

Crossroads

ECONOMIC TRENDS IN THE DESERT SOUTHWEST

Border Cities: Economic Competitors or Complements?

Strong economic interaction exists between communities on both sides of the U.S.–Mexico border. Just count the number of Mexican license plates on autos parked in U.S. malls, or note the many service and goods suppliers in U.S. border cities that support manufacturing in Mexico. Casual observation reveals patterns of local specialization, where work is often divided between the two cities on a sector-by-sector basis. But how do these cities divide local production? Can we measure the nature and strength of this economic interaction and specialization and identify the sectors where it occurs, such as manufacturing or education?

This article looks at how four Texas border city pairs—El Paso–Juárez, McAllen–Reynosa, Laredo–Nuevo Laredo and Brownsville–Matamoros—compete with or complement each other economically. We find significant economic complementarities among these adjacent cities. When one city is strong in specific industries, the other is often weak. Defining the economic base of the combined cities, manufacturing is the single most important factor that drives the economy of the Texas–Mexico border.¹

Sizing Up the Neighboring Cities

The economic base of a city or other region is composed of the sector or sectors that export from the local area to the rest of the world. Exports are necessary to pay for imports and support inherently local activity such as laundries and lawn services. Growth in the export sector is seen as the primary route to greater local income and wealth.

Table 1 shows the population and employment of the eight border cities in 2004. With an estimated combined population of 2.2 million and the largest employment base, El Paso and Juárez are the largest of the four border cities in their respective countries. Laredo–Nuevo Laredo is the smallest pair, with a combined population of 584,000.



Table 1
Population and Employment in Largest Texas–Mexico Border City Pairs

City	Population	Formal employment
El Paso	732,613	255,700
Ciudad Juárez, Chihuahua	1,420,262	331,623
Laredo	219,760	75,700
Nuevo Laredo, Tamaulipas	363,919	118,561
McAllen	642,776	179,200
Reynosa, Tamaulipas	504,748	175,495
Brownsville	370,268	114,700
Matamoros, Tamaulipas	486,941	167,362

SOURCES: Population estimates for U.S. cities are midyear estimates for 2004 from Texas county population projections, 2000–2030, by Texas comptroller. Population estimates for Mexican cities are midyear estimates for 2004 from Consejo Nacional de Población, Proyecciones 2000–2030. Employment for Mexican cities is from Tamaulipas State Government Office (Matamoros, Laredo, Reynosa) and from Chihuahua State Office (Juárez), all for 2004. Employment for U.S. cities is from the Federal Reserve Bank of Dallas.

The four U.S. border cities are on the periphery of the Texas economy, accounting for only 8.6 percent of the state’s population, 6.4 percent of its jobs and 5.1 percent of its income in 2002. In contrast, the Texas Triangle metro areas of Dallas–Fort Worth, Houston, San Antonio and Austin are the state’s largest economies, and in recent years these cities have driven the state’s economic growth.² The Texas Triangle cities accounted for 62.5 percent of the state’s population in 2002, 66.3 percent of its jobs and 71.4 percent of its personal income.

Although Texas border cities enjoyed strong employment growth in the 1990s, slightly outperforming even the rapid growth of the state economy, this job growth produced only a small increase in border income levels. The increase does not approach convergence to U.S. or statewide income levels. The average per capita income of the four cities in 2002 was \$17,222, compared with \$29,039 in Texas and \$33,178 for the four Texas Triangle metro areas.

By comparison, the cities along Mexico’s northern border have experienced high growth rates accompanied by rising income levels.³ The dominant factor affecting the economic

growth and industrial structure of Mexico’s border cities is the maquiladora industry. Out of a nationwide total of more than 1 million maquiladora jobs, approximately 32 percent are generated in these four border cities.

Numerous border economists have noted the importance maquiladora employment growth in Mexico represents for the Texas border cities.⁴ This employment growth creates a demand for transportation services, finance, legal and administrative support needed to move goods across the border. More maquiladora workers implies greater retail sales by U.S. merchants. As a result of just-in-time inventory needs, new U.S. plants are acting as maquiladora industry suppliers, a relatively recent development among border city manufacturing. For instance, plastic injection molding and metal stamping plants are among the most common of the new Texas-based suppliers to maquiladoras.⁵

This apparent linkage between border cities, with the growth of each city dependent on the expansion of the other’s economic base, has long been recognized at an intuitive and anecdotal level. The failure to deal with it at an analytical level, however, is

largely due to differences in the data collection systems. The United States depends on data from agencies such as the Bureau of Labor Statistics (BLS) and the Bureau of Economic Analysis (BEA), while Mexico depends on statistics collected by the Mexican government. Until recently, the data have used different concepts and definitions, making a comparison of the economic sectors between neighboring cities difficult or impossible. The recent advent of the North American Industry Classification System (NAICS) now makes it possible to classify the industrial sectors of both U.S. and Mexican cities on a common basis.⁶

An Analytical Look

Economists and economic developers alike have used location quotients (*LQ*) as a quick and easy means of identifying dominant or prominent industries in an area. An *LQ* isolates an industry—such as retail trade—to identify the percentage of employment (or earnings) it represents out of total employment (or earnings) in a state or the nation.

$$LQ_{ij} = \frac{\text{Percent share of industry } i \text{ in city } j}{\text{Percent share of industry } i \text{ in the national economy}}$$

Texas Border Cities. *LQs* for Texas border cities were computed using employment in the United States as the denominator (*Table 2*). An *LQ* greater than 1 represents an employment concentration higher than the national average in a given city. The cities exhibit high concentrations of retail trade, and with the exception of McAllen, they also have particularly high levels of transportation-related services. Visiting Mexican nationals appear to bolster retail store operations in Texas border cities by shopping in downtown areas

Table 2
Location Quotients for U.S. Cities on Texas–Mexico Border

NAICS code	Sector	El Paso	Laredo	McAllen	Brownsville
11	Agriculture, forestry, fishing and hunting	.5	N.A.	2.2	1.4
21	Mining	0	3.7	1.7	N.A.
22	Utilities	N.A.	N.A.	.3	.1
23	Construction	1.1	.9	1.2	.9
31-33	Manufacturing	.9	.1	.2	.4
42	Wholesale trade	1.1	.9	.9	.8
44-45	Retail trade	1.2	1.5	1.5	1.4
48-49	Transportation and warehousing	1.3	5.3	.8	1.1
51	Information	.4	.1	0	.1
52	Finance and insurance	.6	1.0	.7	.6
53	Real estate and rental and leasing	1.1	.9	.8	1.3
54	Professional, scientific and technical services	.5	.5	.4	.4
55	Management of companies and enterprises	.3	.1	0	.1
56	Administrative and support and waste management and remediation services	1.2	.6	.5	.6
61	Educational services	1.5	1.9	2.3	2.0
62	Health care and social assistance	.9	.7	1.6	1.6
71	Arts, entertainment and recreation	.4	N.A.	.4	.5
72	Accommodation and food services	1.2	1.2	1.2	1.4
81	Other services (except public administration)	.9	.7	.8	1.0

NOTE: An *LQ* > 1 represents an employment concentration higher than the national average in a given city. For instance, agriculture, forestry, fishing and hunting in El Paso has an *LQ* of 0.5, indicating half the employment level of the national average, while McAllen has an *LQ* of 2.2 for the same sector, representing an employment level more than twice the national average.

SOURCES: Bureau of Labor Statistics; Bureau of Economic Analysis; authors' calculations.

and regional malls. They often have a positive impact on accommodation and food services as well. Transportation services is a function of moving goods across the border, much of it closely tied to the maquiladora industry.

As in the retail and manufacturing sectors, *LQs* serve as macro-level indicators that are further clarified by the firm- and industry-specific activities within those cities. For instance, the mining activity in Laredo and McAllen results from natural gas fields in South Texas. Electric generation and a pipeline to transport natural gas out of South Texas explain the large *LQ* for the utilities sector in McAllen. The burgeoning construction sectors in El Paso and McAllen reflect the strengths of the local business cycle in 1998.

The strength of real estate on the Texas border is partly the result of U.S. manufacturers searching for industrial land or buildings in Mexico. These companies will typically turn to U.S.-based brokers, who then work with the Mexican government to locate a maquiladora in an industrial park. In addition, Mexican

land development, both residential and commercial, often relies on U.S. advisors and capital. Furthermore, many Mexicans seeking to hedge against the peso invest in residential or commercial property in the United States, thus expanding the market of U.S. border cities.

With respect to the education sector, Texas border cities exhibit surprising strength. This is due to a variety of factors: (1) For these mostly Hispanic and Catholic cities, family size ranges from 14 percent to 29 percent larger than the average U.S. family. (2) Many upper- and middle-class Mexican families send their children to private (often Catholic) primary and secondary schools in the U.S. border cities. (3) A large number of Mexican border families unable to afford private tuition send their children to U.S. public schools, often using the address of a relative or friend on the U.S. side (a practice fostered by the “don’t ask, don’t tell” policy that prevails generally along the border). (4) Each of the four Texas cities is home to a state university that allows Mexican students from neighboring

states to matriculate at in-state tuition rates. The result is that U.S. border cities become significant suppliers of educational services not only locally, but as exporters of educational services to Mexico.⁷

Mexican Border Cities. As was done for Texas border cities, *LQs* were computed for Mexican border cities, this time using employment in Mexico as the denominator (*Table 3*). Not surprisingly, maquiladoras are responsible for a high concentration of manufacturing-related activity along the Mexican border, as well as related transportation services. Nuevo Laredo contains a particularly strong concentration of transportation services, as Laredo–Nuevo Laredo forms the largest land-based port between the United States and Mexico. This traffic also creates a strong demand for automotive repair and truck maintenance services. Both Nuevo Laredo and Reynosa export personal services to their northern neighbors in Texas border cities. These services include beauty salons, diet and weight-reducing centers, one-hour photofinishing, home

Table 3
Location Quotients for Mexican Cities on Texas–Mexico Border

NAICS code	Sector	Juárez	Nuevo Laredo	Reynosa	Matamoros
11	Agriculture, forestry, fishing and hunting	.1	.1	0	1.1
21	Mining	.1	0	4.1	.1
22	Utilities	.3	.6	.4	.3
23	Construction	.3	.5	.9	.6
31-33	Manufacturing	2.1	1.3	1.7	2.0
42	Wholesale trade	.5	.6	.5	.5
44-45	Retail trade	.6	.8	.7	.6
48-49	Transportation and warehousing	.5	3.3	.6	.6
51	Information	1.9	.7	.9	.7
52	Finance and insurance	.1	.2	.1	.1
53	Real estate and rental and leasing	.7	.6	.9	.5
54	Professional, scientific and technical services	.5	.6	.7	.3
55	Management of companies and enterprises	0	N.A.	0	N.A.
56	Administrative and support and waste management and remediation services	.4	.5	.3	.4
61	Educational services	.3	.4	.5	.5
62	Health care and social assistance	.6	1.0	.7	.6
71	Arts, entertainment and recreation	.5	.7	.4	.5
72	Accommodation and food services	.7	1.1	.8	.7
81	Other services (except public administration)	.5	1.0	1.1	.7

NOTE: An $LQ > 1$ represents an employment concentration higher than the national average in a given city.

SOURCES: Instituto Nacional de Estadística, Geografía e Informática; Censos Económicos 1999; authors' calculations.

and garden equipment repair, and automotive mechanical and electrical repair and maintenance. (We identify these services by conducting an analysis of specific NAICS subsectors.)

Economic Interaction and Integration. Tables 2 and 3 looked separately at the industrial structure of the U.S and Mexican border cities as part of their respective economies. We now pair the border cities in the numerator and include the sum of both countries' employment base in the denominator to capture the LQ values for specific regions along the U.S.–Mexico border.

$$LQ_{ij} = \frac{\text{Percent share of industry } i \text{ in city pair } j}{\text{Percent share of industry } i \text{ in the U.S. and Mexican economies}}$$

The equation above implies complementary roles for the Texas and Mexico neighboring cities. Using U.S. data from the BLS and BEA and comparable information from the 1999 Mexican economic census (both using NAICS), we are able to compare employment by industry sector in the four city pairs along the Texas–Mexico border. If any of these border city pairs

are complements, exports from one will be matched by imports in other cities in the same industry. Where one city has an LQ value greater than 1, the others have an LQ less than 1. If we combine the city pairs by simply adding them together, the variance of the computed LQ s for the combination should be smaller than an average of the variance of the individual cities.⁸

Using a standard statistical test, we can be about 90 percent certain that the variance has declined significantly. The city-pair combinations of El Paso–Juárez and Brownsville–Matamoros test positively for a complementary structure. The McAllen–Reynosa city-pair combination is quite close to the standard. The Laredo–Nuevo Laredo combination appears weak, perhaps implying a more competitive relationship. However, the statistical shortfall may be more a product of the level of data aggregation, which can make it difficult to pick up the specific trade patterns for a given sector.⁹

We also conducted the same calculations by subsector and at the industry group level and used nine sectors common to all

four cities. The standard test showed, with a minimum probability of 90 percent, that manufacturing is highly complementary in all cities. In addition, wholesale trade; educational services; and arts, entertainment and recreation are complementary in three of the four city pairs, while accommodation and food services is complementary in only two cities. Unfortunately, due to the limitations of the data sources, we cannot reliably test for the interdependence of retail and other service sectors where we would most expect these complementary effects to exist.¹⁰ Hence, from a statistical validation perspective, the results for these two sectors are less robust.

The Role of Border Cities. How do the border cities relate to the rest of the world? By combining the cities, we should have canceled out the interaction between them, that is, the combined cities are more self-sufficient. The remaining concentrations of excess employment should reflect only exports that move beyond the city pair and into the rest of the world (*Table 4*).

Retail trade, for example, remains significant in Laredo–

Table 4
Location Quotients for Combined City Pairs

NAICS code	Sector	El Paso–Juárez	Laredo–Nuevo Laredo	McAllen–Reynosa	Brownsville–Matamoros
21	Mining	.1	1.5	4.1	.1
22	Utilities	.4	.8	.5	.5
23	Construction	.6	.6	1.0	.7
31-33	Manufacturing	2.8	1.3	1.5	2.2
42	Wholesale trade	.8	.8	.7	.7
44-45	Retail trade	.9	1.3	1.2	1.1
48-49	Transportation and warehousing	.9	4.5	.7	.9
51	Information	.8	.2	.3	.2
52	Finance and insurance	.2	.5	.4	.3
53	Real estate and rental and leasing	.6	.6	.7	.7
54	Professional, scientific and technical services	.4	.4	.4	.3
55	Management of companies and enterprises	.1	0	0	0
56	Administrative and support and waste management and remediation services	.6	.5	.4	.4
61	Educational services	.6	1.0	1.4	1.0
62	Health care and social assistance	.4	.4	1.0	.8
71	Arts, entertainment and recreation	.4	.2	.3	.4
72	Accommodation and food services	.8	1.1	1.0	.9
81	Other services (except public administration)	.8	1.2	1.2	1.1

NOTE: An $LQ > 1$ represents an employment concentration higher than the national average in a given city. In this specific case, an $LQ > 1$ represents an employment concentration higher than the average of the U.S. and Mexico combined.

SOURCE: Authors' calculations.

Nuevo Laredo, McAllen–Reynosa and Brownsville–Matamoros, cities that draw large numbers of shoppers from the interior of Mexico. The three border pairs sell personal and repair services (subsectors of the “other services” sector) beyond the local area as well. Exports of educational services remain strong in McAllen–Reynosa, which may imply that local universities and private and public schools are providing educational services well beyond the boundary of the two cities and into the interior of the two countries.

Table 4 indicates that mining, which includes oil and gas extraction, remains strong on both sides of the border in Laredo–Nuevo Laredo and McAllen–Reynosa. Also dominant are the traditional border industries of maquila-led manufacturing and, in Laredo, border transportation and warehousing. The shared feature in all the city-pair combinations is manufacturing. Excess manufacturing employment in all eight cities is close to 413,000 jobs, indicating that they are probably tied to exports. With the exception of El Paso–Juárez, employment in retail sales and personal services (29,700 and

22,500 jobs, respectively) remains strong along both sides of the border.

The simplest characterization of the entire border area is that it is an important manufacturing region. Stages of development are typically separated into three successive periods: (1) primary extraction and agriculture, followed by (2) industrialization and culminating in (3) services and information. Our analysis suggests that the Texas–Mexico border remains at the industrialization stage.

Conclusion

We have looked at what composes the economic base of each city and whether border city pairs are competitors or complements. We conclude that the Texas–Mexico border cities have, in general, developed as complements, providing each other with unique goods and services, acting as a single urban area and spurring the growth of their respective neighbors.

—Jesus Cañas
Ebetuel Pallares
Luis Bernardo Torres Ruiz

Cañas is an assistant economist at the El Paso Branch of the Federal Reserve Bank of Dallas. Pallares is an international business Ph.D. student at the University of Texas at El Paso. Torres Ruiz is an economics Ph.D. student at the University of Colorado at Boulder.

Notes

¹ The combined cities are defined on a regional basis and by eliminating exports from one city to the other.

² “The Simple Economics of the Texas Triangle,” by Robert W. Gilmer, Federal Reserve Bank of Dallas *Houston Business*, January 2004.

³ *Problemas estructurales de la economía mexicana*, by Alejandro Díaz-Bautista (ed.), Tijuana, B.C., Mexico: El Colegio de la Frontera Norte, 2003.

⁴ Several authors have made note of this phenomenon. See “Project Link: An Investigation of Employment Linkages Between Cd. Juárez and El Paso,” by Richard Sprinkle, University of Texas at El Paso, December 1986; “The Employment Impact of Maquiladoras Along the U.S. Border,” by J. Michael Patrick, in *The Maquiladora Industry: Economic Solution or Problem?*, ed. Khosrow Fatemi, New York: Praeger Publishers, 1990, pp. 31–35; “Maquiladora Industry Impacts on the Spatial Redistribution of Employment,” by Arthur L. Silvers and Vera K. Pavlakovich, *Journal of Borderlands Studies*, vol. 9, December 1994, pp. 47–64.

⁵ “Maquiladora Downturn: Structural Change or Cyclical Factors?” by Jesus Cañas, Roberto Coronado and Robert W. Gilmer, Federal Reserve Bank of Dallas

Business Frontier, Issue 2, 2004.

⁶ The Mexican data used are from the 1999 Censos Económicos, conducted by Mexico's chief statistical agency, the Instituto Nacional de Estadística, Geografía e Informática (INEGI). This census serves as the backbone of all Mexican economic data collection. It is currently conducted on a five-year cycle, with 16 censuses completed since 1930. The effort is huge: 1.2 million blocks canvassed by 35,000 census takers, along with 23 million homes visited and 3.3 million small businesses contacted. Data are tabulated for 974 NAICS sectors and 2,516 variables. For the U.S. data, we were able to approximate a broad definition of employment by using the sum of wage and salary workers and the self-employed. This omits unpaid family members, but they constitute less than 1 percent of total jobs in all four cities.

⁷ To allow comparison between U.S. and Mexico education-sector labor numbers, we used both private and public employment figures for 1999 for the United States obtained from the BLS and for Mexico obtained from INEGI. Hence, referring to both data collection agencies for raw figures, our analysis includes aggregate employment.

⁸ To illustrate the use of LQ s in the analysis of whether cities are competitors or complements, consider the following example. Three cities (A, B and C) produce four kinds of widgets. City A specializes in green widgets, B in white and C in blue, with each city earning \$300. They divide production of yellow widgets, a local good, equally among the cities, to earn \$100 each. If we combine the three cities, there is equal income earned of \$300 from each kind of widget.

We can compute the location quotient for each kind of widget. For example, for green production in City A, the LQ is $(300/400)/(300/1,200) = 3$. The other cells can be filled out, and the average LQ for each city is $LQ^1 = (3 + 0 + 0 + 1)/4 = 1$. This makes the computed variance for each city: $S^2 = (1/N - 1) \text{Sum } (LQ_i - LQ)^2$ for $1 = 1, \dots, 4 = (1/3) [(3 - 1)^2 + (0 - 1)^2 + (0 - 1)^2 + (1 - 1)^2] = 2$. If we combine the cities, however, the combination is self-sufficient in every kind of widget, and all the LQ s are equal to 1 for every industry. Because they are all equal, variance of the LQ s falls to zero. Looked at separately, the cities have an average variance of 2; once combined, the cities' variance falls to zero. So we have proven that they are complements of each other.

⁹ For more information, see "Industrial Structure and Economic Complementarities in City Pairs on the Texas-Mexico Border," by Robert W. Gilmer and Jesus Cañas, Federal Reserve Bank of Dallas Working Paper no. 0503, March 2005.

¹⁰ Though NAICS provides a common definition of the industry sectors, the employment definition used by the United States and Mexico can be compared mostly for broad industry categories and for some narrowly defined sectors that do not contain large numbers of self-employed. Unfortunately, retail and personal services in these cities contain large numbers of proprietors and partnerships.

Crossroads

ECONOMIC TRENDS IN
THE DESERT SOUTHWEST

ISSUE 2 • 2005

Crossroads is published by the El Paso Branch of the Federal Reserve Bank of Dallas. The views expressed are those of the authors and do not necessarily reflect the positions of the Federal Reserve Bank of Dallas or the Federal Reserve System.

Subscriptions are available free of charge. Please direct requests for subscriptions, back issues and address changes to the Public Affairs Department, El Paso Branch, Federal Reserve Bank of Dallas, 301 E. Main St., El Paso, TX 79901-1326; call 915-521-5235; fax 915-521-5228; or subscribe via the Internet at www.dallasfed.org.

Articles may be reprinted on the condition that the source is credited and a copy of the publication containing the reprinted material is provided to the Research Department, El Paso Branch, Federal Reserve Bank of Dallas.

Crossroads is available on the Bank's web site at www.dallasfed.org.

Editor: Bill Gilmer
Copy Editor: Jennifer Afflerbach
Art Director: Gene Autry
Graphic Designer: Samantha Copen

Cross-Border Shopping Activity

A One-Day Conference on the Border Retail Sector

Friday, January 13, 2006

Holiday Inn Select, 77 N.E. Loop 410, San Antonio, Texas

Retailing to Mexican nationals is big business in South Texas. The retail sector has provided many job opportunities to low- and moderate-skill workers and has been an important reason why job growth along the Texas-Mexico border has outperformed most areas of the country since the 1980s. Experts at this conference will discuss the size, drivers and future of border retailing, especially in light of increasing globalization and the threat of terrorism.

Hosted by

Federal Reserve Bank of Dallas, San Antonio and El Paso Branches

Federal Reserve Bank of Chicago, Detroit Branch

International Council of Shopping Centers

For more information or to register for this conference, visit our web site at www.dallasfed.org and click on "Events."