacturing in Baja California. Specific highlights from the analysis include the following:

- **The CaliBaja region has dozens of industries with a high export capacity.** In 2008, the CaliBaja region was home to 41 industries with LQs greater than 1.5. Of these, 16 have LQs between 1.5 and 1.9, nine with LQs between 2 and 2.4, five with LQs between 2.5 and 2.9, and 11 with LQs of 3.0 or greater.
- **Jobs know no borders, so Baja's labor force plays a major role in the region.** For these 41 highly concentrated industries with LQs greater than 1.5 in 2008, 58 percent of the region's labor supply came from Baja California while 42 percent came from San Diego and Imperial counties. Similarly, if we look only at the region's top 10 industries employment concentration in 2008, Baja California supplied 74 percent of the labor force while San Diego and Imperial supplied 26 percent. To the extent that these concentrations suggest comparative advantages, Baja California is key to the region's export capabilities.
- **CaliBaja has strongest comparative advantage in audio-visual manufacturing.** In 2008, the CaliBaja region accounted for nearly 40 percent of all employment in the audio and video equipment manufacturing throughout Mexico and the United States. During that same year, the region employed 31,609 people in this industry and the Baja California economy supplied 91 percent of that labor. This industry had a LQ of 28.8 in 2008, indicating that the region employed 28.8 times more people in this industry compared to the combined U.S.-Mexico average.

- San Diego County, Imperial County, and Baja California are better together. Looking at these two economies as one regional economy amplifies the importance of certain sectors within the CaliBaja region. For example, individually, the audio and video equipment manufacturing industry had the highest employment concentration in the Baja California and San Diego economies, with 2008 LQs of 15.6 and 10.1 respectively. The same amplification effect is also notable in communications equipment manufacturing and other leather product manufacturing.
- Medical equipment and supplies has become CaliBaja's largest manufacturing sector. In 2008, the medical equipment and supplies manufacturing industry employed the largest number of people for a total of 43,015 in the region and the Baja California economy supplied 87 percent of this labor. Regionally, the industry's location quotient in 2008 was 7.63, which was more than double its 3.4 LQ recorded in 1998.
- Baja's share of the aerospace industry has declined, due to advances elsewhere. While an important industry to the Baja California economy individually, the aerospace product and parts manufacturing industry gets washed out when viewed through the lens of the larger regional economy. The industry's LQ for Baja California in 2008 was 10.0 but only 1.4 for the region. While a LQ greater than 1.0 implies that the sector was still export-oriented, Baja California's employment concentration in this industry has declined since 1998, when it had its peak LQ (26.4).

Jobs Without Borders

Employment Concentrations and Comparative Advantage by Industry in the CaliBaja Region

INTRODUCTION

This study offers new insights into the economy of the "Cali Baja" region, the bi-national area that combines the most dynamic border economies of both the United States and Mexico.[1] For the purposes of this study, CaliBaja is understood to include the California counties adjacent to the border (San Diego and Imperial counties) and five municipalities that make up the state of Baja California. Home to over 6.4 million people, CaliBaja is one of the most populated areas of the U.S.-Mexico border region, and has long been an important nexus of trade and economic integration between the United States and Mexico. Poised on both the U.S.-Mexico border and the Pacific Rim, the CaliBaja region is where the Global North meets the Global South and where East-meets-West, often in dramatic fashion. In the era of globalization, the CaliBaja region has enormous opportunities to develop its economy to benefit from the opportunities provided by international trade. What industries in the CaliBaja region have emerged as leaders in their area of production relative to the rest of the United States and Mexico? How might policy makers, industry leaders, educators, and planners work to strengthen the region's capacity in these or other up-and-coming industries?

This study is a small first step to help answer these questions. Specifically, this study provides insights on the strengths of the CaliBaja region in particular traded sectors, thereby providing indicators of the region's comparative advantages. The study combines and builds upon the existing research of three specific initiatives: the economic analysis of Baja California's economy carried out by researchers at the Colegio de la Frontera Norte (COLEF) in Tijuana, the economic analysis of San Diego conducted by the San Diego Association of Governments (SANDAG), and the CaliBaja Mega-Region Initiative's geo-mapping of key industries in the region. Drawing on these past efforts, this study identifies the region's industrial sectors with the strongest export orientation, compared to other parts of the United States and Mexico. Among the chief findings of the study, it is clear that the CaliBaja region has important strengths and even greater potential when viewed not as two separate U.S. and Mexican economies, but as a combined bi-national economic region. This study highlights where those strengths reside, and provides a foundation for future research that can further illuminate the economic impacts of the CaliBaja region.

[1] For the purposes of this study, we generally use the term CaliBaja, which draws from the regional vision developed by the CaliBaja Bi-National Mega-Region Initiative. The CaliBaja Bi-National Mega-Region Initiative's formal conceptualization of the region—"CaliBaja Bi-National Mega-Region"—is a trademarked promotional term.

BACKGROUND

Economic ties between San Diego and Tijuana are deep and longstanding. For the last two decades, in particular, local leaders, policy makers, and institutions have focused on fostering a bi-national vision to guide the region's planning and global engagement.[2] In recent years, efforts have been made on both sides of the border to not only strengthen the economic ties between Tijuana and San Diego, but take a broader view of the bi-national region that includes the comparatively smaller and unique economies of Imperial County and the rest of Baja California.[3] Economic growth, innovation, and competitiveness are central themes at the local and state levels and form part of the national agendas in both countries, particularly as they relate to larger issues of bi-national integration within the context of the North American Free Trade Agreement (NAFTA). This study provides only a partial understanding of the economic strengths of the CaliBaja region, particularly with regard to export-oriented industries that are most heavily concentrated in the region.

Understanding CaliBaja

In the era of globalization, economies are increasingly integrated and interconnected. In this context, public officials, corporate executives, and economic planners have had to look beyond traditional jurisdictional boundaries, like nation-states or even cities to think regionally about the kind of opportunities available to them. As regions have emerged as the centers of global economic activity, policy makers, industry leaders, and local stakeholders in San Diego County, Imperial County, and Baja California have worked closely together to develop an integrated vision of their shared future.

To this effect, there are numerous bilateral efforts that contribute to building a strong cross-border community, including the CaliBaja Mega-Region Initiative, San Diego Dialogue, the Smart Border Coalition, the San Diego Association of Governments, and the Border Liaison Mechanisms hosted by the San Diego and Tijuana Consulates. In addition, there are countless organizations, companies, and informal groups on both sides of the border that work to strengthen the bi-national relationship. Thanks to such efforts, a vision of the greater "CaliBaja" mega-region has begun to emerge, which helps to advance cross-border collaboration. Moreover, there is an ample body of research that lends insights into the dynamic nature and enormous potential of the CaliBaja region. This study seeks to add to our understanding of the CaliBaja region by offering insights into the major traded sectors in which the region has particular strengths.

As the primary economic drivers of the region, the San Diego and Tijuana metropolitan areas are at the heart of CaliBaja. In 2008, San Diego and Tijuana metropolitan areas were responsible for more than 1.5 million private industry jobs and represented more than 83

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[2] *The Global Engagement of San Diego/Baja California*, Final Report, San Diego: San Diego Dialogue, November 2000, http://www.sandiegodialogue.org/pdfs/global%20English.pdf; David A. Shirk, "Regional Success Stories: Strategies for the Global Engagement of the San Diego/Tijuana Region," San Diego Dialogue-Forum Fronterizo Briefing Paper. April 2000. (La Jolla: San Diego Dialogue, 2000). http://sandiegodialogue.org/pdfs/ffc%20apr%202000.pdf

[3] CaliBaja Bi-National Mega-Region Initiative, *Cali Baja Bi-National Mega-Region Global Competitiveness Strategy*, http://www.calibaja.net/cbdb/lib/GlobalCompetitivenessStrategy.pdf

percent of the region's workforce.[4] As of 2013, San Diego-Tijuana was home to more than 2.1 million total jobs. In 2013, the bi-national region was home to over 1,470,000 jobs in San Diego, 60,600 jobs in Imperial Valley and 637,981 jobs in Tijuana (note that data was only available for Tijuana, not Baja California).[5] According to the U.S. Census Bureau, San Diego ranked as the eighth-largest city in the U.S. in terms of population size in 2010 and Baja California, according to the INEGI, ranked as the 14th largest state in population size in 2010. To further put the size and characteristics of the labor pool into context, Table 1 shows basic demographic statistics for the three separate entities comprising the CaliBaja region and their relation to the national economies of the United States and Mexico.

Table 1: General Demographic Statistics for the CaliBaja Region, 2010

	San Diego	Imperial Valley	Baja California	US Total	Mexico Total
Population Total	3,105,989	175,234	3,155,070	309,349,689	112,336,538
Population Growth Rate	2.6%	1.3%	2.3%	1.7%	1.4%
% of Population that is Male	50.2%	51.4%	50.4%	49.2%	48.8%
Working Age Persons	2,003,363	107,944	2,025,555	190,250,059	69,199,307
% Pop. Working Age (15-60 yrs)	64.5%	61.6%	64.2%	61.5%	61.6%
Unemployment Rate	10.6%	29.0%	4.9%	9.6%	4.5%

Sources: 1) INEGI 2010 Population and Housing Census. 2) 2010 ACS 1-Year Estimates & State and County Quick Facts, US Census Bureau. 3) State of California Employment Development Department, 4) "Labor Force Statistics from the 2010 Population Survey" US Bureau of Labor Statistics.

As is evident in Table 1, Imperial County and other parts of Baja California do not contribute economically to the region on the same scale as San Diego and Tijuana. This will also be statistically apparent in our analysis, since the relatively low employment levels in the other areas of the region have little effect on the outcome of the analysis. This is not to say that these other areas do not contribute to job creation in the region, since combined these outlying areas account for approximately 17 percent of the region's employment. Imperial County and other regions of Baja are also specialized in industries like agriculture and industrial energy, unlike San Diego and Tijuana, which contribute to the economic diversity of the region.

This report helps illuminate some of the strengths, weaknesses, complementarities, and contrasts that exist within this diverse region, as well as the opportunities for further economic integration between San Diego, Tijuana and their surrounding communities. In the following pages, we begin to gauge the economic impact of the CaliBaja region through the lens of employment concentrations in the major industries that exist on both sides of the border. We begin by examining the concept of employment concentrations by industry, and why they are important. We then present the methodology used to study employment trends in the major industry concentrations on both sides of the border, using this information to begin to gauge

[4] U.S. Bureau of Labor Statistics, "Quarterly Census of Employment and Wages" and INEGI "Censo Económico 2009."
[5] State of California Employment Development Department, "Labor Market Info, 2013," and INEGI "Encuesta Nacional de Ocupación y Empleo."

the economic strengths of the region as a whole. Finally, we conclude with an overview of findings from the analysis and recommendations for future research.

Employment Concentration, Comparative Advantage, and Export-Orientation

As the earliest classical economists realized, a strong concentration in certain areas of production can yield "comparative advantages" that bring prosperity as local producers in those industries achieve gains from trade.[6] But how do we know what are the industries of comparative advantage for a given region? How do we know when a particular sector within a given region is truly "competitive" compared to other sectors and regions? One tool frequently used by economists and urban planners to determine a region's comparative advantages is to measure the concentration of employment in different sectors relative to employment in those sectors across the rest of the larger economy of which that region is a part. That is, when compared to employment in the larger national economy, the region's employment concentration in certain sectors provides an indication of export-based comparative advantage.

When the regional employment concentration in certain industries is greater than the national average, this provides a strong indication that that region has a certain degree of comparative advantage in this area. Hence, by making an important distinction between employment concentration and total employment per industry, this study helps bring to the forefront those industries in which the region specializes relative to the rest of the country. That is, this study highlights those industries that are most important from a standpoint of comparative advantage. Because such industries have greater than typical local demand for their goods and services, these industries have a high likelihood of export capability and therefore play an important role in the competitiveness of the overall regional economy.

In order to highlight this distinction, consider the industries that are bastions of employment to the regional economy and upon which workers in our individual and combined economies rely on heavily for employment. For San Diego and Imperial counties and Baja California, employment at food-related establishments are consistently among the top industries in terms of absolute employment. On the U.S. side in 2012, the restaurant and other eating-places industry ranked first and employed 102,791 people, representing just over nine percent of the total employment in those two counties. In Baja California, retail food establishments had the second highest employment in absolute numbers with 37,083, representing 5 percent of the state's total employment. While food service industries are clearly an important source of employment and livelihood for many people in the region, high total employment in these industries is more an indication of population density than of comparative advantage.

Thus, this study's approach to measuring comparative advantage makes a key distinction between two sets of industries that economists and policy analysts refer to as "base" (export-capable) and "non-base" (non-export) sectors. That is, in the literature on this topic, the term "base" or "basic" sector is frequently used to describe those industries whose goods and services can be readily exported, while the term "non-base," "non-basic," or "residentiary"

[6] Here we refer to the works of classical economists like Adam Smith's *An Inquiry into the Nature and Causes of the Wealth of Nations* and David Ricardo's *On the Principles of Political Economy and Taxation*.

sector is often used to refer to those industries that exist only to serve the local economy.[7] For example, steel mills and restaurants can both serve a local clientele. However, for obvious reasons, steel mills are more likely to be export capable than restaurants. Thus, while a steel mill can either sell its goods locally or export them, a restaurant tends to focus *only* on serving local clientele, who may be employed in either basic or non-basic industries.[8]

This distinction aside, it is not to say that an industry cannot be highly concentrated and rank at the top of a region's economy in terms of absolute employment. An industry that stands out among the top industries in the region by both metrics would truly be valuable to the economy as an important source of jobs and economic growth but would also be indicative of the economy's awareness of its relative strength and reliance on that strength for economic stability. Take as an example the scientific research and development services industry in San Diego and Imperial counties in 2012. This industry was not only the second largest absolute employer in total number of jobs (29,382 employees), it ranked third among industries with highest employment concentration in our study. This tendency toward high employment and high employment concentration is even more prevalent in the Baja California economy, where four of the top 10 most concentrated industries are also four of the top 10 industries in terms of absolute employment. For example, the medical equipment and supplies manufacturing industry employs 37,461 people (five percent of total Baja California employment) and is the second most employment concentrated industry for the region.

While these two methods of analysis yield interesting insight into employment trends in the regional economy, this study chooses to focus on employment concentration in order to bring to the forefront those industries that distinguish the region from the rest of the U.S. and Mexican economies, and also to make relevant comparisons to North America as a whole. The sections that follow present an overview of the methodology employed in this study and an analysis of the trends in each local economy within the CaliBaja region. This analysis is intended to set the stage for further cross-border cluster analysis of some of the leading sectors identified here in future studies.

METHODOLOGY AND DATA

Below we discuss the methodology and data sources employed in this study to identify the patterns of employment concentration by industry in the bi-national region, in order to have a sense of those industries in which CaliBaja's enjoys certain comparative advantages. In brief, the methodology of this study employs a mathematical formula to calculate a single statistic that

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[7] Among the widely cited works on this topic, see Walter Isard, "Location Theory and Trade Theory: Short-Run Analysis," *The Quarterly Journal of Economics,* Vol. 68, No. 2. (May 1954), pp. 305-320; Charles Tiebout, "A Pure Theory of Local Expenditures," *Journal of Political Economy* Vol. 64, No. 5, (1956), pp. 416–424. Also, for an excellent review of the overall literature on this topic, see Casey J. Dawkins, "Regional Development Theory: Conceptual Foundations, Classic Works, and Recent Developments," *Journal of Planning Literature,* Vol. 18, No. 2 (November 2003).

[8] There are, of course, exceptions. For example, a chance visit by Oprah Winfrey turned Ezell's—a local restaurant in Seattle—into a worldwide sensation that now exports its fried chicken to customers as far away as Switzerland. Nonetheless, even Ezell's depends mainly on its storefront business rather than its exports. Evidently, even the world's best fried chicken is best eaten locally. Lori Matsukawa, "Ezell's Chicken Still Reaping Oprah Benefits," *King 5 News*, May 24, 2011. http://www.king5.com/video/featured-videos/Ezells-Chicken-still-reaping-Oprah-benefits-122543239.html

indicates the degree of concentration of employment in particular industries in the CaliBaja region, relative to the rest of the U.S. and Mexican economies. While this same formula is regularly used to calculate employment concentrations on either side of the border, this study takes the novel approach of calculating the same formula for the CaliBaja as a single bi-national region. The resulting indicators provide metrics for evaluating the degree to which some industries have an unusually strong capacity for production within the United States and Mexico. While it is not always or necessarily the case, one inference that can be drawn from this information is that such industries likely have a strong export orientation. This study therefore provides an indication of some of the industries in the bi-national region that stand out relative to the rest of the U.S. and Mexican economies. Future studies can build on this research to provide an even more detailed picture of how these industries are structured, how many jobs they contribute to the cross border region, and what kinds of linkages exist between these and other sectors in the region's economy.

Location Quotients: Analyzing Employment Concentrations by Industry

To identify industries that are especially concentrated in the CaliBaja region, relative to the rest of the U.S. and Mexican economies, this study utilizes a metric known as a location quotient (LQ) to compare trends in regional employment by sector across multiple industries found on either side of the U.S.-Mexico border. A location quotient is a statistic that calculates the proportion of a given asset within a particular geographic area, relative to the larger geographic area of which it is a part. In other words, by comparing regional and national data, the LQ for regional employment provides a proxy measure of the intensity of industrial production in a given region, as measured by the number of people working in that sector, relative to the nation as a whole. Specifically, the LQ for employment is calculated by dividing the total number of people employed in a given sector by all people employed in that region, and then dividing that number by the total number of people employed nationally in that sector by the number of people employed nationally. The result of this calculation is a number that provides an indication of the relative concentration of employment in a given sector in that region, relative to the nation as a whole.

If the resulting LQ is equal to "1" this means that the region has a similar share of employment in this sector relative to the nation as a whole. However, if the resulting LQ is greater than one it suggests that the region has a comparative advantage in terms of employment in this sector. Such comparative advantages suggest that production may exceed local consumption and, therefore, offers opportunities to export production elsewhere. According to labor market economist Rob Sentz, "Industries with high LQ are typically (but not always) export-oriented industries, which are important because they bring money into the region, rather than simply circulating money that is already in the region (as most retail stores and restaurants do)."[9] In other words, the more the LQ for employment exceeds "1," the more likely the region is to draw customers to that industry from outside the region because its productive capacity significantly exceeds what would be typically needed to meet local demand.

[9] Rob Sentz, "Using Regional Economic Development Strategies To Diagnose And Treat Skill Gaps," *Forbes.* December 3, 2013.

For the purposes of this study, we classified industries by four different levels of employment concentration, which are presented in Table 2:

Table 2: LQ Classification Levels	
Classification	**LQ Level**
Group A	1.5-1.9
Group B	2.0-2.4
Group C	2.5-2.9
Group D	> 3
Note: This is a relative scale created by the authors for the purpose of this report.	

As a statistical tool, LQ calculations are typically used to examine local industry concentrations relative to the nation as a whole; for example, the U.S. Bureau of Labor Statistics offers a useful LQ calculator for states, counties, and metropolitan areas (bls.gov/cew/cewlq.htm). However, it is also possible to combine data from neighboring regions to look at their combined employment concentrations, even across different countries. For bi-national regions along the U.S.-Mexico border, like CaliBaja this means it is possible to evaluate their combined industry activity levels by looking at employment trends across the border. Location quotient analysis is frequently used to complement other analyses, such as input-output models, network analysis, and surveys. Since this study is intended to provide a foundation for further analysis of the interconnections within the CaliBaja region, an analysis of LQ provides a useful step toward more sophisticated economic analysis, and was chosen because we have consistent, freely available data for both economies.

This study therefore uses LQ analysis to offer new insights on employment concentration in the U.S.-Mexico context by calculating the total employment by industry for the combined economies of CaliBaja as a single region and then comparing the bi-national region's employment concentrations to the larger U.S. and Mexican economies. In focusing on employment as an indicator of industrial capacity, we necessarily assume that all firms across all regions in both countries are roughly similar in their dependence on labor (i.e., there are no major differences between the number of widget cutters needed in factories located in CaliBaja compared to any other location).[10] Assuming this is true, LQ analysis allows us to identify with some degree of objectivity and certainty those industries where CaliBaja stands out in job creation and where production is at higher levels than typically found in both countries. As a point of comparison, we will also show CaliBaja's employment concentration relative to the combined economies of the U.S., Mexico and Canada in order to place the region's comparative advantage within the broader North American context. In a future study, we plan to use our findings here to help identify CaliBaja's regional industry clusters and evaluate the total output and inter-connectivity of these sectors, allowing us to show actual productive capacity in key industry clusters.

[10] It seems highly unlikely, but it is possible that—because of some location-specific advantage—a person in Location X is more productive as persons doing the same job in the same industry in Location Y. If that were true, then LQ analysis would tend to understate the relative importance of that industry in Location X relative to Location Y.

Data Sources: Counting Jobs in Key Industries

For the purposes of this study, the key consideration is employment. We are particularly interested in identifying strong employment concentrations in order to identify the traded sectors where the CaliBaja region has comparative advantage relative to other parts of the United States and Mexico, and to track employment concentrations in these sectors over time to see what industries are becoming more or less concentrated. While this helps to identify those industries with a relatively strong orientation toward exporting their goods and services, it must be stated at the outset that this is not the only way to evaluate the economic strengths of the region, and it is by no means the only or even the best way to gauge a region's overall economic competitiveness.

To do so, we compiled and combined official employment data generated by the U.S. Department of Labor, the State of California's Employment Development Department, the Mexican National Statistics agency (Instituto Nacional de Estadisticas y Geografía, INEGI) and Statistics Canada. Starting in 1997, these data have been coded and made available in all countries using a uniform reporting system known as the North American Industry Classification System (NAICS; referred to as SCIAN in Mexico). NAICS codes are used to identify business and industry data at different levels of aggregation, using classifications with increasing levels of specificity from two digits to six digits. While NAICS coded employment data are reported throughout the year in the United States and Canada, they are only reported in Mexico every five years as part of the country's national industry survey. Thus, for the purposes of our study, we were able to compare NAICS-coded employment data from comparable years where data were available from Mexico: 1998, 2003, and 2008. In an effort to estimate recent employment trends in Mexico relative to previously established patterns vis-à-vis U.S. employment, we also included U.S. employment data from 2012.

Essentially, the results of the study were generated through a two-step process. First, we examined employment concentrations by industry using the most recent data available. This enabled us to examine both the major industries in the CaliBaja region in terms of overall employment, but also the relative comparative advantage of key industries relative to the larger U.S. and Mexican economies. In other words, we looked at what sectors generate the most jobs in CaliBaja overall, but also what sectors in CaliBaja have the highest concentrations of workers in a given industry relative to the two national economies.

Second, in any economy job growth is obviously a desirable trend, and often an indicator of innovation, competitiveness, and opportunity for further economic growth. Because we wanted to gauge longer-term trends in employment and understand the evolution of certain industries over time, we also compared the most recent data to previous years. This enables us to examine changes in employment over time, as well as the growth, maturation, and decline of certain sectors over time.

FINDINGS

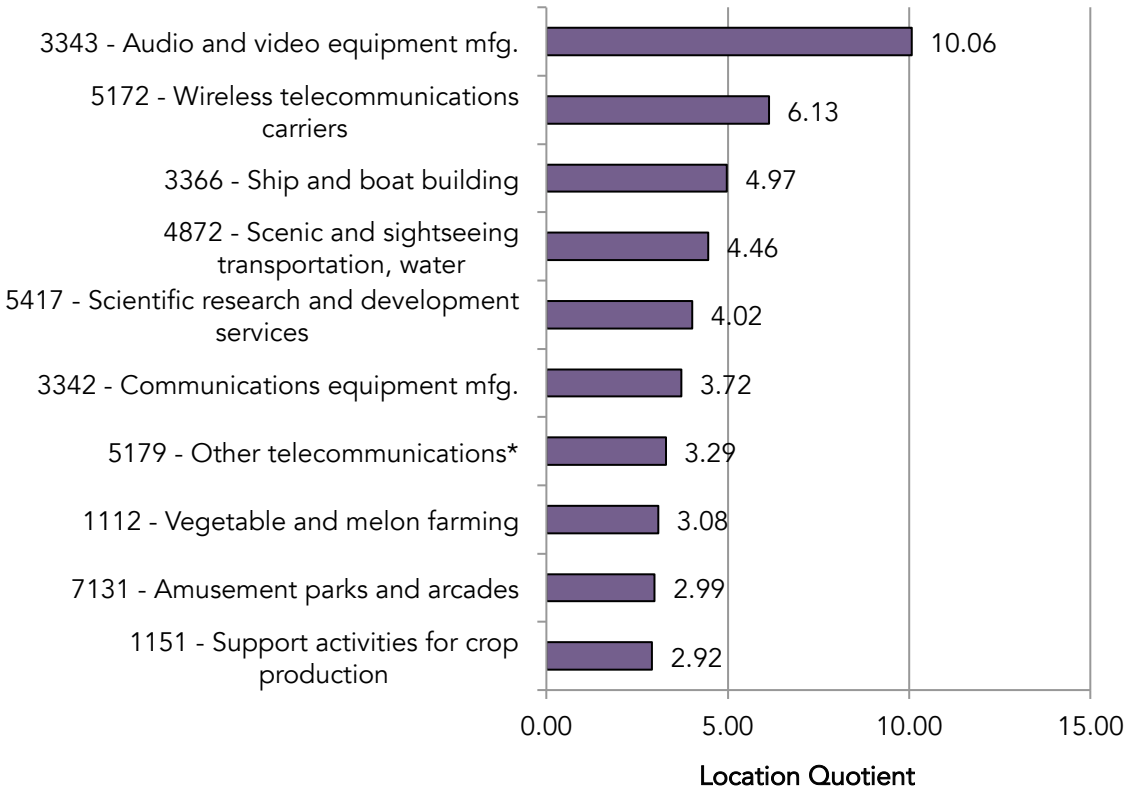
Below we discuss the basic findings regarding employment trends in the CaliBaja region based on current figures and the long-term trends across various industries. Industry definitions come from the U.S. Census Bureau's North American Industry Classification System (NAICS) and

from INEGI. What is particularly striking about the region is its diversity: the combination of high-tech research and development capability in San Diego, agricultural production in Imperial Valley, and manufacturing in Baja California brings together very different sectors in one regional economy. Looking at its combined strengths paints a very different picture of the region as a whole than might be seen otherwise when looking only at one of its components. This section of this report breaks down employment concentration by each national economy individually and then shows the resulting employment concentrations for the combined CaliBaja region. Finally, to broaden our measures somewhat, we consider the concentration of employment in key sectors in CaliBaja relative to North America as a whole.

Employment Concentrations by Industry in San Diego and Imperial Counties

The economies of San Diego and Imperial counties have comparative advantage in 41 industries with location quotients greater than 1.5. Of these 41, there are 20 Group A industries with LQs between 1.5 and 1.9, six Group B industries with LQs between 2 and 2.4, seven Group C industries with LQs between 2.5 and 2.9, and eight Group D industries industries with LQs of 3.0 or greater. Figure 1 below shows the top 10 employment industries in 2008, while Table 4 in the appendix contains a list of all 41 highly concentrated industries.

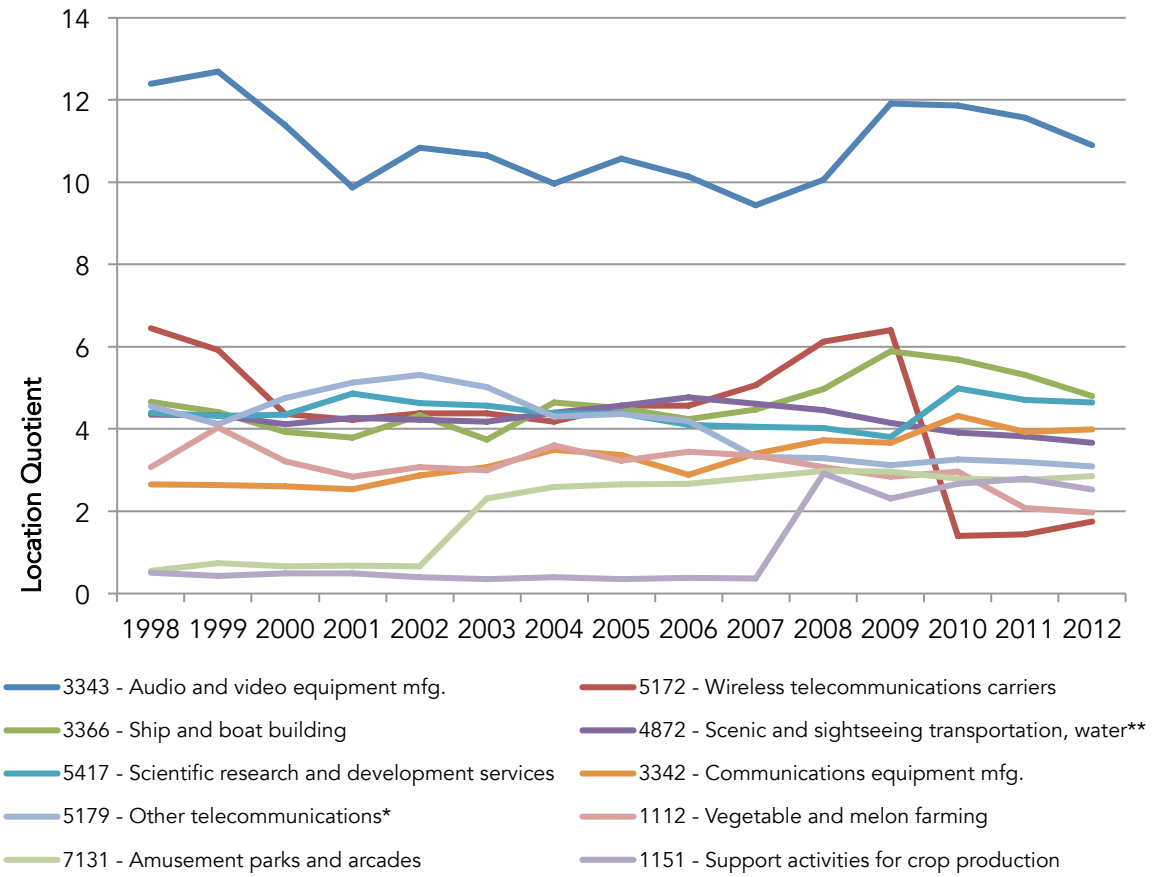
Figure 1: Top 10 Industries in San Diego and Imperial Counties by Employment Concentration (Location Quotients) in 2008



Sources: US Bureau of Labor Statistics, Quarterly Census of Employment and Wages, 2008.

There are five industries that have consistently remained within the top 10 employment industries in San Diego and Imperial Counties from 1998 through 2012 when examined using their four-digit NAICS codes: Audio and video equipment manufacturing (3343); Wireless telecommunications carriers (5172); Ship and boat building (3366); Scenic and sightseeing transportation, water (4872); Scientific research and development services (5417); Communications equipment manufacturing (3342); Other telecommunications (5179). Figure 2 plots the evolution of these industries over time, focusing on the 10 industries with the highest concentrations of employment in 2008.

Figure 2: Evolution of Employment Concentration (Location Quotients) in Leading 2008 Industries in San Diego and Imperial Counties Over Time, 1998-2012



Sources: US Bureau of Labor Statistics, Quarterly Census of Employment and Wages, 1998-2008. Note: The industries in this graph were chosen because they were the top 10 employed industries in the reference year. This graph then plots the evolution of those industries over time. In 2010, the changes in location quotients for NAICS 5172 and 5417 are partially explained by non-economic code changes.
* Due to changes in NAICS reporting post-2007, for all years prior to 2007, 5179 is reported as the sum of 5179 and 5173.
** San Diego and Imperial Counties did not report employment for industry 4872 in 2002. For continuity purposes, this table uses the average of 2001 and 2003 to report employment for 2002.

Focusing on this period between 1998 and 2012 on the U.S. side of the region, there are a few trends worthy of analysis. First and foremost, it becomes apparent that the audio and video equipment sector is unequivocally the leading sector in terms of employment density on the U.S.

side of the border, boasting an average LQ of 10.7 during this period. In 2012, San Diego and Imperial counties had a combined LQ of 10.9, indicating that these counties employed 10.9 times more people in this sector than the national average. This industry comprises businesses primarily engaged in the manufacturing of electronic audio and video equipment for home entertainment, public address and musical-instrument amplification, and vehicles. Examples of goods manufactured by firms in this sector include stereo equipment, televisions, video cameras, speaker systems and amplifiers.

Also of interest is the precipitous decline in employment within the Wireless telecommunications carriers industry. The industry saw steady growth in employment throughout much of this period but the drop from a LQ of 6.4 in 2009 to its 2012 level at 1.76 has pushed the industry far from its past designation as a top-10 sector and into a still significant but less concentrated LQ level. This industry comprises businesses primarily engaged in operating the switching and transmission facilities necessary for communication via airwaves. These are businesses with spectrum licenses that provide cell phone, wireless internet, and wireless video services along their spectrum. Examples include wireless internet service providers and cell phone service providers.

Support activities for crop production saw a marked increase from a low but stable LQ hovering around 0.4 for the period leading up to 2008. From 2007 to 2008, this industry's employment concentration increased by more than a factor of eight, raising its LQ to a high of 2.9. Although this industry would not be considered a top-10 industry by 2012 standards, with a 2012 LQ of 2.53 it is still an important source of employment for the region. This industry comprises businesses primarily engaged in providing support activities to agriculture. Examples include aerial dusting or spraying, farm management services, planting crops, crop cultivation, and vineyard cultivation.

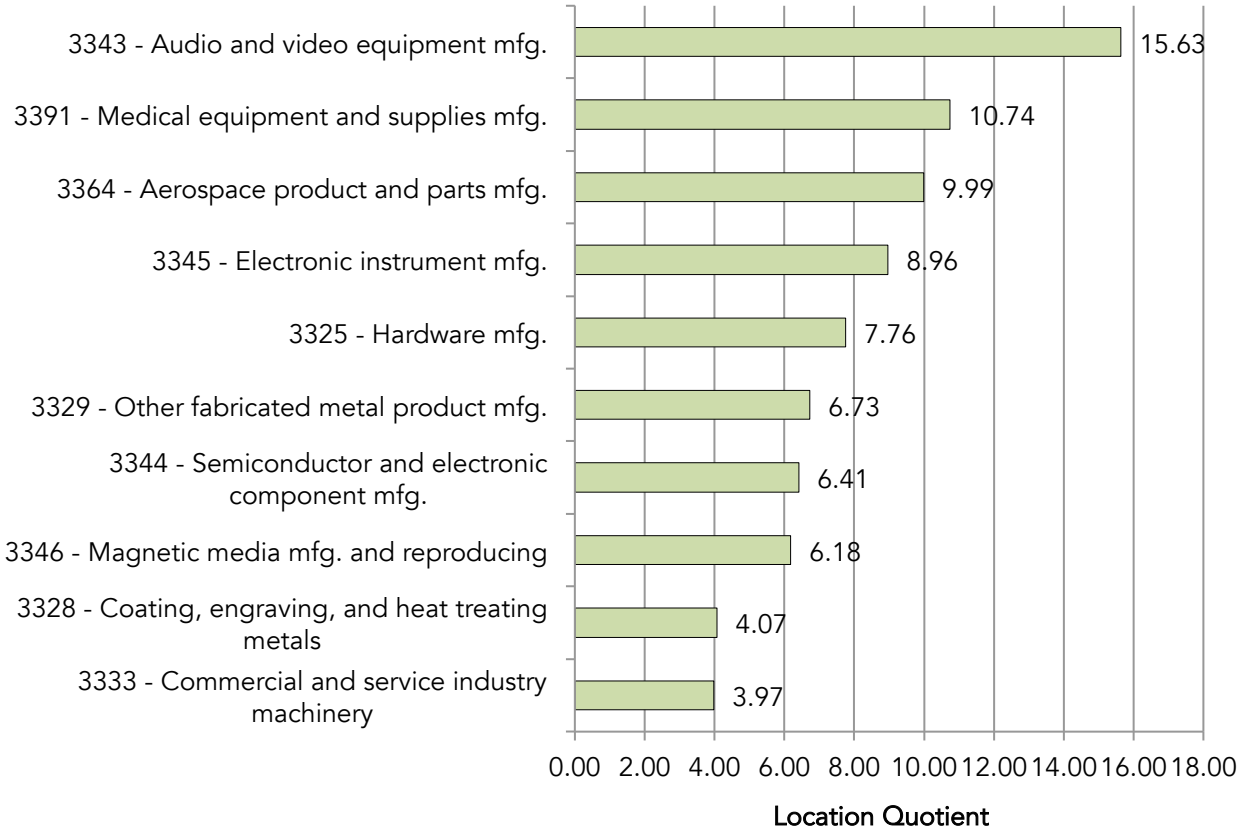
A relatively stable industry over this period of analysis, the Communications equipment manufacturing industry increased its employment concentration by 50 percent from 1998 to 2012. Its LQ increased from 2.6 in 1998 to 4.0 in 2012. This industry is made up of three sub-sectors: Telephone Apparatus Manufacturing (334210), Radio and Television Broadcasting and Wireless Communications Equipment Manufacturing (334220), and Other Communications Equipment Manufacturing (334290). As a whole, this industry comprises businesses primarily engaged in manufacturing both wired and wireless communications equipment across a number of markets. Examples of goods manufactured by this industry include but are not limited to telephones, cell phones, central office switching equipment, telephone answering machines, routers, internal and external computer modems, transmitting and receiving antennas, cable television equipment, GPS equipment, and radio and television studio and broadcasting equipment.

Ship and Boat Building is another major employment industry to San Diego and Imperial counties and with a stable location quotient averaging 4.6 from 1998 to 2012. This industry comprises businesses primarily engaged in operating shipyards or boat yards; that is, facilities with dry docks and fabrication equipment capable of building, repairing or altering a ship or boat. Examples of activities in this industry include barge building, cargo shipbuilding, passenger shipbuilding, and construction of oil and gas drilling and production platforms.

Employment Concentrations by Industry in Baja California

The Baja California economy boasts comparative advantage in 42 industries that have LQs greater than 1.5. Of these, 14 are Group A industries with LQs between 1.5 and 1.9, seven are Group B industries with LQs between 2 and 2.4, five are Group C industries with LQs between 2.5 and 2.9, and a resounding 16 are Group D industries with LQs of 3.0 or greater. Figure 3 shows the top 10 employment industries in 2008, while Table 5 in the appendix contains a list of all 42 highly concentrated industries with LQs greater than 1.5.

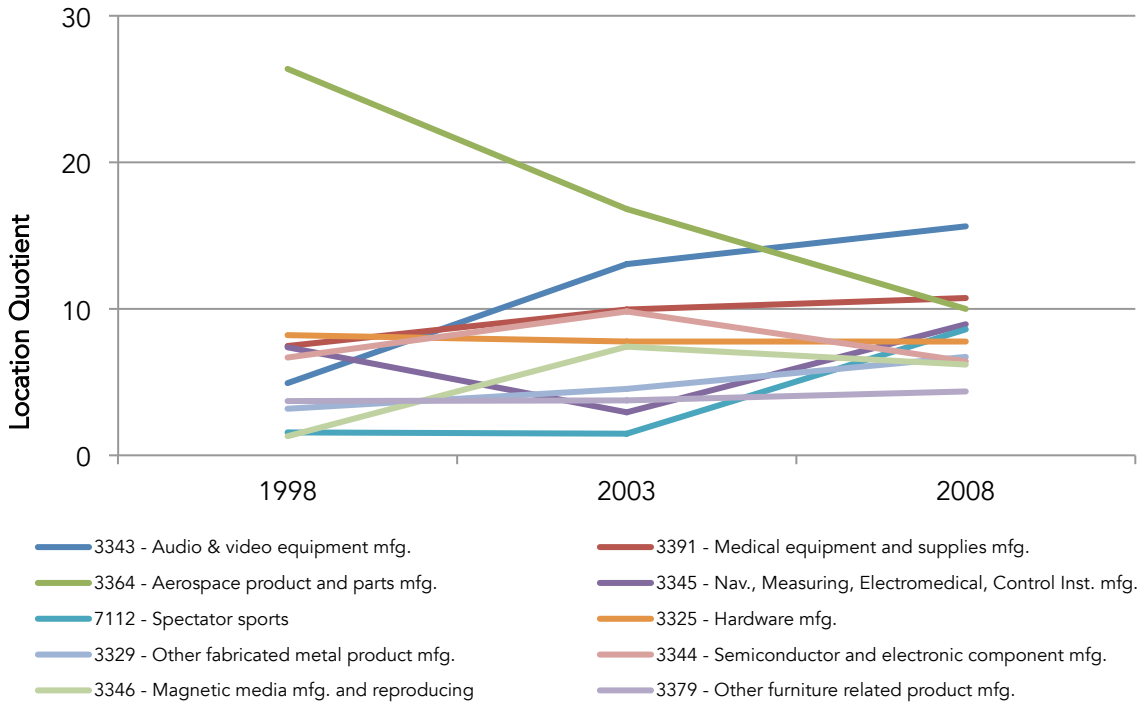
Figure 3: Top 10 Industries in Baja California by Employment Concentration (Location Quotients) in 2008



Sources: INEGI Economic Census, 2008.

There are five industries that have consistently remained within the top 10 employment industries in Baja California from 1998 through 2008: Aerospace product and parts manufacturing (3364); Audio and video equipment manufacturing (3343); Medical equipment and supplies manufacturing (3391); Semiconductor and electronic component manufacturing (3344); Hardware manufacturing (3325). Figure 4 plots the evolution of these Baja California industries over time, focusing on the 10 industries with the highest concentrations of employment in 2008.

Figure 4: Evolution of Employment Concentration (Location Quotients) in Leading 2008 Industries in Baja California Over Time, 1998-2008



Sources: INEGI Economic Census, 1998-2008. Note: The industries in this graph were chosen because they were the top 10 employed industries in the reference year. This graph then plots the evolution of those industries over time.

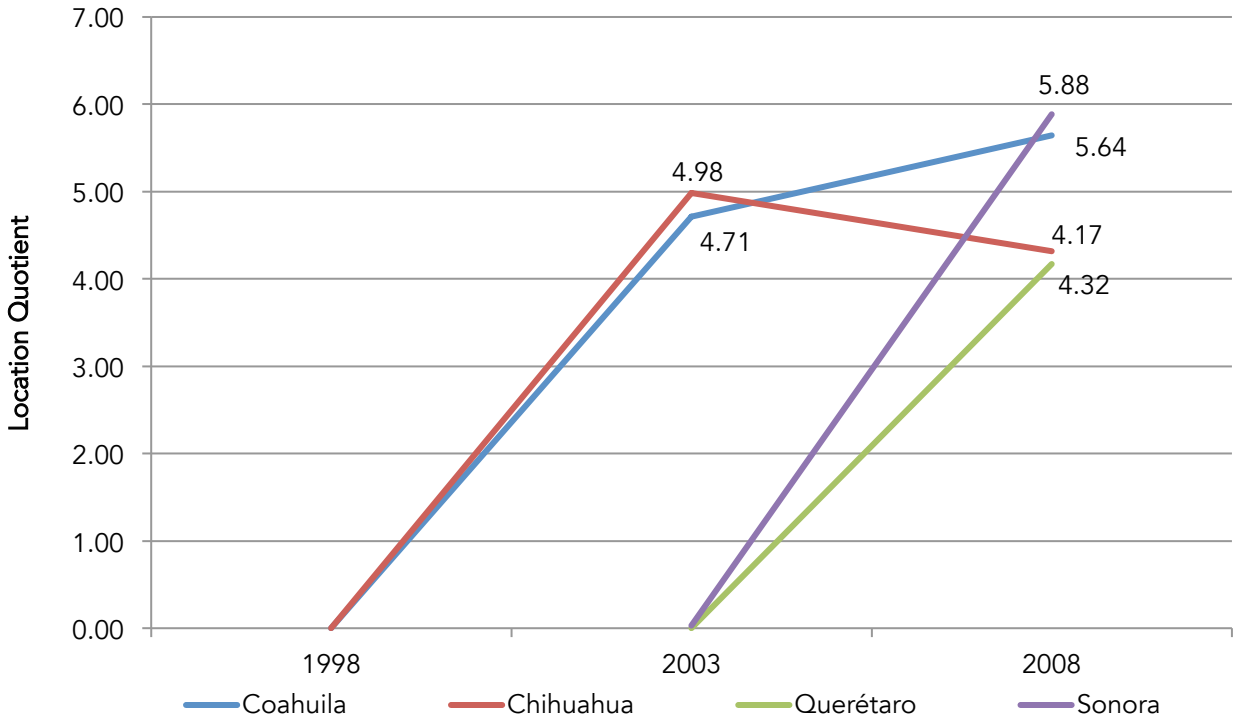
As the time series in Figure 4 clearly depicts, the two biggest employment trends in Baja California during this period were the declining share of aerospace manufacturing and the increasing share of manufacturing in the audio and video equipment industry and the medical equipment and supplies industry. Until 2008, the aerospace product and parts manufacturing industry in Baja California had the highest employment concentration of any industry in the state —and the greatest share of employment in that industry in all of Mexico— with location quotients of 26.4 in 1998 and 16.8 in 2003.[11] However, Baja California's relative share of employment dropped to an LQ of 10.0 in 2008. Thus, while employment in aerospace manufacturing in Baja California was 26.4 times greater than the national average in 1998, it was only 10 times greater in 2008.

While Baja California still had the most jobs in this sector compared to any other state in Mexico (and while absolute levels of employment increased slightly from 3,336 aerospace employees in 2003 to over 3,872 employees in 2008), the national aerospace industry in Mexico grew substantially during that same period. Thanks to major foreign direct investment in other states—like General Electric and Bombardier in Querétaro, Honeywell in Chihuahua, and ITP in Querétaro—other states have begun to erode an area of comparative advantage that was

[11] This industry comprises businesses primarily engaged in manufacturing complete aircraft, missiles or space vehicles; manufacturing aerospace engines, propulsion units or auxiliary equipment; or the conversion or rebuilding of complete aircraft or propulsion systems.

previously much stronger for Baja California.[12] Figure 5 below shows the growth of this industry in terms of employment concentration in other major producing states in Mexico while excluding Baja California to highlight those changes.

Figure 5: Aerospace Products & Parts Manufacturing (3364) in Mexico Excluding Baja California



Sources: INEGI Economic Census, 1998-2008.

Within Baja California, this decline in the aerospace manufacturing industry was offset by increases in other industries. In particular, we see almost the reverse trend with the audio and video equipment manufacturing industry, showing a four-fold increase in its location quotient from 4.9 in 1998 to 15.6 in 2008. This industry comprises businesses primarily engaged in the manufacturing of electronic audio and video equipment for home entertainment, public address and musical instrument amplification, and vehicles. Examples of goods manufactured by firms in this sector include stereo equipment, televisions, video cameras, speaker systems and amplifiers. Additionally, employment concentration in the medical equipment and supplies manufacturing industry increased by nearly 44 percent from 1998 to 2008, with a LQ of 7.5 in 1998 and 10.7 in 2008. This is an important employment sector that is growing markedly. This industry comprises businesses engaged primarily in manufacturing medical equipment and supplies such as surgical and medical instruments, surgical appliances and supplies, dental equipment and supplies, and orthodontic goods and appliances, among others.

[12] "Flight Plan: Mexico's Aerospace Industry Road Map." ProMéxico, Fourth Edition. 2013.

From a growth perspective, other noteworthy employment trends during this time period include a substantial increase in the magnetic media manufacturing and reproducing industry, increasing its employment concentration by a factor greater than four, with a LQ of 1.3 in 1998 to 6.2 in 2008. This industry comprises businesses engaged primarily in manufacturing optical and magnetic media, like blank Audio and Videotape, and mass duplication of audio, video, software or other data onto magnetic and optical media. Additionally, employment concentration in the spectator sports industry rose dramatically from an average of 1.5 in 1998 and 2003 to 8.6 in 2008. This industry comprises sports teams or clubs participating in live sporting events before paying audiences; businesses engaged primarily in operating racetracks; independent athletes participating in sporting/racing[13] events before paying audiences; owners of racing participants (cars, dogs and horses) engaged primarily in entering them in racing events; and businesses, like sports trainers, engaged primarily in services that support participants in sports events. Finally, although an apparent growth industry, employment in the navigational, measuring, electromedical, and control instruments manufacturing industry saw a significant dip in employment concentration in 2003 with its LQ decreasing from 7.4 in 1998 to 2.9 in 2003. However, by 2008 the industry appeared to be back on track with a LQ of 9.0 in 2008. This industry is comprised of businesses primarily engaged in manufacturing navigational, measuring, electromedical, and control instruments. Examples of products made by these establishments are aeronautical instruments, navigation and guidance systems, appliance regulators and controls, laboratory analytical instruments and physical properties testing equipment.

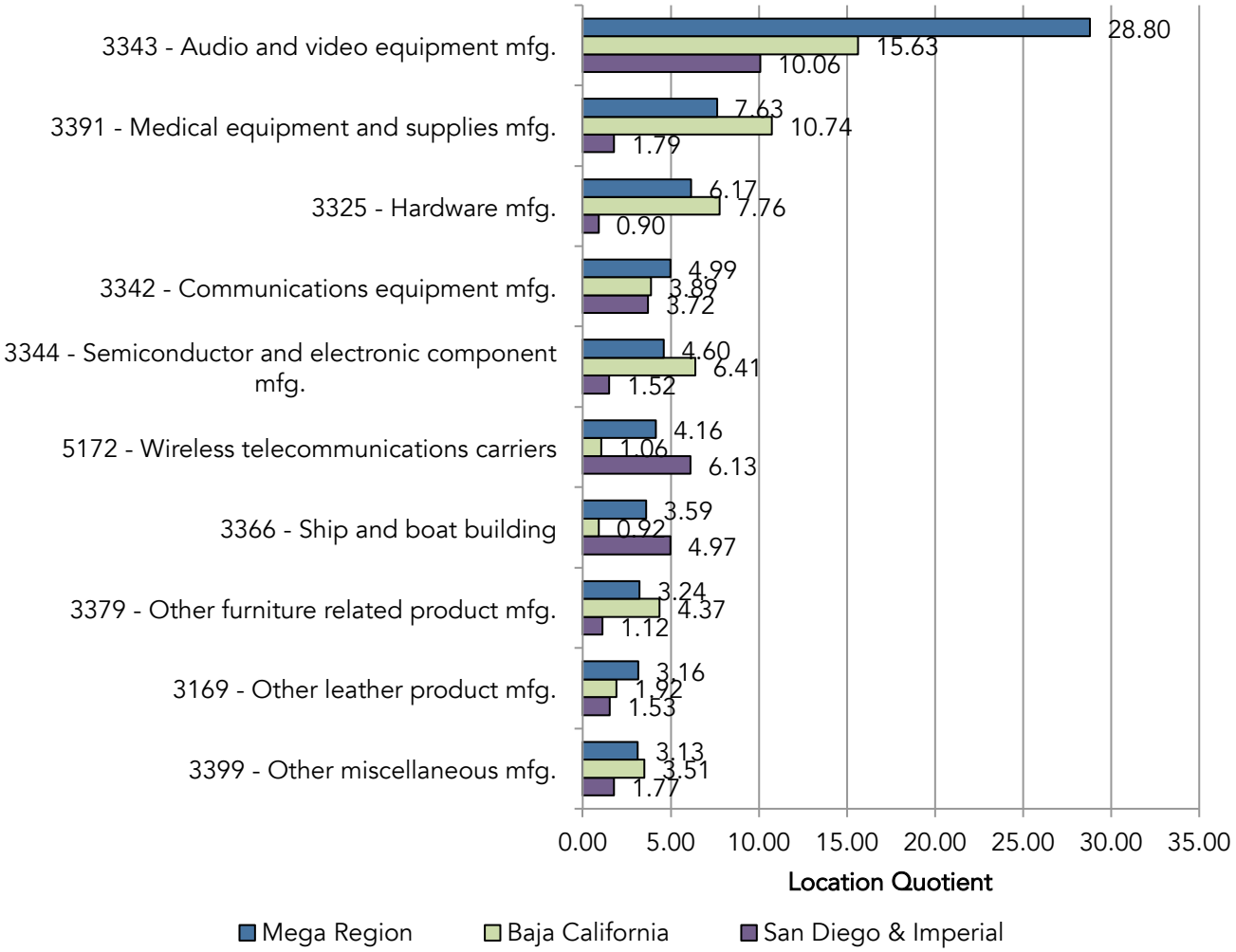
From the perspective of decreasing importance to the local economy, the computer and peripheral equipment manufacturing industry decreased markedly from a LQ of 6.4 in 1998 to just barely over 1.0 in 2008. This change is not surprising, given the global trend during this period towards outsourcing computer equipment manufacturing to Asia.

Total Employment Concentrations in the CaliBaja Region

Combining the San Diego/Imperial and Baja California economies, the CaliBaja region shows comparative advantage in 41 industries with LQs greater than 1.5. Of these, there are 16 Group A industries with LQs between 1.5 and 1.9, nine Group B industries with LQs between 2 and 2.4, five Group C industries with LQs between 2.5 and 2.9, and 11 Group D industries with LQs of 3.0 or greater. Figure 6 shows the top 10 employment industries in 2008, while Table 6 in the appendix contains a list of all 41 highly concentrated industries in that same year.

[13] This increase may be indicative of the relative decline in criminal-related violence within the state of Baja California in the years prior to 2008.

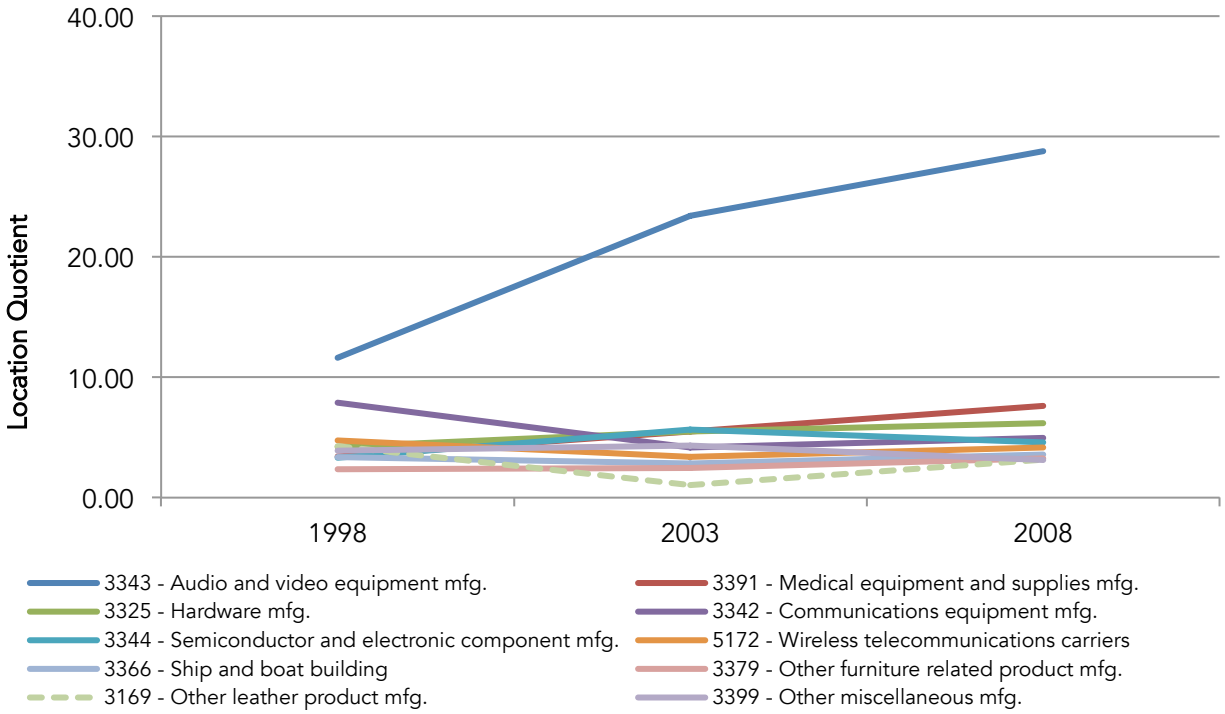
Figure 6: Top 10 Industries in CaliBaja Mega Region by Employment Concentration, 2008



Sources: INEGI Economic Census, 2008. US Bureau of Labor Statistics, Quarterly Census of Employment and Wages, 2008.

There are six industries that figure consistently into the top 10 employment industries in the region over this ten-year period: Audio and video equipment manufacturing (3343), Medical equipment and supplies manufacturing (3391), Hardware manufacturing (3325), Communications equipment manufacturing (3342), Wireless telecommunications carriers (5172), and Other miscellaneous manufacturing (3399). Figure 7 plots the evolution of these industries over time, focusing on the 10 industries with the highest concentrations of employment in 2008.

Figure 7: Evolution of Employment Concentration (Location Quotients) in the 10 Leading Industries of 2008 in CaliBaja Mega-Region Over Time, 1998-2008



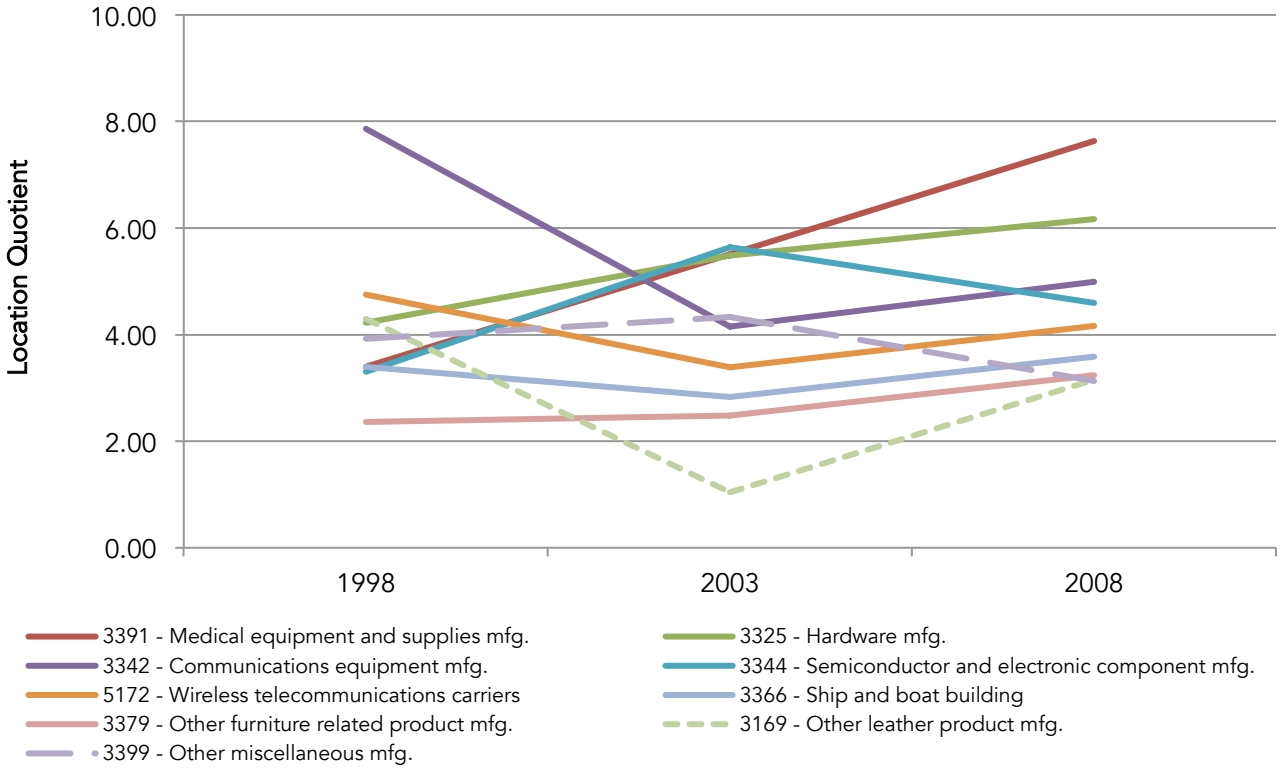
Sources: INEGI Economic Census, 2008. US Bureau of Labor Statistics, Quarterly Census of Employment and Wages, 2008. Note: The industries in this graph were chosen because they were the top 10 employed industries in the reference year. This graph then plots the evolution of those industries over time.

In light of the above discussion of the U.S. and Mexico economies individually, looking at the CaliBaja region economy as a whole yields some interesting insights. First and foremost, while we saw that the Audio and Video Equipment Manufacturing industry played had strong employment concentrations for San Diego/Imperial and Baja California individually, the region amplifies this industry even more. From 2003 to 2008 alone, employment concentration in this industry grew by 23 percent with LQs of 23.4 and 29.0 respectively. This is the top employment industry in the region across all years and, looking only at 2008, strongly outpaces the other leading industries. Noticeably absent from this list is the Aerospace Product and Parts Manufacturing industry. While of significant importance to Baja California's economy over this period, within the region economy employment concentrations are only moderate with an average LQ of 1.4. In effect, the relative lack of employment in this industry on the U.S. side washes out its strength as an employer within the region.

Two other noteworthy trends emerge from the comparison of the region to the U.S. and Mexico-specific economies. First, the medical equipment and supplies manufacturing industry grows in importance. While it was only moderately concentrated within the U.S. economy with a LQ of 1.8 in 2008, its relative strength as an employer in Baja California makes it the second most employed industry in the region with a LQ of 7.6 in 2008. Second, the communications and equipment manufacturing industry, which saw its LQ decrease by 58 percent within the

Mexican economy from 1998 to 2008, decreased at a slower rate within the region due in large part to the industry's LQ increase of 50 percent within the U.S. economy during that same time period. Overall, the industry remains highly concentrated with a LQ of 5 in 2008. To put the region's top 10 industries into better perspective, Figure 8 plots the changes in the region's top 10 industries excluding the audio and video equipment manufacturing sector.

Figure 8: Top 10 Industries by 2008 Employment Concentration Over Time, 1998-2008 (Excluding Audio & Video Equipment Manufacturing)



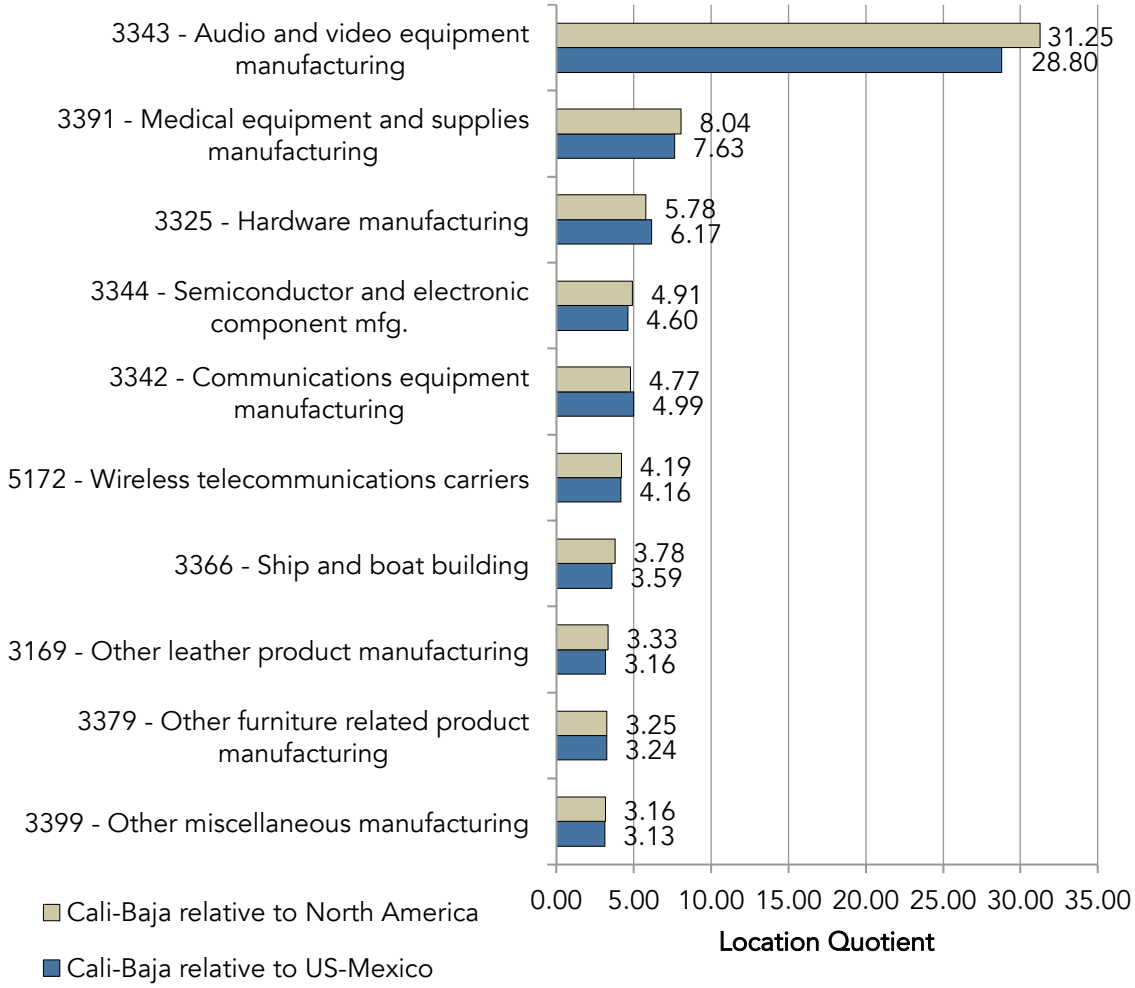
Sources: INEGI Economic Census, 2008. US Bureau of Labor Statistics, Quarterly Census of Employment and Wages, 2008. Note: The industries in this graph were chosen because they were the top 10 employed industries in the reference year. This graph then plots the evolution of those industries over time.

Not mentioned thus far is electrical equipment manufacturing (3353). Interestingly, this industry within the U.S. side of the region has a LQ of only 0.38 but is more significant on the Mexican side of the region with a LQ of 3.7. The comparative advantage of this industry in the Mexican economy renders it highly concentrated within the region. This industry comprises businesses engaged primarily in manufacturing electric motors, generators, and motor generator sets; power, distribution, and specialty transformers; switchgear and switchboard apparatus; industrial controls; and relays.

CaliBaja Region within North America

In an effort to place the CaliBaja region's comparative advantage within the broader context of North America, we added total Canadian employment by industry to the reference area and recalculated the location quotients for all industries. This analysis shows that the region's top 10 employment industries are the same when including Canada, indicating that the region's industry mix is well diversified relative to North America. Furthermore, with the exception of the hardware manufacturing and communications equipment manufacturing industries, the region's comparative advantage improves for eight out of 10 industries when comparing to North America. This increase is most noticeable for the audio and video equipment manufacturing industry, which sees its location quotient increase by 9 percent from 28.8 to 31.5. Figure 9 shows these results.

Figure 9: Top 10 Industries in CaliBaja Mega Region by Employment Concentration Relative to North America, 2008



Sources: INEGI Economic Census, 2008. US Bureau of Labor Statistics, Quarterly Census of Employment and Wages, 2008.

The analysis in the preceding sections clearly draws the connections between each individual region's comparative advantages—high-tech research and development in San Diego,

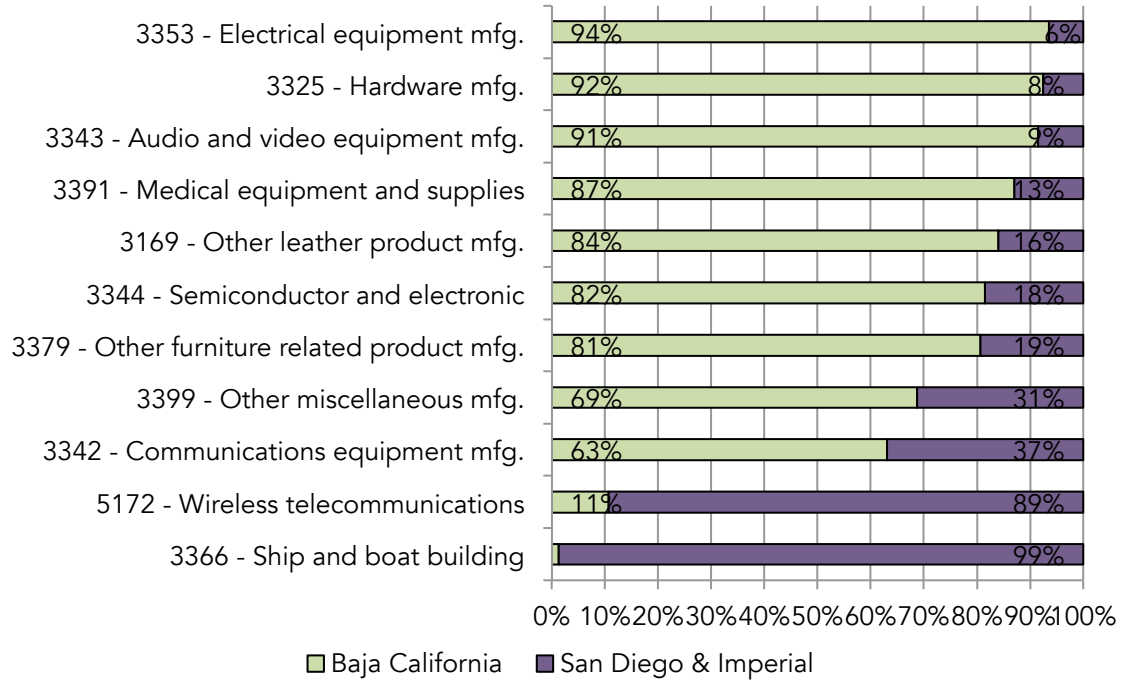
agricultural production in Imperial Valley, and high-tech manufacturing in Baja California—and how they combine to form a dynamic regional economy. The region's capability as a hub for manufacturing, particularly in industries involving medical equipment and supplies, semiconductors and electronic equipment, or Audio and Video equipment, is significant.

ANALYSIS

CaliBaja As a Major Manufacturing Hub in Key Industries

This report underscores that CaliBaja as a whole is a significant manufacturing hub in certain industries. CaliBaja has several important industry concentrations creating comparative advantage in manufacturing. Employing over 43,500 people, the medical equipment and supplies manufacturing industry is the largest single sector of employment for the bi-national region. While one of San Diego's largest employment sectors is scientific research and development services (with nearly 25,000 employees in 2008) and Imperial Valley's largest employment sector is support for crop production (with over 7,400 employees in 2008), Baja California contributes over 37,000 medical equipment sector jobs to the region, which are complemented by another 5,500 jobs in San Diego. This is an uneven breakdown, with 87 percent of medical equipment and supplies manufacturing jobs found in Baja California, and brings to light a sector that is much more important within the region than is commonly recognized. However, what is even more surprising is how concentrated employment in this sector is in the CaliBaja region relative to the rest of the United States and Mexico. In fact, for the top 10 industries by employment concentration in the region in 2008, Baja California supplied 74 percent of the labor force in 2008 (see Figure 10 below for a breakdown of labor sourcing in the region). The LQ calculation registers a figure of 7.63, which suggests that a very large proportion of U.S. and Mexican manufacturing in this sector is concentrated in the CaliBaja region. This is, in fact, the region's second most concentrated industry in terms of employment and the region accounts for 10.5 percent of all the jobs in this industry throughout the U.S. and Mexico. The steady increase in employment density in this industry, with its LQ jumping more than 17 points from 1998 to 2008, is indicative of its long-term importance to the region.

Figure 10: Labor Source Breakdown for CaliBaja Mega Region, 2008



Sources: INEGI Economic Census, 2008. US Bureau of Labor Statistics, Quarterly Census of Employment and Wages, 2008.

Several other major sectors in the region have a similarly uneven distribution of employment on the Mexican side of the border. Looking at combined regional employment, the semiconductor and electronic component manufacturing sector, which employs over 35,669 people, and the audio and video equipment manufacturing sectors, which employs over 31,600 people, are the second and third largest sources of employment in CaliBaja. Both are also industries in which the lion's share of jobs (over 29,000 employees and 28,900 employees, respectively) are heavily concentrated in Baja California, but also accompanied by a substantial complement of people employed in these sectors in San Diego (over 6,500 and nearly 2,700, respectively). The semiconductor and electronic component manufacturing industry had an average LQ of 4.5 between 1998 and 2008. To further put the regional imbalance into perspective, in 2008 San Diego and Imperial counties had a LQ of 1.5 while Baja California had a LQ of 6.4.

This pattern of having a heavy concentration in manufacturing jobs in Baja California is also found in other top industries, including plastics product manufacturing (with 19,180 jobs in Baja California) and fabricated metal product manufacturing (with over 13,200 jobs in Baja California).Overall, the above industries reflect the comparative advantages of production in the bi-national region, with lower manufacturing costs south of the border.

CaliBaja Employment Concentrations In Comparative Perspective

The CaliBaja region is only one of the globally competitive cross-border regions in North America. Comparing CaliBaja to other major cross-border economies will provide greater context to this analysis. By nature, location quotient analysis provides context to the discussion by framing the region's employment strengths relative to a larger geographic reference area. In this case, our reference area is private employment in North America. However, until this point, we have not compared how CaliBaja's export-oriented sectors compare to other major cross-border markets in North America.

In this section, we will compare CaliBaja's employment and concentration in four manufacturing sectors to three of North America's most competitive cross-border regions: Seattle-Vancouver, WA-BC; Detroit-Windsor, MI-ON; and El Paso-Juarez, TX-CH. For this analysis, we used 2008 data for the metropolitan statistical areas that surround the two principal cities in each cross-border region. We also included the San Diego-Tijuana, CA-BC region as a separate analysis area from the CaliBaja region for consistency. As noted, our geographic reference area is all of North America.

Our analysis has shown that employment in the CaliBaja region was most concentrated in manufacturing sectors. For comparison purposes, we will focus on three concentrated sectors to see how they stacked up relative to the other North American cross-border regions. Audio and Video Equipment Manufacturing (NAICS 3343) and Medical Equipment and Supplies Manufacturing (NAICS 3391) were the region's two most concentrated sectors. They also happen to be sectors where concentration was high in both Baja California and San Diego and Imperial Counties. Communications Equipment Manufacturing (NAICS 3342) was the region's fourth most concentrated sector, but was selected above Hardware Manufacturing (NAICS 3325) because of its high concentration on both sides of the border. These three sectors plus the total manufacturing industry (NAICS 31 through 33) will be used in this comparison.

Total Manufacturing (NAICS 31 through 33) Comparison

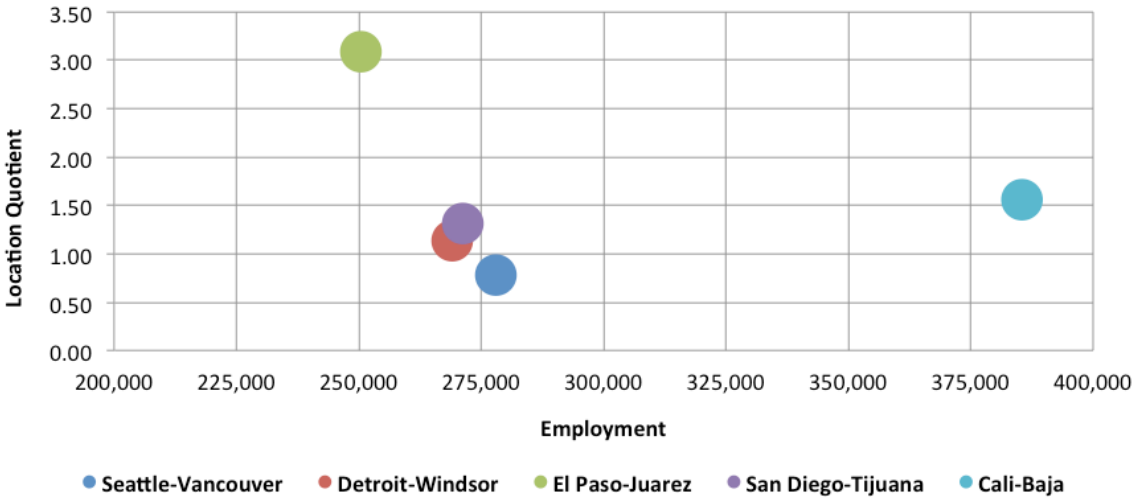
While CaliBaja's employment was most concentrated in key manufacturing sectors with location quotients ranging from three to ten, employment in the region's manufacturing industry as a whole yielded a more modest location quotient of 1.56. We can expect location quotients to shrink as we move up the NAICS hierarchy, since specialization in such large two-digit industries is less likely than in more focused four-digit industry sectors due to the diversity of sub-sectors that make up that industry.

As Table 3 shows, CaliBaja was more concentrated in manufacturing than the other North American cross-border regions in 2008, except El Paso-Juarez, where manufacturing concentration was nearly double at 3.08. However, El Paso-Juarez is much different than the other regions in this analysis because it is the only cross-border region where the non-US metropolitan area is actually larger than its US counterpart. El Paso is much smaller than the other US cities used in this analysis and contributed less to its region's cross-border employment than the other regions studied here. In addition, more than half of Ciudad Juarez's private employment (58.1 percent) was in manufacturing in 2008, and the Ciudad Juarez manufacturing industry alone made up more than one-third (38.1 percent) of the entire El Paso-Juarez private employment base. Therefore, it is no surprise that El Paso-Juarez was so much more concentrated than any of the other North American cross-border regions.

Table 3: Employment Facts for Major North American Cross-Border Regions, Sorted by Employment Size (2008)				
	Total Private Employment	Total Manufacturing Employment	U.S. Area(s) share of Total Regional Employment	Manufacturing Share of Total Private Employment
North America	146,956,555	19,717,398	77.0%	13.4%
Seattle-Vancouver	2,641,022	278,118	55.5%	10.5%
CaliBaja	1,842,723	385,479	61.7%	20.9%
Detroit-Windsor	1,759,641	269,197	90.8%	15.3%
San Diego-Tijuana	1,537,910	271,311	71.2%	17.6%
El Paso-Juarez	605,237	250,414	34.4%	41.4%
Sources: US Bureau of Labor Statistics QCEW, INEGI Economic Census, Statistics Canada Census | 2006-2009				

While El Paso-Juarez eclipsed the other regions in manufacturing concentration, the story changes when looking at total employment in manufacturing. As Figure 11 shows, the CaliBaja region had more manufacturing employees than any other cross-border region in 2008, and by a margin of more than 100,000. Even when isolating the San Diego-Tijuana region, only Seattle-Vancouver had more manufacturing employees (approximately 6,800 more), due in no small part to the fact that their total economy employed more than a million more private employees overall.

Figure 11: Comparison of Manufacturing Employment Concentration in Major North American Cross-Border Regions, 2008



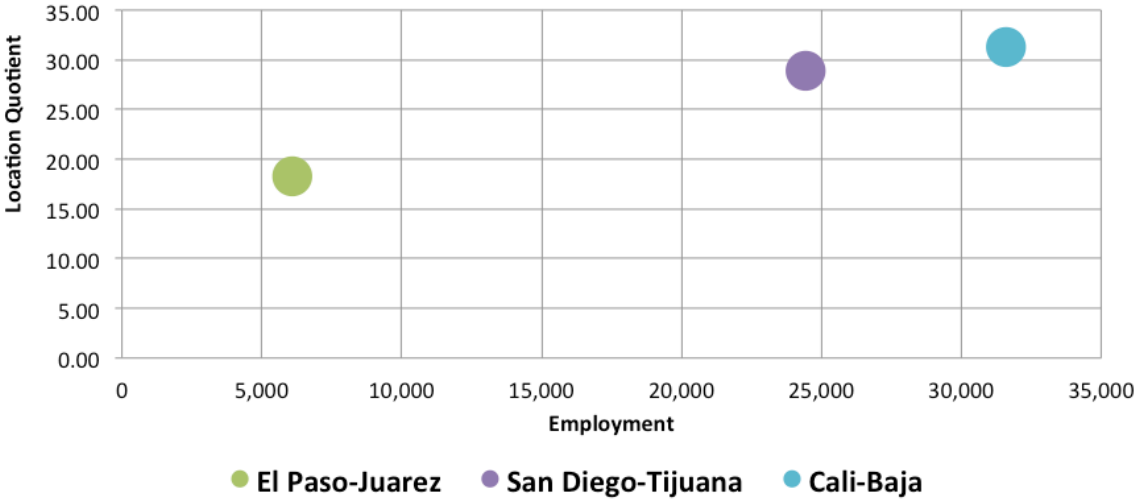
Sources: U.S. Bureau of Labor Statistics QCEW, INEGI Economic Census, Statistics Canada Census | 2006-2009.

Audio and Video Equipment Manufacturing (NAICS 3343) Comparison

CaliBaja is clearly the North American leader in Audio and Video Equipment Manufacturing, as the 31.25 location quotient indicates. Figure 12 reinforces that the region was the most specialized Audio and Video Equipment Manufacturing region in North America in 2008, given

that manufacturing powerhouse El Paso-Juarez was dwarfed by CaliBaja, despite El Paso-Juarez's own high concentration and employment in this sector. While data was unavailable for Detroit-Windsor and Seattle-Vancouver, it is unlikely that these regions would compete with CaliBaja in this sector, as CaliBaja's 31,609 employees accounted for 39.2 percent of all North American employment in the industry.

Figure 12: Comparison of Audio and Video Equipment Manufacturing Employment Concentration in Major North American Cross-Border Regions, 2008



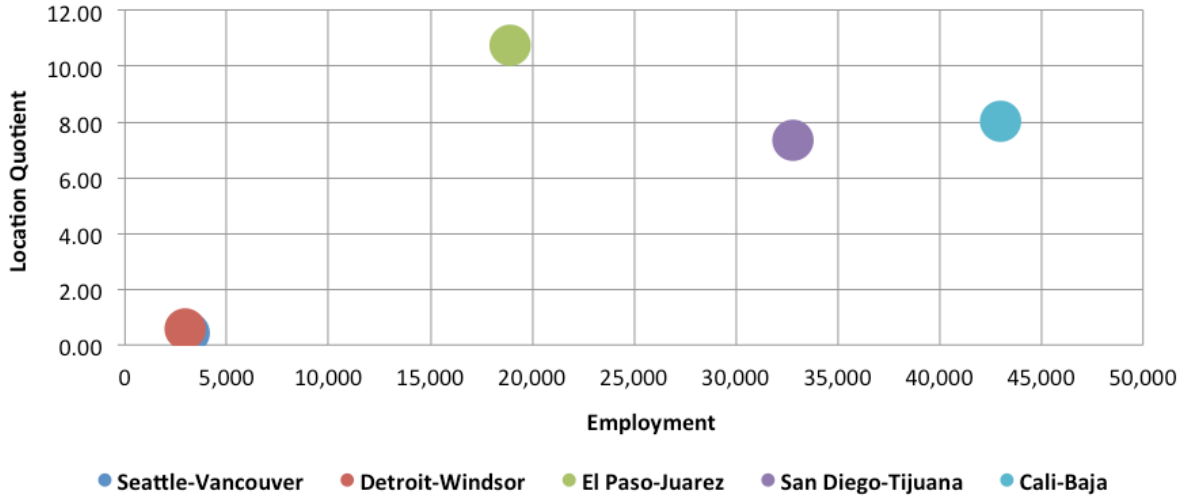
Sources: U.S. Bureau of Labor Statistics QCEW, INEGI Economic Census, Statistics Canada Census | 2006-2009.

Medical Equipment and Supplies Manufacturing (NAICS 3391) Comparison

Of CaliBaja's top 10 most concentrated sectors, Medical Equipment and Supplies Manufacturing was the region's largest employer and second most concentrated sector in the region. The location quotient for this sector was an astounding 8.05, which is second only to El Paso-Juarez, which had a location quotient of 10.77. As mentioned previously, El Paso-Juarez is unique from the other cross-border regions studied here because manufacturing-centric Juarez dominates the cross-border economy, and the region lacks an economically large and diverse US counterpart compared to other cross-border regions.

In terms of total employment in Medical Equipment and Supplies Manufacturing, CaliBaja eclipsed the other regions in 2008. As Figure 13 shows, employment in this sector in CaliBaja was more than double El Paso-Juarez in 2008. The region's 43,025 employees in the sector accounted for more than 10 percent of all Medical Equipment and Supplies Manufacturing employment in North America that year.

Figure 13: Comparison of Medical Equipment & Supplies Manufacturing Employment Concentration in Major North American Cross-Border Regions, 2008

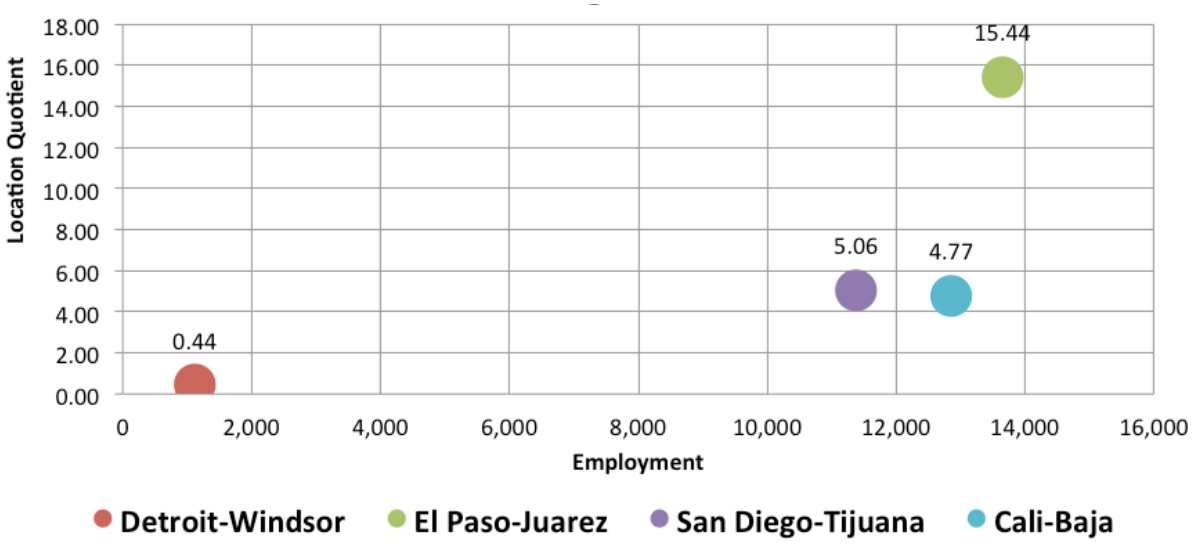


Sources: U.S. Bureau of Labor Statistics QCEW, INEGI Economic Census, Statistics Canada Census | 2006-2009.

Communications Equipment Manufacturing (NAICS 3342) Comparison

Communications Equipment Manufacturing employment was CaliBaja's fourth most concentrated industry in 2008, and we chose it for comparison because of its relative strength on both sides of the border. As Figure 14 shows, CaliBaja's concentration in this industry was eclipsed by El Paso-Juarez. Again, as stated earlier, El Paso-Juarez is unique when measuring its employment concentration in manufacturing sectors. Regardless of this caveat, El Paso-Juarez had more total employment in the sector than CaliBaja, seen in Figure 14. Communications Equipment Manufacturing was still a major export-oriented manufacturing sector in CaliBaja in 2008, but the data shows that El Paso-Juarez surpassed CaliBaja in this sector that year, at least in terms of employment.

Figure 14: Comparison of Communications Equipment Manufacturing Employment Concentration in Major North American Cross Border Regions, 2008



Sources: U.S. Bureau of Labor Statistics QCEW, INEGI Economic Census, Statistics Canada Census | 2006-2009.

While these comparisons are limited to only major cross-border regions and a sample of manufacturing sectors in 2008, the data shows that the CaliBaja region was the largest border manufacturing hub in North America. The CaliBaja region employed more in the manufacturing industry than any other major North American border region. Furthermore, CaliBaja was the clear leader among North American border regions in Audio and Video Equipment Manufacturing employment. The region also specialized in Medical Equipment and Supplies Manufacturing and employed more in the sector than any other cross-border region. The region competed most in these sectors with its Southern US-Northern Mexico border counterpart, El Paso-Juarez, particularly in the specialized sectors detailed in this section.

The Need for Additional Data and Further Analysis

There are two limitations to conducting a complete analysis of employment concentration in the CaliBaja region. The first and foremost is one of limited availability of similar employment data for the United States and Mexico. While annual U.S. economic surveys produce subnational employment data by sector, Mexico's annual surveys do not provide this level of detail. Thus, the analysis in this report is primarily limited to industry employment data from 1998, 2003 and 2008, the years for which the Mexican government has conducted its bi-decadal economic census. The next economic census took place in 2013 and will be released publicly sometime in late 2014. At that time, it will be possible to provide a fully updated analysis using our methodology will be able to evaluate the macroeconomic conditions of the past five years and their effects on the region's economy. This study therefore provides a useful baseline study for further analysis and comparison.

Second, while the U.S., Mexican and Canadian governments have made impressive efforts to standardize industry codes across North America, there are a few exceptions to NAICS

comparability across countries. One such exception involves the Wholesale and Retail Trade sectors, which are coded as 42 and 44-45 in the US and as 43 and 46 in Mexico. Due to the inability to compare within and across these sectors, they were left out of the employment concentration analysis of the region. Looking at each economy separately, no retail or wholesale trade industries appeared in the top 10 results of either economy; however, once combined, the retail sectors on the Baja California side jumped significantly. Because these industry codes do not exist on the U.S. side, they were effectively overweighed in the calculation of the location quotients. In order to provide the most accurate results as possible for all comparable industries, these sectors were dropped from the analysis. While this does limit our study slightly, this leaves a clear opportunity for future research to construct comparison tables between the U.S. and Mexico for retail and wholesale trade industries. Once created, those industries could easily be incorporated into a bi-national employment study such as this.

FINAL CONSIDERATIONS

Understanding the drivers of competitiveness and innovation in the CaliBaja economy is of central importance to ensuring the region's long-term, sustainable economic growth. This study, conducted by a team of bi-national experts from both sides of the border, is the first to analyze industry-specific employment concentrations within the CaliBaja region, the first step in a multi-stage research effort to evaluate and quantify the depth and breadth of the economic ties between our two countries along our shared border. The results shed new light on the major industries that drive the CaliBaja economy, but also on the relative importance of the CaliBaja region in the larger bi-national context. When conceptualized as "one region," CaliBaja has greater potential in certain sectors than when only considering one side of the border or the other.

A comprehensive study on employment concentrations in the region using location quotients as the unit of analysis provides valuable insight about which industries are employing the greatest numbers in the region. Location quotients provide insight into the concentration of a region's employment relative to a larger reference area and are useful points of reference for which industries are export oriented, therefore serving as a proxy measure for production. Applying this framework to the region, we have seen that the audio and video equipment manufacturing industry is of central importance to the region, representing nearly 40 percent of the industry's total employment in 2008, with a concentration 28 times greater than the average for the United States and Mexico. The medical equipment and supplies manufacturing industry is also a standout in the region, representing nearly 11 percent of total employment in the industry and over 10 times the level of employment found in other locations throughout the two countries.

We also see significant comparative advantage for the CaliBaja region in hardware manufacturing and semiconductor and electronic component manufacturing industries. Overall, the region shows significant opportunity as a hub for diverse, hi-tech manufacturing and is home to 41 industries with significant strengths compared to other parts of the United States and Mexico. Eleven of those industries have very high employment concentrations, employing greater than three times the combined average in both countries. What this means for the

CaliBaja region is that these industries offer comparative advantages that may contribute to the region's overall competitiveness.

Future research can build upon this first study of employment trends in the region by bringing to the forefront the magnitude of purchasing and sales relationships between these industries to further quantify the economic value added of the region. That is, identifying key industry concentration as we have done in this study opens the possibility to identify possible linkages and interconnections between different sectors that may constitute an "industry cluster." Industry clusters, as defined by Professor Michael Porter of Harvard University, are geographic concentrations of interconnected companies and related institutions in a particular field linked together by customers, suppliers, or other business relationships. Clusters link different industries together through a variety of connections that are important to competition.

Clusters can include suppliers of inputs, like raw materials, machinery or specialized services, and can extend outwards to companies producing complementary goods or using related technologies, skills or inputs. Clusters also include institutions like universities and industry associations that meet the educational, research, professional development and quality-control needs of the cluster.[14] Strong clusters foster innovation because the industries involved become mutually reinforcing. The concentration of information, technology and talent among companies, academic institutions and other supporting organizations in a cluster leads to increased productivity and faster innovation, which in turn can have a significant impact on local and regional economies, firms and households.[15]

Future analysis can focus on analyzing the industry concentrations identified here to measure the buyer-to-seller relations to better understand the interactions within and between sectors, thereby illustrating the interdependent relationships among different sectors that make up key industry clusters for the CaliBaja region. This framework can also be applied to other city pairs along the U.S.-Mexico border, helping policy makers, business leaders, and civil society to better understand the dynamics of their local, bi-national economy.

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APPENDIX

Table 4. San Diego and Imperial Valley's Top Industries, 2008 (Sorted by LQ)								
		Total Employment for Each Sub-region	113,188,643	1,094,928	42,584	1,137,512		
	NAICS Code	**Industry Name**	**USA**	**San Diego**	**Imperial Valley**	**San Diego + Imperial Valley**	**Location Quotient**	**% Share of Total**
1	3343	Audio and video equipment manufacturing	26,637	2,694		2,694	10.064	10.1%
2	5172	Wireless telecommunications carriers	201,495	12,382	30	12,412	6.129	6.2%
3	3366	Ship and boat building	155,942	7,790		7,790	4.971	5.0%
4	4872	Scenic and sightseeing transportation, water	14,835	665		665	4.460	4.5%
5	5417	Scientific research and development services	619,111	24,972	16	24,988	4.016	4.0%
6	3342	Communications equipment manufacturing	127,056	4,751		4,751	3.721	3.7%
7	5179	Other telecommunications	139,488	4,543	69	4,612	3.290	3.3%
8	1112	Vegetable and melon farming	91,781	1,077	1,765	2,842	3.081	3.1%
9	7131	Amusement parks and arcades	167,164	5,019		5,019	2.988	3.0%
10	1151	Support activities for crop production	290,855	1,094	7,428	8,522	2.915	2.9%
11	1114	Greenhouse and nursery production	165,854	4,810		4,810	2.886	2.9%
12	5174	Satellite telecommunications	12,937	363		363	2.792	2.8%
13	9999	Unclassified	208,532	5,562	108	5,670	2.706	2.7%
14	7121	Museums, historical sites, zoos, and parks	130,703	3,509		3,509	2.671	2.7%
15	8141	Private households	581,486	14,984		14,984	2.564	2.6%
16	1129	Other animal production	18,996	386	55	441	2.310	2.3%
17	7115	Independent artists, writers, and performers	49,223	1,108		1,108	2.240	2.3%
18	8129	Other personal services	238,592	5,214		5,214	2.175	2.2%
19	4911	Postal service	4,133	88		88	2.119	2.1%
20	2372	Land subdivision	79,201	1,633		1,633	2.052	2.1%
21	6115	Technical and trade schools	115,621	2,343		2,343	2.016	2.0%
22	3345	Electronic instrument manufacturing	442,711	8,711		8,711	1.958	2.0%
23	5313	Activities related to real estate	538,606	10,509	46	10,555	1.950	2.0%
24	6114	Business, computer and management training	78,044	1,495		1,495	1.906	1.9%
25	4851	Urban transit systems	40,610	700	58	758	1.857	1.9%
26	3391	Medical equipment and supplies manufacturing	308,372	5,554		5,554	1.792	1.8%
27	3399	Other miscellaneous manufacturing	319,064	5,688		5,688	1.774	1.8%
28	7211	Traveler accommodation	1,794,463	30,781	282	31,063	1.722	1.7%
29	3341	Computer and peripheral equipment mfg.	182,900	3,155		3,155	1.716	1.7%
30	1119	Other crop farming	65,732		1,130	1,130	1.711	1.7%
31	5413	Architectural and engineering services	1,437,060	24,303	204	24,507	1.697	1.7%
32	5611	Office administrative services	404,079	6,464	54	6,518	1.605	1.6%
33	5416	Management and technical consulting services	1,012,246	16,065	240	16,305	1.603	1.6%

Table 4 Con't. San Diego and Imperial Valley's Top Industries, 2008 (Sorted by LQ)

		Total Employment for Each Sub-region	113,188,643	1,094,928	42,584	1,137,512		
	NAICS Code	**Industry Name**	**USA**	**San Diego**	**Imperial Valley**	**San Diego + Imperial Valley**	**Location Quotient**	**% Share of Total**
34	3254	Pharmaceutical and medicine manufacturing	289,586	4,656		4,656	1.600	1.6%
35	2383	Building finishing contractors	902,139	14,251	109	14,360	1.584	1.6%
36	2379	Other heavy construction	110,313	1,715		1,715	1.547	1.6%
37	5112	Software publishers	261,652	4,055		4,055	1.542	1.5%
38	8131	Religious organizations	186,379	2,818	66	2,884	1.540	1.5%
39	5414	Specialized design services	143,084	2,175	32	2,207	1.535	1.5%
40	3169	Other leather product manufacturing	11,784	181		181	1.528	1.5%
41	3344	Semiconductor and electronic component mfg.	431,518	6,577		6,577	1.517	1.5%

Sources: Instituto Nacional de Estadística y Geografía, Censos Económicos, & US Bureau of Labor Statistics, QCEW.

Table 5. Baja California's Top Industries, 2008 (Sorted by LQ)

		Total Employment	20,116,834	705,211		
	NAICS Code	**Industry Name**	**Mexico**	**Baja California**	**Location Quotient**	**% Share of Total**
1	3343	Audio and video equipment manufacturing	52,773	28,915	15.630	54.8%
2	3391	Medical equipment and supplies manufacturing	99,524	37,461	10.737	37.6%
3	3364	Aerospace product and parts manufacturing	11,061	3,872	9.986	35.0%
4	3345	Electronic instrument manufacturing	12,975	4,075	8.959	31.4%
5	7112	Spectator sports	3,768	1,138	8.615	30.2%
6	3325	Hardware manufacturing	12,393	3,370	7.757	27.2%
7	3329	Other fabricated metal product manufacturing	56,236	13,264	6.728	23.6%
8	3344	Semiconductor and electronic component mfg.	129,492	29,092	6.409	22.5%
9	3346	Magnetic media manufacturing and reproducing	4,857	1,053	6.184	21.7%
10	3379	Other furniture related product manufacturing	13,510	2,072	4.375	15.3%
11	3328	Coating, engraving, and heat treating metals	15,938	2,273	4.068	14.3%
12	3333	Commercial and service industry machinery	5,490	765	3.975	13.9%
13	3342	Communications equipment manufacturing	59,451	8,102	3.888	13.6%
14	3353	Electrical equipment manufacturing	67,128	8,784	3.733	13.1%
15	3399	Other miscellaneous manufacturing	101,250	12,472	3.514	12.3%
16	4853	Taxi and limousine service	125	15	3.423	12.0%
17	5231	Securities and commodity contracts brokerage	18,259	1,861	2.907	10.2%

Table 5 Con't. Baja California's Top Industries, 2008 (Sorted by LQ)						
		Total Employment	20,116,834	705,211		
	NAICS Code	**Industry Name**	**Mexico**	**Baja California**	**Location Quotient**	**% Share of Total**
18	3359	Other electrical equipment and component mfg.	58,441	5,828	2.845	10.0%
19	3351	Electric lighting equipment manufacturing	17,704	1,753	2.825	9.9%
20	3261	Plastics product manufacturing	195,697	19,180	2.796	9.8%
21	3372	Office furniture and fixtures manufacturing	20,659	1,838	2.538	8.9%
22	3336	Turbine and power transmission equipment mfg.	10,207	886	2.476	8.7%
23	3362	Motor vehicle body and trailer manufacturing	20,853	1,751	2.395	8.4%
24	5619	Other support services	32,215	2,575	2.280	8.0%
25	6222	Psychiatric and substance abuse hospitals	989	73	2.106	7.4%
26	4889	Other support activities for transportation	3,956	287	2.070	7.3%
27	5312	Offices of real estate agents and brokers	44,762	3,208	2.044	7.2%
28	3371	Household and institutional furniture mfg.	126,522	9,032	2.036	7.1%
29	3169	Other leather product manufacturing	14,203	954	1.916	6.7%
30	2372	Land subdivision	48,508	3,088	1.816	6.4%
31	3312	Steel product mfg. from purchased steel	26,476	1,676	1.806	6.3%
32	4885	Freight transportation arrangement	39,530	2,441	1.761	6.2%
33	7132	Gambling industries	25,510	1,565	1.750	6.1%
34	3322	Cutlery and handtool manufacturing	19,146	1,171	1.745	6.1%
35	3222	Converted paper product manufacturing	75,378	4,565	1.728	6.1%
36	6239	Other residential care facilities	10,647	644	1.725	6.0%
37	3221	Pulp, paper, and paperboard mills	25,817	1,445	1.597	5.6%
38	6212	Offices of dentists	77,403	4,312	1.589	5.6%
39	4871	Scenic and sightseeing transportation, land	10,194	549	1.536	5.4%
40	6242	Emergency and other relief services	5,428	289	1.519	5.3%
41	6214	Outpatient care centers	5,973	316	1.509	5.3%
42	7212	RV parks and recreational camps	967	51	1.504	5.3%

Sources: Instituto Nacional de Estadística y Geografía, Censos Económicos, & US Bureau of Labor Statistics, QCEW.
Note that Industries pertaining to the retail or wholesale trade sectors are not included in this analysis.

Table 6. CaliBaja Region's Top Industries, 2008 (Sorted by LQ)

		Total Employment for Each Sub-region	113,188,643	1,137,512	20,116,834	705,211	133,305,477	1,842,723		
	NAICS Code	**Industry Name**	**USA**	**San Diego + Imperial**	**Mexico**	**Baja California**	**MX + US**	**CaliBaja Region**	**LQ**	**% Share of Total**
1	3343	Audio and video equipment manufacturing	26,637	2,694	52,773	28,915	79,410	31,609	28.795	39.8%
2	3391	Medical equipment and supplies manufacturing	308,372	5,554	99,524	37,461	407,896	43,015	7.629	10.5%
3	3325	Hardware manufacturing	30,375	275	12,393	3,370	42,768	3,645	6.165	8.5%
4	3342	Communications equipment manufacturing	127,056	4,751	59,451	8,102	186,507	12,853	4.985	6.9%
5	3344	Semiconductor and electronic component mfg.	431,518	6,577	129,492	29,092	561,010	35,669	4.599	6.4%
6	5172	Wireless telecommunications carriers	201,495	12,412	39,970	1,484	241,465	13,896	4.163	5.8%
7	3366	Ship and boat building	155,942	7,790	2,985	96	158,927	7,886	3.590	5.0%
8	3379	Other furniture related product manufacturing	43,892	495	13,510	2,072	57,402	2,567	3.235	4.5%
9	3169	Other leather product manufacturing	11,784	181	14,203	954	25,987	1,135	3.160	4.4%
10	3399	Other miscellaneous manufacturing	319,064	5,688	101,250	12,472	420,314	18,160	3.126	4.3%
11	3353	Electrical equipment manufacturing	158,078	604	67,128	8,784	225,206	9,388	3.016	4.2%
12	3329	Other fabricated metal product manufacturing	282,577	641	56,236	13,264	338,813	13,905	2.969	4.1%
13	5417	Scientific research and development services	619,111	24,988	3,943	39	623,054	25,027	2.906	4.0%
14	3359	Other electrical equipment and component mfg.	136,748	1,584	58,441	5,828	195,189	7,412	2.747	3.8%
15	2372	Land subdivision	79,201	1,633	48,508	3,088	127,709	4,721	2.674	3.7%
16	3346	Magnetic media manufacturing and reproducing	34,955	341	4,857	1,053	39,812	1,394	2.533	3.5%
17	4872	Scenic and sightseeing transportation, water	14,835	665	8,026	97	22,861	762	2.411	3.3%
18	5179	Other telecommunications	139,488	4,612	14,152	226	153,640	4,838	2.278	3.1%
19	4871	Scenic and sightseeing transportation, land	10,853	113	10,194	549	21,047	662	2.275	3.1%
20	1112	Vegetable and melon farming	91,781	2,842			91,781	2,842	2.240	3.1%

Table 6 Con't. CaliBaja Region's Top Industries, 2008 (Sorted by LQ)

		Total Employment for Each Sub-region	113,188,643	1,137,512	20,116,834	705,211	133,305,477	1,842,723		
	NAICS Code	**Industry Name**	**USA**	**San Diego + Imperial**	**Mexico**	**Baja California**	**MX + US**	**CaliBaja Region**	**LQ**	**% Share of Total**
21	1151	Support activities for crop production	290,855	8,522	2,630	69	293,485	8,591	2.118	2.9%
22	1114	Greenhouse and nursery production	165,854	4,810			165,854	4,810	2.098	2.9%
23	3351	Electric lighting equipment manufacturing	57,162	390	17,704	1,753	74,866	2,143	2.071	2.9%
24	3261	Plastics product manufacturing	580,138	2,824	195,697	19,180	775,835	22,004	2.052	2.8%
25	3345	Electronic instrument manufacturing	442,711	8,711	12,975	4,075	455,686	12,786	2.030	2.8%
26	7121	Museums, historical sites, zoos, and parks	130,703	3,509	4,231	214	134,934	3,723	1.996	2.8%
27	9999	Unclassified	208,532	5,670			208,532	5,670	1.967	2.7%
28	7131	Amusement parks and arcades	167,164	5,019	45,868	607	213,032	5,626	1.910	2.6%
29	4851	Urban transit systems	40,610	758	138,682	3,952	179,292	4,710	1.900	2.6%
30	8141	Private households	581,486	14,984			581,486	14,984	1.864	2.6%
31	3312	Steel product mfg. from purchased steel	60,970	523	26,476	1,676	87,446	2,199	1.819	2.5%
32	3371	Household and institutional furniture mfg.	307,142	1,518	126,522	9,032	433,664	10,550	1.760	2.4%
33	3152	Cut and sew apparel manufacturing	156,413	1,425	297,996	9,511	454,409	10,936	1.741	2.4%
34	4911	Postal service	4,133	88	22,129	544	26,262	632	1.741	2.4%
35	5174	Satellite telecommunications	12,937	363	2,716	11	15,653	374	1.728	2.4%
36	1129	Other animal production	18,996	441			18,996	441	1.679	2.3%
37	7115	Independent artists, writers, and performers	49,223	1,108	1,605	41	50,828	1,149	1.635	2.3%
38	3341	Computer and peripheral equipment mfg.	182,900	3,155	53,365	2,148	236,265	5,303	1.624	2.2%
39	8129	Other personal services	238,592	5,214	11,920	277	250,512	5,491	1.586	2.2%
40	1141	Fishing	6,531	62	154,598	3,436	161,129	3,498	1.570	2.2%
41	5312	Offices of real estate agents and brokers	335,059	5,035	44,762	3,208	379,821	8,243	1.570	2.2%

Sources: Instituto Nacional de Estadística y Geografía, Censos Económicos, & US Bureau of Labor Statistics, QCEW.
Note that Industries pertaining to the retail or wholesale trade sectors are not included in this analysis.

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