

GDP by Metropolitan Area Methodology

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Overview

This document presents the methodology used by the Bureau of Economic Analysis (BEA) to produce its annual Gross domestic product (GDP) by metropolitan area statistics. In 2007, BEA began officially producing these statistics on an annual basis for use in both the public and private sectors, representing an important milestone for a research project begun in 2001.

The GDP by metropolitan area statistics are based on the same definitional concept as their state and national counterparts, facilitating comparisons across geographic areas.¹ In addition, these statistics provide information related to industrial composition of economic activity in each metropolitan area. In particular, GDP by industry statistics are provided for 61 separate industries in each metropolitan area from 2001 through the second to most recent calendar year. For the most recent calendar year, consistent with the annual GDP by state statistics, GDP by metropolitan area statistics are provided for 21 separate industry sectors (Appendix A).

These statistics are used widely in both the public and private sectors. The statistics are most commonly used to determine the overall size and growth of a metropolitan economy and analyze comparative industrial growth across the metropolitan portion of the U.S. economy.²

The methodology used to produce the GDP by metropolitan area statistics relies heavily on GDP by state and personal income information. Earnings are used to assign activity that is measured at the state level to particular metropolitan areas. These initial statistics are then reviewed to ensure that they are consistent with other sources of data on local economic performance and minor adjustments may be made before the official statistics are released to the public.

Methodology

The calculation the GDP by metropolitan area statistics starts by creating current-dollar statistics for each industry in each metropolitan area. Price information from BEA's industry accounts are then used to adjust these statistics to account for price differences when making comparisons of GDP by metropolitan across time and to calculate industry contributions to growth within a metropolitan area.

Current-dollar statistics

A standard and advance methodology is used to calculate current-dollar GDP by metropolitan area statistics. The standard methodology uses information on all 61 industries from the GDP by state accounts for years when this detail is available.³ The advance methodology uses information on all 21 industry sectors accounts from the GDP by state accounts when the detailed industry information is not available.

¹ The metropolitan (statistical) areas definitions used for BEA statistics are defined by the U.S. Office of Management and Budget. These definitions identify standardized county-based areas having at least one urbanized area with a population of 50,000 or more plus adjacent territory that has a high degree of social and economic integration with the core as measured by commuting ties.

² For a discussion of the uses of GDP by metropolitan see [“Potential Uses of BEA’s Statistics of GDP by Metropolitan Area.”](#)

³ For a discussion of the methodology used to compute of GDP by state see [“GDP by state methodology guide.”](#)

Standard methodology. For each of the 61 detailed industries included in the annual GDP by state statistics, GDP by industry is first assigned to metropolitan areas in two steps:

1. For each county, the ratio of county to state earnings for the industry is multiplied by the related state-level GDP by state statistic to provide a GDP by industry estimate for the county.
2. For each industry, the GDP by industry statistics across counties within a metropolitan area are summed to provide a GDP by industry statistic for the metropolitan area.

After these statistics have been calculated, the GDP by industry statistics for a metropolitan area are summed across all industries to provide an overall measure of GDP by metropolitan area.

The earnings statistics that are used for these calculations are from BEA's Local Area Personal Income (LAPI) statistics.⁴ Earnings consist of wage and salary disbursements, supplements to wages and salaries, and proprietors' income. Because they usually represent over 60 percent of GDP by industry, earnings are considered to be reasonable indicators of relative levels of economic activity for most industry across geographic areas.

Before publishing the statistics, adjustments to the initial results are considered for the Banking and Air Transportation industries. These adjustments are made because additional source data are consistently available to improve the quality of the related measures.

For Banking, the industry-level statistics are adjusted to improve the accuracy of the GDP measures in metropolitan areas with large banking centers. In particular, shares of bank branch deposits for each metropolitan area derived from information available in the Federal Deposit Insurance Corporation's *Summary of Deposits* are used to reallocate GDP for the industry to metropolitan areas where large banking centers are located.

For Air Transportation, the industry-level statistics are adjusted to improve the accuracy of the GDP in metropolitan areas with large transportation hubs. In particular, trends in the financial information provided in transportation firms' annual financial reports are used to adjust growth levels for metropolitan areas with major transportation hubs.

Advance Methodology. For each of the 61 detailed industries included in the annual GDP by state statistics, GDP by industry is first assigned to metropolitan areas in two steps:

1. For each county, growth in wages for the industry is multiplied by the previous year's GDP by industry estimate to provide an extrapolated estimate of GDP by industry for the county.
2. For each county, GDP for each industry is scaled to the advanced GDP by state statistic for the current year to provide a GDP by industry estimate for the county.
3. For each industry, the GDP by industry statistics across counties within a metropolitan area are summed to provide a GDP by industry statistic for the metropolitan area.

After these statistics have been calculated, the GDP by industry statistics for a metropolitan area are summed across all industries to provide an overall measure of GDP by metropolitan area.

⁴ For a discussion of the methodology used to compute local area personal income see "[Local Area Personal Income and Employment.](#)"

Real-dollar statistics

Real GDP by metropolitan area is an inflation-adjusted measure of each metropolitan area based on the national prices of the goods and services produced within that metropolitan area. These measures are important when making comparisons over time and calculating growth.

The real statistics for each industry in each metropolitan area are derived by applying national chain-type price indexes from BEA's industry accounts to the statistics on current-dollar GDP by metropolitan area for the detailed industries. For aggregate industry sectors and total GDP, real GDP by metropolitan area statistics are derived by using the same chain-type index formula that is used in the national accounts.

To the extent that a metropolitan area's output is produced and sold in national markets at relatively uniform prices (or sold locally at national prices), real GDP by metropolitan area should accurately capture the relative differences in the mix of goods and services that metropolitan areas produce. However, these statistics do not capture metropolitan-area-to-metropolitan-area differences in the prices that may exist locally for some goods and services.

Unlike fixed-weighted measures, chain-weighted measures are not based on the price weights of a single base year, but instead on the prices and quantities of adjacent years. Fixed-weighted measures have a number of disadvantages, including the need for periodic rebasing, leading to significant revisions to the historical data, and the inability to capture substitution effects caused by changing relative prices of goods and services. Chain-weighted measures avoid these weaknesses.

To calculate a chain-type quantity index for total GDP by metropolitan area, or real GDP by metropolitan area of any aggregate industry, a Fisher Ideal index is used. Real-dollar statistics are created in three steps:

1. The Fisher Ideal index is calculated with the standard formula⁵:

$$Q_t^F = \sqrt{\frac{\sum_i \frac{P_{i,t-1}}{P_{i,t}} \times (P_{i,t} \times q_{i,t})}{\sum_i (P_{i,t-1} \times q_{i,t-1})} \times \frac{\sum_i (P_{i,t} \times q_{i,t})}{\sum_i \frac{P_{i,t}}{P_{i,t-1}} \times (P_{i,t-1} \times q_{i,t-1})}}$$

where $q_{i,t-1}$ and $q_{i,t}$ represent current dollar GDP values for industry aggregate i in each metropolitan area in period $t - 1$ and t and $P_{i,t-1}$ and $P_{i,t}$ represent the national industry implicit price deflators for the corresponding periods $t - 1$ and t .

⁵ The formula presented is algebraically-equivalent to the original Fisher formula derived as the geometric mean of the Laspeyres and the Paasche index. The algebraic manipulation allows for the use of the formula without composite values (i.e. values based on prices in one year and quantities in an adjacent year) which are not directly observable. For more information on the Fisher index refer to the "GDP by State Estimation Methodology".

2. Chain-type Fisher quantity indexes (I_t^F) are calculated with the following formula:

$$I_t^F = I_{t-1}^F \times Q_t^F$$

3. Chained-real-dollar estimates (CD_t^F) are calculated by multiplying the reference period current-dollar annual value ($\sum p_b q_b$) by the interpolated chain index:

$$CD_t^F = \sum p_b q_b \times I_t^F$$

Real chained-dollar statistics on GDP by metropolitan area are calculated from the chained Fisher Ideal index series by multiplying the index for each year by the current-dollar GDP by metropolitan area value for the reference year.⁶

Contributions to growth

Real chained-dollar GDP by metropolitan area is not additive, because the underlying quantity indexes are geometric means of indexes from adjacent years. As a result, the contribution of each individual industry or region to a change in total GDP by metropolitan area cannot be calculated simply by dividing the change in a component (an industry or a region) by the change in the total. Instead, a special formula is required to account for the non-additivity of the real GDP by metropolitan area measures.

The formula below is used to calculate the contribution of component i to the percent change in total real GDP by metropolitan area:

$$C\% \Delta_{i,t} = 100 \times \frac{\left(\left(\frac{p_{i,t}}{P_t^F} + p_{i,t-1} \right) \times (q_{i,t} - q_{i,t-1}) \right)}{\sum_j \left(\left(\frac{p_{j,t}}{P_t^F} + p_{j,t-1} \right) \times q_{j,t-1} \right)}$$

where:

P_t^F is the Fisher price index for the aggregate in period t relative to period $t - 1$,
 $p_{i,t}$ is the price of component i in period t , and
 $q_{i,t}$ is the quantity of component i in period t .

In the application of this formula, the quantity terms represent current-dollar GDP by metropolitan area for an industry for period $t - 1$ and t and the price terms represent the national industry implicit price deflators in periods $t - 1$ and t .

⁶ Advance GDP by metropolitan area is computed at the 61 detailed industry level as an intermediate step when computing GDP by metropolitan area for industry sectors, but it is not considered a final estimate, and therefore is not released.

Data suppressions

Regional statistics are subject to data suppressions when the underlying source data could be uncovered to reveal confidential information. This is per our agreement with the BLS and their agreement with each state. Earnings published in BEA's local area state personal income accounts comprise the largest data source for GDP statistics for metropolitan areas. In turn, earnings rely on source data from BLS. BLS explains the need for suppressions below in an excerpt from the "*BLS Handbook of Methods*."

Voluntary reporting and assuring the confidential nature of reported data are important characteristics of BLS programs. For more than a century, the Bureau has asked millions of firms and individuals to provide information closely related to their daily affairs and their personal lives. Although Bureau data collectors often return to the same firms or individuals for later information on the same subject or for new types of information, the Bureau's respondents have been remarkable in their generosity. This high degree of voluntary cooperation is due in part to the great care BLS employees take to protect the confidentiality of the information that respondents furnish by combining the data reported by the different sources and issuing the findings in summary tables, analyses, and reports. Respondents are thereby assured that their reports will be used for statistical purposes only. Bureau Commissioners and their staffs have been convinced over the years that these policies contribute to the reliability of BLS statistics.

Appendix A: Industry Detail in the GDP by Metropolitan Area Statistics

	2007 NAICS code
All industry total	...
Private industries	...
Agriculture, forestry, fishing, and hunting	11
Farms	111-112
Forestry, fishing, and related activities	113-115
Mining	21
Oil and gas extraction	211
Mining, except oil and gas	212
Support activities for mining	213
Utilities	22
Construction	23
Manufacturing	31-33
Durable goods manufacturing	...
Wood products manufacturing	321
Nonmetallic mineral products manufacturing	327
Primary metals manufacturing	331
Fabricated metal products	332
Machinery manufacturing	333
Computer and electronic products manufacturing	334
Electrical equipment, appliance, and components manufacturing	335
Motor vehicles, bodies and trailers, and parts manufacturing	3361-3363
Other transportation equipment manufacturing	3364-3366, 3369
Furniture and related products manufacturing	337
Miscellaneous manufacturing	339
Nondurable goods manufacturing	...
Food and beverage and tobacco products manufacturing	311-312
Textile mills and textile product mills	313-314
Apparel and leather and allied products manufacturing	315-316
Paper products manufacturing	322
Printing and related support activities	323
Petroleum and coal products manufacturing	324
Chemical products manufacturing	325
Plastics and rubber products manufacturing	326
Wholesale trade	42
Retail trade	44-45
Transportation and warehousing	48-49
Air transportation	481
Rail transportation	482
Water transportation	483
Truck transportation	484
Transit and ground passenger transportation	485
Pipeline transportation	486
Other transportation and support activities	487-488, 492
Warehousing and storage	493
Information	51
Publishing industries, except Internet (includes software)	511
Motion picture and sound recording industries	512
Broadcasting and telecommunications	515, 517
Data processing, internet publishing, and other information services	518, 519

	2007 NAICS code
Finance, insurance, real estate, rental, and leasing	52, 53
Finance and insurance	52
Federal Reserve banks, credit intermediation, and related services	521-522
Securities, commodity contracts, and investments	523
Insurance carriers and related activities	524
Funds, trusts, and other financial vehicles	525
Real estate and rental and leasing	53
Real estate	531
Rental and leasing services and lessors of intangible assets	532-533
Professional and business services	54, 55, 56
Professional, scientific, and technical services	54
Management of companies and enterprises	55
Administrative and waste management services	56
Administrative and support services	561
Waste management and remediation services	562
Educational services, health care, and social assistance	61, 62
Educational services	61
Health care and social assistance	62
Ambulatory health care services	621
Hospitals and nursing and residential care facilities	622-623
Social assistance	624
Arts, entertainment, recreation, accommodation, and food services	71, 72
Arts, entertainment, and recreation	71
Performing arts, spectator sports, museums, and related activities	711-712
Amusements, gambling, and recreation industries	713
Accommodation and food services	72
Accommodation	721
Food services and drinking places	722
Other services, except government	81
Government	92
Federal civilian	...
Federal military	...
State and local	...
Natural resources and mining	11, 21
Trade	42, 44-45
Transportation and utilities	...
Private goods-producing industries	...
Private services-providing industries	...

Source: Executive Office of the President, Office of Management and Budget, North American Industry Classification System Manual 2007 (Washington, DC: U.S. Government Printing Office, 2007).

Further Resources

McCormick, Matthew J., Sharon D. Panek, and Ralph M. Rodriguez. “Gross Domestic Product by Metropolitan Area: Accelerated Statistics for 2008, New Statistics for 2007, and Revised Statistics for 2005–2007.” *Survey of Current Business* (October 2009).

Panek, Sharon D., Frank T. Baumgardner, and Matthew J. McCormick. “Introducing New Measures of the Metropolitan Economy: Prototype GDP-by-Metropolitan-Area Estimates for 2001–2005.” *Survey of Current Business* (November 2007).

Panek, Sharon D., Jacob R. Hinson, and Frank T. Baumgardner, “Comprehensive Revision of Gross Domestic Product by Metropolitan Area: Advance Statistics for 2013 and Revised Statistics for 2001-2012,” *Survey of Current Business* (October 2014).