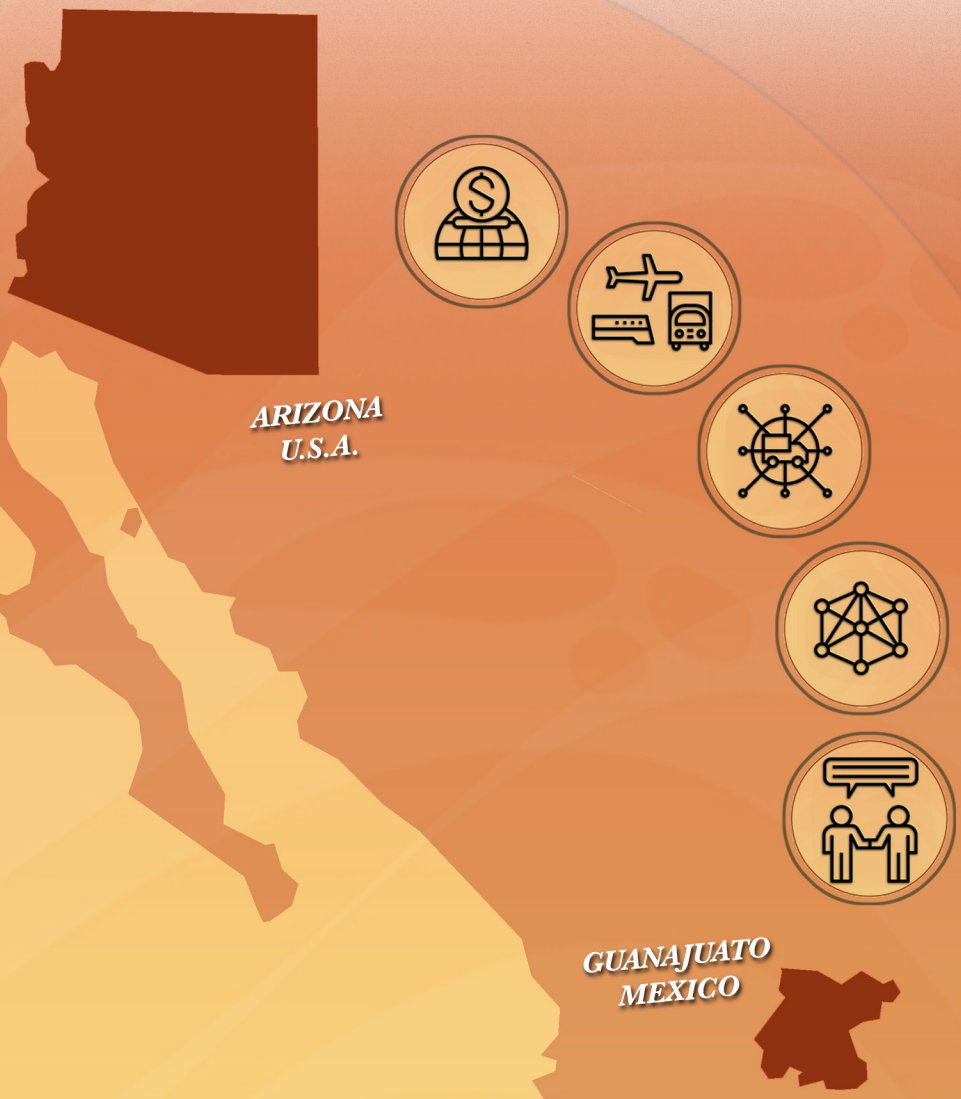
Potential for Enhanced Trade between Arizona and Guanajuato

May 2019



ASU Watts College
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Executive Summary

Mexico is Arizona's No. 1 trading partner with over $15 billion in trade annually. The bulk of Arizona's international commerce is with Sonora, the immediate neighbor to the south, but there are other potential economic opportunities worth exploring across Mexico. Here the focus is on Guanajuato, one of Mexico's most economically advanced states with robust international trading ties.

Watts College of Public Service and Community Solutions and Morrison Institute for Public Policy at Arizona State University researched the potential for enhanced economic ties between Arizona and Guanajuato, a state and capital city by the same name located in Central Mexico, 227 miles northwest of Mexico City and about 1,100 miles southeast of Phoenix.

Watts College and Morrison Institute partnered with the L. William Seidman Research Institute at ASU's W.P. Carey School of Business to produce a detailed economic profile of Guanajuato in order to guide ongoing and future exploration of expanded trade with Arizona.

There are some similarities between the two states. The population of Guanajuato is slightly under 6 million, which is somewhat smaller than Arizona, with about 7 million residents. Both states are landlocked and must work aggressively to ensure land and air transportation connectivity that positions them for trade. And, they both have a history of mineral extraction as a core economic activity. Consequently, they must each make a concerted effort to increase manufacturing activity and raise educational attainment of residents to ensure a competitive workforce.

But, as the two states continue to develop their economies and leverage their natural strengths, there also are some distinct differences:

- Guanajuato is a leading exporter of agricultural products, particularly produce. For example, Guanajuato is the leading Mexican exporter of broccoli, and Guanajuato's broccoli imports to the United States totaled to $196.3 million in 2013. Of the 40,000 hectares of broccoli grown in Mexico, 38,000 of these hectares are located in Guanajuato.
- Guanajuato is aggressively modernizing its manufacturing base, expanding from its traditional strengths in leather goods and apparel into automobiles.
- Arizona has come to rely significantly on construction and the housing market as an economic engine.
- Arizona has experienced success in advanced manufacturing and high tech informatics. Arizona sells computer-related equipment and parts to Guanajuato, accounting for roughly half of Arizona's total exports to Guanajuato since 2011.

As it stands today, there is minimal trade between Arizona and Guanajuato, with the value of exports from Arizona to Guanajuato at $11 million in 2017. (By comparison, the total value of exports from Arizona to Mexico was $7.6 billion in 2017.)

However, leaders from both states believe it is prudent to look beyond today and position themselves as strong trading partners for tomorrow so that opportunities for economic growth and innovation are fully realized. The two states must not only consider areas of alignment, but also complementary assets and industries. As you read this report, consider how either state might pivot to leverage the strengths of the other for mutual economic benefit.

Relationship-building efforts are well underway. For instance, the House International Affairs Committee of the Arizona State Legislature has been cultivating ties with government and business leaders in Guanajuato to support enhanced trade relations. In fact, Guanajuato Governor Diego Sinhué Rodríguez Vallejo visited Arizona in February to meet with a bipartisan group of Arizona legislators, as well as local business and community leaders. In 2017, a delegation of nearly 70 Arizona business, political and community leaders – with leadership from the House International Affairs Committee – visited Mexico City and Guanajuato as part of a trade mission.

Additionally, Arizona Governor Doug Ducey has declared the state's commitment to expanding trade opportunities with Mexico, as noted in his message on the Arizona-Mexico Commission website:

> "The 21st century economy is a global economy. And I am proud that, in many ways, Arizona is at its forefront. As we implement new and innovative ways to lead both domestically and internationally – our strong ties to Mexico help drive our state's competitiveness. Arizona's relationship with Mexico is also about our shared priority of improving the quality of life for everyone."

As is true with most opportunities, there also are some accompanying challenges. In the case of Arizona and Guanajuato, transportation logistics are a key hurdle to overcome, with potentially great payoff if truck, rail and air travel times can be reduced. For instance, Guanajuato's dominance in the production of broccoli could be maximized for shipment via Arizona into the Western U.S. if travel times were shorter.

Manufacturing accounts for 29 percent of Guanajuato's Gross Domestic Product (GDP), and its trade will also be influenced by transportation quality and connectivity. Existing highway and rail networks linking Guanajuato and the United States are most developed in the eastern part of Mexico, headed toward the numerous ports of entry in Texas – not toward Arizona.

This is an important point for commerce moving in both directions, given the fact that at least 80 percent of the value of Arizona's exports to Guanajuato since 2011 has been transported by truck (with nearly all of the rest sent by rail). In addition to computer-related equipment and parts, Arizona's exports to Guanajuato in recent years have involved electrical machinery, equipment and parts; photographic goods; plastics and articles; and paper and paperboard. Looking ahead, overland transport from Guanajuato to Arizona's port of entry in Nogales will need to be studied carefully if trade is to be improved and expanded in the future.

Air connection is another possibility and exists with layovers between the two states, but a non-stop route from Arizona to Guanajuato could greatly increase opportunities. The opening of 360-acre SkyBridge at the Phoenix-Mesa Gateway Airport has garnered much attention, with the freight-processing facility easing shipment of goods from Arizona to the interior of Mexico by centralizing customs processing on the U.S. side of the border. It is this type of connecting-the-dots strategy that will determine whether Arizona and

Guanajuato can improve present trade lines, or create new ones.

The good news is that opportunities do exist to strengthen Arizona's economic ties with Guanajuato. For one, Guanajuato already has a strong agricultural sector, providing vast produce exports to the United States. With faster transit through better transportation infrastructure, the farm-to-table time for Guanajuato's produce could be halved. In particular, stronger infrastructure would position Arizona to be a gateway for Guanajuato's produce to the western half of the United States.

Other opportunities may exist between Guanajuato's automobile manufacturing sector, which is quickly increasing its capacity in the region with nearly 40 automotive plants under expansion in Guanajuato, and Arizona's high-tech manufacturing industries. With both of these manufacturing sectors increasing on their respective sides of the border, it is possible that a synergy of opportunity exists.

Guanajuato also enjoys a strong manufacturing framework in its automobile industry. For example, Henkel recently expanded its Guanajuato production of an automotive sealer. Guanajuato's strong manufacturing seedbed, including its manufacturing heritage in leather goods and shoes, holds opportunities for expansion to support Arizona's economic needs, potentially related to home furnishings, apparel and the housing construction industry.

To support such strategies, this report provides Arizona and Guanajuato leaders with critical baseline economic data that can facilitate pursuit of new and enhanced trade relations. With this data and analysis in hand, leaders of subsequent trade missions, government and business cross-border conversations, and research and investment can build upon where we are today and help propel economic connectivity for the mutual benefit of both states.

Potential for Enhanced Trade between Arizona and Guanajuato

Introduction

In the 2019 state budget, the Arizona Legislature directed Arizona State University to explore economic connections between Arizona and Guanajuato, Mexico.[1] Watts College of Public Service and Community Solutions and Morrison Institute for Public Policy, the university's non-partisan think tank, were tasked with researching these connections and describing the current business climate and potential future relationship between the two states.

Watts College and Morrison Institute partnered with the L. William Seidman Research Institute at ASU's W.P. Carey School of Business to produce a detailed economic profile of Guanajuato as Part II of this report.

Morrison Institute conducted interviews with key stakeholders to provide context around the economic profile and further explore the relationship between Arizona and Guanajuato. The list of organizations that Morrison Institute consulted on this project follows in Appendix 5, and a full list of interview questions is in Appendix 6.

Figure 1: Arizona and Guanajuato

The geography that is now known as Arizona has a long history of productive economic trade with what is now Mexico, dating back to ancient times.[2] More recently, there has been long-standing cooperation between the U.S. and Mexico spearheaded by the Arizona-Mexico Commission and the Arizona Commerce Authority.

Arizona's economic ties with Mexico have traditionally been strongest with the state of Sonora, which sits

[1] Laws 2018, Chapter 276, page 64, lines 35-41:
"The appropriated amount for the Economic Development line item shall be used to establish, in cooperation with a public university located in Guanajuato, Mexico, an office in Guanajuato, Mexico, to develop collaborative efforts between the states of Arizona and Guanajuato, including stimulating bilateral trade and economic development, enhancing cultural exchange opportunities, expanding public service capacity, enhancing innovation and improving public policy development."

[2] Olsen, S., & Olsen, J. (1974). The Macaws of Grasshopper Ruin. *Kiva, 40*(1/2), 67-70. Retrieved from http://www.jstor.org/stable/30245920

immediately to the south of the state. The maquiladoras of Sonora produce everything from water meters to computer cables and are located just a few hours away from Arizona markets.[3]

Additionally, Arizona has an active trade office in Mexico's capital.[4] Locating this office in Mexico City has several strategic purposes. First, the area is the economic heart of the nation, producing a large share of the gross domestic product of Mexico. Additionally, as the seat of the federal government, many economic and trade decisions are concentrated in the capital.

The existing relationships between Arizona and Sonora, as well as with Mexico City, will continue to develop and mature. These are natural connections with a long history in the state's international trade portfolio.

Yet, many trade opportunities await in Guanajuato. Although not as proximate to Arizona as Sonora, Guanajuato's economy is somewhat larger. It also is a fast-growing economy, and there may be prospects for Arizona businesses to trade with Guanajuato's emerging manufacturing sector.

About This Report

This report proceeds as follows: Part I, "Profile of Arizona and Guanajuato," profiles and summarizes Guanajuato's demographics and economics and highlights existing Arizona-Mexican trade. Modes of transportation between Arizona and Guanajuato are described.

Part II, "Detailed Economic Analysis," dives deeper into the economic details of Guanajuato, describing specific characteristics of Guanajuato and Mexico, labor force participation, unemployment, and its economy.

Inherently there is repetition in this approach to structuring a report, and we intend for the reader to get an overview in Part I, with details provided in Part II available for further understanding.

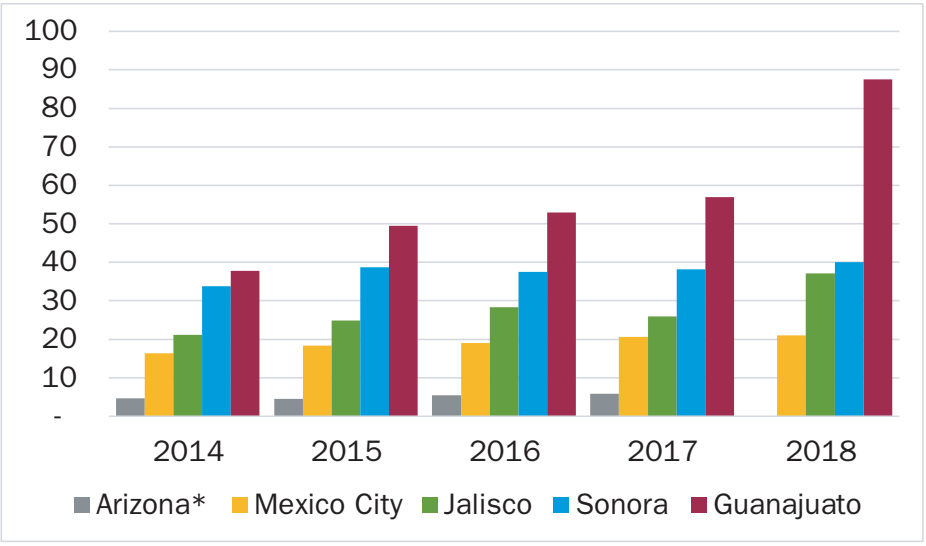
[3] For example: http://indexnogales.org.mx/maquiladoras.html
[4] https://www.azmc.org/neighbors-for-good/mexico-trade-office/

Part 1: Profile of Arizona and Guanajuato

The state of Guanajuato is located in central Mexico, 227 miles northwest of Mexico City and about 1,100 miles southeast of Phoenix (Figure 1). It has a rich history dating back to pre-Columbian times and is home to many historic sites.

A business-friendly government has actively fostered growth of the manufacturing center in Guanajuato. The automotive industry has been a major part of the economy since 1995, when General Motors opened an assembly plant in Silao. This led to the formation of an industrial cluster of suppliers to the industry that attracted other manufacturers such as Volkswagen, Toyota and Mazda.

Chart 1: Homicides per 100,000 Population



*2018 statistics not available for Arizona.
Source: FBI Uniform Crime Reporting Program and Secretaria de Seguridad y Proteccion Ciudadana

In addition to the thriving manufacturing sector, Guanajuato is a prime tourist destination, boasting world-renowned cultural events like the Festival Internacional Cervantino, as well as the Museum of the Mummies and Teatro Juárez. These cultural amenities, coupled with the region's mild climate and low cost of living, have also attracted a significant expatriate community of approximately 10,000 full-time and seasonal residents centered on the San Miguel de Allende area.

The converse of Guanajuato's recent economic prosperity has been a dramatic increase in crime. There were 5,173 homicides in Guanajuato in 2018.[5] This translates to a homicide rate of 88.5 per 100,000 residents, more than twice the rate in Sonora, four times the rate of Mexico City, and 15 times the homicide rate in Arizona (Chart 1).

Demographic Data

The population of Guanajuato, at slightly under 6 million, is slightly smaller than Arizona with its 7 million residents. Sonora, Arizona's neighbor to the south, is much smaller, with a population of 2.2 million. With a land area of about 10 percent of Arizona, Guanajuato's population is more tightly packed than Arizona. The great majority of Arizona's population is concentrated in the two urban areas of Phoenix and Tucson, with

[5] Secretaria de Seguridad y Proteccion Ciudadana, http://secretariadoejecutivo.gob.mx/docs/pdfs/nueva-metodologia/CNSP-V%C3%ADctimas-2018.pdf

much of the state consisting of National Parks, National Forests, Indian reservations and other protected land. In contrast, the population of Guanajuato is more evenly distributed across the land. Léon is by far the largest city, with a population of 1.5 million, but there are 15 other cities in Guanajuato with populations over 100,000. Many of these cities are located close to one another, with easy transport from one to another.

Guanajuato's population is considerably younger than that of Arizona, with a median age of 26 years, compared to Arizona's median age of 37 years (Table 1). Perhaps as a consequence of its young population, educational attainment in Guanajuato is lower than in Mexico as a whole, and also lower than the neighboring states of San Luis Potosí, Querétaro, Michoacán and Jalisco.

Table 1: Demographic Comparisons: Mexican and U.S. States, 2015

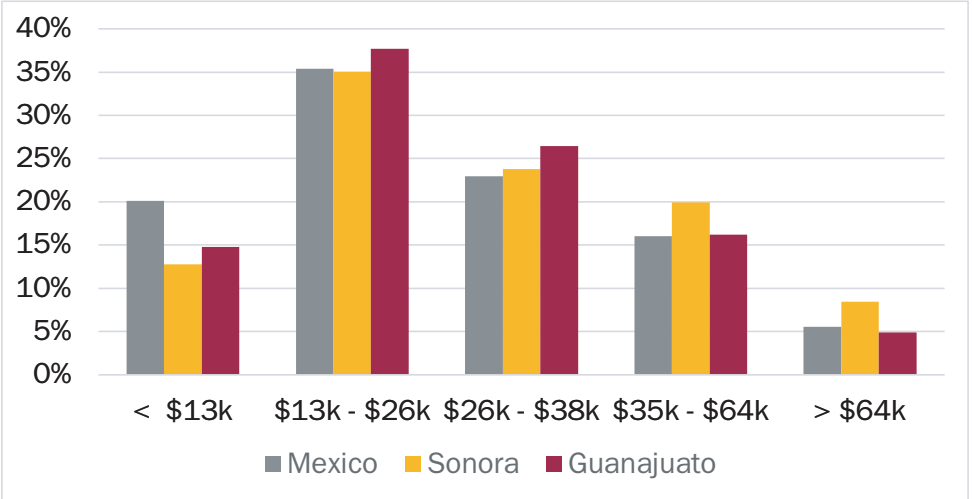
	Mexico	Sonora	Guanajuato	Arizona	Texas	United States
GDP (Millions of US $)	$861,706	$27,950	$34,383	$297,116	$1,568,642	$18,219,297
Population	119,938,473	2,874,391	5,864,777	6,802,262	27,454,880	321,039,839
GDP Per Capita	$7,185	$9,724	$5,863	$43,679	$57,135	$56,751
Households	31,949,709	814,820	1,443,035	2,463,008	9,421,412	118,208,250
Percent of pop w/ HS Diploma	25%	25%	18%	25%	25%	28%
Percent of Pop w/ College Degree*	18%	22%	13%	36%	35%	39%
Median Age	26	24	26	37	34	38
Total workforce participation rate	59%	64%	62%	69%	77%	77%
Male workforce participation rate	77%	77%	79%	74%	84%	82%
Female workforce participation rate	43%	50%	46%	64%	70%	72%

* In Mexico, this is for the population 15 and older. In the US, 25 and older. Mexico figures include those with technical certificates as well as academic degrees equivalent to a bachelor's degree or higher. US figures include academic degrees at the associate's level or higher.

Source: U.S. Census Bureau, Instituto Nacional de Estadística y Geografía (INEGI)

Incomes in Guanajuato are somewhat lower than in Sonora, being more comparable to the nation as a whole (Chart 2). Half of the employed population has income of less than about $26,000 annually. Note that Mexico's National Institute of Statistics and Geography (INEGI) reports income on an individual, not household basis, as is common practice in the United States. In places where two-income families are common, household income may be considerably higher than personal income.

Chart 2: Income Distribution in Guanajuato



Source: Calculated from Instituto Nacional de Estadística y Geografía (INEGI)

Economic Profiles

Although the state of Guanajuato has more than twice the population of Sonora, its gross domestic product (GDP) – a broad measure of the size of a region's economy – is only slightly larger than that of Sonora. This indicates that people in Guanajuato are poorer compared to their counterparts in Sonora and many other areas of Mexico. The per-capita GDP of Guanajuato is considerably lower than that of Mexico as a whole and comparison states such as Sonora or Querétaro.

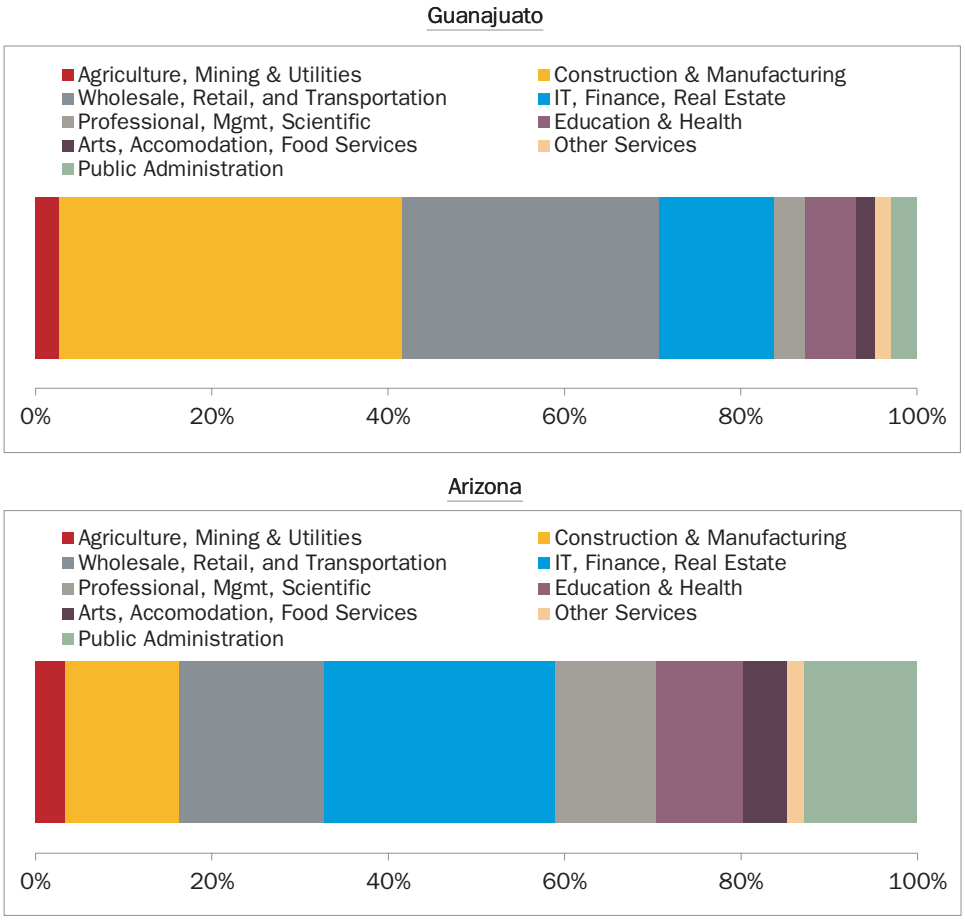
Figure 2: Guanajuato Skyline

Figure 3: San Miguel

Guanajuato has a strong manufacturing base that is modernizing rapidly. For centuries, Guanajuato has been known for its leather goods and the production of shoes. Although these industries are still an important part of the economy, in recent years the area has expanded its economic base to include the automobile industry. For example, Volkswagen has opened an international manufacturing facility in Silao, Guanajuato. Guanajuato's reliance on manufacturing contrasts with Arizona's diverse economy that has a strong presence in information technology, finance, health care and other service industries (Chart 3).

Much of this new industrial activity is centered on the

Chart 3: Industrial Composition of Guanajuato and Arizona



Source: Calculated from Instituto Nacional de Estadística y Geografía (Mexico and Guanajuato) and U.S. Department of Commerce, Bureau of Economic Analysis (United States and Arizona)

Guanajuato Inland Port.[6] This is a large industrial park adjacent to the airport in Silao. The Inland Port hosts manufacturing, logistics and educational facilities related to the emerging automotive sector.

There are 35 firms in the automotive industry at Inland Port involved in the automotive industry. In addition, there is one firm manufacturing corrugated cardboard packaging, a cosmetics plant, and a campus of the National Polytechnic Institute on the site. There are also supporting facilities on the site for services such as logistics and real estate.

Guanajuato's pleasant year-round climate and abundance of historic sites make it a promising destination for tourism. The area also supports a community of about 10,000 retirees and expatriates from the United States, attracted to the low cost of living and the good climate. This community is centered in the San Miguel area and dates from the 1940s, when a small colony of art students began living in the area.

As noted later in this report in the detailed economic analysis in Part II, there are a few industries that are significant in both Guanajuato and Arizona. These could be considered priority industries in terms of more-immediate opportunities to create synergies of trade that will be beneficial to both states.

Existing Arizona-Mexico Trade

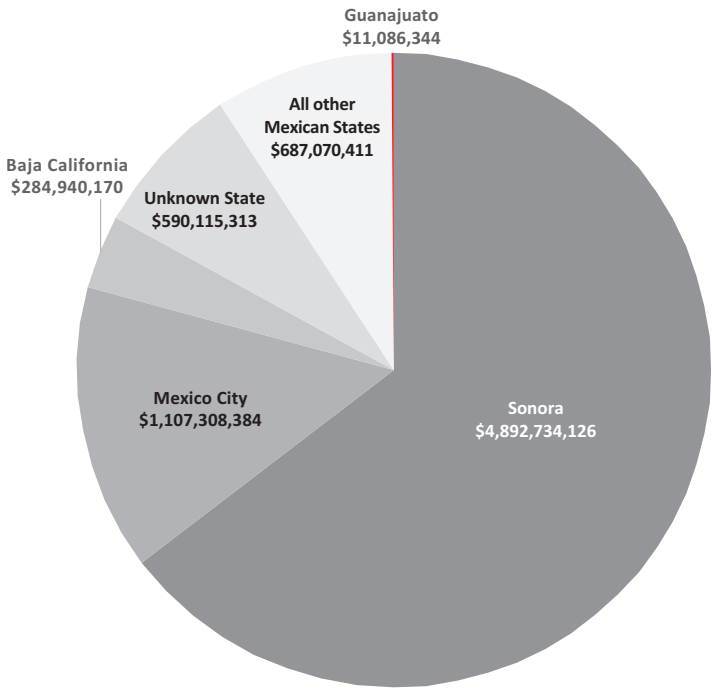
Arizona has a long history of robust trading relations with Mexico. The bulk of this trade is with the state of Sonora, located adjacent to Arizona's southern border (Chart 4, Table 2).

The total value of trade between Arizona and Mexico, counting both imports and exports, is over $15 billion annually. This level of economic activity is nearly four times Arizona's level of trade with China and over five times Arizona's level of trade with Canada.

About 30 percent of Arizona-Mexico trade in each direction comes from the electronics sector. Mining products make up another 24 percent of Arizona's exports to Mexico. In turn, agricultural products make up about 27 percent of imports. This trade is responsible for an estimated 90,000 jobs in Arizona.[7]

The value of goods exported from Arizona to Guanajuato in 2017 was $11 million in 2017.[8]

Chart 4: Value of Exports from Arizona to Mexican States, 2017



Source: U.S. Department of Transportation, Research and Innovative Technology Administration, Bureau of Transportation Statistics.

[6] http://www.puertointerior.com.mx/ventajas/index?lang=en
[7] https://www.azmc.org/media/1559/az-mx-data.jpg
[8] Bureau of Transportation Statistics

This accounted for just 0.15 percent of the state's total exports to Mexico, thus there may be opportunity to increase this share through concerted efforts and a trade promotion presence in Guanajuato.

Since 2006, the value of goods exported from Arizona to Mexico has increased by 42 percent to $76 billion in 2018. Exports to Sonora have increased by 23 percent (Chart 5). This is an indication that exports to other Mexican states has increased substantially. Exports to the capital, Mexico City, have increased greatly form $96 million in 2006 to $650 million in 2018. Chihuahua, Baja California and Queretaro have also seen significant increases. Exports to Guanajuato have declined from $39 million in 2006 to $6.6 million in 2018, indicating that a more concerted effort may be needed to increase trade.

Table 2: Value of Arizona Exports to Mexican States, 2017

Rank	Mexican State	Value	Rank	Mexican State	Value
1	Sonora	$ 4,892,734,126	18	San Luis Potosi	$ 6,358,985
2	Districto Federal	$ 816,475,530	19	Baja California Sur	$ 5,851,199
3	Estado de Mexico	$ 290,832,854	20	Yucatan	$ 4,441,016
4	Baja California	$ 284,940,170	21	Aguascalientes	$ 3,354,781
5	Chihuahua	$ 210,060,169	22	Michoacan	$ 1,207,120
6	Jalisco	$ 92,682,243	23	Colima	$ 877,095
7	Sinaloa	$ 82,712,774	24	Guerrero	$ 798,217
8	Nuevo Leon	$ 71,845,903	25	Nayarit	$ 753,953
9	Durango	$ 68,825,107	26	Veracruz	$ 750,698
10	Queretaro	$ 42,498,633	27	Chiapas	$ 423,004
11	Coahuila	$ 29,653,429	28	Quintana Roo	$ 296,024
12	Zacatecas	$ 16,071,449	29	Oaxaca	$ 212,053
13	Tamaulipas	$ 14,311,113	30	Tlaxcala	$ 186,711
14	Hidalgo	$ 13,355,315	31	Morelos	$ 122,295
15	Guanajuato	$ 11,086,344	32	Tabasco	$ 8,724
16	Campeche	$ 11,055,449	N/A	State Unknown	$ 590,115,313
17	Puebla	$ 8,356,952			

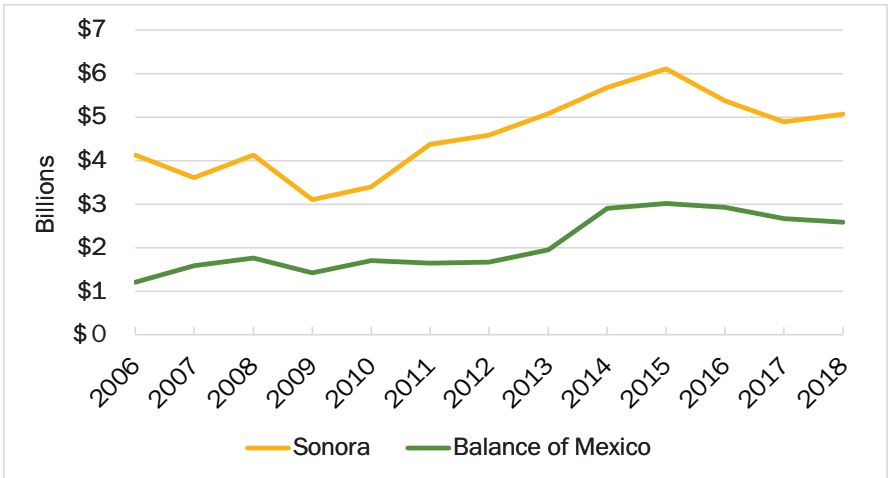
Source: U.S. Department of Transportation, Bureau of Transportation Statistics.

Sonora

Sonora has long been Arizona's primary trading partner in Mexico. In 2017, exports from Arizona to Sonora totaled $4.9 billion, representing 65 percent of total Arizona exports to Mexico.

The Nogales-Mariposa port of entry handles commercial shipments from Sonora into Arizona, including heavy trade in fresh produce. The facility was upgraded in 2016 to help reduce the long wait times for trucks at the border, but at times inadequate staffing by Customs and Border Patrol agents may still create bottlenecks.[9]

Chart 5: Value of Exports from Arizona to Mexico, 2006-18



Over this period, exports from Arizona to Guanajuato ranged from $6.4M to $54.4M.

Source: U.S. Department of Transportation, Research and Innovative Technology Administration, Bureau of Transportation Statistics.

[9] https://www.thepacker.com/article/updates-nogales-port-entry-keep-traffic-flowing-suppliers-say

Mexico City

Mexico City is the hub of both politics and the economy of Mexico. As the nation's capital, Mexico City often serves as the central location for conducting business in Mexico. Arizona exported $1.1 billion to Mexico City and the State of Mexico in 2017, accounting for 15 percent of all exports to Mexico.

The Arizona Commerce Authority operates a trade office in Mexico City, which represents Arizona's interests in Mexico and helps Arizona businesses wishing to pursue opportunities throughout the country.

The state of Arizona also operates a trade and investment office in Mexico City that provides assistance to Arizona companies seeking to do business not only in the capital, but throughout the entire country. Most of this work involves helping Arizona firms with exporting products and services to private and public sector entities in Mexico. In addition to assisting private firms, the office also aids business associations, economic development groups and universities in developing ties with Mexico. To date, Arizona's trade office in Mexico has engaged in over 260 projects to assist Arizona firms doing business throughout Mexico.

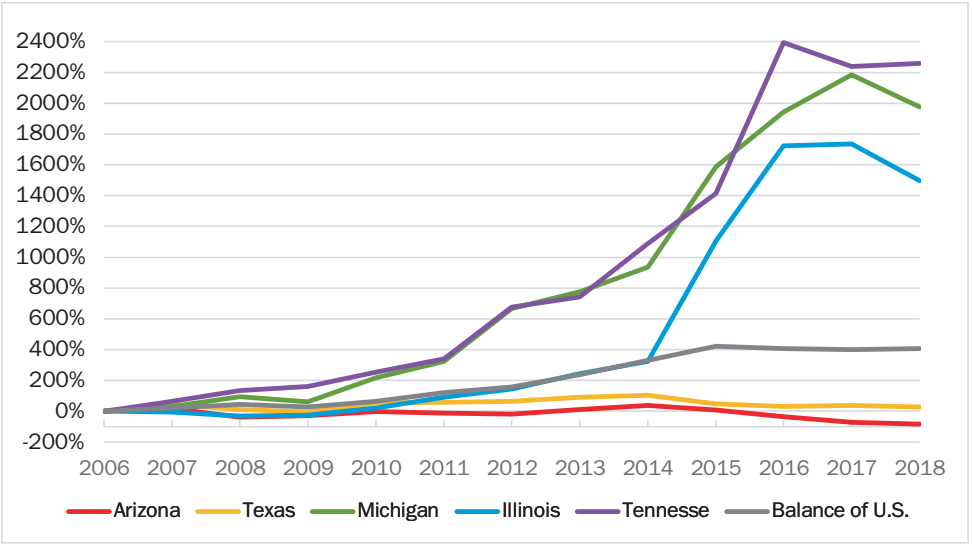
Exports from Other States to Guanajuato

Guanajuato's commitment to increased trade with the United States is spearheaded by trade offices in Dallas, Los Angeles, Atlanta and Chicago, as well as a presence in North Carolina.

In 2006, Guanajuato imported $2.8 billion in goods from the United States. Seventy percent of this amount came from the state of Texas, with slightly over one percent coming from Arizona. By 2018, total imports from the United States into Guanajuato reached $8.4 billion, an increase of nearly 200 percent. The Texas share of this activity had dropped dramatically, to 30 percent, even though the total value of imports from Texas has grown since 2006.

This change in import patterns for Guanajuato has been driven by the state's emergence as a hub for the automotive industry. As shown in Chart 6, there have been huge increases in imports to Guanajuato from states with a large presence in the automotive sector since 2010. Since 2014, when imports from the U.S. surged dramatically, exports from states that have less concentration in the automotive industry have declined. Exports from Texas to Guanajuato have

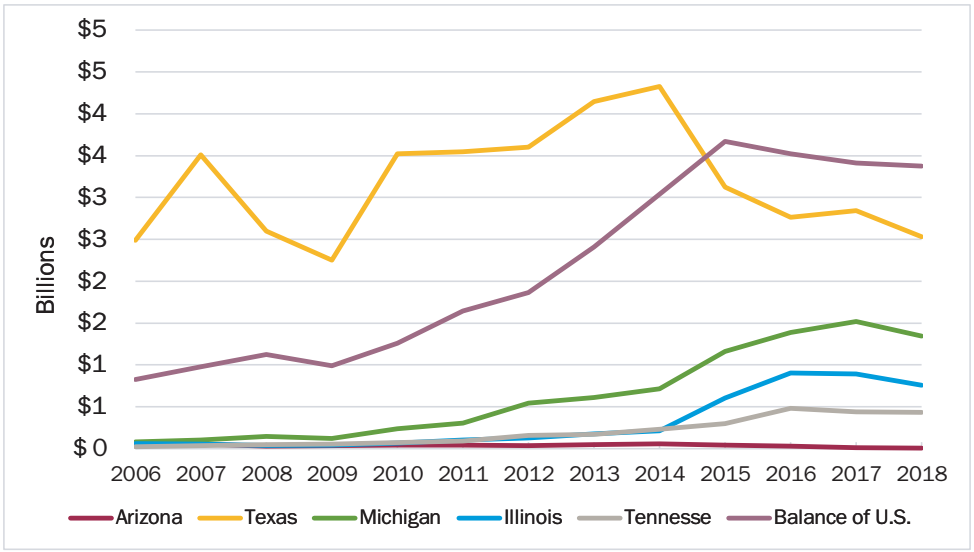
Chart 6: Percent Change in Value of Exports to Guanajuato



Source: U.S. Department of Transportation, Research and Innovative Technology Administration, Bureau of Transportation Statistics.

decreased by 38 percent and those from Arizona have decreased by 88 percent. The decline in Arizona exports to Guanajuato was led by decreases in computer-related machinery and parts, which went from $29 million in 2014 to $3 million in 2018. Paper and paperboard exports from Arizona also declined sharply, from $12 million in 2014 to $295,000 in 2018.

Chart 7: Change in Value of Exports to Guanajuato in 2018 dollars



Source: U.S. Department of Transportation, Research and Innovative Technology Administration, Bureau of Transportation Statistics.

Tennessee provides an example of how a state can capitalize on industrial alignments to increase its exports. In 2006, that state exported $18 million in goods to Guanajuato, less than half of the amount Arizona exported. Tennessee already had a presence in the automotive industry, with a GM assembly plant in Spring Hill, when Guanajuato began its expansion in the field. Guanajuato represented a new market for Tennessee and exports grew substantially starting around 2010, growing to $435 million in 2018.

Other states can expand trade with foreign partners as Tennessee has done. This will require recognizing and exploiting existing compatibilities in the industrial profile of potential partners and searching for opportunities to expand into new industries that show promise for future trade relations.

Transportation

Located in central Mexico, Guanajuato is well positioned to be a transportation and logistics hub for trade in the region. Although shipments between Mexico and the United States necessarily run on north-south alignments up the east and west coasts of the country, Guanajuato is positioned so that it can play an important role in east-west movement of goods in Mexico.

Since the ratification of the NAFTA trade agreement in 1993, Mexico has made considerable progress in improving its transportation infrastructure. Mexico's newly elected President Andres Manuel Lopez Obrador has made transportation infrastructure a priority in his administration, including improvements to road, rail and air facilities.[10]

Although landlocked like Arizona, Guanajuato may have an opportunity to facilitate the movement of goods to the port of Guaymas in Sonora. Arizona has signed onto an agreement to improve natural gas pipelines to

[10] https://www.export.gov/apex/article2?id=Mexico-Transportation-Infrastructure-Equipment-and-Services

Guaymas, positioning the port to be an export site for liquefied natural gas headed to Asia.[11] Over the past decade, the port at Guaymas has doubled its capacity in a bid to increase its share of shipping to and from Asian ports.

Guanajuato has an opportunity to insert itself into a larger supply chain of goods flowing around the continent, bringing parts together from disparate locations for final assembly and shipment to consumers. Guanajuato and Arizona have something in common in this respect. Although manufacturing does not play a dominant role in Arizona's economy, the state has an increasing role in transportation and logistics, facilitating manufacturing operations that may be thousands of miles away.

Highways

Highway infrastructure is generally good in Mexico (Figure 4), but it is more developed in the country's East, facilitating easy travel to border crossings in Texas. This eastern orientation gives easy access to large markets in the South, East and Midwest regions of the United States.

Conversely, the highway system in the West of Mexico, which provides access to the ports of entry in Arizona, is less developed. This, coupled with the greater distance to Arizona from Guanajuato, translates to travel times between Nogales and Guanajuato of over 22 hours. This is double the 11 hours it takes to drive between Guanajuato and Laredo, Texas. Travel time to the crossing at El Paso, Texas, is also considerably less than that to Nogales.

At least 80 percent of Arizona's current exports to Guanajuato travel by truck, such that the highways connecting the two states are a key piece of their shared economic infrastructure.

Figure 4: Highway Connections

Railroads

Railroads can be more efficient than trucks when moving cargo that is large and heavy, or when shipping over long distances.

As with the highway system, railroads in Mexico are oriented to provide transportation in the East of the country (Figure 5). Again, this expedites trade with the large, densely packed population centers in the Midwest and Eastern United States.

[11] http://www.kallanishenergy.com/2018/12/21/new-mexico-arizona-sonora-to-develop-new-natural-export-plan/

The rail line that parallels the Mexican West Coast links to the United States rail network in Nogales. Ford Motor Company has an assembly plant in Hermosillo, Sonora, and has sent automobiles by rail into the U.S. through Mexico. According to an official for the Arizona Department of Transportation, criminal activity on the rail line has placed this service in jeopardy. Ford now finds it easier to send assembled vehicles by cargo ship from Hermosillo to the port of Long Beach, where they are loaded onto railcars for shipment to U.S. markets.

Air Links

Del Bajio International Airport, located between the cities of Silao and León will be an important asset in the economic development of Guanajuato. In 2018,

Figure 6: Air Connections

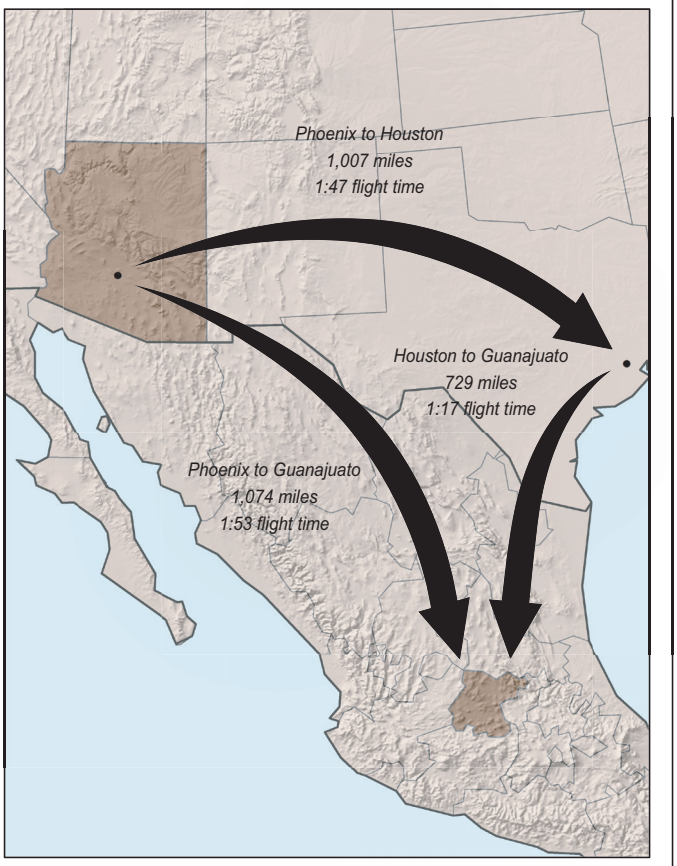


Figure 5: Rail Connections

there were 12 regularly scheduled daily flights into Guanajuato from the United States and 12 returning to U.S. The five airlines operating these flights carried over 600,000 passengers into and out of Guanajuato from the U.S. in 2018.[12] This amounted to over 800 passengers daily in each direction.

The passenger traffic between the United States and Guanajuato is largely focused on the major hub cities of Los Angeles, Dallas and Houston (Table 3).

In addition to the regularly scheduled flights between Guanajuato and the United States, there were also about 100 unscheduled cargo flights in 2018. These flights carried 354 tons of cargo into Guanajuato and shipped 56 tons to the United States. Sixty percent of the inbound air cargo to

[12] Secretaria de Communicaciones y Transportes: http://www.sct.gob.mx/transporte-y-medicina-preventiva/aeronautica-civil/5-estadisticas/53-estadistica-operacional-de-aerolineas-traffic-statistics-by-airline/

Guanajuato was from Laredo, Texas and 81 percent of the outbound cargo flew to Laredo.

However, there are currently no regularly scheduled flights between Arizona and Guanajuato, either for passengers or cargo. Passengers flying to Guanajuato now fly to an intermediate stop, such as Houston, and then connect to a flight to Guanajuato International Airport, located near Silao.

With a layover in Houston, travel time by air to Guanajuato from Phoenix is more than 8 hours. If non-stop service were available between Phoenix and Guanajuato, this could be reduced to less than 2 hours (Figure 6).

Table 3: Airline Passengers Arriving in Guanajuato from the United States, 2018

Origin City	Passengers	Percent
Atlanta	26,818	9%
Chicago	26,057	8%
Dallas-Fort Worth	51,896	17%
Detroit	6,271	2%
Houston	78,310	25%
Los Angeles	100,533	32%
Oakland	15,770	5%
Ontario	609	0%
Sacramento	2,021	1%
San Jose, California	2,107	1%
Total	**310,392**	**100%**

Source: Secretaria de Communicaciones y Transportes

Interestingly, the neighboring state of Querétaro, which is becoming a major player in aviation-related manufacturing, does not have an international airport. Querétaro lies just 150 kilometers (93 miles) from Guanajuato International Airport.

Higher Education

The University of Guanajuato is the major institution of higher education in Guanajuato. It offers bachelor's, master's and doctoral degrees as well as specialty degrees for training in specific occupations.

The main campus is in the capital of Guanajuato city. In addition, the University of Guanajuato has satellite campuses in Celaya, Irapuato and León. Total enrollment is approximately 26,000 students. Enrollment grew by 12 percent between 2017 and 2018. Graduations have also increased in recent years. In 2018, 3,698 degrees were awarded, a 76 percent increase from 2016.[13]

Graduate students in master's and doctoral programs made up 6 percent of the students at University of Guanajuato. The remainder were in bachelor's programs, which include technical certifications in Mexico. These technical programs exist to fill the industrial needs of the country, providing the occupational skills needed to power the economy.

The university offers a Mathematical Sciences Semesters in Guanajuato (MSSG) program to attract international students who wish to study data science and mathematical modelling. This program is sponsored by el Centro de Investigación en Matemáticas (CIMAT), a research center at the University of Guanajuato that focuses on mathematics, statistics and computer science.

Arizona State University's College of Nursing and Health Innovation has had a continuing memorandum of understanding to collaborate with the University of Guanajuato since 2007. Through the relationship, ASU's College of Nursing and Health Innovation (CONHI) has partnered with the University of Guanajuato and the Pan-American Health Organization on sleep research and other health issues. In 2015, faculty from CONHI

[13] http://www.ugto.mx/informe2017-2018/

received the ASU President's Medal for a Spanish language sleep-training program in Guanajuato. The current MOU is set to expire in June 2019 and discussions to renew the agreement are underway.

Arizona State University has about 100 students from Mexico each year studying at one of the university's campuses or online.[14] ASU has a significant educational presence around the world, including programs in China and partnerships with several Mexican universities including the National Autonomous University of Mexico, Monterrey Institute of Technology and Higher Education and the University of Sonora.

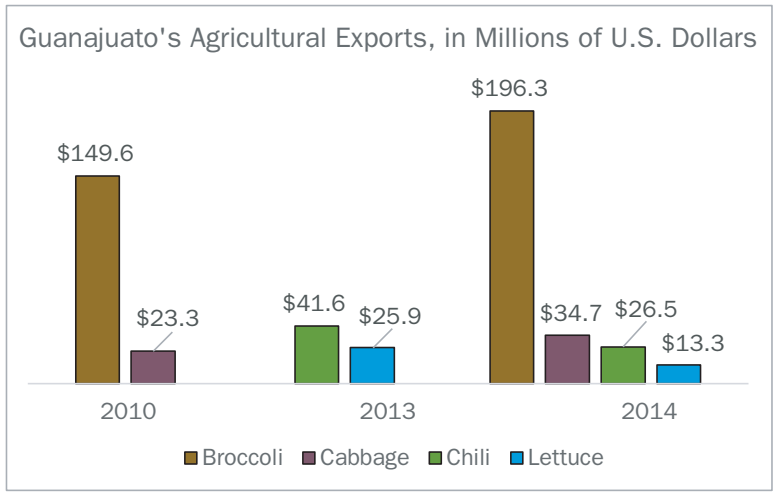
Agriculture

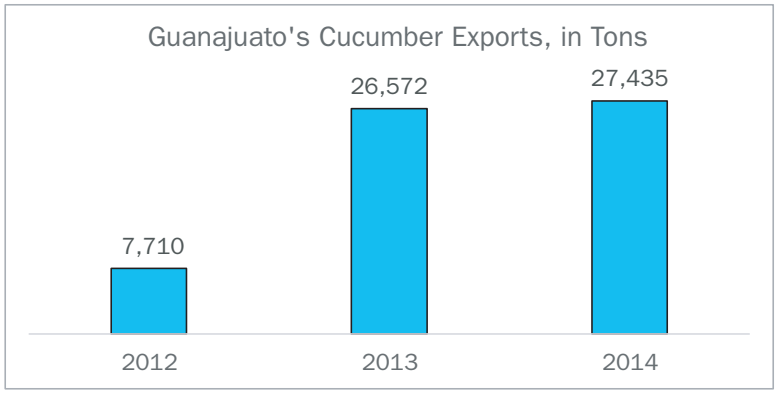
Guanajuato is a leading exporter of agricultural products, particularly produce. The United States accounts for over 97 percent of the products grown in and exported from Guanajuato. Guanajuato also exports produce to Canada, France, Japan and Poland. For example, Guanajuato is the leading Mexican exporter of broccoli, and Guanajuato's broccoli imports to the United States totaled to $196.3 million in 2013.[15] Of the 40,000 hectares of broccoli grown in Mexico, 38,000 of these hectares are located in Guanajuato.

Vegetable exports are increasing, as Guanajuato's cabbage exports increased to $34.7 million in 2013, up from $23.3 million in 2010 (Chart 8). Onions, carrots and celery follow similar increasing trends while chili and lettuce exports are decreasing.

While exports are growing year over year, the upward trend could be hastened with new and improved transportation infrastructure that would vastly reduce transit times, of particular importance to importing produce.

Chart 8: Guanajuato Agricultural Exports





Source: www.freshplaza.com

[14] Arizona State University Office of Institutional Analysis
[15] Mexico: Guanajuato Leading Exporter of Broccoli. https://www.freshplaza.com/article/134815/Mexico-Guanajuato-leading-exporter-of-broccoli/

Case Study

SkyBridge

Moving cargo quickly and efficiently around the globe has allowed for tremendous increases in business productivity, both by opening new markets for products and by streamlining the supply chains that businesses rely upon.

A new venture at Phoenix-Mesa Gateway Airport seeks to increase speed and convenience of trade between the United States and Mexico. SkyBridge plans to have Mexican customs officials on site at its facility adjacent to the runway, clearing cargo through customs before it ever leaves Arizona. Cargo would be loaded directly onto planes in Mesa and then flown to Mexico.

This Unified Cargo Processing program is a significant step beyond the Preclearance Program operating in Laredo, Texas. The Laredo facility initiates shipments to export to specific companies operating maquiladora plants in the electronics, aerospace and automotive industries.

The Unified Cargo Processing planned for SkyBridge will allow shipments from Mesa to any airport in Mexico and to any firm or individual in that country. That's because the cargo already would have cleared customs, so the planes would not necessarily have to land at an international airport with customs facilities in Mexico. This not only allows for a wider choice of destinations within Mexico, but also will save time.

SkyBridge has recently processed the first e-commerce shipment to Mexico through the facility.[16] Shipments to Mexico from online vendors such as Amazon typically take

Figure 7: Automotive Manufacturing Facilities in Guanajuato

Source: Guanajuato Puerto Interior (Interior Port of Guanajuato)

[16] http://chamberbusinessnews.com/2019/02/08/first-e-commerce-shipment-using-joint-us-mexico-customs-completed-at-skybridge/

15 days to arrive, according to Marco Lopez of SkyBridge. The new firm hopes to reduce this delivery time by streamlining the customs process at a central location.

Metropolitan Phoenix is already host to a substantial Amazon presence with a large fulfillment center on the west side of Phoenix. SkyBridge may be able to capitalize on this by providing a conduit for Amazon to extend its services to an emerging middle class in Mexico.

If SkyBridge can convince freight forwarders – the companies that arrange transport of cargo for global companies – that its model is efficient and cost-effective, Phoenix-Mesa Gateway Airport soon could be a major hub of shipments headed in and out of Mexico, including Guanajuato.

SkyBridge is owned by the same company that owns SkyPlus, a comparable facility at the Guanajuato Inland Port.[17] Skyplus Developments, LLC is the controlling interest in both properties.

Potential Opportunities and Complementarites

Multiple potential opportunities exist to strengthen Arizona's economic ties with Guanajuato. For one, Guanajuato already has a strong agricultural sector, providing vast produce exports to the United States. With faster transit through increased transportation infrastructure, the farm-to-table time for Guanajuato's produce could be halved. In particular, such stronger infrastructure could position Arizona to be a gateway for Guanajuato's produce to the western half of the United States.

Other complementary opportunities may exist between Guanajuato's automobile manufacturing sector and Arizona's high-tech manufacturing industries. Guanajuato's automobile manufacturing sector is quickly increasing its capacity in the region (Figure 5) with nearly 40 automotive plants under expansion.[18] Guanajuato also enjoys a peripheral manufacturing framework related to its strong automobile industry. For example, Henkel recently expanded its Guanajuato production of an automotive sealer. As well, Arizona's high-tech manufacturing contributes to the state's economic future. With both of these manufacturing sectors increasing on their respective sides of the border, certainly a synergy of opportunity exists.[19]

Guanajuato's strong manufacturing heritage, including its role in manufacturing leather goods, shoes and automobiles presents opportunities for expansion to support the economic sectors experiencing growth in Arizona's economy. One can imagine numerous instances for opportunity between Guanajuato and Arizona. Coupling Guanajuato's manufacturing foundation supply with Arizona's economic growth demand areas (such as housing and construction) through strategic partnerships may shorten the trade distance between these two states.

Arizona's industrial portfolio is diverse and not reliant on any one sector of the economy for success (Chart 3). There may be opportunities for Arizona to capitalize on some of these varied strengths to compliment

[17] Email from Martin Lopez, SkyPlus
[18] "Nearly 40 Automotive Plants are under Expansion in Guanajuato, says Official." 2/19/2018. https://mexico-now.com/index.php/article/3661-nearly-40-automotive-plants-are-under-expansion-in-guanajuato-says-official
[19] "Germany-based Manufacturer Henkel to Increase Production in Guanajuato." 12/11/17. https://mexico-now.com/index.php/article/3401-germany-based-manufacturer-henkel-to-increase-production-in-guanajuato

Guanajuato's emphasis on manufacturing. Arizona has developed abilities providing the financial infrastructure needed to sustain business – everything from call centers to insurance and banking services. These may be brought into play in support of Guanajuato's manufacturing capacity.

Manufacturing represents both a challenge and an opportunity for increased trade between the two states. While Arizona's manufacturing sector isn't currently producing automotive components that match Guanajuato's exact demands, Arizona's high-tech manufacturing sector is strong and could pivot towards such production if the will existed and economic conditions were favorable. Given the information we have today, changes would be required among companies on both sides of the border to grow a successful manufacturing trade relationship.

Certainly, a role for government exists in stimulating economic activity between Arizona and Guanajuato, but a large role also exists for the multinational corporations on both sides of the border to invest in a stronger trade relationship.

Part II: Detailed Economic Analysis

Summary

The Mexican state of Guanajuato is in the central portion of the country. Its capital — the city of Guanajuato — is 365 kilometers northwest of Mexico City. The state's high elevation of more than 2,000 meters combined with the relatively low latitude of about 21 degrees north results in a pleasant year-round climate.

Settlement of the state began in earnest during the 1540s, following the discovery of gold and silver deposits. Over time, the economy diversified to include farming and ranching. More recently, manufacturing has become the primary economic activity.

In this section, a demographic, economic and international trade profile of the state of Guanajuato is presented. Guanajuato is compared both to Arizona and to three of its bordering states: Jalisco, Querétaro, and San Luis Potosí. Guanajuato consists of 46 municipalities (a municipality is similar to a U.S. county). The seven municipalities with the greatest employment — León, Celaya, Irapuato, Silao, Salamanca, San Francisco del Rincón, and Guanajuato — also are examined in this paper.

Demographics

In 2015, the population of Guanajuato was estimated at 5.85 million, 86 percent of Arizona's population of 6.8 million. In contrast, the land area of Guanajuato is only 10 percent that of Arizona. The settlement pattern in Guanajuato is considerably different from that in Arizona, in which 75 percent of the population is concentrated in Maricopa County and Pima County. In these urban areas, cities generally are not separated from each other by less densely settled areas. In 2015, León, the most populous municipality in Guanajuato, had a population just 39 percent that of Maricopa County; Irapuato, the second most populous municipality, had a population 57 percent that of Pima County. Thus, a greater share of Guanajuato's residents was dispersed across the state, with physical separation existing between each of the major population centers.

Most of the demographic data derives from the 2015 Mexican Intercensal Survey. With a median age of approximately 27, residents of Mexico were much younger than residents of the United States, whose median age was between 36 and 37. Residents of the state of Guanajuato were somewhat younger than residents of the entire nation and of each of the three comparison states. In contrast, residents of Arizona were slightly older than the United States median age.

Of those 25 and older, educational attainment in the United States was far greater than in Mexico. Guanajuato's figures were lower than Mexico and each of the three comparison states. Looking at the attainment of young adults (age 25 to 34), the differential was not as large between Mexico and the United States. Guanajuato's figures again were lower than the nation and each of the three comparison states.

In Mexico in 2015, the labor force participation rate for individuals 12 and older was 50.4 percent. Males had much higher rates of labor force participation than females in all age groups. The overall rate was 68.7 percent for men and 33.6 percent for women. Participation rates among Mexican men exceeded the rates of American men, but participation rates among Mexican women were considerably less than the rates of women in the United States.

The overall labor force participation rate in Guanajuato in 2015 (50.1 percent) was marginally less than the national figure. Relative to the nation, the rate in Guanajuato was higher among those younger than 25 but lower in each of the other age groups. Guanajuato's overall labor force participation rate was higher than in San Luis Potosí, but less than in Jalisco and Querétaro.

In the prime working age group of 25 to 54 years of age, the participation rate nationally was 91.4 percent for men, 47.0 percent for women, and 68.1 percent for men and women combined. The participation rate in Guanajuato for men was marginally less than the national figure; the differential was larger for women. For both sexes, the participation rate in Guanajuato was less than in Jalisco and Querétaro.

The overall unemployment rate in Mexico in 2015 was 4.1 percent, less than that of the United States. The unemployment rate in Mexico was highest among young labor force participants and considerably higher among men (4.8 percent) than women (2.7 percent). In Guanajuato, the overall unemployment rate was marginally higher (4.4 percent) than in the nation. The rate for men was higher than the national average, while the rate for women was slightly less than the national figure. Guanajuato had the highest unemployment rate among the four states, though the differences between the states were not substantial.

In the 2015 Mexican Intercensal Survey, employment for the nation and states was presented for five broad sectors: agriculture; mining, manufacturing and utilities; construction; wholesale and retail trade; and other. The employment share in Guanajuato was greater than the nation and each of the comparison states in the mining, manufacturing and utilities category, offset by a below-average share and the lowest of the four states in the "other" category, which includes various services as well as transportation and warehousing.

Employment for the nation and states also was presented for nine occupational divisions. The employment share in Guanajuato was greater than the nation and each of the comparison states in two of the occupational divisions: craft workers; and machine operators, assemblers and drivers. These high shares were offset by below-average shares, and the lowest shares of the four states, in three occupational divisions: administrators and managers; professional and technical; and administrative support.

Economics

The economic analysis is based on two economic indicators. Gross domestic product (GDP) estimates are available for 2017 by state in the United States and Mexico, but provide data only for 20 sectors and selected subsectors. To obtain more industrial detail, and for data on municipalities in Guanajuato, employment data for 2014 are used. However, disclosure laws preclude the release of some of the employment data.

Guanajuato Compared to Mexico and Neighboring States

At the broad level of 20 sectors and based on GDP data, the mix of economic activities in Guanajuato in 2017 differed from that of Mexico primarily by its manufacturing sector accounting for a considerably larger share of the total. The wholesale trade sector's share also was higher than the national average, while the share of the mining sector was considerably less than the national average. In the other sectors, the share in Guanajuato ranged from somewhat more than the national average in a few sectors to less than average in the majority of sectors. Lower shares occurred particularly in "white collar" services sectors: information; finance and insurance; real estate and rental; professional, scientific and technical services; administrative

support; and public administration.

Within the manufacturing sector and based on GDP, the share in Guanajuato was much higher than the national average in two of the 12 categories: apparel, leather and allied products; and petroleum, coal, chemicals, plastics and rubber. The share was marginally above average in the broadly defined machinery, electronic, electrical, and transportation equipment and products category. In each of the other nine manufacturing categories, the share in Guanajuato was less than the national average. Thus, manufacturing was particularly concentrated in a relatively small number of activities in Guanajuato.

The sectoral mix in Guanajuato was relatively similar to each of the comparison states, but greater differences were present within the manufacturing sector. The share of manufacturing GDP in Guanajuato was much higher than the national average and each of the three comparison states in two categories: apparel, leather and allied products; and petroleum, coal, chemicals, plastics and rubber. In the machinery, electronic, electrical, and transportation equipment and products category, the share in Guanajuato was similar to the national average and to Jalisco but lower than in Querétaro and San Luis Potosí. In several of the other manufacturing categories, the share in Guanajuato was less than the national average and less than in at least two of the comparison states.

Consistent GDP data for Mexican states are available for 2003 through 2017. Economic activity in Guanajuato expanded more than the national average over these 14 years. The overall stronger increase was primarily due to a larger gain in manufacturing in Guanajuato than in the nation. Other sectors with stronger than average advances in Guanajuato included wholesale trade and transportation and warehousing.

Eleven of the 12 manufacturing categories experienced a greater increase in GDP in Guanajuato than in the nation between 2003 and 2017. Much larger increases occurred in the categories of beverages and tobacco; primary metal and fabricated metal products; machinery, electronic, electrical, and transportation equipment and products; petroleum, coal, chemicals, plastics and rubber; and apparel, leather and allied products.

Using the employment data, it is possible to determine the most important industries in Guanajuato. Footwear manufacturing was the dominant industry in 2014. Other significant manufacturing industries in the state included leather and hide tanning and finishing; frozen fruit, juice and vegetables; rubber products other than tires, hoses and belts; and plastic plumbing fixtures and other plastics. Other important manufacturing industries included toilet preparations, such as cosmetics; motor vehicle transmission and power train parts; other leather and allied products; dairy products; and paperboard containers. Other than manufacturing, long-distance truck transportation and wholesale trade of footwear were the most important activities.

None of the three comparison states had such a dominant industry as footwear manufacturing in Guanajuato. Among the four central Mexican states, few industries were among the leading industries in more than one state. Within the manufacturing sector, exceptions included footwear (Guanajuato and Jalisco), other plastics products (Guanajuato and Querétaro), major appliances (Querétaro and San Luis Potosí), and other motor vehicle parts (Querétaro and San Luis Potosí).

Among activities other than manufacturing, Jalisco and Querétaro had substantial wholesale trade activities,

though not in the footwear category as in Guanajuato. Long-distance truck transportation was an important activity in Guanajuato and Querétaro.

Guanajuato Compared to Arizona

The differences in the sectoral shares between Guanajuato and Arizona partially follow the general pattern of the two nations. The economies of Mexico and the United States are considerably different, as expected when comparing a still-developing country to a highly developed country. Based on GDP, the sectoral share was higher in the United States in most of the services sectors, while the share was higher in Mexico primarily in the goods-producing and related sectors (such as wholesale trade). Even within manufacturing, the economic composition differed considerably between the two countries. In particular, the share of manufacturing was much higher in Mexico in the food, beverages and tobacco category, offset by a much lesser share in the plastics and rubber category.

The differences in the sectoral shares between Guanajuato and Arizona were larger than between the nations. In particular, the difference in the manufacturing share was much larger between the states than between the nations, with a much higher share in Guanajuato than Arizona. Other sectors in which the differences between the states were considerably variant from the differences between the nations included mining, real estate and rental, and administrative support, whose shares were higher in Arizona than in Guanajuato. Within manufacturing, while the shares in the machinery, electronic, electrical and transportation equipment category were similar nationally, the share in Guanajuato was much less than in Arizona. In contrast, Guanajuato had higher shares than Arizona in the petroleum, coal, chemicals, plastics and rubber category and in the apparel, leather and allied category.

As measured by both GDP and employment, the manufacturing sector in Guanajuato was substantially more important than in Arizona. In each of the available manufacturing categories except for the miscellaneous category, manufacturing in Guanajuato was more important than in Arizona, especially in apparel, leather and allied products; and petroleum, coal, chemicals, plastics and rubber. Other manufacturing categories more important in Guanajuato than Arizona included food, beverages and tobacco; and textile mills and textile products. Other than manufacturing, wholesale trade was relatively more important in Guanajuato. In contrast, several sectors — particularly mining, management of companies, and administrative support — were relatively more important in Arizona than in Guanajuato. A more in-depth look at the economies of the two states reveals the magnitude of the differences in their economic structures. In fact, hardly any industries are important in both states.

Municipalities within Guanajuato

The nondisclosure of detailed employment data is much more of an issue at the municipality level, even for seven municipalities with the most employment in the state of Guanajuato. Manufacturing was a significant activity in 2014 in each of the seven municipalities except Guanajuato. However, the type of goods produced varied significantly across the municipalities.

The state of Guanajuato's major industry of footwear manufacturing was located in León and San Francisco del Rincón. The concentration was greater in San Francisco but León was the center of the industry due to its much larger size. Associated leather industries were primarily located in León. The state's rubber and

plastics industries were located in León, San Francisco, and Celaya, with a high concentration in the rubber industry in San Francisco, but with León again the primary center. In contrast, the conservation of fruits and vegetables through freezing or canning was strongest in Irapuato, with some activity in Salamanca and Silao. Other food manufacturing, including animal processing, dairy products, bakeries and grains primarily were located in Celaya, but some activity occurred in Irapuato, Salamanca and San Francisco. The production of toilet preparations occurred in Celaya. Paperboard products were produced mostly in León but also in San Francisco. The various motor vehicle industries were strongest in Silao, though some also were located in Celaya.

While not of particular importance at the state level, additional manufacturing industries were significant in a few of the municipalities. This list includes textile and fabric finishing in San Francisco; textile mills in San Francisco; cut and sew apparel in Irapuato and San Francisco; printing in San Francisco, Celaya and León; petroleum and basic chemicals in Salamanca; fabricated metals in Irapuato, with some activity in Celaya and Silao; and household appliances in Celaya.

Wholesale trade of footwear primarily occurred in León, though the concentration was stronger in San Francisco. Wholesale trade of raw materials was important in Irapuato, Celaya and León. Long-distance trucking was located in León, Celaya and Salamanca.

Transportation Infrastructure

In general, Guanajuato and its comparison states are equally well served by the surface transportation infrastructure. Each state and the primary population centers have access to major highways and to major rail lines. In contrast, the air transportation infrastructure varies by state. Guanajuato has an international airport between the cities of León and Silao. Jalisco has two international airports, San Luis Potosí has two national airports but no international airport, and Querétaro does not have a major airport.

While Guanajuato is well served by its transportation infrastructure, the distance and travel time to the U.S. ports of entry in the lower Rio Grande Valley of Texas is about half of that to Arizona. El Paso, Texas, also is closer to Guanajuato than Arizona.

International Trade

Trade data are available on the shipment of goods from the United States and from individual U.S. states to Mexico and to individual states within Mexico. The state-level data are not as reliable as the national data. Data also are available for goods shipped from Mexico to the United States. However, data are unreliable on the shipment of goods from Mexico to individual U.S. states and nonexistent for the shipment of goods from specific Mexican states to specific U.S. states. Trade data that are available provide the value of trade in U.S. dollars by commodity category and by mode of transportation.

Exports from the United States to Mexico, Guanajuato and Neighboring States

The per capita value of total exports from the United States to Guanajuato in 2017 was 25 percent less than the per capita value of exports from the United States to Mexico (based on the populations of Guanajuato

and Mexico). The lower per capita value to Guanajuato is a reflection of the distance from Guanajuato to the United States and the disproportionate amount of trade between the border states of Mexico and the United States due to the maquiladora program that initially was designed only for the region of Mexico close to the United States.

Of the total value of exports from the United States to Guanajuato in 2017, four of 98 commodity categories accounted for 62 percent: vehicles other than railway; computer-related machinery and parts; electrical machinery, equipment and parts; and plastics. By commodity, the mix of exports from the United States to Guanajuato was different from that to all of Mexico. The per capita value of exports to Guanajuato was considerably higher in the categories of vehicles other than railway; paper and paperboard; and articles of iron and steel. The per capita values to Guanajuato were much less than to the nation in the categories of mineral fuels, oils and waxes; special classification provisions; organic chemicals; cereals; and aircraft, spacecraft and parts. Per capita values to Guanajuato also were lower in the categories of electrical machinery, equipment and parts; and aluminum.

More than two-thirds of the value of goods exported from the United States to both Mexico and Guanajuato were transported by truck. While the remainder of the value of exports from the United States to Mexico was split among other modes of transportation (including ship, rail, air, pipeline and other means), nearly all of the balance to Guanajuato was transported by rail.

Between 2010 and 2017, the total value of exports to Guanajuato increased more than the value of all exports to Mexico. Categories experiencing an especially large increase relative to the nation included electrical machinery, equipment and parts; articles of iron and steel; and plastics. Substandard increases occurred in the vehicles other than railway and cereals categories. Between 2010 and 2017, an increasing share of the value of exports from the United States to Guanajuato was transported by truck, offset by a decreasing share traveling by rail.

Based on the populations of the Mexican states, the per capita value of exports from the United States to Guanajuato was considerably higher than the per capita value to Jalisco, a little higher than the per capita value to San Luis Potosí, and considerably less than the per capita value to Querétaro. The commodity mix varied by state, with Guanajuato's per capita value within the range of the four states in the primary categories. Guanajuato's per capita value was highest of the four states in some of the less-sizable categories, including articles of iron and steel; miscellaneous chemical products; and raw hides and skins. In addition, the per capita value shipped by rail was higher to Guanajuato than to the comparison states.

Exports from Arizona to Mexico, Guanajuato and Neighboring States

The per capita value of exports from Arizona to Mexico in 2017 was greater than the U.S. per capita value, based on the populations of the United States and Arizona. The commodity mix of exports from Arizona to Mexico differed considerably from the nation. In particular, the per capita value of exports was considerably higher in Arizona than the nation in the categories of electrical machinery, equipment and parts; and ores, slag and ash. In contrast, Arizona's per capita values were moderately lower in the categories of computer-related machinery and parts; and mineral fuels, oils and waxes.

Annual fluctuations in the value of exports from Arizona make it difficult to discern between a true trend

in trade value and transitory increases or decreases. Commodities in which a trend in the share of Arizona's exports appear to be present include an increase in vehicles other than railway, and decreases in computer-related machinery and parts, and food residue and waste.

The per capita value of exports from Arizona to Guanajuato in 2017 was only 6 percent of the U.S. per capita value to Guanajuato, based on the populations of the United States and Arizona. That is, very few goods were exported from Arizona to Guanajuato. Between 2010 and 2017, the value of exports from Arizona to Guanajuato varied annually, but even in the year with the highest value, Arizona's per capita value was far below the national average. The per capita value of exports from Arizona to Guanajuato's neighboring states also was far below Arizona's per capita value to Mexico.

The value of exports from Arizona to Guanajuato of specific commodities varied widely by year. Between 2011 and 2017, computer-related equipment and parts accounted for roughly half of the Arizona total. Other commodities that had a moderate value in some years include electrical machinery, equipment and parts; photographic goods; plastics; and paper and paperboard. Between 2011 and 2017, at least 80 percent of the value of Arizona's exports to Guanajuato were transported by truck; nearly all of the rest were sent by rail.

Differences in the mix of commodities exported from Arizona to Mexico relative to those exported from the United States to Mexico in 2017 generally reflect Arizona's economic base. In contrast, the commodity mix of the limited exports from Arizona to Guanajuato bear little resemblance to Arizona's economy. In 2017, disproportionate shares of Arizona's exports to Guanajuato occurred in the commodities of dairy products; food residue and waste; essential oils and resinoids; photographic goods; plastics; and computer-related machinery and parts.

General Description and Population of Guanajuato

The geopolitical subdivisions in Mexico are similar to those of the United States. Mexico consists of 31 states and a federal district. States are divided into municipalities, which are comparable to counties in the United States. Generally, the name of a municipality is the same as that of its largest city, which often is home to a sizable proportion of the municipality's residents. For example, in each of Guanajuato's three most-populous municipalities in 2010, the namesake city accounted for more than 70 percent of the municipality's residents.

Metropolitan areas are defined in Mexico, but the definitional methodology differs from that of the United States. Each country specifies a minimum population size for a metro area, but the criteria used in Mexico to designate metro areas generally requires that a metro area consist of at least two municipalities with economic linkages, while a single county can be designated as a metro area in the United States.[20] As a result, some populous municipalities, such as Irapuato in the state of Guanajuato, are not included in the list of metro areas in Mexico. Thus, municipality, rather than metro area, is the preferred unit of geography in this paper.

[20] Under certain conditions, including a state capital, a single municipality can be designated as a metro area in Mexico. See Consejo Nacional de Población (CONAPO), *Delimitación de las Zonas Metropolitanas de México 2015*, 26 de enero de 2018, https://www.gob.mx/conapo/documentos/delimitacion-de-las-zonas-metropolitanas-de-mexico-2015

State of Guanajuato and its Municipalities and Metro Areas

The Mexican state of Guanajuato is in the central portion of the country. Its capital — the city of Guanajuato — is 365 kilometers (227 miles) northwest of Mexico City. It is in the central time zone and observes daylight savings time. Thus, it is one hour ahead of Arizona in the winter and two hours ahead in the summer.

The state of Guanajuato lies at a high elevation that averages more than 2,000 meters (more than 6,600 feet — Appendix 1 provides conversion factors between various measurement scales). The northern part of the state, which is sparsely settled, is mountainous (the Sierra Madre) and forested. The central part is a high plateau dotted with low mountains. The Trans-Mexican Volcanic Belt extends into the southern portion of the state.

The high elevation combined with the relatively low latitude of about 21 degrees north (Arizona is about 34 degrees north) results in a pleasant year-round climate in Guanajuato. In the capital city of Guanajuato, average monthly high temperatures range from 22 to 31 degrees Celsius (72 to 87 degrees Fahrenheit) and low temperatures range from 7 to 15 degrees Celsius (44 to 58 degrees Fahrenheit). Thus, Guanajuato is considerably cooler than Phoenix in the summer and a little warmer in the winter. Approximately 90 percent of the rainfall in Guanajuato occurs during the monsoon season, which lasts from mid-May to mid-October; the annual total is 730 millimeters (28.8 inches) in the capital. Guanajuato is in a transition zone between the more arid northern part of the country and the wetter southern states.

The region was initially explored by the Spanish in the 1520s, who found gold and silver deposits near the current city of Guanajuato. Other mineral deposits also were discovered. Settlement of the area began in earnest during the 1540s. The name "Guanajuato" is derived from a Native American term meaning either "place of many hills" or "mountainous place of frogs." Over time, the economy diversified to include farming and ranching. In 1810, the Mexican War of Independence began at Dolores Hidalgo. The state has become popular with tourists, particularly the historical cities of Guanajuato, San Miguel de Allende and Dolores Hidalgo. A substantial number of Americans and Canadians live in San Miguel.

According to the 2010 Mexican census, the state of Guanajuato had nearly 5.5 million residents living in 46 municipalities.[21] By 2015, the population had increased to 5.85 million.[22] Arizona's population of 6.8 million in 2015 was 16 percent greater. The land area of Guanajuato is 30,607 square kilometers (11,817 square miles); the land area in Arizona is 9.65 times larger. Thus, the population density in Guanajuato is much greater than in Arizona. However, this comparison is misleading since so much of Arizona's land is unpopulated and government owned.

Table 4 provides a population summary for municipalities in Guanajuato of at least 50,000 residents in either 2010 or 2015. León, the most-populous municipality in Guanajuato, is located in the west-central portion of the state, near the border with the state of Jalisco. The next seven most-populous municipalities — Silao, Guanajuato, Dolores Hidalgo, San Miguel de Allende, Celaya, Salamanca and Irapuato — are

[21] Instituto Nacional de Estadística y Geografía (INEGI), Censo de Población y Vivienda 2010, https://www.inegi.org.mx/programas/ccpv/2010/

[22] The 2015 estimates are available from INEGI. Data for each state are available from https://www.inegi.org.mx/temas/estructura/; see, for example, Panorama Sociodemográfico de Guanajuato 2015

located in the central part of the state and are connected to each other by a circular set of highways. Guanajuato's only international airport is located southeast of León, in the municipality of Silao.

Table 4: Population of the State of Guanajuato and its Largest Municipalities

	Population		2010 – 2015 Change		Largest City (2010)
	2010	2015	Numeric	Percent	
Guanajuato	**5,486,372**	**5,853,677**	**367,305**	**6.7 %**	
Abasolo	84,332	90,990	6,658	7.9	27,389
Acámbaro	109,030	112,125	3,095	2.8	57,972
Apaseo el Alto	64,433	68,455	4,022	6.2	27,991
Apaseo el Grande	85,319	92,605	7,286	8.5	26,121
Celaya	468,469	494,304	25,835	5.5	340,387
Comonfort	77,794	82,572	4,778	6.1	23,683
Cortazar	88,397	95,961	7,564	8.6	61,658
Dolores Hidalgo	148,173	152,113	3,940	2.7	59,240
Guanajuato	171,709	184,239	12,530	7.3	72,237
Irapuato	529,440	574,344	44,904	8.5	380,941
Jarecuaro	50,832	49,053	-1,779	-3.5	<15,000
León	1,436,480	1,578,626	142,146	9.9	1,238,962
Moroleón	49,364	50,377	1,013	2.1	43,200
Pénjamo	149,936	150,570	634	0.4	40,070
Purisima del Rincón	68,795	79,798	11,003	16.0	43,512
Romita	56,655	59,879	3,224	5.7	21,176
Salamanca	260,732	273,271	12,539	4.8	160,169
Salvatierra	97,054	100,391	3,337	3.4	37,203
San Felipe	106,952	113,109	6,157	5.8	28,452
San Francisco del Rincón	113,570	119,510	5,940	5.2	71,139
San José Iturbide	72,411	78,794	6,383	8.8	23,471
San Luis de la Paz	115,656	121,027	5,371	4.6	49,914
San Miguel de Allende	160,363	171,857	11,494	7.2	69,811
Santa Cruz de Juventino Rosas	79,214	83,060	3,846	4.9	42,264
Silao	173,024	189,567	16,543	9.6	74,242
Uriangato	59,305	62,761	3,456	5.8	51,382
Valle de Santiago	141,058	142,672	1,614	1.1	68,058
Villagrán	55,782	58,830	3,048	5.5	27,079
Yuriria	70,782	69,763	-1,019	-1.4	25,216
Other Municipalities	341,311	353,054	11,743	3.4	

Source: Instituto Nacional de Estadística y Geografía

Each of the cities in these populous municipalities are geographically distinct, separated from the other cities by much-less-populated territory but are within a short distance (less than 75 kilometers by road) of at least one of the other cities. This settlement pattern is considerably different from that in Arizona, in which 60 percent of the population is concentrated in Maricopa County in cities that border one another and an additional 15 percent are clustered in Pima County.

Five of the 74 metropolitan areas defined in Mexico as of 2015 are wholly within the state of Guanajuato; another is partially within the state:

- León: municipalities of León and Silao. The metro population was 1,609,504 in 2010 and 1,768,193 in 2015. The León metro area was home to 30 percent of the state's residents in 2015.
- Celaya: municipalities of Celaya, Comonfort, Cortazar and Villagrán. The metro population was 690,442 in 2010 and 731,667 in 2015.
- San Francisco del Rincón: the municipalities of San Francisco del Rincón and Purisima del Rincón. The metro population was 182,365 in 2010 and 199,308 in 2015. These municipalities are located southwest of León, along the border with Jalisco. The city of San Francisco del Rincón is 32 kilometers from the city of León.
- Guanajuato: municipality of Guanajuato. The 2015 population was 184,239; it was not defined as a metro area in 2010.
- Moroleón-Uriangato: the municipalities of Moroleón and Uriangato. The metro population was 108,669 in 2010 and 113,138 in 2015. These municipalities are located south of Salamanca; the city of Uriangato is 63 kilometers from the city of Salamanca.

- La Piedad-Pénjamo: the municipalities of Pénjamo and La Piedad; the latter is in the state of Michoacan. The metro population was 249,512 in 2010 and 254,272 in 2015; Pénjamo's share was 59 percent in 2015. The city of Pénjamo is 52 kilometers southwest of the city of Irapuato.

Apaseo el Alto — the city is 26 kilometers southeast of the city of Celaya — is included in the Querétaro metro area, which predominantly is in the neighboring state of Querétaro.

Metropolitan Phoenix, with 4.5 million residents in 2015, is much more populous than any of Guanajuato's metro areas. Only Metro León is more populous than Metro Tucson (1.0 million residents).

Population growth in Mexico is rapidly decelerating from rates well above those of the United States to rates similar to the United States (see Table 5). Historically, the growth rate in the state of Guanajuato varied from somewhat less than the nation during the 1970s and 1990s to substantially more during the 1980s. Currently, the population of Guanajuato is increasing at about the same pace as Mexico; growth rates in Guanajuato in coming decades are predicted to be a little less than the nation. Except during the 1980s, the growth rate in Arizona has exceeded the rate in Guanajuato. Arizona's faster growth is expected to continue in coming decades.

Comparison States

The state of Guanajuato shares a border with four states: San Luis Potosí to the north, Querétaro to the east, Michoacán to the south, and Jalisco to the west. Other states in the region include Aguascalientes and Zacatecas to the northwest, Hidalgo to the east, and the state of Mexico to the southeast.

Table 5: Population Growth Rates

	Guanajuato	Mexico	Arizona	United States
1970-80	27.9%	33.1%	52.5%	11.5%
1980-90	35.1	24.6	34.6	9.9
1990-2000	14.7	17.4	40.1	13.0
2000-10	17.2	15.1	24.2	9.6
2010-20	12.4	12.3	14.1	7.5
2020-30	7.0	8.0	15.2	6.8
2030-40	3.8	5.0	12.5	5.2
2040-50	0.9	2.3	9.6	4.1

Sources: Consejo Nacional de Población (Guanajuato and Mexico), U.S. Department of Commerce, Census Bureau (United States and historical Arizona), and Arizona Office of Economic Opportunity (Arizona projections).

In addition to geographic proximity, several other factors were considered in selecting states to compare to Guanajuato: population of the state and the geographic distribution of residents across the state; economic composition based on industrial shares of employment and gross product; imports and exports; and the transportation infrastructure. Three adjacent states were selected: Jalisco, Querétaro, and San Luis Potosí. The neighboring state of Michoacán was not selected, largely due to its very different economic composition. None of the nonadjacent but proximate states shared as many characteristics with Guanajuato as the three selected bordering states.

Jalisco Jalisco is more populous than Guanajuato, with 7.8 million residents in 2015. The Guadalajara metro area — home to 4.9 million, 62 percent of the state's residents — consists of two municipalities with more than 1 million residents, three others with more than 500,000, as well as some less-populous municipalities. Puerto Vallarta, located on the Pacific Coast, is the state's largest population center outside of Guadalajara, with just more than 275,000 residents in 2015. Three other municipalities had a population of more than 100,000.

Querétaro The number of residents of Querétaro (2.0 million in 2015) is substantially less than in Guanajuato. As in Jalisco, 62 percent of Querétaro's residents live in one metro area (Querétaro). The municipality of Querétaro had nearly 879,000 residents in 2015; other populous municipalities include San Juan del Rio (268,000) and Corregidora (182,000).

San Luis Potosí The 2015 population of this state was 2.7 million. Nearly 43 percent of the residents lived in the San Luis Potosí metro area, which consists of the municipalities of San Luis Potosí (824,000) and Soledad de Graciano Sanchez (309,000). Ciudad Valles is the only other municipality with more than 100,000 residents.

Socioeconomic Characteristics of Guanajuato

Education, labor force participation, employment and similar topics are explored in this section, using data from the 2015 Mexican Intercensal Survey, which provided an update to the 2010 decennial census information. Approximately 6 million households were surveyed, with information reported at the national, state, and municipality levels. Due to sampling error, less detail was reported by municipality than by state and nation.

Age

The age distribution in 2015 was significantly different between the United States and Mexico, with the residents of Mexico much younger. In 2015, 45.4 percent of the residents of Mexico were under the age of 25 and 53.1 percent were younger than 30. The median age was approximately 27. In contrast, the median age in the United States was between 36 and 37.

Residents of the state of Guanajuato were somewhat younger than residents of the entire nation and of each of the three comparison states, with 47.9 percent below the age of 25 and 55.7 percent younger than 30. In contrast, residents of Arizona were slightly older than the United States total.

Seven Guanajuato municipalities were identified as the largest based on economic activity (discussed later in this paper): Celaya, Guanajuato, Irapuato, León, Salamanca, San Francisco del Rincón and Silao. The youngest population was in Silao, with 50.8 percent younger than 25 and 59.5 percent younger than 30, while Salamanca had the oldest residents, with 43.4 percent younger than 25 and 50.9 percent younger than 30.

Despite the difference in the overall age distribution between the nations, the percentage of the residents in the prime working age group of 25 to 54 years of age was nearly identical: 40.2 percent of Mexicans and 39.8 percent of Americans. Looking more broadly at the 20-to-64 age group, the shares also were similar: 56.4 percent in Mexico and 57.1 percent in the United States.

Educational Attainment

The 2015 Mexican Intercensal Survey reports educational attainment for those 15 years and older (and for more narrow age groups for the nation and states). Various attainment measures are available, including literacy, mean number of years of schooling and the percentage whose highest attainment was at various

levels, such as higher education.

Literacy rates have improved substantially in Mexico in recent decades. In 2015, literacy exceeded 99 percent among Mexicans 15 to 17 years old — as high as in the United States — but decreased with age. The literacy rate among those 65 and older was only 77 percent in Mexico.

For the entire population 15 and older, the literacy rate in Mexico was 94.5 percent. In Guanajuato, the figure was 93.6 percent, the lowest of the four states. Of the seven large municipalities in Guanajuato, four — Celaya, Guanajuato, Irapuato and León — had rates of at least 95.8 percent. Silao had the lowest literacy rate at 92.8 percent. Each of the four central Mexican states had a literacy rate greater than 99 percent among those aged 15 to 17.

Nationally, the mean number of years of schooling for the population age 15 and older was 9.2. The mean was highest for the 20-to-24 and 25-to-29 age groups at 10.9 years; the mean decreased significantly with age to 3.7 years for individuals 75 and older. In Guanajuato, the mean number of years of schooling for the population 15 and older (8.4 years) was less than the national mean. Attainment in Guanajuato was lower than in the nation in each age group. Guanajuato's educational attainment also was lower than in each of the comparison states. The municipality of Guanajuato had the highest mean years of schooling at 9.6, followed by Celaya at 9.4 years. San Francisco del Rincón had the lowest figure at 7.7 years.

"Educación media superior" (upper secondary education) in Mexico includes grades 10 through 12; in the United States, high school is defined as grades 9 through 12 by the Census Bureau. "Educación superior" is equivalent to higher education in the United States. In the Mexican Intercensal Survey, attainment is reported as an attendance measure, while the American Community Survey distinguishes between attendance and graduation. To ensure as much consistency as possible, Table 6 presents attendance figures for each country at the high school and higher education levels. In the United States, education data are not presented for those 15 and older. Commonly, U.S. education data are presented for the population 25 and older, since most people have completed their education by age 25. Since the entire population includes individuals who completed their education decades ago, the 25-to-34 age group often is examined as measure of attainment over the last decade.

Based on the 15-and-older age group, and focusing on the percentage who attended higher education and the share who had attended at least high school, educational attainment in Guanajuato was lower than the nation and each of the three comparison states in 2015, as seen in Table 6. Of the seven large municipalities in Guanajuato, attainment was highest in Guanajuato and Celaya, each exceeding the national figure. In contrast, attainment was much below the nation in San Francisco del Rincón and Silao.

Of those 25 and older, educational attainment in the United States was far greater than in Mexico. Guanajuato's figures were lower than the nation and each of the three comparison states. Looking at the attainment of young adults (age 25 to 34), the differential was not as large between Mexico and the United States. Guanajuato's figures again were lower than the nation and each of the three comparison states.

Labor Force Participation

The Mexican Intercensal Survey asked if people 12 years of age and older were economically active, and if so,

if they were working. A workforce participation rate and unemployment rate can be calculated from these data, reported for five-year age groups (other than the 12-to-14 age group and the 75-and-older age group).

In Mexico in 2015, the labor force participation rate for individuals 12 and older was 50.4 percent. The rate was highest among individuals 40 to 44 years of age at 69.7 percent. Labor force participation was lowest among individuals 12 to 14 years of age (3.1 percent) and among those 75 and older (11.4 percent).

Males had much higher rates of labor force participation than females in all age groups. The overall rate was 68.7 percent for men and 33.6 percent for women. Participation rates among Mexican men exceeded the rates of American men, but participation rates among Mexican women were considerably less than the rates of women in the United States.

Table 6: Educational Attainment, 2015

	Attendance as a Share of the Population		
	High School*	Higher Education	High School or More
Age 15 and Older			
Mexico	21.8%	18.7%	40.5%
States:			
Guanajuato	18.4	13.2	31.6
Jalisco	20.8	19.0	39.8
Querétaro	20.9	21.2	42.1
San Luis Potosí	19.8	16.7	36.5
Large Municipalities in Guanajuato:			
Celaya	22.3	18.4	40.7
Guanajuato	20.2	22.1	42.3
Irapuato	20.6	16.2	36.8
León	21.5	17.6	39.1
Salamanca	20.5	15.4	35.9
San Francisco del Rincón	14.8	9.7	24.5
Silao	16.3	9.1	25.4
Age 25 and Older			
Mexico	17.0	19.6	36.6
United States	34.9	59.5	94.5
Arizona	32.4	61.6	94.0
Guanajuato	13.4	14.0	27.4
Jalisco	16.1	20.2	36.3
Querétaro	16.1	23.1	39.2
San Luis Potosí	14.3	17.3	31.6
Age 25 to 34			
Mexico	23.4	26.3	49.7
United States	31.0	65.7	96.7
Arizona	33.3	62.9	96.2
Guanajuato	19.5	19.6	39.1
Jalisco	22.5	27.2	49.7
Querétaro	21.0	28.5	49.5
San Luis Potosí	22.0	24.4	46.4

** Defined as grades 10 through 12 in Mexico and 9 through 12 in the United States.*

Source: Instituto Nacional de Estadística y Geografía, Encuesta Intercensal and U.S. Department of Commerce, Census Bureau, American Community Survey

The overall labor force participation rate in Guanajuato in 2015 (50.1 percent) was marginally less than the national figure. Relative to the nation, the rate in Guanajuato was higher among those younger than 25 but lower in each of the other age groups, as seen in Chart 9. The participation rate of men in Guanajuato was marginally higher than the national figure, but the rate for women was somewhat less in Guanajuato than in the nation.

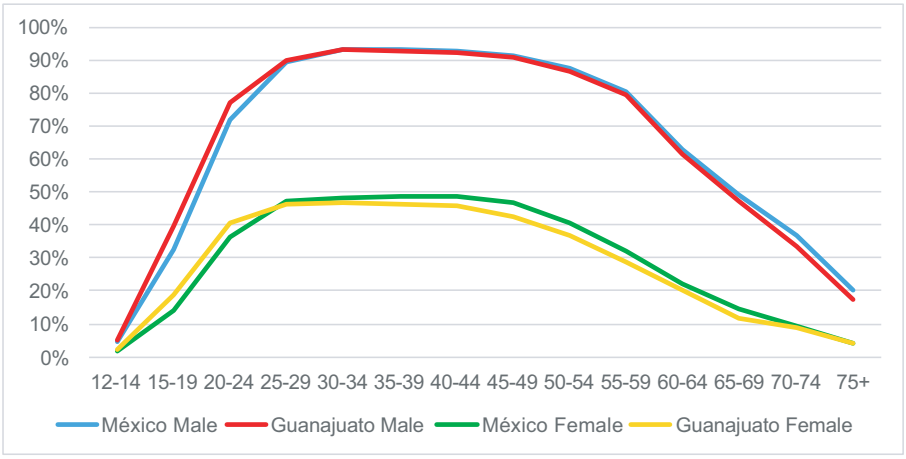
Guanajuato's overall labor force participation rate was higher than in San Luis Potosí, but less than in Jalisco and Querétaro (see Chart 10). Guanajuato had the third-highest rate among the four states in each age group between the ages of 20 and 64 (see Table 7). Among those younger than 20, only Jalisco had a higher rate. Guanajuato had the lowest rate among those older than 64.

In the prime working age group of 25 to 54 years of age, the participation rate nationally was 91.4 percent for men, 47.0 percent for women, and 68.1 percent for men and women combined. The participation rate in Guanajuato for men was marginally less than the national figure; the differential was larger for women. For

both sexes, the participation rate in Guanajuato was less than in Jalisco and Querétaro.

Among those 12 and older, San Francisco del Rincón had the highest labor force participation rate among the seven large municipalities in Guanajuato at 57.8 percent, followed by León at 57.6 percent. Salamanca had the lowest participation rate at 47.1 percent. Labor force data by age group are not available for municipalities.

Chart 9: Labor Force Participation Rates by Age and Sex, 2015



Source: Instituto Nacional de Estadística y Geografía, Encuesta Intercensal (2015).

Unemployment Rate

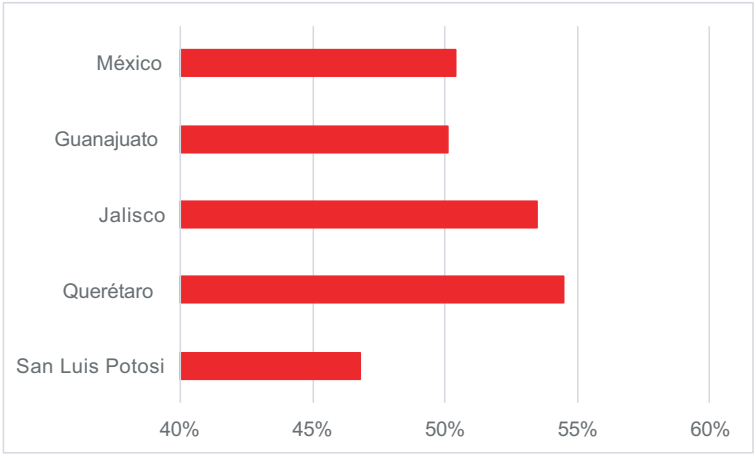
The overall unemployment rate in Mexico in 2015 was 4.1 percent, less than that of the United States. The unemployment rate in Mexico was highest among young labor force participants and considerably higher among men (4.8 percent) than women (2.7 percent). The rate was higher among men in every age group except 12 to 14. In Guanajuato, the overall unemployment rate was marginally higher (4.4 percent) than in the nation. The rate for men was higher than the national average, while the rate for women was slightly less than the national figure.

The overall unemployment rates are shown in Chart 11. Guanajuato had the highest rate among the four states, though the differences between the states were not substantial. In Guanajuato's largest municipalities, the overall unemployment rate varied more widely, from a very low 1.5 percent in San Francisco del Rincón to a rather high 6.2 percent in Salamanca.

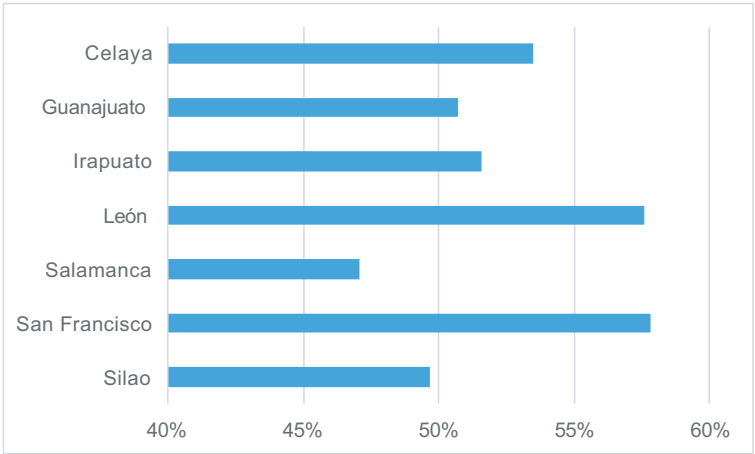
In the prime working age group of 25

Chart 10: Labor Force Participation Rates, Age 12 and Older, 2016

Nation and States



Large Municipalities in Guanajuato



Source: Instituto Nacional de Estadística y Geografía, Encuesta Intercensal (2015).

to 54 years of age, the unemployment rate nationally was 4.0 percent for men, 2.0 percent for women, and 3.2 percent for men and women combined. The unemployment rate in Guanajuato in this age group was marginally higher for men than the national figure and higher than in each of the three comparison states. In contrast, the unemployment rate in Guanajuato for women was lower than the national figure and marginally lower than in each of the three comparison states.

Table 7: Labor Force Particpation Rates by Age, 2015

Age	Mexico	Guanajuato	Jalisco	Querétaro	San Luis Potosi
Total, 12+	50.4%	50.1%	53.5%	54.5%	46.8%
12-14	3.1	3.7	4.6	2.9	2.6
15-19	23.3	29.3	30.0	27.7	22.2
20-24	53.7	58.2	60.5	60.1	53.4
25-29	67.5	66.8	71.7	72.5	64.8
30-34	69.5	68.3	72.8	72.7	66.6
35-39	69.6	68.1	72.2	72.7	65.9
40-44	69.7	68.0	72.2	73.9	65.7
45-49	67.9	64.9	70.1	70.7	63.9
50-54	62.9	60.0	64.7	66.4	58.7
55-59	54.7	51.9	55.7	58.0	51.8
60-64	41.3	39.6	41.4	39.9	39.2
65-69	30.7	28.4	29.9	29.9	29.9
70-74	22.1	20.3	20.6	20.6	23.0
75+	11.4	10.0	10.2	10.6	12.0

Source: Instituto Nacional de Estadística y Geografía, Encuesta Intercensal (2015).

Employment by Sector and Occupational Division

In the 2015 Mexican Intercensal Survey, employment for the nation and states was presented for five broad sectors: agriculture; mining, manufacturing and utilities; construction; wholesale and retail trade; and all else. For municipalities, construction was combined with mining, manufacturing and utilities. The results are presented in Table 8.

The employment share in Guanajuato was greater than the nation and each of the comparison states in the mining, manufacturing and utilities category, offset by a below-average share and the lowest of the four states in the "other" category, which includes various services as well as transportation and warehousing. In the other three broad sectors, the share in Guanajuato was second-highest of the four states, below the nation in agriculture but above the nation in construction.

In each of Guanajuato's seven large municipalities, agriculture's share was less than in Mexico. Only in Salamanca was the share greater than that of the state of Guanajuato. In contrast, the share of mining, manufacturing, utilities and construction was much greater than the nation, and higher than the state of Guanajuato in all seven municipalities. Trade's share exceeded the national and Guanajuato figures in Celaya, Irapuato and León. The "other" category's share exceeded the nation only in Guanajuato; the share exceeded the state of Guanajuato in Celaya, León, Irapuato and Salamanca.

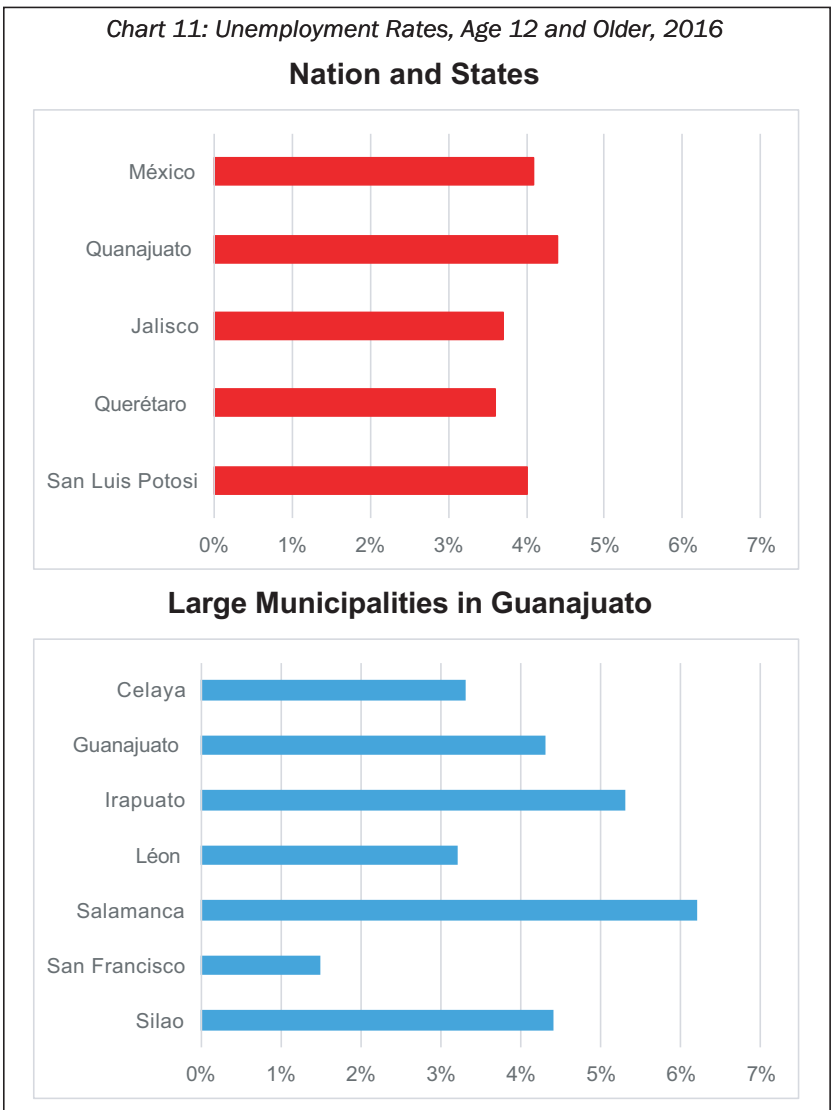
Employment for the nation and states also was presented for nine occupational divisions in the 2015 Mexican Intercensal Survey. For municipalities, the nine divisions were combined into four categories. The results are presented in Table 9.

The employment share in Guanajuato was greater than the nation and each of the comparison states in two of the occupational divisions: craft workers; and machine operators, assemblers and drivers. These high

shares were offset by below-average shares, and the lowest shares of the four states, in three occupational divisions: administrators and managers; professional and technical; and administrative support.

In each of Guanajuato's seven large municipalities, the share in the agricultural workers category was less than in Mexico; only in Salamanca did the share exceed that of the state of Guanajuato. In contrast, the share in the industrial workers category was greater than the nation in all seven municipalities, with León, San Francisco and Silao exceeding the share in the state of Guanajuato. In the services and merchants category, the share exceeded the national and state of Guanajuato figures in Celaya and Irapuato. In the professional and technicians category, the share exceeded the nation in Guanajuato and Celaya; the share exceeded the state of Guanajuato in these municipalities as well as León, Irapuato and Salamanca.

Chart 11: Unemployment Rates, Age 12 and Older, 2016



Source: Instituto Nacional de Estadística y Geografía, Encuesta Intercensal (2015).

Economic Base

The North American Industry Classification System (NAICS) is used to classify business establishments for the purpose of collecting, analyzing and publishing statistical data related to the economy in Canada, Mexico and the United States. These data are measured by place of work; in contrast, the Mexican Intercensal Survey is expressed by place of residence. The NAICS is a hierarchical system, with the economy first divided into 20 sectors. These sectors are progressively divided into subsectors, industry groups and industries. The versions of the NAICS used by Mexico and the United States are not entirely consistent, as explained in Appendix 2.

Using the NAICS, an economic base study identifies the leading economic activities in a region (such as a state or municipality). An economic base study is an important tool in regional economics. A discussion of regional economics and base studies is provided in Appendix 3.

A key concept in regional economics is the distinction between "traded" and "nontraded" economic activities. Goods and services sold to customers (individuals or businesses) who are not residents of a region are referred to as traded economic activities. These activities import money into a region that would not otherwise be there, "driving" the regional economy. In contrast, nontraded economic activities sell their goods

Table 8: Employment Shares by Broad Sector, 2015

	Nation	Guanajuato	Jalisco	Querétaro	San Luis Potosi		
Agriculture	11.3%	9.1%	7.8%	5.0%	13.6%		
Mining, Manufacturing & Utilities	17.0	27.0	18.9	23.0	20.0		
Construction	8.6	9.3	8.8	10.4	9.2		
Trade	18.6	18.7	21.3	17.4	17.0		
Other	44.5	36.0	43.3	44.1	40.2		
	Celaya	Guanajuato	Irapuato	León	Salamanca	San Francisco	Silao
Agriculture	4.9%	3.4%	6.6%	1.1%	9.9%	6.0%	7.9%
Mining, Manufacturing, Utilities & Construction	30.0	31.2	32.3	38.5	35.3	55.2	46.5
Trade	22.6	13.5	21.8	20.4	17.3	14.7	14.6
Other	42.6	52.0	39.3	40.0	37.5	24.1	31.0

Source: Instituto Nacional de Estadística y Geografía, Encuesta Intercensal (2015)

Table 9: Employment Shares by Occupational Division, 2015

	Nation	Guanajuato	Jalisco	Querétaro	San Luis Potosi		
Officers, Directors and Heads	2.8%	2.2%	3.0%	3.9%	2.6%		
Professionals and Technical Staff	19.2	15.7	19.0	20.5	18.3		
Auxiliary Workers in Administrative Activities	6.5	5.2	6.5	6.3	5.6		
Merchants, Sales Employees & Sales Agents	13.4	14.1	15.7	14.2	12.9		
Workers in Personal Services & Surveillance	8.5	7.5	9.2	8.5	7.8		
Agricultural Workers	9.8	7.7	6.7	3.8	9.4		
Craft Workers	11.6	15.3	14.1	11.3	11.8		
Machine Operators, Assemblers and Drivers	11.4	15.5	10.2	15.2	12.8		
Workers in Elementary Activities and Support	16.7	16.8	15.6	16.3	18.8		
	Celaya	Guanajuato	Irapuato	León	Salamanca	San Francisco	Silao
Professionals and Technicians	28.6%	31.7%	25.3%	28.4%	26.5%	16.9%	18.1%
Agricultural Workers	4.5	3.7	5.1	0.9	8.6	4.9	7.0
Industrial Workers	24.6	28.0	27.5	33.1	26.4	46.1	41.5
Merchants and Workers in Various Services	42.3	36.5	42.1	37.6	38.5	32.1	33.4

Source: Instituto Nacional de Estadística y Geografía, Encuesta Intercensal (2015).

and services to regional customers. Nontraded activities respond to, and are dependent upon, the growth occurring in traded activities.

Most activities within the agriculture, mining and manufacturing sectors are traded. A moderate portion of the wholesale trade and transportation and warehousing sectors is traded. The traded share is less in the other sectors, particularly retail trade and health care and social assistance. The traded portion of these sectors primarily result from purchases made by tourists and other visitors. At the municipality level, residents of rural areas outside of the municipality also contribute to the activity in sectors such as retail trade.

For this report, an economic base study was conducted using each of two economic indicators. Gross domestic product (GDP) is the broadest measure of the economy. GDP estimates are available annually by state in the United States and Mexico, but little industrial detail is provided. Further, GDP estimates are not produced at a substate level in Mexico. In order to provide more industrial detail and to examine the economic bases of municipalities in the state of Guanajuato, a base study also was conducted using employment. The employment figures come from the economic census that is conducted every five years in Mexico.

Gross Domestic Product by State

GDP estimates were recently released by Mexican state for 2017, overall and for each of 20 sectors. The mining sector is split into oil/gas and all else, while the 21 manufacturing subsectors are grouped into 12 categories. Subsectoral detail is not available for any of the other 18 sectors.

Sectoral Shares

In the top portion of Table 10, the sectoral shares — shares of total GDP — in 2017 are displayed for Guanajuato, its comparison states and the nation. In the bottom portion of the table, the shares of manufacturing GDP are shown for the 12 available categories.

Guanajuato's sectoral mix in 2017 differed from that of the nation primarily by its manufacturing sector accounting for a considerably larger share of total GDP. The wholesale trade sector's share also was higher than the national average, while the mining share was considerably less than the national average. In the other sectors, the share in Guanajuato ranged from somewhat more than to less than the national average. Lower shares occurred particularly in "white collar" services sectors: information; finance and insurance; real estate and rental; professional, scientific and technical services; administrative support; and public administration.

Within manufacturing, the share in Guanajuato was much

Table 10: Shares of Gross Domestic Product by Sector and Manufacturing Category, Mexico, 2017

	Nation	Guanajuato	Jalisco	Querétaro	San Luis Potosí
Sectoral Share of Total GDP					
Agriculture, Forestry, Fishing and Hunting	3.58%	3.61%	6.00%	2.32%	4.45%
Mining, Quarrying, and Oil and Gas Extraction	4.36	0.42	0.25	0.61	2.17
Utilities	2.10	2.18	1.38	1.84	4.18
Construction	7.89	8.58	8.33	10.35	7.83
Manufacturing	18.17	28.89	22.31	29.28	28.37
Wholesale Trade	9.94	11.30	12.66	11.49	8.76
Retail Trade	9.89	10.00	10.53	10.01	8.32
Transportation and Warehousing	6.41	6.84	4.61	6.85	4.99
Information	1.71	0.62	1.05	1.45	0.55
Finance and Insurance	4.11	2.78	3.22	2.62	2.16
Real Estate and Rentals	10.60	9.11	11.62	7.61	10.55
Professional, Scientific and Technical Services	1.96	0.89	1.84	2.89	0.78
Management of Companies	0.59	0.06	0.11	0.06	0.01
Administrative Support and Waste Management	3.53	2.50	2.34	2.01	2.01
Educational Services	4.04	3.35	3.31	3.07	4.20
Health Services and Social Assistance	2.30	2.20	2.04	1.34	1.83
Arts, Entertainment and Recreation	0.44	0.33	0.41	0.14	0.16
Accommodation and Food Services	2.43	1.73	3.26	1.98	1.69
Other Services	2.03	1.83	1.91	1.55	3.12
Public Administration	3.94	2.76	2.83	2.52	3.86
Categorical Share of Manufacturing GDP					
Food	20.43	17.67	23.89	18.48	16.18
Beverages and Tobacco	5.67	5.37	14.51	2.83	1.05
Textile Mills and Textile Products	1.29	1.01	0.54	1.95	0.87
Apparel, Leather and Allied Products	2.74	7.90	1.51	2.48	0.96
Wood Products	0.86	0.27	0.45	0.52	0.34
Paper and Printing	2.36	1.29	1.86	6.12	2.49
Petroleum, Coal, Chemicals, Plastics, Rubber	12.58	18.33	10.33	13.20	7.69
Nonmetallic Mineral Products	2.60	1.39	1.48	2.36	4.15
Primary Metal and Fabricated Metal Products	9.55	6.96	5.44	7.17	12.71
Machinery, Electronic, Electrical, and Transportation Equipment and Products	38.37	38.55	37.45	42.93	51.64
Furniture and Related Products	1.07	0.51	1.20	0.84	0.60
Miscellaneous Manufacturing	2.48	0.74	1.35	1.12	1.33

Source: Instituto Nacional de Estadística y Geografía.

higher than the national average in two categories: apparel, leather and allied products; and petroleum, coal, chemicals, plastics and rubber. The share was marginally above average in the broadly defined machinery, electronic, electrical, and transportation equipment and products category, which consists of four subsectors. In each of the other nine manufacturing categories, the share in Guanajuato was less than the national average.

The sectoral shares in Querétaro were quite similar to those in Guanajuato, with the largest differences being greater shares in Querétaro in the professional, scientific and technical services sector and in the construction sector, offset by lesser shares in the real estate and rental sector and in agriculture. However, differences between the two states were greater within the manufacturing sector, with Querétaro having lesser shares in three categories: apparel, leather and allied products; petroleum, coal, chemicals, plastics and rubber; and beverages and tobacco. Querétaro's manufacturing shares were higher in paper and printing and in machinery, electronic, electrical, and transportation equipment and products.

Location Quotients:

Location quotients (LQ) are a common measure of the economic specialization of a region. To calculate the LQ, per capita gross domestic product (GDP) of a region in a particular industry is divided by the per capita GDP for that industry in the nation as a whole.

Location quotients greater than one indicate that a region is showing economic activity that is stronger than the nation as a whole. For example, a location quotient of 4.15 in Guanajuato's 'Apparel, Leather and Allied Products' sector indicates that this is an important part of the industrial mix.

If the LQ for an industry is less than one, this is an indication of less activity in that sector and that the region likely imports goods and services related to that industry to support its economy.

In San Luis Potosí, shares were somewhat higher than in Guanajuato in several sectors, including utilities and mining. Shares were lower in San Luis Potosí in wholesale trade; transportation and warehousing; and retail trade. Differences between the two states were much greater within the manufacturing sector, with San Luis Potosí having considerably higher shares in the machinery, electronic, electrical, and transportation equipment and products category; and in the primary metal and fabricated metal products category. The shares were lower in San Luis Potosí than in Guanajuato in the petroleum, coal, chemicals, plastics and rubber; apparel, leather and allied products; and beverages and tobacco categories.

Compared to Guanajuato, the sectoral mix in Jalisco was less dependent on manufacturing and transportation and warehousing, offset by larger shares in real estate and rental; agriculture; accommodation and food services; and wholesale trade sectors. Within manufacturing, the categorical mix was quite different in Jalisco than Guanajuato, with much greater shares in Jalisco in the food category and the beverages and tobacco category and much lesser shares in petroleum, coal, chemicals, plastics and rubber; and apparel, leather and allied products.

Thus, the sectoral mix in Guanajuato was relatively similar to each of the comparison states, but greater differences were present within the manufacturing sector. The share of manufacturing GDP in Guanajuato was much higher than the national average and each of the three comparison states in the apparel, leather and allied products category and in the petroleum, coal, chemicals, plastics and rubber category. In

contrast, the share in Guanajuato in the machinery, electronic, electrical, and transportation equipment and products category was similar to the national average and to Jalisco but lower than in Querétaro and San Luis Potosí.

Table 11: Location Quotients and Excess GDP Based On Per Capita Gross Domestic Product by Sector and Manufacturing Category, Guanajuato, 2017

	Location Quotient	Excess GDP in Millions of Pesos
Total	0.90	-96,884
Sectors		
Agriculture, Forestry, Fishing and Hunting	0.91	-3,156
Mining, Quarrying, and Oil and Gas Extraction	0.09	-40,178
Utilities	0.94	-1,268
Construction	0.98	-1,281
Manufacturing	1.44	80,466
Wholesale Trade	1.03	2,807
Retail Trade	0.91	-8,569
Transportation and Warehousing	0.97	-2,241
Information	0.33	-11,605
Finance and Insurance	0.61	-16,169
Real Estate and Rentals	0.78	-23,911
Professional, Scientific and Technical Services	0.41	-11,696
Management of Companies	0.09	-5,406
Administrative Support and Waste Management	0.64	-12,803
Educational Services	0.75	-10,164
Health Services and Social Assistance	0.86	-3,195
Arts, Entertainment and Recreation	0.68	-1,394
Accommodation and Food Services	0.64	-8,734
Other Services	0.82	-3,766
Public Administration	0.63	-14,618
Manufacturing Categories		
Food	1.24	9,142
Beverages and Tobacco	1.36	3,771
Textile Mills and Textile Products	1.13	308
Apparel, Leather and Allied Products	4.15	15,842
Wood Products	0.46	-857
Paper and Printing	0.79	-918
Petroleum, Coal, Chemicals, Plastics, Rubber	2.09	25,309
Nonmetallic Mineral Products	0.77	-1,121
Primary Metal and Fabricated Metal Products	1.05	853
Machinery, Electronic, Electrical, and Transportation Equipment and Products	1.44	31,342
Furniture and Related Products	0.68	-619
Miscellaneous Manufacturing	0.43	-2,586

Source: Calculated from Instituto Nacional de Estadística y Geografía (GDP) and Consejo Nacional de Población (population).

Location Quotients and Excess GDP

Base studies commonly utilize sectoral shares in the calculations, but this method produces misleading results when overall per capita economic activity varies across the geographies being compared. In 2017, per capita GDP in Guanajuato was 10 percent less than the national average; in the three comparison states, it ranged from 4 percent below average to 35 percent above average. Thus, the economic base study conducted for this report uses per capita GDP rather than sectoral shares in its calculations.

The results of base studies typically are expressed in two ways. The "location quotient" (LQ) is calculated as per capita GDP in Guanajuato (or in another state or municipality) divided by per capita GDP in the nation. Overall, per capita economic activity in Guanajuato in 2017 was 10 percent below the national average — the total location quotient was 0.90. In 18 of the 20 sectors, the LQ was less than 1, but in manufacturing, the LQ was a strong 1.44; wholesale trade's LQ was slightly above 1. In seven of the 12 manufacturing categories, the LQ exceeded 1 (see Table 11).

Conceptually, the "excess GDP" shown in Table 11 is calculated as the difference between regional employment and regional employment divided by the location quotient.[23] The magnitude of excess GDP is determined by the location quotient and the relative size of each sector nationally. Guanajuato's greatest deficit — most negative excess figure — was in the mining sector, due to a very low location quotient and

[23] Effectively, the excess is calculated as regional GDP minus the product of the regional population in thousands and national GDP per 1,000 residents. This formula allows the excess figure (actually, the deficit) to be calculated when employment and the location quotient are equal to zero.

moderate national size. Guanajuato had substantial excess GDP in the manufacturing sector and a small amount in wholesale trade. The largest manufacturing excess was in the machinery, electronic, electrical, and transportation equipment and products category. Other large excesses were present in the categories of petroleum, coal, chemicals, plastics and rubber (which had a high LQ of 2.09); apparel, leather and allied products (which had a very high LQ of 4.15); and food manufacturing.

The overall location quotient in Guanajuato was less than in each of the three comparison states (see Table 12). The LQ in Guanajuato was the lowest of this group of states in six sectors; in another eight sectors, the LQ in Guanajuato was lower than in Jalisco and Querétaro but higher than in San Luis Potosí. Guanajuato did not have the highest LQ of the four states in any sector. The number of sectors with a location quotient of more than 1 was 11 in Querétaro, 10 in Jalisco, four in San Luis Potosí, but only two in Guanajuato.

Among the 12 manufacturing categories, the location quotient exceeded 1 in 11 categories in Querétaro, seven categories in Guanajuato, six in Jalisco, and five in San Luis Potosí. Guanajuato's LQ was the highest of the four states only in the apparel, leather and allied products category; it was the lowest in four categories: wood products; paper and printing; furniture and related products; and miscellaneous manufacturing.

Consistent GDP data for Mexican states are available for 2003 through 2017. In Guanajuato, the overall location quotient rose from 0.76 to 0.90 over these 14 years (see the top graph of Chart 12). The increase was primarily due to a large gain in the manufacturing LQ, from 0.97 to 1.44. Lesser gains occurred in two sectors with moderate proportions of traded activities: wholesale trade,

Table 12: Location Quotients Based On Per Capita Gross Domestic Product by Sector and Manufacturing Category, Guanajuato and Comparison States, 2017

	Guanajuato	Jalisco	Querétaro	San Luis Potosi
Total	0.90	1.08	1.35	0.96
Sectors				
Agriculture, Forestry, Fishing and Hunting	0.91	1.81	0.87	1.20
Mining, Quarrying, and Oil and Gas Extraction	0.09	0.06	0.19	0.48
Utilities	0.94	0.71	1.18	1.92
Construction	0.98	1.14	1.77	0.96
Manufacturing	1.44	1.32	2.17	1.50
Wholesale Trade	1.03	1.37	1.56	0.85
Retail Trade	0.91	1.15	1.36	0.81
Transportation and Warehousing	0.97	0.77	1.44	0.75
Information	0.33	0.66	1.15	0.31
Finance and Insurance	0.61	0.84	0.86	0.51
Real Estate and Rentals	0.78	1.18	0.97	0.96
Professional, Scientific and Technical Services	0.41	1.01	1.99	0.38
Management of Companies	0.09	0.20	0.13	0.02
Administrative Support and Waste Management	0.64	0.72	0.77	0.55
Educational Services	0.75	0.89	1.03	1.00
Health Services and Social Assistance	0.86	0.96	0.78	0.76
Arts, Entertainment and Recreation	0.68	1.01	0.45	0.36
Accommodation and Food Services	0.64	1.45	1.10	0.67
Other Services	0.82	1.01	1.03	1.48
Public Administration	0.63	0.77	0.86	0.94
Manufacturing Categories				
Food	1.24	1.55	1.86	1.19
Beverages and Tobacco	1.36	3.39	1.08	0.28
Textile Mills and Textile Products	1.13	0.55	3.28	1.01
Apparel, Leather and Allied Products	4.15	0.73	1.97	0.53
Wood Products	0.46	0.69	1.32	0.59
Paper and Printing	0.79	1.04	5.64	1.59
Petroleum, Coal, Chemicals, Plastics, Rubber	2.09	1.09	2.28	0.92
Nonmetallic Mineral Products	0.77	0.75	1.97	2.39
Primary Metal and Fabricated Metal Products	1.05	0.75	1.63	2.00
Machinery, Electronic, Electrical, and Transportation Equipment and Products	1.44	1.29	2.43	2.02
Furniture and Related Products	0.68	1.49	1.72	0.85
Miscellaneous Manufacturing	0.43	0.72	0.98	0.80

Source: Calculated from Instituto Nacional de Estadística y Geografía (GDP) and Consejo Nacional de Población (population).

and transportation and warehousing. Several of the services sectors also experienced small increases in LQ over time.

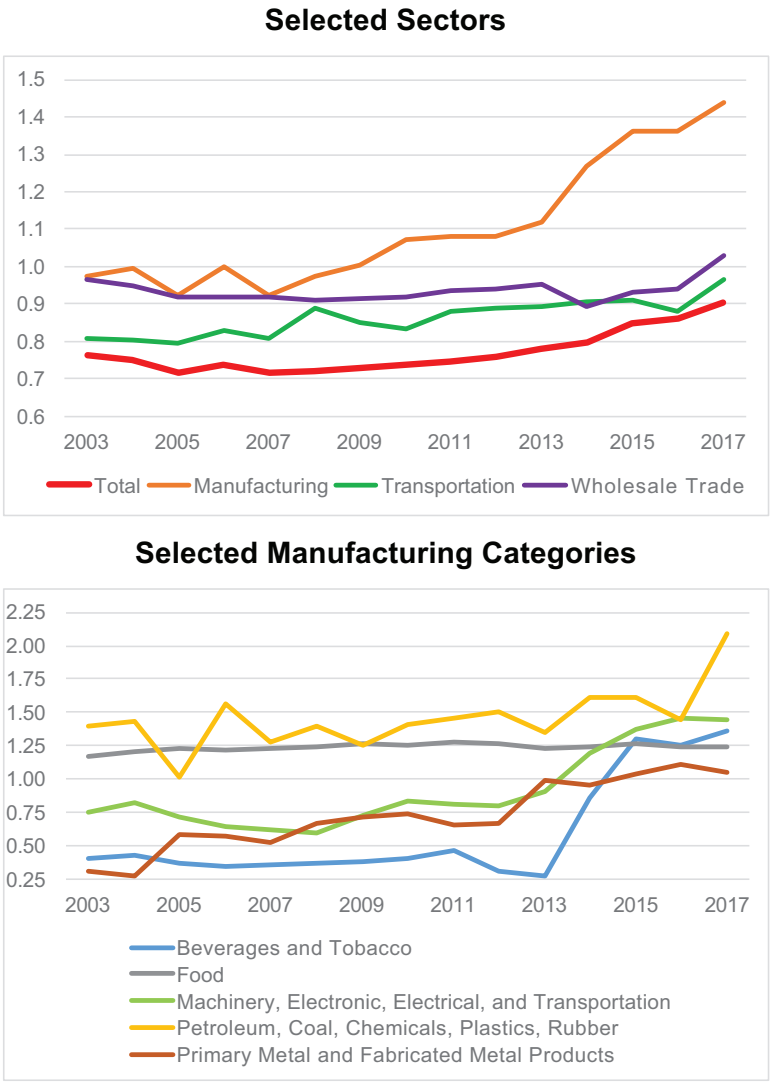
Eleven of the 12 manufacturing categories experienced an increase in location quotient in Guanajuato between 2003 and 2017. Large increases occurred in the categories of beverages and tobacco (from 0.40 to 1.36); primary metal and fabricated metal products (from 0.31 to 1.05); machinery, electronic, electrical, and transportation equipment and products (from 0.75 to 1.44); petroleum, coal, chemicals, plastics and rubber (from 1.40 to 2.09); and apparel, leather and allied products (from 3.61 to 4.15). The time series for the largest of the manufacturing categories are shown in the bottom graph of Chart 12.

Employment by State

In order to get a more detailed look at the industrial mix (using subsectors, industry groups and industries), the economic census was examined; the latest data are for 2014. Of the various economic measures that are available from the economic census, employment was selected, given its wide use in base studies and its familiarity to the public. However, the sectoral mix based on employment differs from that based on a monetary measure such as GDP for several reasons, particularly because wages and other monetary considerations vary so widely across sectors. In 2014, the shares based on GDP were considerably higher than those based on employment — nationally and in Guanajuato — in the real estate and rental and construction sectors. The shares based on employment were considerably higher than those based on GDP in the retail trade, accommodation and food services, and administrative support sectors.

For subnational geographies, a significant shortcoming of the economic census is that data are not disclosed for all sectors, subsectors, industry group and industries. Thus, the sum of the disclosed employment, for example by NAICS industry, is less than the overall employment total. The proportion not

Chart 12: Location Quotients Based On Per Capita Gross Domestic Product, Guanajuato, 2003-2017



Source: Calculated from Instituto Nacional de Estadística y Geografía (GDP) and Consejo Nacional de Población (population).

disclosed generally is insignificant by sector, but progressively increases by subsector, industry group and industry. The proportion not disclosed is greater in less-populous areas than in more-populous areas. The proportion undisclosed in 2014 was less 5 percent at the industry group level for each of the four Central Mexico states examined in this report, but exceeded 5 percent in two of the states at the industry level. For municipalities in Guanajuato, the percentage not disclosed was much higher. Even for the seven municipalities with the greatest employment, the proportion undisclosed at the industry level exceeded 15 percent except in León. At the industry group level, the proportion exceeded 18 percent in three municipalities.

Table 13: Location Quotients and Excess Employment Based On Per Capita Employment and Per Capita Gross Domestic Product by Sector, Guanajuato, 2014

	Employment Location Quotient	GDP Location Quotient	Excess Employment
Total*	1.01	0.80	13,452
Sectors			
Agriculture, Forestry, Fishing, and Hunting	0.20	0.89	-7,411
Mining, Quarrying, and Oil and Gas Extraction	0.43	0.05	-4,632
Utilities	0.49	0.76	-5,479
Construction	0.98	0.87	-445
Manufacturing	1.39	1.27	96,154
Wholesale Trade	0.98	0.89	-1,080
Retail Trade	1.01	0.81	3,517
Transportation and Warehousing	0.90	0.91	-3,680
Information	0.38	0.38	-8,700
Finance and Insurance	0.64	0.59	-8,465
Real Estate and Rentals	0.91	0.77	-1,101
Professional, Scientific, and Technical Services	0.69	0.41	-9,255
Management of Companies	0.41	0.08	-1,241
Administrative Support and Waste Management	0.76	0.58	-19,727
Educational Services	1.11	0.73	4,062
Health Services and Social Assistance	0.98	0.86	-463
Arts, Entertainment, and Recreation	0.90	0.67	-1,171
Accommodation and Food Services	0.85	0.63	-14,179
Other Services	0.95	0.84	-3,253

** The economic census used for employment does not include public administration or the entire agriculture sector.*

Source: Calculated from Instituto Nacional de Estadística y Geografía (employment and GDP) and Consejo Nacional de Población (population).

State of Guanajuato

The differences in the sectoral location quotients between the employment and GDP measures are seen in Table 13, using 2014 data for Guanajuato. Overall, the employment LQ was much higher than the LQ based on GDP, but this is not a direct comparison since the economic census excludes part of the agriculture sector and the public sector, which had a low LQ based on GDP. Among the other sectors (with the exception of utilities), the location quotient based on employment was similar to or greater than the LQ based on GDP. The higher LQ based on employment indicates that GDP per worker was lower in Guanajuato than the national average.

Based on employment, manufacturing was the most important economic activity in Guanajuato in 2014, with the highest location quotient of any sector and by far the most excess employment. The location quotient also was a little above 1 in the educational services and retail trade sectors, which primarily serve the local population and therefore do not drive the Guanajuato economy.

In Table 14, economic base study results based on employment are provided for each of the manufacturing sector's 21 subsectors, with comparisons to the location quotients based on GDP for available subsectors and for groupings of subsectors. Based on employment, the location quotient exceeded 1 in nine of the 21 subsectors, with an extremely high LQ for leather and allied products. The excess employment in this

subsector dwarfed that of the other subsectors. The second-highest LQ was in petroleum and coal products, but excess employment was only moderate in this subsector. The second-greatest excess employment was in the food processing subsector, closely followed by the plastics and rubber products subsector. The other subsectors with a LQ greater than 1 provided much less excess employment.

Table 14: Location Quotients and Excess Employment Based On Per Capita Employment and Per Capita Gross Domestic Product by Manufacturing Subsector, Guanajuato, 2014

	Employment Location Quotient	Employment Location Quotient	Excess Employment
Manufacturing Subsectors			
Food	1.32	1.24	13,944
Beverage and Tobacco Products	0.51	0.86	-4,024
Textile Mills	0.68		-1,627
Textile Product Mills	0.73		-905
Apparel	1.05		676
Leather and Allied Products	13.82		95,852
Wood Products	0.68	0.41	-1,195
Paper	1.41		2,186
Printing and Related Industries	0.97		-167
Petroleum and Coal Products	2.66		3,025
Chemical	1.21		2,612
Plastics and Rubber Products	1.95		13,826
Nonmetallic Mineral Products	1.05	0.74	482
Primary Metal	0.78		-1,073
Fabricated Metal Products	0.99		-189
Machinery and Equipment	0.70		-1,872
Computer and Electronic Products	0.12		-12,847
Electrical Equipment, Appliance, and Component	0.65		-3,381
Transportation Equipment	1.06		2,384
Furniture and Related Products	0.47	0.74	-4,161
Miscellaneous	0.33	0.43	-7,392
Combined Subsectors			
Textile Mills and Textile Product Mills	0.70	0.98	-2,533
Apparel and Leather and Allied Products	5.35	4.26	96,528
Paper and Printing and Related Industries	1.17	0.85	2,019
Petroleum, Coal, Chemicals, Plastics and Rubber	1.67	1.61	19,464
Primary Metal and Fabricated Metal Products	0.95	0.95	-1,262
Machinery, Electronic, Electrical, and Transportation Equipment and Products	0.77	1.20	-15,717

Source: Calculated from Instituto Nacional de Estadística y Geografía (employment and GDP) and Consejo Nacional de Población (population).

The employment and GDP location quotients can be directly compared for six of the 21 subsectors. The results are reasonably consistent, though the employment LQ slightly exceeded 1 in the nonmetallic mineral products subsector while the GDP LQ was below 1. The other 15 subsectors are combined into six groupings in the GDP data:

- The very high employment and GDP LQs in the apparel and leather and allied products category, as based on employment, were due almost entirely to the leather and allied products subsector.
- The employment and GDP LQs were similar and greater than 1 in the petroleum, coal, chemicals, plastics and rubber category; based on employment, the LQ exceeded 1 in each of the three subsectors, with the plastics and rubber products subsector accounting for most of the excess.
- In the primary metal and fabricated metal products category, the employment and GDP LQs were identical and a little less than 1; based on employment data, the LQ was less than 1 in each of the two subsectors.
- The employment and GDP LQs were less than 1 in the textile mills and textile product mills category; based on employment data, the LQ was less than 1 in each of the two subsectors.
- Due to a moderately high LQ in the paper subsector, the employment LQ for paper and printing and related industries exceeded 1, but the GDP LQ was less than 1.
- In the broad machinery, electronic, electrical, and transportation equipment and products category, the LQ based on GDP was greater than 1 but the employment LQ was less than 1. Of the four subsectors, the employment LQ exceeded 1 (by a small margin) only in transportation equipment.

In Table 12, significant industries within the key manufacturing subsectors, as based on employment, are listed in NAICS order. Footwear manufacturing was the dominant industry in Guanajuato in 2014 based on employment. Leather and hide tanning and finishing, which is in the same subsector as footwear, provided the second-most excess employment at the industry level. Production of frozen fruit, juice and vegetables ranked third, followed by manufacturing of rubber products other than tires, hoses and belts; and the production of plastic plumbing fixtures and other plastics.

Of the nonmanufacturing subsectors and industries listed in Table 15, most are not typically considered to be traded activities. The exceptions are long-distance truck transportation and wholesale trade of footwear.

Comparison to Other States

Overall, Guanajuato's location quotient based on employment in 2014 was less than that of Jalisco and Querétaro, but more than that of San Luis Potosí (see Table 13). The LQ in Guanajuato ranked second or third among the four states in each sector, except in finance and insurance (Guanajuato had the highest LQ), construction (Guanajuato had the lowest LQ), and real estate and rental (Guanajuato had the lowest LQ). Guanajuato had three sectors with a LQ greater than 1, fewer than Jalisco (12), Querétaro (seven), and San Luis Potosí (four).

Manufacturing was the only sector with a location

Table 15: Location Quotients and Excess Employment Based On Per Capita Employment by Subsector and Industry, Guanajuato, 2014

Industries With A Location Quotient Of At Least 1.1 And Excess Employment Of At Least 2,500 Based On Per Capita Employment

Subsector Industry	Location Quotient	Excess Employment
Food Manufacturing	1.32	13,944
Frozen Fruit, Juice, and Vegetables	11.73	9,366
Dairy Derivatives	3.15	3,152
Leather and Allied Product Manufacturing	13.82	95,852
Leather and Hide Tanning and Finishing	11.73	10,431
Footwear	14.86	81,483
Other Leather and Allied Products	7.31	3,939
Paper Manufacturing	1.41	2,186
Paperboard Containers	2.19	3,126
Chemical Manufacturing	1.21	2,612
Toilet Preparations (e.g. Cosmetics)	5.37	5,472
Plastics and Rubber Product Manufacturing	1.95	13,826
Plastic Plumbing Fixtures and Other Plastics	1.78	6,208
Other Rubber Products	6.39	8,110
Transportation Equipment Manufacturing	1.06	2,384
Motor Vehicle Transmission & Power Train Parts	5.31	5,379
Wholesale Trade in Textiles and Footwear	3.97	5,190
Footwear	5.85	3,061
Retail Trade of Textiles, Jewelry, Clothing, and Footwear	1.35	9,074
Clothing, Jewelry, and Apparel Accessories	1.32	5,304
Footwear	1.61	3,461
Truck Transportation	1.19	2,137
General Freight Trucking, Long Distance	1.68	4,241
Transit and Ground Passenger Transportation	1.25	3,233
Interurban and Rural Bus Transportation	1.80	4,120
Credit Intermediation and Related Activities	0.71	-5,298
Savings Banks	3.30	3,688
Business Support Services	0.73	-22,402
Collection Agencies	3.53	3,591
Waste Management and Remediation Services	3.47	2,675
Nonhazardous Waste Management and Remediation	4.55	2,860
Educational Services	1.11	4,062
Private-Sector Higher Education	1.42	4,865

Source: Calculated from Instituto Nacional de Estadística y Geografía (employment) and Consejo Nacional de Población (population).

quotient exceeding 1 in each of the four states. However, the mix of manufacturing activities varied considerably by state.

In each of the 21 manufacturing subsectors except the miscellaneous subsector, at least one of the four states had a LQ of more than 1. The LQ exceeded 1 in all four states in three subsectors: food (Guanajuato ranked second); paper (Guanajuato ranked third); and nonmetallic minerals (Guanajuato ranked fourth). Guanajuato had the highest LQ of the four states in leather and allied products and in petroleum and coal products.

Excess employment can be used to make comparisons of sectors within a state, but cannot be used to compare states due to size differences (as measured by employment) across the states. Thus, in Table 17, excess employment is measured as a percentage of total employment. At the sectoral level, manufacturing by far provided the greatest excess employment in both Guanajuato and Querétaro, but Querétaro had an excess in more sectors. Manufacturing also provided the most excess employment in San Luis Potosí, but the amount was modest. In Jalisco, manufacturing provided excess employment, but a number of other sectors also provided a moderate amount of excess employment.

Based on excess employment at the subsectoral level, manufacturing activity in Guanajuato was dominated

Table 16: Location Quotients Based On Per Capita Employment by Sector and Manufacturing Subsector, Guanajuato and Comparison States, 2014

	Guanajuato	Jalisco	Querétaro	San Luis Potosi
Total	1.01	1.10	1.26	0.85
Sectors				
Agriculture, Forestry, Fishing, and Hunting	0.20	0.33	0.06	0.10
Mining, Quarrying, and Oil and Gas Extraction	0.43	0.21	0.87	1.06
Utilities	0.49	0.54	0.56	*
Construction	0.98	1.14	1.41	1.10
Manufacturing	1.39	1.17	1.92	1.08
Wholesale Trade	0.98	1.40	1.36	0.92
Retail Trade	1.01	1.18	0.99	0.84
Transportation and Warehousing	0.90	0.75	0.97	0.64
Information	0.38	1.08	1.53	0.37
Finance and Insurance	0.64	0.35	0.42	0.26
Real Estate and Rentals	0.91	1.21	1.34	1.02
Professional, Scientific, and Technical Services	0.69	1.06	1.59	0.68
Management of Companies	0.41	0.22	0.44	*
Administrative Support and Waste Management	0.76	0.82	0.93	0.57
Educational Services	1.11	1.16	1.34	0.88
Health Services and Social Assistance	0.98	1.19	1.14	0.95
Arts, Entertainment, and Recreation	0.90	1.20	0.95	0.77
Accommodation and Food Services	0.85	1.21	1.06	0.83
Other Services	0.95	1.19	1.00	0.91
Manufacturing Subsectors				
Food	1.32	1.50	1.15	1.17
Beverage and Tobacco Products	0.51	1.99	0.74	0.82
Textile Mills	0.68	0.39	1.42	0.43
Textile Product Mills	0.73	0.76	0.78	1.19
Apparel	1.05	0.78	1.61	0.41
Leather and Allied Products	13.82	1.97	0.06	0.09
Wood Products	0.68	1.10	1.58	0.77
Paper	1.41	1.03	2.41	1.47
Printing and Related Industries	0.97	1.33	2.67	0.60
Petroleum and Coal Products	2.66	0.30	0.90	*
Chemicals	1.21	1.82	2.10	0.38
Plastics and Rubber Products	1.95	1.59	2.95	0.93
Nonmetallic Mineral Products	1.05	1.11	1.24	1.29
Primary Metals	0.78	0.73	0.83	3.58
Fabricated Metal Products	0.99	1.33	2.29	1.07
Machinery and Equipment	0.70	0.83	3.33	1.99
Computer and Electronic Products	0.12	2.15	1.65	*
Electrical Equipment, Appliances, Components	0.65	0.26	5.11	2.36
Transportation Equipment	1.06	0.24	2.98	1.79
Furniture and Related Products	0.47	2.05	0.56	0.69
Miscellaneous Manufacturing	0.33	0.83	0.65	0.38

* Not disclosed

Source: Calculated from Instituto Nacional de Estadística y Geografía (employment) and Consejo Nacional de Población (population).

by leather and allied products; significant excess employment also occurred in food processing and in plastics and rubber products. Jalisco was the only other state with an excess in leather and allied products; Jalisco and Querétaro had significant excesses in plastics and rubber products; each state had an excess in food processing, but the amount was significant only in Guanajuato and Jalisco. In Querétaro and San Luis Potosí, the transportation equipment manufacturing subsector provided the most excess employment, but the concentrations in this subsector were considerably less than that of the leather and allied products subsector in Guanajuato.

Table 17: Excess Employment Based On Per Capita Employment as a Percentage of Total Employment by Selected Sector and Subsector, Guanajuato and Comparison States, 2014

	Guanajuato	Jalisco	Querétaro	San Luis Potosi
Total	1.3%	9.3%	20.6%	-17.0%
Sectors^				
Construction	-0.0	0.3	0.9	0.3
Manufacturing	9.0	3.6	17.1	2.2
Wholesale Trade	-0.1	2.2	1.7	-0.6
Retail Trade	0.3	3.9	-0.2	-4.4
Information	-0.8	0.1	0.6	-1.0
Real Estate and Rentals	-0.1	0.2	0.3	0.0
Professional, Scientific, and Technical Services	-0.9	0.1	1.3	-1.1
Educational Services	0.4	0.5	1.0	-0.5
Health Services and Social Assistance	-0.0	0.5	0.3	-0.2
Arts, Entertainment, and Recreation	-0.1	0.2	-0.0	-0.3
Accommodation and Food Services	-1.3	1.7	0.4	-1.8
Other Services	-0.3	1.0	0.0	-0.6
Subsectors^^				
Food Manufacturing	1.3	1.8	0.5	0.8
Leather and Allied Product Manufacturing	9.0	0.6	-0.5	-0.8
Chemical Manufacturing	0.2	0.9	1.0	-0.9
Plastics and Rubber Products Manufacturing	1.3	0.7	2.1	-0.1
Fabricated Metal Product Manufacturing	-0.0	0.5	1.9	0.1
Machinery and Equipment Manufacturing	-0.2	-0.1	1.1	0.7
Computer and Electronic Product Manufacturing	-1.2	1.4	0.7	*
Electrical Equipment & Appliance Manufacturing	-0.3	-0.6	3.0	1.4
Transportation Equipment Manufacturing	0.2	-2.5	5.7	3.3
Retail Trade: Groceries, Food, Beverages, Ice	0.5	1.2	-1.0	-1.0
Food and Beverage Preparation Services	-0.6	1.5	0.7	-0.9

^ All sectors with excess employment in at least one state.
^^ Subsectors with excess employment equal to at least 1 percent of total employment in at least one state.
* Not disclosed

Source: Calculated from Instituto Nacional de Estadística y Geografía (employment) and Consejo Nacional de Población (population).

Few subsectors other than those in manufacturing provided a significant amount of excess employment in any state. Moreover, the excesses in many of these other activities, such as retail trade of groceries, reflect local purchasing patterns, rather than economic activities that drive the economy by selling goods and services to companies and individuals located in another state or country.

Within the manufacturing sector, the industries providing the most excess employment are shown in Table 18. Few industries were among the leading industries in more than one state. Industries with excess employment of at least 0.5 percent of total employment in more than one state included footwear (Guanajuato and Jalisco), other plastics products (Guanajuato and Querétaro), major appliances (Querétaro and San Luis Potosí), and other motor vehicle parts (Querétaro and San Luis Potosí).

Among traded activities other than manufacturing providing a significant amount of excess employment, Querétaro was the regional leader, with excesses in wholesale trade of raw materials for industry; wholesale trade of machinery, equipment and furniture; long-distance general freight trucking; and computer systems design and other professional, scientific and technical services. Jalisco also had a significant excess in wholesale trade of raw materials for industry.

Employment by Municipality

Employment in 2014 and population in 2015 are shown in Table 19 for those municipalities in Guanajuato ranking among the 12 largest on either population or employment. The employment-to-population ratio varies considerably across these municipalities, with some of the less-populous municipalities having a high ratio.

A base study using employment in 2014 was done for each of Guanajuato's seven municipalities with employment of more than 25,000 in 2014. Even for these larger municipalities, the volume of undisclosed data is significant.

Location quotients at the sectoral level are displayed in Table 20 and excess employment expressed as a percentage of total employment is shown in Table 21 for sectors. Five of the seven municipalities, including each of the three largest, had an overall LQ greater than 1. The LQs in the construction and manufacturing sectors exceeded 1 in six of the municipalities; five municipalities had a LQ of more than 1 in the other services sector. In contrast, in the agriculture, mining, utilities and information sectors, none of the municipalities had a LQ of more than 1.

León had the second-highest overall location quotient, with LQs exceeding 1 in 15 of the 19 sectors, including the highest LQ among the seven municipalities in seven sectors. Based on excess employment at the sectoral level, manufacturing was the dominant economic activity, but considerable excess employment also was present in the retail trade, educational services, transportation and warehousing, and wholesale trade sectors.

Celaya had the third-highest overall location quotient, with LQs exceeding 1 in 12 of the 19 sectors, including the highest LQ among the seven municipalities in four sectors. Based on excess employment at the sectoral level,

Table 18: Excess Employment Based On Per Capita Employment as a Percentage of Total Employment by Selected Manufacturing Industry, Guanajuato and Comparison States, 2014

	Guanajuato	Jalisco	Querétaro	San Luis Potosi
Most Significant in Guanajuato:				
Footwear	7.6%	0.6%	-0.4%	-0.6%
Leather and Hide Tanning and Finishing	1.0	0.0	*	-0.1
Frozen Food	0.9	-0.1	*	-0.1
Rubber Products Other Than Tires, Hoses, Belts	0.8	0.2	0.1	-0.1
Other Plastics Products	0.6	0.2	1.6	-0.4
Toilet Preparations	0.5	0.1	0.3	-0.1
Motor Vehicle Transmission & Power Train Parts	0.5	*	0.4	-0.1
Others Significant in Jalisco:				
Semiconductors & Other Electronic Components	-0.5	1.1	0.3	*
Pharmaceuticals and Medicines	-0.3	0.7	0.3	-0.4
Computers and Peripheral Equipment	*	0.7	*	*
Household and Institutional Furniture	-0.2	0.6	-0.2	-0.2
Others Significant in Querétaro:				
Major Appliances	0.1	-0.2	2.7	0.9
Other Motor Vehicle Parts	-0.3	-0.5	1.8	0.7
Aerospace Products and Parts	*	*	0.8	*
Printing	-0.0	0.2	0.8	-0.3
Motor Veh. Steering & Suspension Components	0.0	0.1	0.8	0.4
Motor Vehicle Brake Systems	0.0	-0.1	0.7	*
Animal Food	*	0.1	0.6	0.1
Others Significant in San Luis Potosí:				
Motor Vehicle Electrical & Electronic Equipment	-0.3	-0.9	0.3	2.1
Nonchocolate Confectionery	-0.1	0.4	-0.1	0.6
Rolling and Drawing of Purchased Steel	0.0	0.0	-0.1	0.5

* Employment not disclosed.

Note: Industries with excess employment equal to at least 0.5 percent of total employment in at least one state are listed.

Source: Calculated from Instituto Nacional de Estadística y Geografía (employment) and Consejo Nacional de Población (population).

manufacturing had the highest figure, followed by retail trade, administrative support and educational services.

Table 19: Employment and Population, Municipalities in Guanajuato

	Employment, 2014	Population, 2015	Employment Per 1,000 Residents
San Francisco del Rincón	33,027	119,510	276.4
León	420,520	1,578,626	266.4
Celaya	122,569	494,304	248.0
San José Iturbide	18,828	78,794	239.0
Silao	43,604	189,567	230.0
Purisima del Rincón	15,978	79,798	200.2
Irapuato	110,481	574,344	192.4
Salamanca	43,293	273,271	158.4
Cortazar	13,989	95,961	145.8
Guanajuato	25,289	184,239	137.3
San Miguel de Allende	20,107	171,857	117.0
Pénjamo	15,082	150,570	100.2
Dolores Hidalgo	13,933	152,113	91.6
San Luis de la Paz	10,054	121,027	83.1
Valle de Santiago	10,334	142,672	72.4

Source: Instituto Nacional de Estadística y Geografía.

Irapuato had the fifth-highest overall location quotient, with LQs exceeding 1 in 11 of the 19 sectors, though Irapuato did not have the highest LQ among the seven municipalities in any sector. Based on excess employment at the sectoral level, manufacturing had the highest figure, with none of the other sectors providing a significant amount.

Silao had the fourth-highest overall location quotient, though the LQ exceeded 1 in only two of the 19 sectors. However, the manufacturing LQ was very high at 3.32. Based on excess employment at the sectoral level, manufacturing was the dominant economic activity, with none of the other sectors providing a significant amount.

Salamanca's overall location quotient was less than 1. The LQ exceeded 1 in four sectors. Based on excess employment at the sectoral level, manufacturing had the highest figure, followed by construction.

San Francisco del Rincón, with the sixth-most employment among the municipalities, had the highest overall location quotient, though the LQ exceeded 1 in only eight sectors. It had the highest LQ among the seven municipalities in two sectors, including a very high 3.49 in manufacturing. Based on excess employment at the sectoral level, manufacturing was the dominant economic activity; retail trade provided the next most excess employment.

Guanajuato's overall location quotient was less than 1. The LQ exceeded 1 in only two sectors, but was the highest of the seven municipalities in each of these sectors. Based on excess employment at the sectoral level, accommodation and food services had the highest figure, followed by construction.

Detailed Economic Base

León The dominance of manufacturing largely resulted from just two of the 21 subsectors. In the leather and allied products subsector, footwear manufacturing was the primary activity, producing very substantial excess employment. The excess employment in leather and hide tanning and finishing also was higher than in any other industry group; a lesser excess was present in the other leather and allied industry group. In the plastics and rubber products subsector, substantial excess employment was present in each of the two industry groups of plastics and rubber, primarily in the other plastic products and other rubber products industries. In addition, a lesser excess occurred in the paper subsector, in the paperboard container industry.

In the wholesale trade sector, León had an excess in the textiles and footwear subsector — in the footwear and textiles other than clothing industries — and in the raw materials for industry subsector. In the transportation and warehousing sector, the general freight trucking and interurban and rural bus transportation industry groups, but the latter generally is a nontraded activity.

Table 20: Location Quotients Based On Per Capita Employment by Sector, Populous Municipalities in Guanajuato, 2014

	León	Celaya	Irapuato	Silao	Salmanca	San Francisco	Guanajuato
Total^	1.48	1.38	1.07	1.28	0.88	1.54	0.76
Sectors							
Agriculture, Forestry, Fishing, and Hunting	*	0.07	*	*	*	*	*
Mining, Quarrying, and Oil and Gas Extraction	0.07	*	0.07	*	*	*	*
Utilities	*	*	*	*	*	*	*
Construction	1.54	1.47	1.37	0.48	1.83	1.13	2.19
Manufacturing	2.03	1.62	1.22	3.32	1.14	3.49	0.28
Wholesale Trade	1.61	1.34	1.24	0.62	0.69	1.17	0.33
Retail Trade	1.25	1.32	1.12	0.78	0.94	1.18	0.89
Transportation and Warehousing	2.03	1.04	0.63	1.37	0.81	0.22	0.94
Information	0.59	0.51	0.46	0.30	0.30	0.67	0.90
Finance and Insurance	1.46	0.49	0.33	0.23	0.36	0.57	0.24
Real Estate and Rentals	1.42	1.03	1.31	0.69	0.77	0.94	0.40
Professional, Scientific, and Technical Services	1.05	1.09	1.08	0.33	0.47	1.30	0.79
Management of Companies	1.37	*	*	*	*	*	*
Administrative Support and Waste Management	1.38	1.95	1.04	0.53	0.26	0.12	0.18
Educational Services	2.11	2.08	1.33	0.48	0.95	0.89	0.80
Health Services and Social Assistance	1.29	1.73	1.21	0.54	0.97	1.17	0.70
Arts, Entertainment, and Recreation	1.45	0.93	1.01	0.31	1.05	0.81	0.57
Accommodation and Food Services	1.11	1.01	0.86	0.68	0.85	1.12	1.42
Other Services	1.18	1.43	1.11	0.77	1.07	1.20	0.74

^ The economic census used for employment does not include public administration or the entire agriculture sector.
* Not disclosed.

Note: The population estimate for 2015 was used.

Source: Calculated from Instituto Nacional de Estadística y Geografía.

Other activities provided moderate amounts of excess — but generally nontraded — employment. The excesses may result from León serving residents of other municipalities within the state; large metro areas in a state commonly provides service that extend to residents throughout the state:

- Construction of buildings, both residential and nonresidential.
- Retail trade of groceries and food.
- Retail trade of footwear and also of clothing, jewelry, clothing accessories.
- Retail trade of motor vehicles, spare parts, fuel and lubricants, spread across the various industries.
- Credit and financial intermediation.
- Administrative and support services, particularly collection agencies and janitorial services.
- Waste management and remediation services.
- Educational services in colleges, universities and professional schools; and elementary and secondary schools.
- Restaurants and other eating places.

Celaya Unlike León, Celaya does not have a dominant industry. Instead, smaller manufacturing excesses in 2014 were spread across a greater number of activities:

- Food processing, including grains and oilseeds; nonfrozen dairy products; animal processing; and cookies, crackers and pastas.
- Chemicals, especially toilet preparations.
- Electrical equipment, appliance, and components, especially household appliances.
- Transportation equipment, including motor vehicle bodies and trailers; motor vehicle engines; and steering and suspension components.
- Paper products.
- Printing.
- Rubber products.
- Fabricated metals, particularly springs and wires.

Table 21: Excess Employment Based On Per Capita Employment as a Percentage of Total Employment by Sector, Populous Municipalities in Guanajuato, 2014

	León	Celaya	Irapuato	Silao	Salmanca	San Francisco	Guanajuato
Total^	32.5%	27.4%	6.5%	21.8%	-13.6%	34.9%	-31.1%
Agriculture, Forestry, Fishing, and Hunting	*	-0.6	*	*	*	*	*
Mining, Quarrying, and Oil and Gas Extraction	-0.5	*	-0.7	*	*	*	*
Utilities	*	*	*	*	*	*	*
Construction	1.0	0.9	0.9	-1.1	2.5	0.2	4.1
Manufacturing	16.3	10.6	4.9	42.6	3.7	38.1	-22.1
Wholesale Trade	2.5	1.5	1.3	-1.8	-2.1	0.6	-5.2
Retail Trade	3.9	5.5	2.6	-4.0	-1.6	2.8	-3.5
Transportation and Warehousing	2.5	0.1	-1.2	1.0	-0.8	-1.8	-0.3
Information	-0.4	-0.5	-0.7	-0.7	-1.1	-0.3	-0.2
Finance and Insurance	0.7	-0.8	-1.4	-1.3	-1.6	-0.6	-2.2
Real Estate and Rentals	0.3	0.0	0.3	-0.3	-0.3	0.0	-0.9
Professional, Scientific, and Technical Services	0.1	0.2	0.2	-1.5	-1.7	0.6	-0.8
Management of Companies	0.0	*	*	*	*	*	*
Administrative Support and Waste Management	2.1	5.4	0.3	-2.9	-6.7	-4.6	-8.5
Educational Services	2.6	2.8	1.1	-1.4	-0.2	-0.3	-0.9
Health Services and Social Assistance	0.6	1.5	0.6	-1.0	-0.1	0.3	-1.1
Arts, Entertainment, and Recreation	0.3	-0.1	0.0	-0.6	0.1	-0.1	-0.6
Accommodation and Food Services	0.7	0.1	-1.2	-2.2	-1.6	0.7	5.0
Other Services	0.7	1.8	0.6	-1.0	0.4	0.8	-2.0

^ The economic census used for employment does not include public administration or the entire agriculture sector. Excess employment was calculated based on location quotients determined from per capita employment.
* Not disclosed.
Note: The population estimate for 2015 was used.
Source: Calculated from Instituto Nacional de Estadística y Geografía.

In the wholesale trade sector, Celaya had an excess in the grocery, food, drinks, ice and tobacco subsector and in the raw materials for industry subsector. In the transportation and warehousing sector, the general freight and specialized freight trucking industry groups had excesses.

Like León, Celaya had excesses in a number of generally nontraded activities:

- Construction of buildings, mostly residential.
- Retail trade of groceries and food.
- Retail trade in department stores.
- Retail trade of motor vehicles, spare parts, fuel and lubricants, spread across the various industry groups.

- Several other retail trade subsectors also provided smaller excesses.
- Administrative and support services — the employment services industry group produced a substantial excess; and the investigation, guard, and armored car services industry also provided an excess.
- Educational services in colleges, universities and professional schools; and elementary and secondary schools.
- Health care in various outpatient industries and in hospitals.
- Restaurants and other eating places.
- Repair and maintenance services, particularly automotive.

Irapuato Manufacturing provided the greatest excess in Irapuato, primarily in the three following subsectors, though the foundries industry also provided moderate excess employment:

- Food processing, particularly fruit and vegetable preserving — mostly frozen.
- Apparel, especially cut and sew apparel.
- Fabricated metal products, including architectural and structural metals.

In the wholesale trade sector, Irapuato had an excess in the grocery, food, drinks, ice and tobacco subsector and in the raw materials for industry subsector.

Like León and Celaya, Irapuato had a number of generally nontraded activities that provided moderate excess employment:

- Construction of nonresidential buildings, including commercial, institutional, and industrial.
- Retail trade of groceries and food.
- Retail trade of pharmaceuticals.
- Retail trade of motor vehicle products.
- Management consulting services.
- Investigation, guard, and armored car services.
- Educational services, particularly colleges, universities and professional schools.
- Health care, especially physicians.
- Repair and maintenance services, especially for autos.

Silao Silao has a narrow economic base, overwhelmingly dependent on transportation equipment manufacturing. primarily of motor vehicle parts. Industries included engines, electrical and electronic equipment, transmissions and power trains, interiors, and metal stamping.

Other manufacturing activities provided lesser excess employment: plastics and rubber products, leather and allied products, and fabricated metal products. No detail is available below the subsectoral level. Other subsectors with an excess included transportation support services and special food services.

Salamanca One manufacturing subsector was largely responsible for the excess employment in Salamanca: petroleum and coal products (no detail is available). Food manufacturing provided a much lower number of excess jobs, in the grain and oilseed milling and fruit and vegetable preserving and specialty foods industry groups. The basic chemical manufacturing industry group also produced an excess. Other activities with a

traded component that had an excess include truck transportation, especially specialized freight trucking, and wholesale trade in beverages and ice.

The list of generally nontraded activities that provided moderate excess employment is short:

- Construction of nonresidential buildings.
- Oil and gas pipeline construction.
- Repair and maintenance of commercial and industrial machinery and equipment.

San Francisco del Rincón Like León, the economic base in San Francisco del Rincón is dominated by the footwear manufacturing industry. Several other manufacturing activities provided excess employment of a much lesser magnitude:

- Plastics and rubber products.
- Food processing, including animal food.
- Apparel accessories.
- Textile and fabric finishing and fabric coating.
- Textile mills.
- Printing and related support activities.

An excess also was present in the wholesale trade of textiles and footwear.

Generally nontraded activities that provided moderate excess employment follow:

- Retail trade of groceries and food.
- Retail trade of apparel and footwear.
- Advertising and public relations.
- Restaurants and other eating places.
- Maintenance and repair services.

Guanajuato Limited excess employment was present in Guanajuato in traditional traded activities, restricted to the manufacturing of clay products and electrical equipment and appliances. However, a sizable excess was present in tourism-related activities, particularly traveler accommodation (hotels and motels) and the associated industry of restaurants and other eating places.

Generally nontraded activities that provided moderate excess employment follow:

- Commercial and institutional construction.
- Land subdivision.
- Various retail trade industries, including pharmaceuticals, miscellaneous items for personal use, and motor vehicles.
- Newspaper publishers.
- Advertising and public relations.

Comparison of the Economic Bases of Guanajuato and Arizona

The economies of Mexico and the United States are considerably different, as expected when comparing a developing country to a highly developed country. Sectoral shares based on GDP are shown for each country in Table 22. (The manufacturing detail are for 2016 since the subsectoral data for Arizona in 2017 have not yet been released.) The share was higher in the United States in most of the services sectors, while the share was higher in Mexico primarily in the goods-producing and related sectors. Even within manufacturing, the economic composition differed considerably between the two countries. In particular, the share of manufacturing was much higher in Mexico in the food, beverages and tobacco category, offset by a much lesser share in the plastics and rubber category.

The differences in the sectoral shares between Guanajuato and Arizona are larger than between the nations, as seen by the absolute value of the differences shown in Table 22. The sectoral differences between the states partially follow the general pattern of the two nations. However, the difference in the manufacturing share is much larger between the states than between the nations. Other sectors in which the differences between the states were considerably variant from the differences between the nations include mining, real estate and rental, and administrative support. Within manufacturing, while the shares in the machinery, electronic, electrical, and transportation equipment category were similar nationally, the share in Guanajuato was much less than in Arizona. This was offset in the petroleum, coal,

Table 22: Shares of Gross Domestic Product by Sector and Manufacturing Category, Mexico and the United States

	Mexico	United States	Difference	Guanajuato	Arizona	Difference
Sectoral Share of Total GDP, 2017						
Agriculture	3.58%	0.87%	2.71	3.61%	0.88%	2.73
Mining	4.36	1.38	2.98	0.42	1.29	-0.87
Utilities	2.10	1.58	0.52	2.18	2.06	0.12
Construction	7.89	4.01	3.88	8.58	4.38	4.20
Manufacturing	18.17	11.19	6.98	28.89	8.39	20.50
Wholesale Trade	9.94	6.03	3.91	11.30	5.71	5.59
Retail Trade	9.89	5.58	4.31	10.00	7.32	2.68
Transportation and Warehousing	6.41	3.12	3.29	6.84	3.24	3.60
Information	1.71	5.39	-3.68	0.62	3.45	-2.83
Finance and Insurance	4.11	7.52	-3.41	2.78	7.05	-4.27
Real Estate and Rental	10.60	13.30	-2.70	9.11	15.49	-6.38
Prof, Scientific, Technical Services	1.96	7.44	-5.48	0.89	5.65	-4.76
Management of Companies	0.59	1.90	-1.31	0.06	1.23	-1.17
Admin Support & Waste Management	3.53	3.12	0.41	2.50	4.53	-2.03
Educational Services	4.04	1.26	2.78	3.35	1.19	2.16
Health Services & Social Assist	2.30	7.47	-5.17	2.20	8.61	-6.41
Arts, Entertainment, and Recreation	0.44	1.10	-0.66	0.33	1.15	-0.82
Accommodation and Food Services	2.43	3.03	-0.60	1.73	3.68	-1.95
Other Services	2.03	2.14	-0.11	1.83	2.01	-0.18
Public Administration	3.94	12.59	-8.65	2.76	12.70	-9.94
Absolute Value			63.54			83.19
Categorical Share of Manufacturing GDP, 2016						
Food, Beverages and Tobacco	26.78%	12.53%	14.25	24.49%	7.36%	17.13
Textile Mills and Textile Products	1.40	0.86	0.54	1.02	0.48	0.54
Apparel, Leather, and Allied	2.92	0.45	2.47	8.89	0.12	8.77
Wood Products	0.87	1.68	-0.81	0.28	1.11	-0.83
Paper and Printing	2.38	4.69	-2.31	1.39	2.79	-1.40
Petroleum, Coal, Chemicals, Plastics, Rubber	12.17	24.78	-12.61	12.91	6.36	6.55
Nonmetallic Mineral Products	2.63	2.76	-0.13	1.46	3.18	-1.72
Primary Metal and Fabricated Metal	9.33	9.66	-0.33	7.57	9.31	-1.74
Machinery, Electronic, Electrical, Transportation Equipment	37.89	36.99	0.90	40.64	62.63	-21.99
Furniture and Related Products	1.13	1.45	-0.32	0.56	1.52	-0.96
Miscellaneous Manufacturing	2.50	4.15	-1.65	0.80	5.14	-4.34
Absolute Value			36.52			65.97

Sources: Calculated from Instituto Nacional de Estadística y Geografía (Mexico and Guanajuato) and U.S. Department of Commerce, Bureau of Economic Analysis (United States and Arizona).

chemicals, plastics and rubber category and the apparel, leather and allied category.

The base study results, based on the per capita measure, are shown in Table 23 (based on 2017/2016 GDP) and Table 24 (based on 2014 employment). The overall location quotient (LQ) in Guanajuato was higher than in Arizona based on both GDP and employment.

As measured by both GDP and employment, the location quotient in Guanajuato was substantially higher than in Arizona in the manufacturing sector. In each of the available manufacturing categories except for the miscellaneous category, the LQ calculated from GDP was higher in Guanajuato, with far higher LQs in apparel, leather and allied products; and petroleum, coal, chemicals, plastics and rubber. In addition, the LQ in Guanajuato was considerably higher in the food, beverages and tobacco; and textile mills and textile products categories.

Table 23: Location Quotients Based On Per Capita Gross Domestic Product by Sector and Manufacturing Category, Guanajuato and Arizona

	Location Quotient		
	Guanajuato	Arizona	Difference
Total	0.90	0.77	0.13
Sectors, 2017			
Agriculture, Forestry, Fishing, and Hunting	0.91	0.78	0.13
Mining, Quarrying, and Oil and Gas Extraction	0.09	0.72	-0.63
Utilities	0.94	1.01	-0.07
Construction	0.98	0.84	0.14
Manufacturing	1.44	0.58	0.86
Wholesale Trade	1.03	0.73	0.30
Retail Trade	0.91	1.01	-0.10
Transportation and Warehousing	0.97	0.80	0.17
Information	0.33	0.49	-0.16
Finance and Insurance	0.61	0.72	-0.11
Real Estate and Rentals	0.78	0.90	-0.12
Professional, Scientific, and Technical Services	0.41	0.59	-0.18
Management of Companies	0.09	0.50	-0.41
Administrative Support and Waste Management	0.64	1.12	-0.48
Educational Services	0.75	0.73	0.02
Health Services and Social Assistance	0.86	0.89	-0.03
Arts, Entertainment, and Recreation	0.68	0.81	-0.13
Accommodation and Food Services	0.64	0.94	-0.30
Other Services	0.82	0.73	0.09
Public Administration	0.63	0.78	-0.15
Manufacturing Categories, 2016			
Food, Beverages and Tobacco	1.25	0.34	0.91
Textile Mills and Textile Products	1.13	0.33	0.80
Apparel, leather and allied products	4.15	0.15	4.00
Wood Products	0.46	0.39	0.07
Paper and Printing	0.79	0.35	0.44
Petroleum, Coal, Chemicals, Plastics, Rubber	2.09	0.15	1.94
Nonmetallic Mineral Products	0.77	0.68	0.09
Primary Metal and Fabricated Metal Products	1.05	0.56	0.49
Machinery, Electronic, Electrical, and Transportation Equipment and Products	1.44	0.99	0.45
Furniture and Related Products	0.68	0.62	0.06
Miscellaneous Manufacturing	0.43	0.73	-0.30

Sources: Calculated from Instituto Nacional de Estadística y Geografía (Guanajuato GDP), Consejo Nacional de Población (Guanajuato population), U.S. Department of Commerce, Bureau of Economic Analysis (Arizona GDP) and U.S. Department of Commerce, Census Bureau (Arizona population).

The LQ in Guanajuato also was higher than in Arizona based on both GDP and employment in wholesale trade. In contrast, the LQs based on both GDP and employment were greater in Arizona than in Guanajuato in several sectors, particularly mining, management of companies, and administrative support.

A more in-depth look at the economies of the two states is provided in Table 25, based on per capita employment. This table includes all industries in either of the two states with a location quotient greater than 1.1 and excess employment of at least 2,500, as well as the figures for the subsector in which the industry is categorized. This reveals the magnitude of the differences in the economic structure of the two states — hardly any industries had a LQ greater than 1.1 in both states.

International Trade

Significant limitations are present in the available trade data, as discussed in this section. Before examining the trade data, the transportation infrastructure in Mexico is summarized.

Table 24: Location Quotients and Excess Employment Based On Per Capita Employment by Sector, Guanajuato and Arizona, 2014

	Location Quotient			Excess Employment	
	Guanajuato	Arizona	Difference	Guanajuato	Arizona
Total^	1.01	0.89	0.12	13,452	-290,281
Sectors, 2017					
Agriculture, Forestry, Fishing, and Hunting	0.20	0.44	-0.24	-7,411	-1,839
Mining, Quarrying, and Oil and Gas Extraction	0.43	0.75	-0.32	-4,632	-3,947
Utilities	0.49	0.92	-0.43	-5,479	-1,070
Construction	0.98	1.10	-0.12	-445	11,858
Manufacturing	1.39	0.59	0.80	96,154	-98,324
Wholesale Trade	0.98	0.74	0.24	-1,080	-33,044
Retail Trade	1.01	0.95	0.06	3,517	-14,787
Transportation and Warehousing	0.90	0.92	-0.02	-3,680	-7,681
Information	0.38	0.66	-0.28	-8,700	-24,223
Finance and Insurance	0.64	1.08	-0.44	-8,465	9,653
Real Estate and Rentals	0.91	1.03	-0.12	-1,101	1,278
Professional, Scientific, and Technical Services	0.69	0.79	-0.10	-9,255	-37,767
Management of Companies	0.41	0.71	-0.30	-1,241	-19,762
Administrative Support and Waste Management	0.76	1.16	-0.40	-19,727	36,047
Educational Services	1.11	0.81	0.30	4,062	-13,894
Health Services and Social Assistance	0.98	0.83	0.15	-463	-68,585
Arts, Entertainment, and Recreation	0.90	0.94	-0.04	-1,171	-2,863
Accommodation and Food Services	0.85	1.02	-0.17	-14,179	5,344
Other Services	0.95	0.76	0.19	-3,253	-26,546

^ In each country, the dataset used does not include public administration or the entire agriculture sector.

Sources: Calculated from Instituto Nacional de Estadística y Geografía (Guanajuato employment), Consejo Nacional de Población (Guanajuato population), and U.S. Department of Commerce, Census Bureau (Arizona employment and population).

Table 25: Location Quotients and Excess Employment Based On Per Capita Employment by Subsector and Industry, Guanajuato and Arizona, 2014

Industries With A Location Quotient Of At Least 1.1 And Excess Employment Of At Least 2,500 In One Of The States, Based On Per Capita Employment

	Location Quotient		Excess Employment	
Subsector Industry	Guanajuato	Arizona	Guanajuato	Arizona
Mining (except oil and gas)	0.63	2.65	-1,925	6,804
Copper, Nickel, Lead, and Zinc Mining	0.00	28.12	-1,202	8,957
Specialty Trade Contractors	0.78	1.15	-657	11,520
Drywall and Insulation Contractors	0.87	1.59	-16	2,511
Food Manufacturing	1.32	0.41	13,944	-17,893
Frozen Fruit, Vegetables and Prepared Foods	11.18	0.00	9,323	-1,793
Conservation of Foods by Other Than Freezing	2.21	0.32	2,529	-1,031

(Continued)

Table 25 (Continued): Location Quotients and Excess Employment Based On Per Capita Employment by Subsector and Industry, Guanajuato and Arizona, 2014

	Location Quotient		Excess Employment	
Subsector Industry	Guanajuato	Arizona	Guanajuato	Arizona
Leather and Allied Product Manufacturing	13.82	0.20	95,852	-428
Leather and Hide Tanning and Finishing	11.73	0.04	10,431	-68
Footwear	14.86	0.15	81,483	-204
Other Leather and Allied Products	7.31	0.30	3,939	-157
Paper Manufacturing	1.41	0.31	2,186	-5,094
Paperboard Containers	2.19	0.32	3,126	-2,012
Chemical Manufacturing	1.21	0.41	2,612	-9,304
Toilet Preparations (e.g. Cosmetics)	5.37	0.29	5,472	-751
Plastics and Rubber Product Manufacturing	1.95	0.40	13,826	-9,109
Plastic Plumbing Fixtures and Other Plastics	1.78	0.47	6,208	-3,978
Other Rubber Products	6.39	0.19	8,110	-1,034
Computer and Electronic Product Manufacturing	0.12	1.42	-12,847	7,206
Semiconductor and Other Electronic Components	0.23	2.32	-5,475	7,498
Transportation Equipment Manufacturing	1.06	0.75	2,384	-7,398
Motor Vehicle Transmission & Power Train Parts	5.31	0.06	5,379	-1,290
Aerospace Products and Parts	0.00	2.16	-1,344	9,882
Wholesale Trade in Textiles and Footwear	3.97	*	5,190	*
Footwear	5.85	*	3,061	*
General Merchandise Stores	*	1.03	*	2,034
Warehouse Clubs and Supercenters	*	1.27	*	3,070
Retail Trade of Textiles, Jewelry, Clothing & Footwear	1.35	*	9,074	*
Clothing, Jewelry, and Apparel Accessories	1.32	*	5,304	*
Footwear	1.61	*	3,461	*
Air Transportation	0.00	1.88	-1,554	7,885
Scheduled Air Transportation	0.00	1.96	-1,493	7,880
Truck Transportation	1.19	0.79	2,137	-6,210
General Freight Trucking, Long Distance	1.68	0.84	4,241	-2,501
Transit and Ground Passenger Transportation	1.25	0.79	3,233	-2,076
Interurban and Rural Bus Transportation	1.80	3.37	4,120	688
Credit Intermediation and Related Activities	0.71	1.26	-5,298	15,378
Savings Banks	3.30	*	3,688	*
Credit Card Issuing	*	6.06	*	7,121
Other Nondepository Credit Intermediation	*	1.70	*	5,785
Financial Transactions Processing and Reserve	*	2.02	*	2,820
Insurance Carriers and Related Activities	0.43	0.99	-2,423	-392
Direct Insurance (except life, health, and medical)	*	1.37	*	4,699
Administrative and Support Services	0.73	1.18	-22,402	37,296
Office Administrative Services	0.32	1.40	-3,015	3,605
Professional Employer Organizations	0.52	1.57	-18,979	26,562
Telephone Call Centers	0.32	2.45	-2,017	13,147
Collection Agencies	3.53	1.42	3,591	1,115
Travel Agencies	0.79	3.02	-306	4,208
Landscaping Services	0.51	1.34	-51	4,077

(Continued)

Table 25 (Continued): Location Quotients and Excess Employment Based On Per Capita Employment by Subsector and Industry, Guanajuato and Arizona, 2014

Subsector Industry	Location Quotient		Excess Employment	
	Guanajuato	Arizona	Guanajuato	Arizona
Waste Management and Remediation Services	3.47	0.84	2,675	-1,249
Waste Management and Remediation	4.55	*	2,860	*
Educational Services (Private Sector Only)	1.11	0.81	4,062	-13,894
Higher Education	1.42	0.63	4,865	-14,124
Technical and Trade Schools	0.95	2.28	-34	2,999
Ambulatory Health Care Services	1.08	0.90	1,164	-14,584
Outpatient Mental Health & Substance Abuse Ctrs	1.22	1.61	6	2,834
Amusement, Gambling, And Recreation Industries	0.91	1.02	-821	625
Casinos (except casino hotels)	*	2.24	*	2,594
Golf Courses and Country Clubs	0.00	1.81	-556	4,949
Accommodation	0.57	1.19	-7,549	7,787
Hotels (except casino hotels) and Motels	0.58	1.24	-7,028	7,596

* Not comparable.

Source: Calculated from Instituto Nacional de Estadística y Geografía (employment), Consejo Nacional de Población (population), and U.S. Department of Commerce, Census Bureau (employment and population).

Transportation Infrastructure

In general, Guanajuato and its comparison states are equally well served by the surface transportation infrastructure. Each state and major metropolitan area has access to major highways and to major rail lines. Two companies — Ferromex and Kansas City Southern de Mexico — operate Class I railways. The federal highway system in Mexico consists of a mixture of high-speed, restricted-access highways (supercarreteras), most of which are toll roads, and lower-speed highways with limited restricted access (carreteras).

In contrast, the air transportation infrastructure varies by state. Guanajuato has an international airport between the cities of León and Silao. Jalisco has two international airports, in the southern portion of the Guadalajara metro area and in Puerto Vallarta. San Luis Potosí has two national airports, in San Luis Potosí and east of Ciudad Valles, but no international airport. Querétaro does not have a major airport; its capital is 150 kilometers from the international airport near Silao.

In Table 26, the distances and travel times by highway between the major population centers in Guanajuato and its comparison states to selected cities on the border of the United States and Mexico are displayed. From each of the population centers in Guanajuato and neighboring states, the distance and travel time to Nogales, Sonora (Nogales, Arizona) is more than that to Ciudad Juárez, Chihuahua (El Paso, Texas) and substantially more than to Nuevo Laredo, Tamaulipas (Laredo, Texas). León is 1.95 times as far from Nogales as from Nuevo Laredo; travel time is 2.15 times as much.

Municipalities in Guanajuato

Using the economic base data discussed in preceding section, the municipality of León is the major

manufacturing center in the state of Guanajuato. This manufacturing region extends to the southeast to include Silao and to the southwest to include San Francisco del Rincón and Purisima del Rincón. The other major manufacturing region in the state extends from east of Celaya to Irapuato.

The Celaya-Irapuato region is served by a Class I railroad that runs southeast to Ciudad Mexico and beyond and travels west to Guadalajara then north to Nogales. Another Class I railway runs north from Celaya. From this line, connections can be made to Laredo and to other Texas cities along the lower Rio Grande Valley. Another Class I railway runs north from Irapuato to El Paso, passing through Silao, León, and San Francisco del Rincón. Connections exist between this line and rail lines that extend to such Texas cities as Laredo. In contrast, in order to reach Nogales by rail, trains would first have to head south from León and surrounding cities to join the railroad that connects Guadalajara and Nogales.

Table 26: Distance and Travel Time by Highway Between Central Mexico and the United States Border

	Distance in Kilometers			Travel Time in Hours:Minutes		
	Nogales	Ciudad Juárez	Nuevo Laredo	Nogales	Ciudad Juárez	Nuevo Laredo
Guadalajara	1,652	1,532	1,000	19:05	16:38	11:06
León	1,766	1,435	904	20:57	15:39	9:46
Querétaro	1,918	1,588	912	22:23	17:04	9:48
San Luis Potosí	1,712	1,381	721	20:08	14:49	7:51

Source: distancecalculator.globefeed.com

Major highways parallel each of these rail lines. Highway 45 connects each of the major industrial cities in Guanajuato and continues on to El Paso. In the city of Querétaro (east of Celaya), Highway 45 connects to Highway 57, which travels south to Ciudad Mexico and north to near Monterey, with direct connections to Laredo and other lower Rio Grande cities. Highway 15 connects Ciudad Mexico to Guadalajara and continues north to Nogales, but the route is south of the state of Guanajuato. Thus, trucks from the state of Guanajuato need to divert to the south to pick up Highway 15 in order to travel to Nogales by supercarretera. Alternatively, Nogales can be reached in a more direct way if part of the route is by carretera.

Trade Data from the Secretaría de Economía

The Secretaría de Economía, Subsecretaría de Comercio Exterior provides data on Mexican imports and exports, including international totals and totals specific to trade with the United States. In 2017, the worldwide value of Mexican exports was $409 billion; nearly 80 percent of the value came from exports to the United States. In contrast, the U.S. share of the value of imports to Mexico ($420 billion) was 46 percent. Thus, Mexico had an overall trade deficit of $11 billion (less than 3 percent of the export value). Mexico had a trade surplus with the United States of $132 billion, but a trade deficit with the rest of the world of $143 billion.

The annual value of trade fluctuates with the economic cycle. Apart from this cyclicality, inflation-adjusted Mexican trade values — both imports and exports —increased substantially from the mid-1990s through 2012. Gains since then have been small. In the mid-1990s, the values of Mexico's imports and exports with the United States were nearly equal. By the early 2010s, a large surplus had developed; the inflation-adjusted magnitude of the surplus has not changed much in recent years. A small trade deficit with the rest of the world in the mid-1990s became much larger by the early 2010s, but the magnitude of the trade deficit also has not changed much in recent years.

The Secretaría de Economía also provides trade values for the 50 largest commodity subcategories (of approximately 17,000 subcategories) of imports. The 50 largest export categories also are reported. Over the last several years, the sum of the value of the 50 subcategories accounted for about half of the total export value but only a third of the total import value.

Three subcategories within the mineral fuels commodity category each accounted for more than 2 percent of the total import value from the United States in 2017: gasoline, diesel fuel and natural gas. None of the other subcategories accounted for even 1.5 percent of the total import value.

In contrast, seven subcategories each accounted for at least 2 percent of the total value of exports to the United States. One, crude oil, is part of the mineral fuels category. The other six consist of manufactured goods within three commodity categories:

- Computer-related machinery and parts category: automatic data-processing machines.
- Electrical machinery, equipment and parts category: machines for the reception, conversion and transmission or regeneration of voice, images or other data; reception apparatus for television; and ignition wiring sets and other wiring sets of a kind used in vehicles, aircraft or ships.
- Vehicles other than railway category: motor homes; and motor vehicles equipped with spark-ignition internal combustion piston engines used for the transport of goods.

The Secretaría de Economía does not provide trade data by Mexican state.

Trade Data from the U.S. Department of Transportation

The U.S. Department of Transportation, Research and Innovative Technology Administration, Bureau of Transportation Statistics (BTS) reports the value of exports from the United States to Mexico by commodity category (98 categories) and mode of transportation. The value of imports from Mexico to the United States also are reported by the BTS by commodity category and mode of transportation.

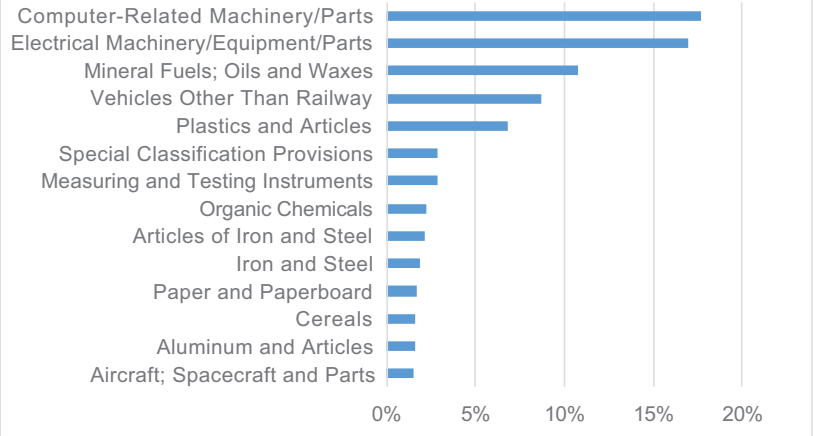
The BTS also provides trade data by state within Mexico and the United States by commodity category and mode of transportation, but these data have limitations, as discussed below. The state data include exports from each U.S. state to each Mexican state. Imports to each U.S. state are available, but information on the Mexican state from which the import originated is not available.

Trade data by state are limited to goods. While the export data by state are conceptually based on origin of movement (that is, where the good was produced, mined or grown), in reality the export data do not always represent the origin of movement. When shipments are consolidated, the state in which the consolidation occurs is reported as the origin. (Such consolidations are most common for agricultural products from states in the middle of the country, which often are consolidated in New Orleans.) More generally, the origin of nonmanufactured goods may not be accurately reported, as such goods are frequently stored in a central location before being exported. While not completely accurate as to the state of origin, the quality of the export data by state is generally considered to be good.

The quality of import data by state of destination is more problematic. If the contents of a shipment are destined for more than one state, all of the shipment value is assigned to the state with the greatest

aggregate value. If the primary destination is unknown, then the shipment may be assigned to the state of the final consignee or the state in which the shipment entered the United States. In some cases, shipments are sent to a storage or distribution point, which may be recorded as the import state. Thus, the quality of the import data by state is poor. Because of the limitations in the export and import data by state, trade balances are not reported by state.

Chart 13: Value of Exports from the United States to Mexico, Leading Commodities as a Share of the Total, 2017



Source: U.S. Department of Transportation, Research and Innovative Technology Administration, Bureau of Transportation Statistics

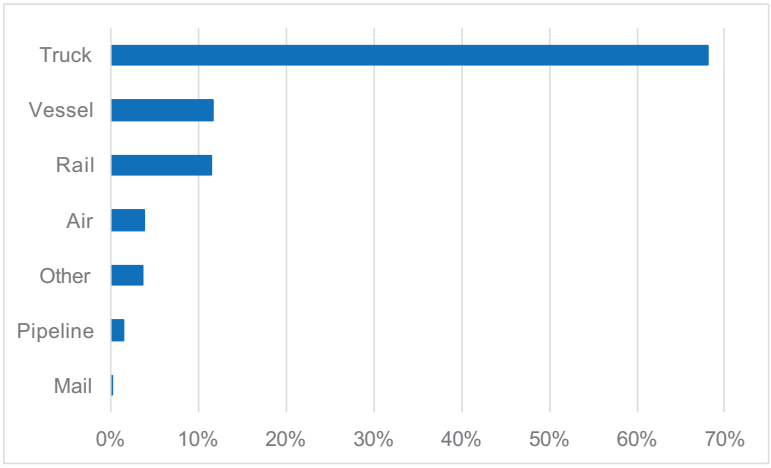
Exports from the United States to Mexico

According to the BTS, the total value of exports from the United States to Mexico was $243 billion in 2017. Expressed as a share of the total value of exports, the leading commodity categories in 2017 are shown in Chart 13. In the five largest categories, the share exceeded 6 percent. In nine categories the share was between 1.5 percent and 3 percent.

Between 2010 and 2017, the value of exports of computer-related machinery and parts trended up relative to other commodities. The aircraft, spacecraft and parts category also experienced an increase in share. The share decreased in the organic chemicals category.

In 2017, trucks were the primary mode of transportation for U.S. exports to Mexico, accounting for 68 percent of the value of all exports. The other transportation modes are shown in Chart 14. Between 2010 and 2017, there was little change in the share of the value of exports by mode.

Chart 14: Value of Exports from the United States to Mexico, Mode of Transportation as a Share of the Total, 2017



Source: U.S. Department of Transportation, Research and Innovative Technology Administration, Bureau of Transportation Statistics.

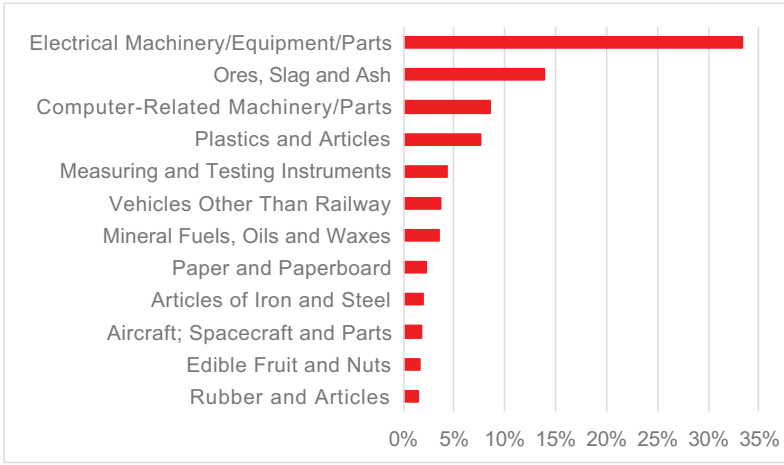
Imports from Mexico to the United States

The total value of imports to the United States from Mexico was $314 billion in 2017. Three commodity categories combined to account for 63.5 percent of the total: vehicles other than railway (26.6 percent); electrical machinery, equipment and parts (19.7 percent); and computer-

related machinery and parts (17.2 percent). The next three largest categories each accounted for between 3 percent and 5 percent of the total import value: measuring and testing instruments; mineral fuels, oils and waxes; and furniture, lamps and prefabricated buildings. Six other categories had shares of between 1.5 percent and 3 percent.

In 2017, trucks were the primary mode of transportation for imports to the United States from Mexico, accounting for 70 percent of the value of all imports. Other shares were 16.5 percent by rail and 7.8 percent by vessel.

Chart 15: Value of Exports from Arizona to Mexico, Leading Commodities as a Share of the Total, 2017

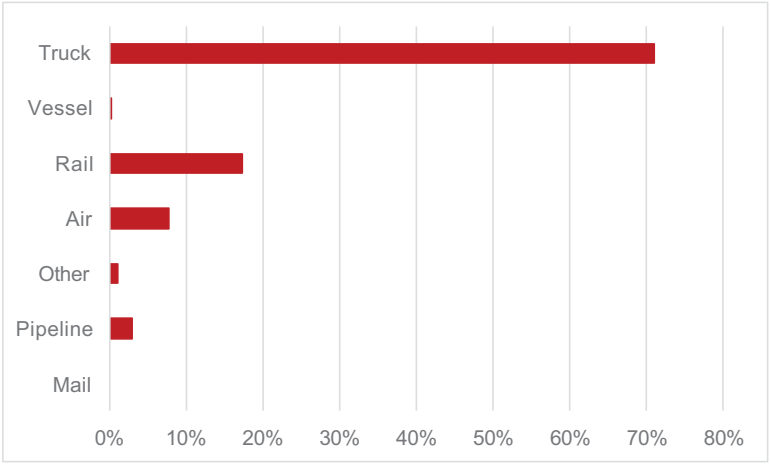


Source: U.S. Department of Transportation, Research and Innovative Technology Administration, Bureau of Transportation Statistics.

The United States had a negative trade balance with Mexico of $71.1 billion in 2017. The overall trade deficit was overwhelmingly due to one commodity category: the deficit was $62.5 billion in vehicles other than railway. Other sizable deficits were $20.7 billion for electrical machinery, equipment and parts; $11.1 billion for computer-related machinery and parts; $8.6 billion for furniture, lamps and prefabricated buildings; $7.1 billion for measuring and testing instruments; $6.1 billion for edible fruits and nuts; and $5.6 billion for edible vegetables and roots. In contrast, the United States had a trade surplus in 60 percent of the commodity categories, including sizeable surpluses in mineral fuels, oils and waxes ($15.0 billion), and plastics and articles ($11.6 billion).

The U.S. trade balance was negative for goods shipped by truck and by rail. Small trade surpluses were present for goods shipped by vessel (ship), pipeline, air and other means.

Chart 16: Value of Exports from Arizona to Mexico, Mode of Transportation as a Share of the Total, 2017



Source: U.S. Department of Transportation, Research and Innovative Technology Administration, Bureau of Transportation Statistics.

Exports from Arizona to Mexico

The total value of exports from Arizona to Mexico was $7.6 billion in 2017. Exports from Arizona to Mexico totaled $1,074 per Arizona resident, considerably greater than the U.S. per capita figure of $747.

The share of the total value of exports from Arizona to Mexico exceeded 6 percent in four commodity categories and was between 1.5 percent and 4.5 percent in eight categories. These categories are shown in Chart 15. The value of exports

by mode of transportation are shown in Chart 16.

Since the magnitude of exports to Mexico, as measured by the per capita value, differs between Arizona and the United States, a comparison between Arizona and the nation of the value of commodities based on share of the total is a less desirable measure than a comparison of per capita values. The per capita values in 2017 are shown in Table 27 for commodity categories with a value of at least $10 in either the United States or Arizona and for each mode of transportation. The commodity mix of exports from Arizona differed considerably from the nation. In particular, the per capita value of exports was considerably higher in Arizona than the nation in the categories of electrical machinery, equipment and parts; and ores, slag and ash. In contrast, Arizona's per capita values were moderately lower in the categories of computer-related machinery and parts; and mineral fuels, oils and waxes.

The value of exports from Arizona to Mexico varies from year to year by more than the value of exports from the United States to Mexico. For example, Arizona's export value from 2014 through 2016 accounted for an unusually large share of the U.S. total (peaking at 3.9 percent), but Arizona's share was back to a typical level (of 3.1 percent) in 2017. The annual fluctuations are greater by commodity category, making it difficult to discern between a true trend in trade value and transitory increases or decreases. For example, the ores, slag and ash category accounted for just 2 percent of Arizona's exports in 2010; the share rose to 27 percent in 2015, but dropped back to 14 percent in 2017. Commodities in which a trend in the share of Arizona's exports appears to be present include vehicles other than railway (an increase), computer-related machinery and parts and food residue and waste (decreases).

Table 27: Per Capita Value of Exports from the United States and Arizona to Mexico, 2017

			Arizona Versus United States	
	United States	Arizona	Ratio	Difference
Total	$747.32	$1,074.39	1.44	$327.07
Leading Commodities*				
Computer-Related Machinery/Parts	131.84	91.41	0.69	-40.43
Electrical Machinery/Equip/Parts	126.98	358.99	2.83	232.01
Mineral Fuels, Oils and Waxes	80.28	37.12	0.46	-43.16
Vehicles Other than Railway	64.99	40.10	0.62	-24.89
Plastics and Articles	51.19	81.37	1.59	30.18
Special Classification Provisions	21.68	1.90	0.09	-19.78
Measuring and Testing Instruments	21.38	46.53	2.18	25.15
Organic Chemicals	16.95	0.48	0.03	-16.47
Articles of Iron and Steel	15.98	20.43	1.28	4.45
Iron and Steel	14.02	6.37	0.45	-7.65
Paper and Paperboard	12.41	24.90	2.01	12.49
Cereals	12.14	0.22	0.02	-11.92
Aluminum and Articles	11.76	8.08	0.69	-3.68
Aircraft, Spacecraft and Parts	11.62	19.19	1.65	7.57
Rubber and Articles	10.41	16.48	1.58	6.07
Ores, Slag and Ash	3.56	149.70	42.01	146.14
Copper and Articles	7.40	18.98	2.56	11.58
Edible Fruit and Nuts	2.60	18.04	6.94	15.44
Furniture, Lamps & Prefab Buildings	6.83	10.98	1.61	4.15
Tools of Base Metal	2.74	10.71	3.92	7.97
Mode of Transportation				
Truck	508.30	762.32	1.50	254.02
Rail	86.29	185.90	2.15	99.61
Pipeline	10.67	32.11	3.01	21.44
Air	28.23	82.18	2.91	53.95
Vessel	87.06	0.37	0.00	-86.69
Mail	0.01	0.00	0.00	-0.01
Other	26.77	11.51	0.43	-15.26

* The commodities listed have a per capita value of at least $10 from either the United States or Arizona.

Note: The per capita value is calculated using population estimates for the United States and Arizona.

Source: U.S. Department of Transportation, Research and Innovative Technology Administration, Bureau of Transportation Statistics (exports) and U.S. Department of Commerce, Census Bureau (population).

While vessels (ships) are a common mode of transporting exports from the United States to Mexico, this option is not available for exports from Arizona. Thus, the per capita values shipped by truck, rail, air and pipeline were greater in Arizona than the nation.

Table 28: Per Capita Value of Exports from the United States and Arizona to Guanajuato, 2017

			Arizona Versus United States	
	United States	Arizona	Ratio	Difference
Total	$27.37	$1.57	0.06	$-25.80
Leading Commodities*				
Vehicles Other than Railway	6.19	0.02	0.00	-6.17
Computer-Related Machinery/Parts	5.38	0.77	0.14	-4.61
Electrical Machinery/Equip/Parts	3.59	0.21	0.06	-3.38
Plastics and Articles	1.95	0.17	0.09	-1.78
Articles of Iron and Steel	1.30	0.00	0.00	-1.30
Paper and Paperboard	1.13	0.04	0.03	-1.09
Rubber and Articles	1.00	0.01	0.01	-0.99
Measuring and Testing Instruments	0.77	0.02	0.02	-0.75
Iron and Steel	0.63	0.00	0.00	-0.63
Miscellaneous Chemical Products	0.63	0.00	0.00	-0.63
Mode of Transportation				
Truck	18.63	1.51	0.08	-17.12
Rail	8.71	0.05	0.01	-8.66
Other	0.03	0.02	0.58	-0.01

* The commodities listed have a per capita value of at least $0.50 from either the United States or Arizona.

Note: The per capita value is calculated using population estimates for the United States and Arizona.

Source: U.S. Department of Transportation, Research and Innovative Technology Administration, Bureau of Transportation Statistics (exports) and U.S. Department of Commerce, Census Bureau (population).

Since some commodities are predominantly shipped by a particular mode of transportation, the annual fluctuations in the value of exports by commodity cause annual variations in the value by mode of transportation. From 2010 through 2017, the share of the value of Arizona's exports transported by truck ranged from 58 percent in 2014 to 88 percent in 2010. Rail's share ranged from 4 percent in 2010 to 32 percent in 2015.

Imports from Mexico to Arizona

The unreliability of the import data by state is easily seen in the category of edible vegetables and roots. In 2017, Arizona was reported to be the destination of 26 percent of the value of the imports to the United States from Mexico. The state's share of the nation's population was 2.2 percent. Rather than Arizonans consuming a highly disproportionate share of vegetables and roots, Arizona was reported as the destination for some loads of vegetables and roots that were destined for multiple states, since the load passed through the Nogales port of entry. Arizona's share also was too high in other categories, such as edible fruits and nuts (8.6 percent).

Exports from the United States to Guanajuato

The value of exports from the United States to the state of Guanajuato was $8.9 billion in 2017. In recent years, the value to Guanajuato rose more than the value of exports to Mexico. Per resident of Guanajuato, the 2017 amount was $1,469 — 25 percent less than the per capita value of exports to all of Mexico ($1,959 based on the population of Mexico).

By commodity, the mix of exports from the United States to Guanajuato was different from that to all of Mexico. Comparing Guanajuato to Mexico on a per capita basis in the primary commodities exported to Mexico, the value of exports to Guanajuato was considerably higher in the categories of vehicles other

than railway; paper and paperboard; and articles of iron and steel. The per capita values to Guanajuato were much less than the nation in the categories of mineral fuels, oils and waxes; special classification; organic chemicals; cereals; and aircraft, spacecraft and parts. Per capita values to Guanajuato also were lower in the categories of electrical machinery, equipment and parts; and aluminum and articles.

Table 29: Per Capita Value of Exports from the United States to Mexico and Selected Mexican States, 2017

	Per Capita	Per Capita Values by State: Ratio to Mexico Per Capita Value			
	Mexico	Guanajuato	Jalisco	Queretaro	San Luis Potosi
Total	$1,959	0.75	0.47	1.21	0.70
Leading Commodities*					
Computer-Related Machinery/Parts	346	0.84	0.37	0.89	0.81
Electrical Machinery/Equipment/Parts	333	0.58	0.75	0.66	0.55
Mineral Fuels, Oils and Waxes	210	0.04	0.08	0.17	0.04
Vehicles Other than Railway	170	1.95	0.24	2.89	1.23
Plastics and Articles	134	0.78	0.42	1.47	0.93
Special Classification Provisions	57	0.02	0.15	0.13	0.02
Measuring and Testing Instruments	56	0.73	0.32	0.51	0.94
Organic Chemicals	44	0.10	0.25	0.84	0.13
Articles of Iron and Steel	42	1.66	0.37	1.29	0.96
Iron and Steel	37	0.92	0.18	0.94	3.25
Paper and Paperboard	33	1.86	0.39	1.89	0.30
Cereals	32	0.17	2.10	0.22	0.14
Aluminum and Articles	31	0.55	0.12	1.99	1.16
Aircraft; Spacecraft and Parts	31	0.09	0.10	1.94	0.12
Other Commodities**					
Rubber and Articles	27	1.97	0.33	4.74	2.93
Live Animals	25	1.20	0.56	1.37	0.09
Miscellaneous Chemical Products	24	1.41	0.33	0.74	0.41
Inorganic Chemicals	13	0.26	0.27	10.04	1.31
Food Residues and Waste	12	1.09	3.49	1.47	0.33
Tanning or Dyeing Extracts	12	0.36	0.31	3.00	1.19
Dairy Products	11	2.37	0.99	4.21	0.22
Sugars and Sugar Confectionary	6	0.06	8.87	0.80	0.02
Raw Hides and Skins	3	10.24	0.01	0.00	0.16
Ceramic Products	2	0.25	0.03	12.99	0.55
Mode of Transportation					
Truck	1,332	0.75	0.52	1.48	0.85
Vessel	228	0.00	0.00	0.00	0.00
Rail	226	2.07	1.00	1.74	1.05
Air	74	0.00	0.00	0.00	0.00
Other	70	0.02	0.03	0.09	0.02
Pipeline	28	0.00	0.00	0.00	0.00

* The commodities listed have a per capita value of at least $30 in Mexico.
** The commodities listed have a per capita value of at least $30 in one of the four states.
Note: The per capita value is calculated using population projections for Mexico and each of the states.

Source: U.S. Department of Transportation, Research and Innovative Technology Administration, Bureau of Transportation Statistics (exports) and Consejo Nacional de Población (population).

Between 2010 and 2017, considerably more annual fluctuation was experienced in the commodity shares of the total value of exports to Guanajuato than to the nation, masking any trends in the exports of particular commodities. However, a substantial increase in share occurred in the electrical machinery, equipment and parts category, offset by a large drop in share in the vehicles other than railway category. The share also increased in the categories of articles of iron and steel; and plastics and articles. The share decreased in the cereals category.

As with exports from the United States to Mexico, a little more than two-thirds of the export value to Guanajuato was transported by truck in 2017. While the remainder of the value of exports from the United States to Mexico was split among other modes of transportation, nearly all of the balance was transported to Guanajuato by rail. Thus, the per capita value was much above the nation by rail, but considerably below the nation in the other modes. Between 2010 and 2017, an increasing share of the value of exports from the United States to Guanajuato were transported by truck, offset by a decreasing share traveling by rail.

Exports from Arizona to Guanajuato

The value of exports from Arizona to Guanajuato was only $11 million in 2017. This is a per capita value of $1.57 based on the population of Arizona, only 6 percent of the U.S. per capita value to Guanajuato based on the U.S. population. Table 28 compares the per capita values in Arizona and the United States for 2017.

Between 2010 and 2017, the value of exports from Arizona to Guanajuato varied from a low of $11 million in 2017 to a high of $54 million in 2014. Even in 2014, Arizona's per capita value was far below the national average.

Table 30: Value of Exports from Arizona to Mexico and Selected Mexican States, 2017

	Per Capita	Per Capita Values by State: Ratio to Mexico Per Capita Value			
	Mexico	Guanajuato	Jalisco	Queretaro	San Luis Potosi
Total	$61.1	0.03	0.19	0.32	0.04
Leading Commodities*					
Electrical Machinery/Equipment/Parts	20.4	0.01	0.25	0.06	0.02
Ores, Slag and Ash	8.5	0.00	0.00	0.00	0.00
Computer-Related Machinery/Parts	5.2	0.17	0.30	0.27	0.01
Plastics and Articles	4.6	0.04	0.12	0.17	0.09
Measuring and Testing Instruments	2.6	0.01	0.24	0.08	0.19
Vehicles Other than Railway	2.3	0.01	0.03	0.13	0.00
Mineral Fuels, Oils and Waxes	2.1	0.00	0.02	2.35	0.00
Paper and Paperboard	1.4	0.03	0.32	0.03	0.10
Articles of Iron and Steel	1.2	0.00	0.28	0.10	0.02
Aircraft, Spacecraft and parts	1.1	0.00	0.00	1.55	0.00
Copper and Articles	1.1	0.00	0.04	0.00	0.00
Edible Fruits and Nuts	1.0	0.00	1.09	0.00	0.00
Mode of Transportation					
Truck	43.3	0.04	0.25	0.44	0.04
Rail	10.6	0.01	0.05	0.02	0.05
Air	4.7	0.00	0.00	0.00	0.00
Pipeline	1.8	0.00	0.00	0.00	0.00
Other	0.7	0.03	0.18	0.87	0.00

* The commodities listed have a per capita value of at least $30 in Mexico.
Note: The per capita value is calculated using population projections for Mexico and each of the states.

Source: U.S. Department of Transportation, Research and Innovative Technology Administration, Bureau of Transportation Statistics (exports) and Consejo Nacional de Población (population).

The value of exports from Arizona to Guanajuato of specific commodities varied widely by year. Since 2011, computer-related equipment and parts have accounted for roughly half of the Arizona total. Other commodities that have had a moderate value in some years include electrical machinery, equipment and parts; photographic goods; plastics and articles; and paper and paperboard.

Since 2011, at least 80 percent of the value of Arizona's exports to Guanajuato has been transported by truck; nearly all of the rest have been sent by rail.

Exports from the United States and Arizona to the Comparison States

The overall per capita value of exports from the United States to Mexico in 2017 is shown in Table 29 along with the ratios of the per capita values in Guanajuato and its comparison states to the national figure. Each commodity with a national per capita value of at least $30 is shown, as well as other categories in which at least one of the four states have a per capita value of at least $30.

For six of the top eight commodities nationally, the per capita value was less than the national average in each of the four states. In only one of the 14 leading national commodities was the per capita value in excess of the national average in at least three of the states. Though the raw hides and skins category was insignificant nationally, its per capita value of exports to Guanajuato was moderate.

Among the modes of transport, each of the four states had a per capita value at least equal to the national figure; in the other modes, the per capita value in the states was almost always lower than the national value.

The overall per capita value of exports from Arizona to Mexico in 2017 is shown in Table 30, along with the ratios of the per capita values in Guanajuato and its comparison states to the national figure. Each commodity with a national per capita value of at least $1 is shown; no other commodities have a per capita value of at least $1 in any of the four states.

Of the 12 commodities listed, the per capita value exceeded the national average only in two commodities in Querétaro and one in Jalisco. Generally, the per capita value was far below the national average in each commodity in each state. Among the modes of transport, each of the four states had a per capita value less than the national figure in each mode.

Comparison of Bureau of Transportation Trade Data to the Economic Base of Arizona

Based on the BTS data, differences in the mix of commodities exported from Arizona to Mexico relative to those exported from the United States to Mexico in 2017 generally reflect Arizona's economic base. The shares of the total value of exports from Arizona exceeded those from the United States in the categories of electrical machinery, equipment and parts (including electronics); measuring and testing instruments; ores, slag and ash; and plastics. Arizona's economy has concentrations in each of these commodities except plastics. The shares of the total value of exports from Arizona were lower than the national average in the commodities of computer-related machinery and parts; mineral fuels, oils and waxes; and vehicles other than railway. Arizona's economy has limited activity in these commodities.

In contrast, the commodity mix of the small volume of exports from Arizona to Guanajuato bears little resemblance to Arizona's economy. In 2017, disproportionate shares of Arizona's exports to Guanajuato occurred in the commodities of dairy products; food residue and waste; essential oils and resinoids; photographic goods; plastics; and computer-related machinery and parts.

Metropolitan Areas

In 2013, the Brookings Institution released estimates of metropolitan area trade data.[24] The Brookings database, which is limited to 2010 data, is conceptually different from the BTS data. The Brookings methodology "attempts to estimate where goods are produced and where they are consumed." The Brookings database of metro area trade consists of allocations of national trade data — which include information on origins, destinations, and border crossings — based on production and consumption levels in metro areas and the distance of each metro area from the U.S. port of entry or exit. The methodology used by Brookings is detailed in Appendix 4.

The Brookings database is subject to other limitations. While the Brookings analysis included 43 two-digit

[24] Brookings Institution, Metro North America, November 2013, https://www.brookings.edu/wp-content/uploads/2013/11/bmpp_MetroNA_FINAL.pdf. The dataset used in this analysis was supplied by Brookings upon request.

categories within the Standard Classification of Transported Goods, only 12 groupings of categories are reported by Brookings: nine for manufactured products, one for agricultural products, one for stones and ores, and one for energy products. Similarly, while 369 U.S. metro areas as well as the nonmetropolitan portion of each state were included in the analysis, Brookings released estimates only for the 100 largest U.S. metros, each of which had more than 500,000 residents in 2010. The 59 metro areas in Mexico that were officially defined as of 2013 were used by Brookings.

Due to the highly derived nature of the estimates, Brookings warns that "caution should be used in interpreting these estimates." A comparison of the export values from U.S. states reported by the BTS to the export values from U.S. metropolitan areas reported by Brookings in 2010 reveals significant inconsistencies, even after adjusting for the difference between state-level data from the BTS and metro-level data from Brookings.

In order to compare the export data from Arizona reported by Brookings to the export data reported by the BTS in 2010, the export values of the Phoenix and Tucson metro areas were aggregated, as were the metro areas by Mexican state. Per capita values were calculated using the 2010 census counts of the metropolitan areas in Mexico. These per capita values were compared to per capita values calculated by state, using the data from the BTS.

The overall per capita value of exports from the aggregation of the metro areas in Arizona to the aggregation of the metro areas in each of the four central Mexican states ranged from somewhat greater than to somewhat less than the figure to the aggregation of the 59 Mexican metro areas in 2010. This is highly inconsistent with the BTS data for 2010, which show per capita exports from Arizona to the four central Mexican states to be far below the per capita figure to Mexico. Given the distance from Arizona to Central Mexico and the disproportionate presence of maquiladoras near the U.S.-Mexico border, as well as the methodology used by the BTS and Brookings to generate the trade values, the data from the BTS are assessed to be much more accurate. Thus, the Brookings data are not presented in this report.

Conclusion

At this time, business transactions between Arizona and Guanajuato are small compared to other U.S. and Mexican regions. However, trade may increase as the two states continue to develop their economies and refine their industrial mix.

Arizona's industrial portfolio is oriented towards the service sector, with large shares of GDP going to the financial, real estate, healthcare and public administration sectors. On the other hand, Guanajuato has a very strong manufacturing presence, with 29 percent of its GDP coming from this sector.

The strong manufacturing sector in Guanajuato means that trade with Arizona will likely be influenced by transportation considerations. Existing highway and rail networks linking Guanajuato and the United States are most developed in the eastern part of Mexico, headed toward the ports of entry in Texas. Overland transport from Guanajuato to Arizona to the Nogales port of entry will need to be studied carefully if it is to be expanded in the future.

Air connections between the two states exist, but a non-stop route connection to Guanajuato would increase opportunities. The opening of SkyBridge at the Phoenix-Mesa Gateway Airport has garnered much attention. This freight processing facility will ease shipment of goods from Arizona to the interior of Mexico by centralizing customs processing on the U.S. side of the border. However, air freight is best suited to the shipment of items that are low in weight and high in value. Parts from the factories supplying the automotive industry are unlikely to be moved by air, as are loads of copper ore from Arizona. Air transport of semiconductors and electronic sub-assemblies from electronics and aerospace firms in Arizona are a better candidate for air shipment, provided that customers for these products can be found in Mexico.

Guanajuato is a state that is aggressively working to modernize its manufacturing base, expanding from its traditional strengths in leather goods and apparel into automobiles. As well, Arizona is always looking for opportunities to expand its economy. Currently there is relatively little trade between Arizona and Guanajuato, however, it is prudent to look ahead and position economic assets so that Arizona and Guanajuato can capitalize on trade opportunities more aggressively.

The baseline demographic and economic data presented in this report can facilitate pursuit of new and enhanced trade relations. With this data and analysis in hand, leaders of subsequent trade missions, government and business cross-border conversations, research initiatives and strategic investments can build upon where we are today and help propel economic connectivity for the mutual benefit of both Arizona and Guanajuato.

Appendix 1

Measurement Conversions

1 mile = 1.6093 kilometers

1 kilometer = 0.6214 miles

1 foot = 0.3048 meters

1 meter = 3.281 feet

1 inch = 25.4 millimeters

1 millimeter = 0.0394 inches

Fahrenheit (F) = (C*1.8) + 32

Celsius (C) = (F-32) * 0.8

Appendix 2

North American Industry Classification System

The North American Industry Classification System (NAICS) is used to classify business establishments for the purpose of collecting, analyzing, and publishing statistical data related to the economy in Canada, Mexico and the United States. All economic activities are classified into one of 20 sectors, which are consistent across the countries. The sectors are divided first into subsectors, then into industry groups, and then into industries, each of which are assigned a unique NAICS code. Codes for sectors are two digits in length, subsectors have a three-digit code, industry groups have a four-digit code and industries have a five-digit code.

While the subsectors, industry groups, and industries are designed to be as similar as possible across the three countries, differences exist. In contrast, each nation also uses a six-digit definition of industries that is not intended to be comparable across the countries.

The comparability of the NAICS in Mexico and the United States by sector follows:

11 Agriculture. Comparable.
21 Mining: Comparable.
22 Utilities. Some subsectors, industry groups and industries are not comparable.
23 Construction. Comparable except for some industries in one industry group.
31-33 Manufacturing. A few differences are present at the industry level.
42 (U.S) or 43 (Mexico) Wholesale Trade. Subsectors, industry groups and industries are not comparable.
44-45 (U.S.) or 46 (Mexico) Retail Trade. Subsectors, industry groups and industries are not comparable.
48-49 Transportation and Warehousing. Differences are present in one industry group and in a few industries.
51 Information. Comparable.
52 Finance and Insurance. Numerous differences by subsector, industry group and industry.
53 Real Estate and Rental. Some industries are not comparable.
54 Professional, Scientific and Technical Services. One difference at the industry level.
55 Management of Companies. Comparable.
56 Administrative support and waste management. Differences in industry groups and industries are present in the waste management subsector.
61 Education Services. Industries differ in one industry group. This sector includes only private-sector education.
71 Arts, Entertainment and Recreation. Comparable.
72 Accommodation and Food Services. Comparable.
81 Other services. Differences at the industry group and industry levels.
92 (U.S.) or 93 (Mexico) Public Administration. Subsectors, industry groups and industries are not comparable.

Appendix 3

Introduction to Regional Economics and Economic Base Studies

At a subnational level, a region can be defined in various ways, such as a grouping of states, a single state, a metropolitan area or a labor market area. Regional economics, sometimes referred to as "spatial economics," has been described as addressing the question of "what is where, and why — and so what?"[25] Regional economics has three "foundation stones":

- Natural resource advantages. The unequal distribution of climate, minerals, soil, topography and most other natural features helps to explain the location of many kinds of economic activity. In economic terms, this is "imperfect factor mobility." The complete or partial immobility of land and other productive factors is one essential part of any explanation of what is where. Such immobility lies at the heart of the comparative advantage that various regions enjoy for specialization in production and trade.
- Economies of spatial concentration. In economic terms, this is "imperfect divisibility." Economies of scale can result from the concentration of an economic activity in a particular location. Such concentrations have been described as clusters.
- Costs of transportation and communication. Such costs vary by location. In economic terms, this is "imperfect mobility of goods and services."

As the distribution of economic activity over space changes, there are important consequences for individuals and for communities. For example, electronics manufacturing used to be a dominant economic activity in Arizona, especially in the Phoenix area. As this economic activity has shrunk in size, at a disproportionate rate relative to the nation, it has had a substantial impact on workers — many of whom have had to move to find work — and on the communities in which the manufacturing facilities were located. Empty buildings and reduced consumer consumption put a strain on city finances. The impacts have been especially large due to the high average wage paid by the electronics manufacturers and by the lower wages paid by companies that eventually occupied the empty space.

A key concept in regional economics is the distinction between "traded" economic activities and other ("nontraded") economic activities.

Traded Economic Activities

Goods and services sold to customers (individuals or businesses) who are not residents of a region are referred to as "traded" economic activities. Synonyms for "traded" include "tradable," "export" and "basic."[26]

[25] The discussion in this paragraph is from Edgar M. Hoover and Frank Giarratani, *An Introduction to Regional Economics*, http://www.rri.wvu.edu/webbook/giarratani/chapterone.htm

[26] The definition of "export" in this situation applies to any sale to a customer from outside the region and is not limited to international exports.

The sale of goods and services to customers from outside the region imports money into the regional economy that would otherwise not be present. Importing money into a regional economy is a necessity since "leakages" of money from the regional economy inevitably occur. Since no region produces all of the goods desired by its residents, money leaves the region when purchases of goods manufactured in other regions are made. Expenditures by residents while visiting another region is another form of leakage.

Few economic activities sell wholly to customers outside the region or entirely to regional residents, but in many cases, customers are predominantly from either the region or from other regions. Many manufacturing, mining and agricultural activities have a high percentage of sales made to customers from outside the region. For example, a high percentage of the aerospace goods manufactured in Arizona are sold to customers outside the state. Other activities that import money into a region include tourism and some services, such as call centers of a national company that serve a market area greater than the region.

A few traded activities, such as a copper mine, are location specific but most traded activities can locate anywhere since their customers are spread out across the country or the globe. Traded activities tend to concentrate geographically in relatively few regions. For example, high-technology activities are disproportionately found in a handful of U.S. locations, such as the Silicon Valley and Boston. This concentration is due to factors other than customer location.

In contrast to traded activities, nontraded (or "local") economic activities are location specific since they sell their goods and services to regional customers (which consist of local companies as well as individuals). Local economic activities do not display geographic concentrations across the country. Instead, their presence largely is proportional to a region's size, as defined by purchasing power.

While an integral part of a regional economy, nontraded activities do not import money into the regional economy. Their presence in the region is due to traded activities — the expenditures made locally by companies selling traded goods and services and by the employees of these businesses. In this way, traded activities "drive" the regional economy while nontraded activities respond to the growth occurring in traded activities.

To illustrate the relationship between traded and nontraded activities, consider the extreme case of a community that is wholly dependent on one traded activity. In some mining towns, the output of the mine is the sole traded product. No one lived in the area until the mine began to hire workers. While the mine is operating, a variety of nontraded activities spring up to serve those employed at the mine. When the mine closes, the mine's employees leave the town to find jobs elsewhere and the businesses engaged in nontraded activities immediately lose many of their customers. A community cannot survive by selling goods and services to each other because of leakages of local monies. Some former mining towns have survived by attracting other traded activities, such as tourism. Otherwise, without a means of importing money into the community to offset the leakages, the nontraded businesses in a former mining town eventually shut down, resulting in a ghost town.

Regional economic development interests do not need to be concerned about attracting companies to serve local residents and businesses. If an unmet demand is present, a company will fill the opening without

any intervention from local governments or economic development agencies.[27,28] Regional economic development focuses on traded activities since communities located outside the region — elsewhere in the same state, in other states, or in other nations — are competing to become the home of these traded activities.

Every regional economy has both traded and untraded economic activities; each type of activity is integral. For example, in a smaller region, the addition of a specialized retailer "plugs a leak." That is, consumers of the specialized product can buy it locally, keeping their money within the regional economy. This has the same effect on regional dollars as a traded activity with an equivalent sales volume moving into the region. However, there is a key distinction between traded and untraded activities: the capacity for growth in a regional economy is severely limited unless growth in traded activities occurs. In addition, most traded activities pay considerably higher wages than most nontraded activities, and more generally have a larger "footprint" on the region than a nontraded activity with the same number of employees.

Economic Base Studies

An economic base study identifies leading economic activities in a region. In order to conduct an economic base study, measures of economic activity must be available for components of the overall economy. The North American Industry Classification System (NAICS) hierarchically divides economic activity into sectors (two-digit code — for example the agriculture sector is 11), subsectors (three digit), industry groups (four digit), and industries (five and six digit). While an economic base study can be undertaken using any level of the NAICS, utilizing the most-detailed industry data produces the most precise and useful results.

Any one of several economic measures conceptually could be used in a base study. Since employment data by industry are available, employment generally is the economic measure used in base studies. However, employment is an inferior measure of economic activity because it does not consider the number of hours worked or the hourly wage. Monetary economic measures generally are not available for industries.

An economic base study differs from a simple examination of the composition of a regional economy (using employment or another economic measure) by considering the importance of an economic activity in a regional economy relative to its significance in a geographically broader economy — usually the national economy is used for the comparison.

In order to determine the importance of economic activities in a regional economy relative to their significance in a broader economy, a "location quotient" is calculated for each economic activity. Typically, a base study compares the shares of total economic activity by sector, subsector, industry group and/or industry in a region to those in the nation. A location quotient is calculated by dividing the share in the region by the national share. For example, if an industry's employment makes up 0.11 percent of the total

[27] This assumes that the unmet demand is large enough to result in a profitable operation. Residents of small communities often have to travel to other communities to make purchases because the unmet demand in the community is inadequate to attract a merchant to the community.

[28] However, cities within a metropolitan area compete with each other to attract companies serving the local population in order to receive the tax benefits of the economic activity. This competition is unhealthy from the perspective of the metro area.

employment in a region but 0.10 percent nationally, the location quotient is 1.1 (0.11 divided by 0.10). If a location quotient is greater than 1, then "excess" — that is, above average — employment exists in that industry in the region.

The standard method of calculating location quotients is less than desirable if the overall level of economic activity in a region is much different from the national average after adjusting for the size differential, as measured by population. In Arizona for example, overall per capita employment is considerably lower than the national average. In a case such as this, location quotients based on industrial shares present a misleading picture of the concentration of an economic activity in a regional economy — an activity's share of the regional economy may be above average but its per capita activity may be below the national average.

Thus, an alternative means of calculating location quotients is to compare per capita economic activity in a region to the national per capita figure. For example, if an industry's employment per 1,000 residents is 0.10 regionally, but 0.11 nationally, the location quotient is 0.91 (0.10 divided by 0.11). A location quotient less than 1 indicates that economic activity in the region is less than average and that a "deficit" of employment exists in that activity in the region.

The magnitude of the employment "differential" — the excess or deficit — is quantified by subtracting from the region's employment the product of population in thousands and national employment per 1,000 residents. The existence of excess employment indicates an unusually strong concentration in that economic activity.

A location quotient greater than 1 can result from an above-average level of sales to customers from outside the region or from local conditions that cause above-average sales to regional residents. In the Arizona desert, for example, activities related to air conditioners (sales, maintenance and repair) have excesses because of climate-induced high levels of expenditures by local residents relative to the national average.

Historically, base studies have focused on employment excesses (economic activities with a location quotient greater than 1) without considering whether an economic activity primarily serves regional residents or primarily sells to customers located outside the region. This serious omission was necessitated by a lack of information regarding the nature of an economic activity's customers. Thus, information relative to the traded portion of economic activities is a key addition to a traditional economic base study.

An economic activity can be traded but not have an excess or can have an excess but not be traded. The most important activities to a regional economy are those that are traded and have an excess.

Appendix 4

Methodology Used by Brookings Institution to Produce Estimates of Trade Values by Metropolitan Area

The following description is taken from "Appendix A – Methodology" of the November 2013 report Metro North America produced by Brookings Institution, https://www.brookings.edu/wp-content/uploads/2013/11/bmpp_MetroNA_FINAL.pdf

Goods Trade Database

To estimate flows between metropolitan areas, Brookings Institution worked with the Economic Development Research Group (EDR) to create a database that allocates national goods trade to the metropolitan scale. It builds on a database created by Brookings and EDR that estimated international goods-trade flows between 369 U.S. metropolitan areas and 40 international geographic areas (18 countries, 11 larger country groups and 11 continental remainders). We used this existing database's estimated freight flows from U.S. metropolitan areas to Canada and Mexico, at the national level, as a starting point.

These flows were estimated using trade data from the World Institute for Strategic Economic Research (WISER) for 2010. The methodology used a gravity constraint to link the origin for exports and destination for imports more directly in terms of each metropolitan area's and "rest of state" regions' production and consumption. Estimates for consumption and production were based on EDR's access to IMPLAN data on local industrial activity. This database presented trade flows in terms of the Standard Classification of Transported Goods (SCTG) system's two-digit level (43 commodity categories).

It should be noted that this Brookings database shares a 0.91 correlation with ExportNation's 2010 goods data. However, because this report and ExportNation use different statistical bases, and only ExportNation includes service exports, the actual numbers will not match between the two datasets. It should be noted that a special process was used to allocate crude petroleum (SCTG 16). Limited by the sample size for this commodity – as well as by the suppression of numerous industry records for confidentiality – our database allocates these missing flows to counties with non-suppressed refinery data. As such, our estimates may overrepresent or underrepresent petroleum flows between certain geographic zones.

Where this analysis differs from previous Brookings research on freight flows is that it down-allocates goods movement from the national level to the metropolitan level in Canada and Mexico. To do this, the same methodology used to estimate U.S. metropolitan-level international goods imports and exports was applied to Canada and Mexico. Using 2010 WISER data for U.S. metropolitan trade with Canada and Mexico, the database identifies U.S. origins and destinations, as well as border crossings (or ports of entry/exit). Brookings and EDR then allocated existing U.S. metropolitan import and export estimates from the national level in Canada and Mexico to subnational zones in each country.

The resulting database includes 369 U.S. core based statistical area (CBSAs) and 48 rest-of-state zones; 59 census-defined Mexican metropolitan zones and 29 rest-of-state zones; and 33 Canadian census metropolitan areas (CMAs), nine rest-of-province zones, and four province zones. Bilateral trade flows, by value and weight, were estimated between U.S. and Mexican and U.S. and Canadian geographic areas

for individual SCTG commodity codes. This database contains trade flows between the 100 largest U.S. metropolitan areas (by population), 59 Mexican metropolitan areas and 33 Canadian metropolitan areas.

Estimating Commodity Consumption and Production Subnationally in Canada and Mexico

Prior to down-allocating trade flows, Brookings and EDR used several data sources to estimate commodity consumption and production for subnational zones in Canada and Mexico. To do this, three pieces of information were necessary:

- Industry output and value added for all detailed zones in Canada and Mexico, at approximately three-digit NAICS industry detail.
- A make and use table with industry dimension matching the industry detail in the above bullet (for each country), and with a crosswalk on the commodity dimension to the SCTG-based target commodity detail.
- Final demand data for all detailed zones, with a crosswalk to the target SCTG commodity codes.

For Mexico, industry output and value-added data for metropolitan zones were compiled through INEGI's 2009 Economic Census and data from the Secretariat of Agriculture, Livestock, Rural Development, Fisheries, and Food. National input-output data and state-level value added were obtained from the INEGI National Accounts database. After updating Mexico's 2003 make-use tables to 2009 levels, final demand (by SCTG commodity code) for each zone was determined for each Mexican geographic zone. National household consumption was allocated based on the zone's share of national value added. Government consumption was allocated based on the zone's share of government expenditure. Capital investment was allocated based on the zone's share of national employment in construction and manufacturing industries. Finally, inventory changes were allocated based on the zone's share of manufacturing and trade employment.

For Canada, Statistics Canada provided industry data at a detailed NAICS level for 2009, but only for provinces, while the only identified CMA data were employment at the two-digit NAICS level. Therefore, we used Canadian Business Pattern data from 2009 at the six-digit NAICS level to down-allocate provincial-level industry data to Canadian CMAs. Statistics Canada provides detailed provincial-level make-use tables for 2009. Finally, provincial final demand was apportioned to CMAs by population estimated total value added (for household consumption), total employment estimated manufacturing output (for business investment and inventory change), and estimated government employment output (for government consumption). As with industry activity, final demand not accounted for in CMAs was assigned to "Rest of Province."

For each country, make-use tables were used to convert metropolitan industry activity to commodity supply and demand. In each case, an aggregation template (or crosswalk, if the aggregation is many-to-many) was developed for the commodity side of the make-use table to convert commodity production and consumption to an SCTG basis. These data were used to estimate total commodity supply and demand for each detailed geographic zone at the target SCTG commodity detail. Commodity demand for each geographic zone was estimated as the sum of intermediate demand (industry demand) and final demand. Intermediate demand is calculated as industry purchases (output minus value added) matrix-multiplied by the absorption table, then aggregated to SCTG commodities. Final demand is simply aggregated from NAICS-based commodity definitions to SCTG categories.

Appendix 5

Organizations Contacted

This Appendix lists the organizations contacted by Morrison Institute for Public Policy for this project. Not all organizations were interviewed for this work.

Arizona Chamber of Commerce & Industry
Arizona Commerce Authority
Arizona Department of Transportation
Arizona Hispanic Chamber of Commerce
Arizona Office of Tourism
Arizona State University, College of Nursing and Health Innovation
Arizona State University, Mexico and Latina America Initiatives
Arizona-Mexico Commission
Guanajuato Ministry of Economic Development
Phoenix-Mesa Gateway Airport
Port of Tucson
Secretaría del Migrante y Enlace Internacional
SkyBridge Arizona
United States Commercial Service

Appendix 6

Interview Questions

Guanajuato Interviews:

Name:
Affiliation:
Phone:
Email:
Date/Time:

Do you know of any firms that are currently transacting business between Arizona and Guanajuato?

What goods/services are being traded?

How are they being transported?

Any idea of the volume or growth of this trade?

Do you know of any firms that are planning to do business between Arizona and Guanajuato?

What goods/services will be traded?

How will they be transported?

Any projections on the volume or growth of this trade?

What industries have the highest potential for trade between the two states?

What does Guanajuato have to offer Arizona?

What does Arizona have to offer Guanajuato?

Who else should I be talking to?

In Arizona?

In Guanajuato?

Who is your closest counterpart in Mexico?

Appendix 7

Methodology

As the proposal for this work was being developed, a list of likely sources for information was compiled by Morrison Institute for Public Policy. This list included government agencies, business development groups and educational organizations. This list was refined iteratively as the work progressed. Many organizations that were originally believed to represent promising contacts were later found to either have no pertinent information or declined to participate. Where possible, other organizations were sought out to fill these voids.

Phone interviews were scheduled for participants. Subjects were asked for permission to record the session and, where this permission was granted, recordings were reviewed to ensure that ideas were accurately represented. The questions listed in Appendix 6 were used to guide the initial conversation, but interviews were free-ranging and loosely structured. As many respondents did not wish to be directly quoted, the ideas expressed in interviews were woven into the final report, rather than being expressed as direct quotations.

Representatives from the Arizona Commerce Authority, Arizona-Mexico Commission, and the Arizona Chamber of Commerce and Industry were interviewed separately and asked about current business relations between Arizona and Guanajuato. Each said that there is little or no known activity between the two states. When queried about what factors might be impeding trade between Arizona and Guanajuato, these economic development professionals cited Guanajuato's relative remoteness from Arizona compared to Sonora, and the differing profiles of the states with few shared industrial sectors. (See *Comparison of the Economic Bases of Guanajuato and Arizona*)

Watts College
of Public Service and Community Solutions
Arizona State University