

## BEA vs BLS Value Added

(January 2018)

REMI is often asked the question “*why does the historical industry value added REMI reports for my state differ from that reported by the BEA in their Annual Gross Domestic Product (GDP) by State data?*” The answer is “*REMI does not use national or state-level BEA GDP by industry data as a direct source.*” This document outlines the primary reasons for this decision.

### 1. National IO Data from BLS is not Consistent with BEA

Input-output data show the flow of commodities from production through intermediate use by industries to purchases by final users. The REMI model relies on national input-output relationships published every two years by the Bureau of Labor Statistics (BLS) instead of the Benchmark IO tables published every 5 years by the Bureau of Economic Analysis (BEA) (last published for the year 2007), or its annual accounts (available for sector and summary level only) primarily because the BLS prepares 10-year projections in addition to its historical time series.

The analysis underlying the BLS 10-year projections focuses on long-term structural change and growth and assumes a full employment economy in the target year. This provides a measure from which to project technology changes independent from economic conditions. The input-output tables produced by the BLS are derived from input-output data initially developed by the BEA, but the final tables do not match (either due to changes due to BLS methodology, or because the BEA provides more frequent updates to its data series). Also, the BLS industries are based on 2012 NAICS codes, and the BEA industries are still based on the older 2007 NAICS codes. Due to this difference, we are able to directly compare 56 REMI industries between the two data sets for the history year 2015, and we can compare these in both nominal dollars as well as real dollars<sup>1</sup>.

The comparisons show a wide range of discrepancies, from 0.2% for Construction to -16.8% for Plastics and rubber products manufacturing when considering the two data sets in nominal dollars. Overall, 12 of the 56 industries diverge by more than +/- 5%.

The real dollar series differ by considerably more – from 0.0% for Computer and electronic product manufacturing, to 50.3% for Petroleum and coal manufacturing. Overall, in the real dollar data series, 31 of 56 industries (more than half) diverge by more than +/- 5%. This suggests that the BLS and the BEA have different industry price methodologies.

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<sup>1</sup> This comparison is based on BEA value added data from their 11/21/2017 release, and BLS value added data from their 10/24/2017 release.

**Comparison of 2015 Data**  
**(% Difference between BLS and BEA)**

<b>REMI Industry</b>	<b>NAICS Code</b>	<b>Industry Name</b>	<b>Nominal Dollars</b>	<b>Real Dollars</b>
1, 2	113-115	<i>Forestry and logging; Fishing, hunting, and trapping; Agriculture and forestry support activities</i>	-1.4%	-4.0%
3	211	<i>Oil and gas extraction</i>	-2.6%	-8.1%
4	212	<i>Mining (except oil and gas)</i>	6.6%	-0.3%
5	213	<i>Support activities for mining</i>	8.9%	15.0%
6	22	<i>Utilities</i>	1.0%	3.2%
7	23	<i>Construction</i>	0.2%	5.9%
8	321	<i>Wood product manufacturing</i>	1.0%	13.9%
9	327	<i>Nonmetallic mineral product manufacturing</i>	-5.4%	5.2%
10	331	<i>Primary metal manufacturing</i>	1.9%	0.8%
11	332	<i>Fabricated metal product manufacturing</i>	4.3%	-1.5%
12	333	<i>Machinery manufacturing</i>	6.8%	15.3%
13	334	<i>Computer and electronic product manufacturing</i>	-0.8%	0.0%
14	335	<i>Electrical equipment and appliance manufacturing</i>	2.0%	6.8%
15	3361-3363	<i>Motor vehicles, bodies and trailers, and parts manufacturing</i>	7.4%	8.7%
16	3364-3369	<i>Other transportation equipment manufacturing</i>	1.0%	6.1%
17	337	<i>Furniture and related product manufacturing</i>	-3.9%	-4.0%
18	339	<i>Miscellaneous manufacturing</i>	2.8%	8.0%
19, 20	311,312	<i>Food manufacturing; Beverage and tobacco product manufacturing</i>	-5.5%	-3.3%
21	313,314	<i>Textile mills; Textile product mills</i>	-1.9%	-0.2%
22	315,316	<i>Apparel manufacturing; Leather and allied product manufacturing</i>	4.9%	5.2%
23	322	<i>Paper manufacturing</i>	3.2%	9.9%
24	323	<i>Printing and related support activities</i>	1.8%	-1.0%
25	324	<i>Petroleum and coal products manufacturing</i>	1.7%	50.3%
26	325	<i>Chemical manufacturing</i>	-4.1%	5.5%
27	326	<i>Plastics and rubber products manufacturing</i>	-16.8%	-16.6%
28	42	<i>Wholesale trade</i>	-0.4%	2.3%
29	44,45	<i>Retail trade</i>	0.5%	3.5%
30	481	<i>Air transportation</i>	-2.7%	17.8%
31	482	<i>Rail transportation</i>	-1.0%	7.0%
32	483	<i>Water transportation</i>	5.0%	8.5%
33	484	<i>Truck transportation</i>	-2.3%	-2.3%
35	485	<i>Transit and ground passenger transportation</i>	-3.4%	8.9%
36	486	<i>Pipeline transportation</i>	-2.1%	-18.9%
37, 34	487,488,492	<i>Scenic and sightseeing transportation; Support activities for transportation; Couriers and messengers</i>	0.3%	7.3%
38	493	<i>Warehousing and storage</i>	4.6%	-23.9%

39	511	<i>Publishing industries, except Internet</i>	-12.6%	-10.5%
40	512	<i>Motion picture and sound recording industries</i>	-4.2%	-16.6%
41	518,519	<i>Data processing, hosting, and related services; Other information services</i>	-4.8%	-8.3%
42, 43	515,517	<i>Broadcasting, except Internet; Telecommunications</i>	-1.7%	-4.1%
44, 45	521-523,525	<i>Monetary authorities – central bank; Credit intermediation and related activities; Securities, commodity contracts, other investments; Funds, trusts, other vehicles</i>	-9.1%	-8.2%
46	524	<i>Insurance carriers and related activities</i>	-11.9%	-12.2%
47	531	<i>Real estate</i>	1.7%	2.5%
48	532,533	<i>Rental and leasing services; Lessors of nonfinancial intangible assets</i>	3.9%	1.2%
49	54	<i>Professional, scientific, and technical services</i>	0.4%	2.6%
50	55	<i>Management of companies and enterprises</i>	-0.8%	-21.4%
51	561	<i>Administrative and support services</i>	3.3%	4.9%
52	562	<i>Waste management and remediation services</i>	4.6%	12.6%
53	61	<i>Educational services; private</i>	2.8%	-0.1%
54	621	<i>Ambulatory health care services</i>	3.6%	4.8%
55, 56	622,623	<i>Hospitals (private); Nursing and residential care facilities</i>	2.4%	4.6%
57	624	<i>Social assistance</i>	1.3%	4.5%
58, 59	711,712	<i>Performing arts and spectator sports; Museums, historical sites, zoos, and parks</i>	5.3%	7.7%
60	713	<i>Amusement, gambling, and recreation</i>	2.1%	5.8%
61	721	<i>Accommodation</i>	-1.9%	2.1%
62	722	<i>Food services and drinking places</i>	-0.3%	2.4%
63-66	811-814	<i>Other services</i>	2.4%	7.2%

## 2. BEA Real GSP by State Series uses National Deflators

The Real GSP by State series published by the BEA is deflated using the national chain-type price indexes. This means that BEA assumes every state has the same industry prices. Since the REMI model uses national industry deflators plus the region's industry relative cost of production to convert between real and nominal dollars, the estimate of a region's real output needs to take into account local costs relative to the nation.

## 3. Description of REMI Methodology

The REMI historical data series for value added by industry is required at the county and industry level (sector, summary, and detailed). Since earnings or compensation are typically the largest component of value added, and we have previously estimated earnings and compensation for every county, industry, and history year, we begin the value added

estimation process by using the larger of industry earnings or compensation<sup>2</sup> to allocate the county's share of national output<sup>3</sup> (BLS definition). We then add up all of the counties in a state (by industry, by year) and develop scaling factors based on a comparison of state output (by industry and year) derived from the initial REMI estimates, and those derived from the BEA GSP by State data. These state/industry/year-specific scaling factors are then applied to each county within a state to derive an adjusted estimate of output. The final estimate of real output (and value added, once the national value added to output ratio is applied) is determined by applying an initial estimate of the cost of production in the county.

In summary, these are the three steps:

$$Q1_{i,t}^k = \frac{YLP_{i,t}^k}{YLP_{i,t}^u} * Q_{i,t}^u \quad \text{initial estimate} \quad (1)$$

$$Q1_{i,t}^K = \sum Q1_{i,t}^k \quad \text{sum counties to state}$$

$$Q2a_{i,t}^k = \frac{\left(\frac{GSP_{i,t}^K}{GSP_{i,t}^u}\right) * Q_{i,t}^u}{Q1_{i,t}^K} * Q1_{i,t}^k \quad \text{calibrate to BEA GSP} \quad (2)$$

$$Q2b_{i,t}^k = \frac{Q_{i,t}^u}{\sum Q2a_{i,t}^k} * Q2a_{i,t}^k \quad \text{normalize to US}$$

$$Q3_{i,t}^k = \frac{Q2b_{i,t}^k}{\Omega_{i,t}^k} \quad \text{adjust for local prices} \quad (3)$$

$$Q_{i,t}^k = \frac{Q_{i,t}^u}{\sum Q3_{i,t}^k} * Q3_{i,t}^k \quad \text{normalize to US}$$

Where,

$k$  = county

$K$  = state

$u$  = nation

<sup>2</sup> Since earnings include proprietor's income, which can be smaller than compensation (or even negative) due to losses, compensation is used when larger than earnings. In the rare situation where compensation is zero but employment is non-zero (indicating the entire industry in the county is based on self-employment), then earnings is used as the share unless negative, in which case employment is used.

<sup>3</sup> Since the national value added to output ratio is for all counties and states (from the national input-output tables), a county's value added share of national value added is assumed to be the same as its output share of national output.

$i$  = industry

$t$  = year

$Q$  = BLS output (real)

$YLP$  = earnings or compensation (nominal)

$GSP$  = BEA value added (nominal)

$\Omega_{i,t}^k$  = relative cost of production restricted between  $0.8 < \Omega < 1.2$  to maintain reasonableness and discount outliers

The resulting REMI real value added for a state will differ from what is reported by the BEA due to differences between the BLS and BEA national data sets as well as due to the incorporation of regional price differences from those in the nation.