The More We Get Together
Benefits of Regional Concentration

By Ali Anari

Regional concentration of economic activity has been one of the most important sociodemographic transformations in the United States since the Second World War. An urban research program at the Real Estate Center studied the concentration of economic activities, population and housing units as well as commercial and industrial real estate properties in Texas since 1950.

The study revealed that the relationship between productivity growth, population density and educational attainment is both a cause and a consequence of regional economic concentration in the Texas economy.

Economic Concentration in Metro Areas

The United States has 366 metropolitan areas. The top 100 cover 12 percent of the nation's land and produced three-quarters of the U.S. gross domestic product (GDP) in 2008. The top six U.S. metros, which include Houston–Sugar Land–Baytown and Dallas–Fort Worth–Arlington, generated more than a quarter of U.S. GDP in the same year (Table 1). New York–Northern New Jersey–Long Island produced 8.8 percent of the U.S. GDP, ranking first among U.S. metro areas in terms of share of GDP produced by metro areas, followed by Los Angeles–Long Beach–Santa Ana (5.0 percent), Chicago-Naperville-Joliet (3.6 percent), Houston–Sugar Land–Baytown (2.8 percent), Washington, D.C.–Arlington–Alexandria (2.7), and Dallas–Fort Worth–Arlington (2.6 percent).

Texas currently has 25 metro areas, but the state's top four metro areas produced about 77 percent of Texas GDP in 2008. Two metros, Houston and Dallas, accounted for 64 percent of the state's GDP in the same year (Table 2).

Table 1. Top Six U.S. Metropolitan Areas Ranked by Share of U.S. GDP, 2008

Rank	Area	GDP $Million	Percent Share U.S. GDP	Percent Total Share
1	New York–Northern New Jersey–Long Island	1,264,896	8.8	8.8
2	Los Angeles–Long Beach-Santa Ana	717,884	5.0	13.8
3	Chicago–Naperville–Joliet	520,672	3.6	17.4
4	**Houston–Sugar Land–Baytown**	**403,202**	**2.8**	**20.2**
5	Washington, D.C.–Arlington–Alexandria	395,747	2.7	22.9
6	**Dallas–Fort Worth–Arlington**	**379,863**	**2.6**	**25.5**

Source: Bureau of Economic Analysis

Table 2. Top Four Texas Metropolitan Areas Ranked by Share of State's GDP, 2008

Rank	Area	GDP $Million	Percent Share Texas GDP	Percent Total Share
1	Houston–Sugar Land–Baytown	403,202	33.0	33.0
2	Dallas–Fort Worth–Arlington	379,863	31.0	64.0
3	San Antonio	80,896	6.6	70.6
4	Austin–Round Rock	80,077	6.5	77.1

Sources: Bureau of Economic Analysis and Real Estate Center at Texas A&M University

On a county level, Harris County alone generated 22 percent of Texas personal income in 2007 while eight counties accounted for more than 61 percent of the state's personal income (Table 3).

Regional concentrations of output and income in Texas have been closely associated with regional population concentration. Dallas–Fort Worth–Arlington, the fourth-largest metro area in the United States, and Houston–Sugar Land–Baytown, the sixth-largest metropolitan area, together accounted for about half of the Texas population in 2008 (Table 4). More than 70 percent of the state's population is located in seven metro areas (Table 4). On a county level, seven Texas counties contained half of Texas' population in 2008 (Table 5).

Regional concentration of population leads to regional concentration of housing units followed by regional concentration of commercial real estate properties. Seven Texas metro areas accounted for about 70 percent of total housing units in Texas (Table 6). About 50 percent of housing units in Texas are located in eight counties (Table 7).

Agglomeration Economics

Concentration of people and housing units in a region results from the concentration of economic activities in the area.

In urban economics, the term *agglomeration* is used to describe the benefits firms obtain when locating in densely populated areas or in highly concentrated markets. Study of the economics of agglomeration began in the late 19th century with Alfred Marshall, who argued that when similar firms locate near each other, the proximity encourages informational and technological spillovers. This generates higher productivity for all firms in the market because of economies of scale and network effects.

The top four metro areas in Texas provide examples of agglomeration effects. For example, 65.5 percent of business establishments with paid employees located in Texas in 2007 were in the Houston, Dallas, San Antonio or Austin metro areas (Table 8).

The Dallas and Houston metro areas were home to more than 50 percent of Texas business establishments in 2007. The Dallas metro area had 27 percent of Texas establishments with

paid employees in 2007, with a larger concentration in communications equipment manufacture, computer system design and services, and air transportation services.

Houston's share was 23.1 percent with a concentration in oil and gas production, petroleum refining, chemicals, petrochemicals, pipelines, water transportation, and computer and peripheral equipment manufacturing. The area is home to more than 4,000 energy-related firms, more than 10,000 manufacturing establishments, more than 2,000 metal manufacturing companies, and 450 chemical plants.

San Antonio's share of total number of business establishments in Texas in 2007 was 7.8 percent, concentrated in electric and gas production and distribution firms, tourism and insurance firms. Austin's share was 7.6 percent, mainly concentrated in electronic components manufacturing, and computer and peripheral equipment manufacturing.

The top four Texas metro areas also held similar shares of nonemployer establishments — that is, businesses without paid employees (Table 9). This group consists mostly of

Table 3. Top Eight Texas Counties Ranked by Share of Personal Income, 2007

Rank	Area	$Million	Percent Share Texas Personal Income	Cumulative Share
1	Harris	194,177.9	22.0	22.0
2	Dallas	107,556.4	12.2	34.2
3	Tarrant	65,870.3	7.4	41.6
4	Bexar	54,324.0	6.1	47.7
5	Travis	39,212.7	4.4	52.1
6	Collin	35,115.6	4.0	56.1
7	Denton	24,126.5	2.7	58.8
8	Fort Bend	21,205.8	2.4	61.2

Sources: Bureau of Economic Analysis and Real Estate Center at Texas A&M University

Table 4. Top Seven Most Populous Texas Metropolitan Areas Ranked by Population, 2008

Rank	Area	Population	Percent Share Texas Population	Cumulative Share
1	Dallas–Fort Worth–Arlington	6,303,407	25.9	25.9
2	Houston–Sugar Land–Baytown	5,722,952	23.5	49.4
3	San Antonio	2,032,024	8.4	57.8
4	Austin–Round Rock	1,650,887	6.8	64.6
5	El Paso	742,062	3.1	67.7
6	McAllen–Edinburg–Mission	726,604	3.0	70.7
7	Corpus Christi	415,527	1.7	72.4

Sources: U.S. Census Bureau and Real Estate Center at Texas A&M University

Table 5. Top Seven Most Populous Texas Counties Ranked by Population, 2008

Rank	Area	Population	Percent Share Texas Population	Cumulative Share
1	Harris	3,984,349	16.4	16.4
2	Dallas	2,412,827	9.9	26.3
3	Tarrant	1,750,091	7.2	33.5
4	Bexar	1,622,899	6.7	40.2
5	Travis	998,543	4.1	44.3
6	Collin	762,010	3.1	47.4
7	El Paso	742,062	3.1	50.5

Sources: U.S. Census Bureau and Real Estate Center at Texas A&M University

self-employed individuals operating small unincorporated businesses that may or may not be the owner's principal source of income.

But agglomeration benefits cannot continually increase. At some point, they become subject to the law of diminishing marginal returns. Competition among firms in concentrated industries drives down both profit rates and profit margins. And densely populated areas have to deal with the problems of congestion and crowding. Houston was the fourth most congested metro area in the nation based on annual delay hours per traveler while Dallas ranked sixth according to a 2007 study by the Texas Transportation Institute (Table 10). Houston ranked third in terms of wasted fuel per traveler while Dallas ranked eighth according to the same study.

Productivity and Population Density

The net benefits of industrial agglomeration are divided between firms and their employees. Firms receive higher returns and employees earn higher wages. Firms pay efficiency wages — that is, wages above market clearing wages — to increase employee productivity.

One approach to forecasting the relationship between regional productivity and agglomeration is to study the relationships between average wage per job and population density across regions. This study looked at average wage per job, percent of population 25 years and older with college degrees, and population density per square mile for the top 15 most populated Texas counties (Table 11). These 15 counties were home to two-thirds of the Texas population in 2008.

County datasets are used because the Census Bureau's most recent population density data are on a county basis. Percent of population with college degrees is an important determinant of average wage per job because wages are incomes derived from human capital and investment in education has been shown to be the most important investment to be made in human

Table 6. Texas Metropolitan Areas Ranked by Number of Housing Units, 2008

Rank	Area	Housing Units	Texas	Cumulative Share
1	Dallas–Fort Worth–Arlington	2,404,770	25.1	25.1
2	Houston–Sugar Land–Baytown	2,229,926	23.2	48.3
3	San Antonio	767,961	8.0	56.3
4	Austin–Round Rock	658,422	6.9	63.2
5	El Paso	257,079	2.7	65.9
6	McAllen–Edinburg–Mission	253,379	2.6	68.5
7	Corpus Christi	177,898	1.9	70.4

Sources: U.S. Census Bureau and Real Estate Center at Texas A&M University

Table 7. Texas Counties Ranked by Number of Housing Units, 2008

Rank	Area	Housing Units	Texas	Cumulative Share
1	Harris	1,582,079	16.5	16.5
2	Dallas	946,151	9.9	26.4
3	Tarrant	685,169	7.1	33.5
4	Bexar	612,081	6.4	39.9
5	Collin	286,452	3.0	42.9
6	El Paso	257,079	2.7	45.6
7	Hidalgo	253,379	2.6	48.2
8	Denton	225,210	2.3	50.5

Sources: U.S. Census Bureau and Real Estate Center at Texas A&M University

Table 8. Number of Texas Business Establishments With Paid Employees, 2007

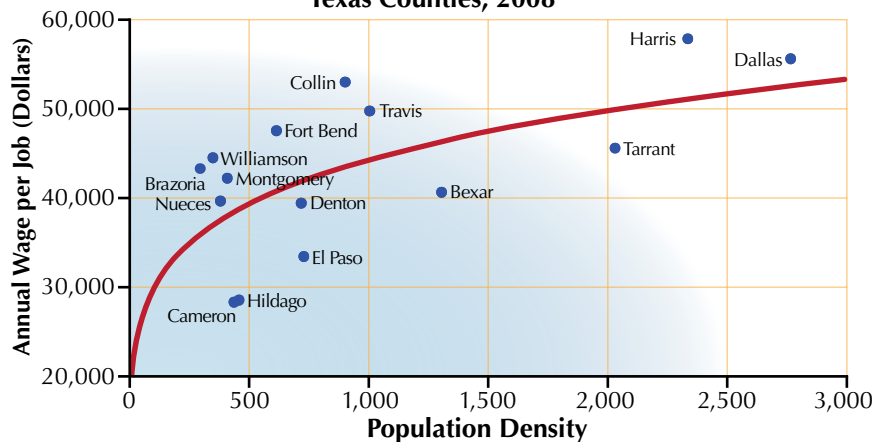| Area	Number of Establishments	Percent of Texas
Dallas–Fort Worth–Arlington	140,829	27.0
Houston–Sugar Land–Baytown	120,542	23.1
San Antonio	40,635	7.8
Austin–Round Rock	39,539	7.6
Total Top Four Metro Areas	341,545	65.5
Texas	521,408	100.0

Sources: U.S. Census Bureau and Real Estate Center at Texas A&M University

capital. Compared with the average wage per job for Texas, five counties — Harris, Dallas, Travis, Collin and Fort Bend — have above average wage rates.

Given that regional wage rates reflect regional productivity, Harris and Dallas with the highest wage rates, highest population densities, and lower than average educational attainment, have benefitted most from the positive impact of agglomeration. For Travis, Collin, and Fort Bend Counties, above average educational attainment have offset the impact of smaller agglomeration effects caused by lower population densities. Hidalgo and Cameron Counties, with wage rates

Figure 1. Wage per Job and Population Density
Texas Counties, 2008

Sources: U.S. Census Bureau and Real Estate Center at Texas A&M University

about half the rates of Harris and Dallas Counties, have the lowest percentages of population with college degrees.

The fitted line on a scatter diagram shows that, in general, higher wage rates are associated with higher population density rates, but the relationship is subject to the law of diminishing marginal rates of returns (Figure 1).

Having obtained most of the benefits of agglomeration, the Houston and Dallas areas are now expected to experience

Table 9. Texas Business Establishments Without Paid Employees, 2007

Area	Number of Establishments	Percent of Texas
Dallas–Fort Worth–Arlington	493,768	27.1
Houston–Sugar Land–Baytown	434,138	23.8
San Antonio	143,319	7.9
Austin–Round Rock	131,322	7.2
Total Top Four Metro Areas	1,202,547	66.0
Texas	1,819,963	100.0

Sources: U.S. Census Bureau and Real Estate Center at Texas A&M University

Figure 2. Wage per Job, Percent of Educational Attainment
Texas Counties, 2008
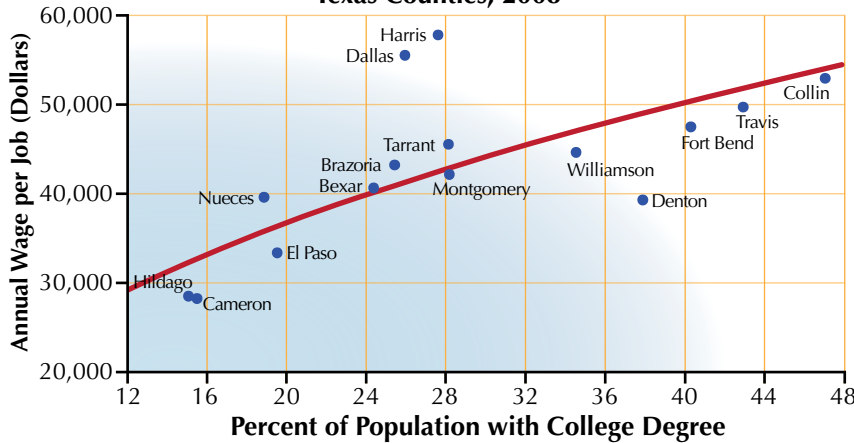
Sources: U.S. Census Bureau and Real Estate Center at Texas A&M University

Table 10. Top Congested U.S. Metro Areas, 2007

Metro Area	Annual Delay per Traveler*		Wasted Fuel per Traveler	
	Hours	Rank	Gallons	Rank
Los Angeles-Long Beach-Santa Ana	70	1	53	1
Washington, D.C.	62	2	42	2
Atlanta	57	3	40	3
Houston	56	4	40	3
San Francisco-Oakland	55	5	40	3
Dallas-Fort Worth-Arlington	53	6	36	8
Austin	39	24	27	23
San Antonio	38	29	27	23

*Annual Delay per Traveler – Extra travel time for peak-period travel during the year divided by the number of travelers who begin a trip during the peak period (6 to 9 a.m. and 4 to 7 p.m.). Free-flow speeds (60 mph on freeways and 35 mph on principal arterials) are used as the comparison threshold.

Source: Texas Transportation Institute

Table 11. Demographic and Wage Data
Top 15 Texas Counties, 2008

County	Wage per Job, $	Educational Attainment, Percent	Population Density per Square Mile
Harris	57,721	27.6	2,339
Dallas	55,483	26.1	2,769
Tarrant	45,454	28.2	2,035
Bexar	40,521	24.4	1,309
Travis	49,629	43.0	1,009
Collin	52,865	47.1	906
El Paso	33,310	19.6	733
Hidalgo	28,451	15.1	463
Denton	39,286	37.9	722
Fort Bend	47,422	40.3	618
Montgomery	42,108	28.2	413
Williamson	44,388	34.6	352
Cameron	28,196	15.5	441
Nueces	39,534	18.9	384
Brazoria	43,171	25.5	299
Texas	45,517	31.6	93

Sources: U.S. Census Bureau and Bureau of Economic Analysis

diminishing marginal returns. Travis, Collin, Fort Bend, Montgomery, Williamson, Brazoria and Nueces are expecting higher income growth rates associated with higher population density.

A second scatter diagram shows the estimated regression line fitted to the wage variable and the educational attainment variable (Figure 2). The fitted line shows that, in general, higher wage rates are associated with higher educational attainment with little sign of diminishing marginal returns. The positions of Dallas and Harris Counties suggest that in addition to educational attainment there should be another factor behind the higher wage rates for these counties. That factor is the agglomeration effect (Figure 1).

Educational attainment and population density together explain about 77 percent of the variation in average wages. Calculations for population density show that if the population per square mile increases by one, say from 97 to 98 people per square mile, the average annual wage per job is forecast to increase $6.90. Estimates for college graduates show that if the percent of population with college degrees increases by 1 percent, say from 19 to 20 percent, the average annual wage per job is expected to increase by $539.

Analysis of the relationship between population density and productivity reveals that in the future the marginal economic benefits of higher population density are expected to diminish for counties included in Houston-Sugar Land-Baytown and Dallas-Fort Worth-Arlington metro areas. The Austin area is expected to benefit more from increasing population density. ✦

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THE TAKEAWAY

Agglomeration is a term describing the benefits businesses and employees gain by locating in densely populated areas. Texas' top four metro areas (Dallas, Houston, San Antonio and Austin) are good examples of such benefits, as they produce roughly 77 percent of the state's GDP.

Advisory Committee