Diversification and Specialization Across Urban Areas

BY ANN MACHERAS AND MICHAEL STANLEY

Los Angeles is famous for the entertainment industry, San Jose for technology companies, and New York for the financial firms surrounding Wall Street. While each of these urban areas has a unique identity related to a particular sector of the economy, each is also, in fact, very diverse in its industrial composition. Urban areas differ in the extent to which they have a diverse set of industries or, conversely, the degree to which they are very specialized in a particular industry. Richmond Fed analysis supports previous research findings on the extent to which diversification or specialization varies with the employment size of urban areas. The concentration of firms in urban areas provides benefits that can derive from being close to other firms within the same industry and also from having access to a wider array of products and services from other industries. These benefits, or "economies," help to explain why some urban areas grow more than others. This article examines some of these important concepts, provides relevant data for urban areas across the United States, and describes how diverse or specialized Fifth District urban areas are relative to other urban areas.

Diversification, Size, and Growth

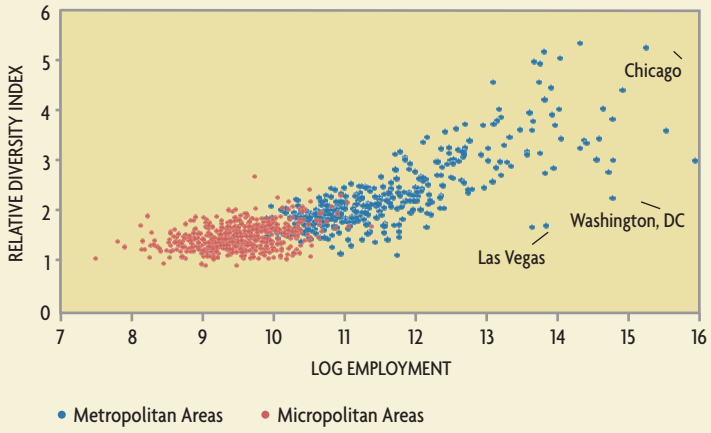
Researchers have explored why urban areas arise and what forces contribute to their growth. (Such research often considers not just urban areas, but metropolitan areas, which can include the urban core and surrounding counties.) In the Richmond Fed's *2016 Annual Report* essay, Santiago Pinto and Tim Sablik explained that cities arise because of the advantages of concentrating economic activity in one place — a concept economists refer to as "agglomeration economies." Firms within the same industry that cluster together can benefit from creating enough demand for their inputs that producers of these shared inputs decide they want to locate close by as well. The resulting improved access and lower cost of inputs is an example of "localization economies."

Another type of agglomeration benefit can arise from firms in multiple industries locating in an area, providing a diverse industrial base. Such a variety of industries can give firms access to a broader array of business activities such as banking and legal services or better transportation networks, as well as a more abundant pool of educated workers. Benefits arising because of the diversity of industries are known as "urbanization economies." An important source of agglomeration economies, both within industries and across industries, comes from the frequency of interactions between people within an urban area and the opportunities to learn from each other, which creates knowledge spillovers, or benefits that firms receive at no cost to them.

To study the industrial diversity of urban areas, economists need a measure of diversity that can be compared across different areas. One such measure is the relative diversity index (RDI), which compares the employment shares of industries in a given area to the industry shares of employment in the nation as a whole. The index increases as an area's employment pattern moves closer to the nation's pattern of industry employment, but it decreases toward zero as an area becomes more specialized in a few industries.

Gilles Duranton of the University of Pennsylvania and Diego Puga of the Centro de Estudios Monetarios y Financieros, or CEMFI, in a 2000 article in *Urban Studies*, calculated the RDI using 1992 data to compare diversity across U.S. metro areas. They found that larger urban areas, as measured by total employment, tend to be more diverse than smaller ones. We replicated this comparison using 2015 data from the U.S. Census Bureau and found that the relationship still holds: The diversity of urban areas generally increases with the employment size of the area. (See chart.) Our results show a strong relationship between size and diversity, with a correlation of 0.83 between the log of metro area employment and the RDI in 2015. Phoenix, Ariz., and Chicago, Ill., are the most diverse metro areas in the nation, while smaller urban areas are the least diverse. (For each metro area, we used employment at the three-digit NAICS level, a level of detail that provides enough variation

Size-Diversity Relationship for U.S. Urban Areas

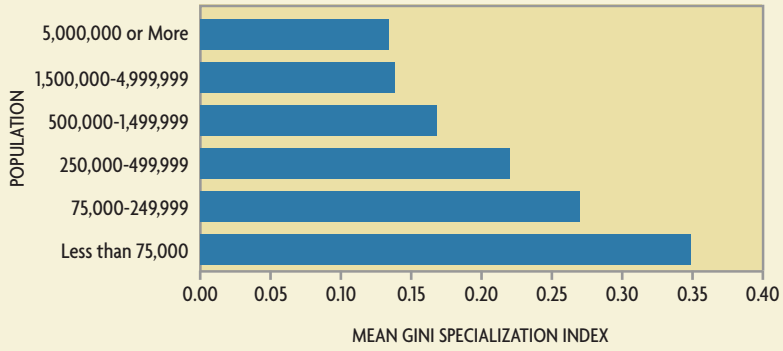


NOTE: "Micropolitan areas" consist of the area around an urban core with population between 10,000 and 50,000.

SOURCE: Census Bureau – 2015 County Business Patterns, authors' calculations

across industries but limits the problem of data suppression that occurs if an industry is too small for the data to be reported publicly.)

Urban Area Industry Specialization by Population



SOURCE: Census Bureau – 2015 County Business Patterns and American Community Survey, authors' calculations

Specialization, Size, and Growth

At the other end of the spectrum, some urban areas are characterized by a few large industries that tend to dominate local economic activity. For example, the Napa, Calif., metro area is specialized in wine production, and Gulfport, Miss., is concentrated in petroleum refining and related activities. As described in the previous section, these metropolitan areas may be characterized by strong localization economies that have provided advantages that lead firms within an industry to cluster together geographically. When viewed against national patterns of industry concentration, measured by shares of employment in a particular industry, urban areas can be described by the extent to which they are "specialized." It turns out that large urban areas, based on total employment, are less specialized (more diverse) and smaller urban areas are more specialized (less diverse), but this does not tell the entire story.

One measure of urban area specialization involves a variation of the Gini index, which is most commonly used to measure income inequality. The Gini specialization index (GSI) is equal to zero if the employment shares for all industries in the area match those in the nation, but it approaches a value of 1.0 if the area is fully specialized in a single industry that is very small in the nation as whole. This index is directly related to the inverse of the RDI, so areas with high GSIs should have comparably low RDIs.

Using the GSI as a measure of specialization, Duranton and Puga, in a 2005 article in the *Journal of Urban Economics*, explored the change in industrial specialization over time and also across population size categories within a given year. They found that industrial specialization has declined over time, from 1977 to 1997, and that the degree of specialization at a given point in time was largest, on average, for smaller urban areas. We used 2015 data at the three-digit NAICS level to replicate their work and found that the relationship still holds — smaller urban areas are more specialized on average, as indicated by a larger GSI, than urban areas with greater population. (See chart.)

Can Diverse Metros Have Specialized Industries?

Our analysis, and the work of Duranton and Puga, shows that an area can be diverse in its industrial composition and at the same time have one or more highly specialized industries. The previous measures we have described here, the RDI and GSI, are broad measures of relative diversity or specialization, respectively. They are calculated with data from all industries in order to provide a single measurement for an urban area, comparing the pattern of employment across all industries to the national pattern. But it is also useful to understand the concentration of an individual industry within a single area relative to its concentration nationally. For this, we need a new measure: The location quotient (LQ) measures how concentrated a single industry is in an area by comparing shares of employment (or some other measure of economic activity) in that area with the same industry's share in the nation. Using shares of employment makes it easier to compare areas of different size, which would not be possible by comparing employment numbers directly. For example, an LQ of 2.0 means the industry is twice as concentrated in the urban area as in the nation, while an LQ of 0.5 means it is only half as concentrated. If the LQ equals 1.0, then the United States and the area of comparison must have the same relative industry concentration. These comparisons of LQs have the same interpretation no matter how large or small the urban areas and provide an easy way to compare industry concentration across urban areas, all relative to the nation.

Using the LQ measure to reveal specialized industries, it is possible for an area to be highly diverse, based on its RDI, even though some industries in that area are highly concentrated when compared to their employment shares in the nation as a whole. For example, the Chicago metro area is the second most diverse area in the United States as measured by the RDI, but employment in funds, trusts, and related financial activities is more than four times as concentrated in Chicago as in the United States. (See table on next page.) This is possible because the relative size of the industry matters for the RDI. The funds and trusts industry accounts for only two-hundredths of a percent of employment in the Chicago metro area, but this is still significantly larger than the share of U.S. employment in that industry. Because this industry is so small, it has little impact on the RDI, and total diversity in the region can be high even though that industry is highly concentrated in Chicago according to the LQ.

Urban Areas with Highest Industry Diversity

RDI Rank	Urban Area	Most Concentrated Industry (Location Quotient)	RDI	GSI
1	Phoenix, AZ	Air Transportation (2.7)	5.9	0.085
2	Chicago, IL	Funds, Trusts, and Other Financial Vehicles (4.1)	5.8	0.087
3	Portland, OR	Computer and Electronic Product Manufacturing (2.7)	5.7	0.088
4	St. Louis, MO	Primary Metal Manufacturing (1.9)	5.5	0.091
5	Indianapolis, IN	Warehousing and Storage (2.8)	5.4	0.092
6	Kansas City, MO	Telecommunications (2.1)	5.4	0.093
7	Cincinnati, OH	Paper Manufacturing (2.0)	5.0	0.100
8	Buffalo, NY	Transit and Ground Passenger Transportation (2.0)	5.0	0.100
9	Tampa, FL	Leather and Allied Product Manufacturing (2.5)	4.9	0.103
10	Dallas, TX	Air Transportation (3.3)	4.8	0.104

SOURCE: Census Bureau – 2015 County Business Patterns, authors' calculations

The fact that metro areas can be simultaneously diverse and specialized (when narrowly defined) explains why even in large metropolitan areas, policymakers often define target industry clusters for the purpose of economic development marketing. The Boston area promotes the diversity of its economy (with an RDI of 2.97, ranked 81 out of 917 in our data) at the same time that it highlights its concentration of several industry segments such as financial services, information technology, health care, manufacturing, and tourism. Fittingly, our calculations show that the Boston metro area is relatively specialized in some of these fields. Two financial industries (funds, trusts, and other financial vehicles; securities, commodities, and other financial investments) are tied for the second-highest LQ in Boston at 2.6. Other specialized industries (as measured by LQ) that Boston boasts of include educational services, non-Internet publishing, data processing and hosting, computer and electronics manufacturing, and other information services, all of which are at least twice as concentrated in Boston as in the nation. In particular, Boston has been vying with San Francisco in claiming a position as the premier biotech hub. San Francisco, compared to Boston, measures as slightly more diverse overall, with an RDI of 3.25. But when comparing individual industries, San Francisco appears far more specialized than Boston, with an LQ of 3.3 in non-Internet publishing, 4.4 in data processing and hosting, and an impressive 8.2 for other information services. Both metro areas benefit from a density of colleges and universities and the ability to attract college graduates and scientific talent, which are important contributors to knowledge transfer spillovers.

Industry Diversity in the Fifth District

Urban areas in the Fifth District are distributed across the diversity spectrum. For example, Charlotte, N.C., is one of the most diverse metro areas in the nation, ranked 11, while Bennettsville, S.C., is one of the least diverse, ranked 902 out of 917 urban areas. (See chart on next page.) When compared to urban areas across the nation, areas in the Fifth District are slightly more diverse than average, with a mean RDI of 2.0 in the Fifth District versus 1.9 for the United States, but this difference is likely not significant.

Among Fifth District urban areas, Charlotte has the greatest industry diversity, with an RDI of 4.6. Rounding out the top five diverse urban areas in the Fifth District, Charlotte is followed by Richmond, Va.; Raleigh, N.C.; Baltimore, Md.; and Columbia, S.C. The largest urban area in the Fifth District, Washington, D.C., ranks 19th within the district in diversity and 157th nationally. The Washington, D.C., metro area is not a typical large urban area, however, in view of the strong presence of the federal government and federal government contractors.

The Charlotte metro area serves as a good example of many of the complexities involved in discussing diversity and specialization. The most specialized industry in Charlotte, based on the LQ, is textile mills, which is more than seven times as concentrated in Charlotte as in the nation as a whole. Yet Charlotte is not particularly known for its textiles, which represent less than 1 percent of employment in the area. Bennettsville, the most specialized area in the Fifth District based on its low RDI value, also has its highest LQ in textile mills. But in Bennettsville, they account for approximately 15 percent of employment, with a concentration more than 177 times as strong as in the nation. This illustrates that areas differing widely in our broadest measure of industry diversity can be quite similar in terms of their most concentrated industries – in this case, textile mills. Yet the textile mill industry plays a much more significant role in Bennettsville than it does in Charlotte. Charlotte is better known for its financial sector, which is much larger than textiles despite appearing less concentrated by LQ. Credit intermediation services account for more than 50,000 jobs in the area and have the third-highest LQ in Charlotte at 2.4. Importantly, these financial jobs are supported by a wide array of other business services that provide agglomeration economies, while also making Charlotte one of the most diverse urban areas in the Fifth District and the nation.

As previously mentioned, it is notable that the Fifth District has a high concentration in the textile mills industry.

Of the 87 urban areas in the district, the textile mills industry has the highest LQ in 25 of them. The next most common industry is mining (excluding oil and gas), which has the highest LQ in seven urban areas. Despite this concentration, the Fifth District does not appear more specialized, overall, than the nation as a whole, likely because these industries are relatively small. In the 25 urban areas where textile mills are the most concentrated industry, the average employment share of that industry is only 2.5 percent, so this does not have a large impact on diversity measures across all industries.

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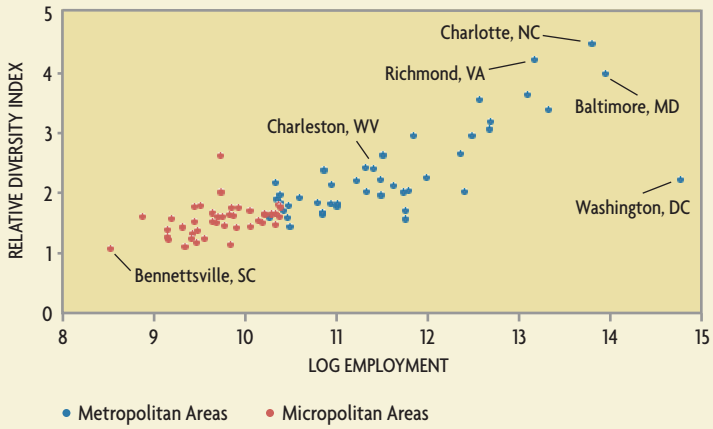

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Conclusion

Urban areas vary in size and in industry composition across the nation, with some having a diverse mix of industries and others being relatively more specialized. Past economic research has found that measures of relative industry diversity increase with the population size of metropolitan areas. This makes sense because larger urban settings provide the backdrop for beneficial "urbanization economies" that occur when an industry experiences production or cost advantages from close proximity to a variety of other industries such as a range of business activities or improved transportation networks. In contrast, smaller urban areas tend to be more specialized. Our analysis confirms that this relationship between population size and industry diversity still holds true, both across the nation and within the Fifth District.

Interestingly, diversity and specialization are not mutually exclusive, as large and diverse urban areas can be specialized in one or more particular industries. This is easily seen by examining LQs, or the concentration of a particular industry in an urban area relative to that same industry's concentration in the nation. In general, the pattern of diversity and specialization in the Fifth District mimics the national pattern, with increasing measures of diversification as we move along the spectrum from Bennettsville, S.C., its smallest urban area, to Charlotte, N.C., one of its largest. **EF**