

BEER SERVES AMERICA

**A Study of the U.S. Beer Industry's Economic Contribution
in 2018**

Analysis, Methodology and Documentation

Prepared for

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&

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Beer Serves America

Executive Summary of Findings:

- Brewers and beer importers directly employ 69,928 Americans. About 58 percent of brewing jobs are linked to large and mid-sized brewers and beer importers.
- The number of distributor jobs has increased by more than 19 percent in the last decade, to nearly 141,600.
- Overall, the beer industry contributes nearly \$328.4 billion in economic output which is equivalent to 1.6 percent of the U.S. Gross Domestic Product.
- Suppliers to the brewing industry – enterprises that manufacture bottles and cans, cardboard case boxes, brewing equipment or marketing displays – generate almost \$102 billion in economic activity and are responsible for nearly 436,650 jobs alone.

Summary of Analysis and Methodology:

Beer Serves America, the Study of the U.S. Beer Industry’s Economic Contribution, has been conducted on a regular basis by the Beer Institute and the National Beer Wholesalers Association (NBWA). This study estimates the economic contributions made by the malt beverage industry to the U.S. economy in 2018. John Dunham & Associates (JDA) conducted the research in concert with the Beer Institute and NBWA. This work used standard econometric models first developed by the U.S. Forest Service, and now maintained by IMPLAN. Data came from industry sources, government publications and Infogroup.

Table 1
Total Economic Impact of the Beer Industry

	Industry	Supplier	Induced	Total
Jobs	1,123,607	436,648	629,217	2,189,472
Wages	\$ 40,076.68	\$ 28,583.69	\$ 32,472.58	\$ 101,132.95
Economic Output	\$ 123,288.52	\$ 101,909.98	\$ 103,178.86	\$ 328,377.36

(\$ Millions)

Based on data from 2018, the beer industry in the United States generated a total of nearly 2.19 million jobs and an economic impact of almost \$328.4 billion. Table 1 summarizes the total

contribution of the beer industry to the U.S. economy.

Table 2
Taxes Generated by the Beer Industry

Tax Type	Federal	State & Local	Total
Business & Personal	\$ 24,672.24	\$ 21,642.44	\$ 46,314.68
Excise	\$ 3,267.27	\$ 1,548.23	\$ 4,815.50
State Sales Tax	\$ -	\$ 6,633.74	\$ 6,633.74
Other Sales Based Taxes	\$ -	\$ 815.55	\$ 815.55
Total	\$ 27,939.51	\$ 30,639.96	\$ 58,579.47

(\$ Millions)

In addition to examining economic activity, the study also estimates taxes paid by the industry and its employees, and consumer taxes generated by the sale of malt beverage products. All told, nearly \$58.6 billion in tax revenues are generated by the production and sale of beer and other malt beverages. This is equal to almost 40 percent of the retail price paid for these products by consumers.

Beyond the numerical indicators of brewers' economic activity there is another powerful story. The brewing industry has a presence in every congressional district in the U.S., and family names appear on most beer packages sold in the United States. Brewers and beer distributors are responsible corporate citizens who care deeply about the responsible use of their products. Members of the brewing industry have worked individually and collectively on dozens of successful education and awareness programs to reduce drunk driving, underage drinking, and all other forms of alcohol abuse.

Industry Components:

Beer Serves America measures the impact of the malt beverage industry, as defined by its traditional three tiers of brewing, wholesaling and retailing, on the entire economy of the United States. Overall, the industry contributes \$328.4 billion in economic output which is equivalent to about 1.6 percent of GDPⁱ and, through its production and distribution linkages, impacts firms in 514 of the 536 sectors of the U.S. economy.ⁱⁱ

The three tiers are described in more detail below.

Brewing

The brewing process (as defined in this study) begins in one of two ways. First, agricultural products – such as barley, corn, rice and hops – are purchased from farmers and agricultural supply companies throughout the country. Alternatively, beer can enter the country as an imported finished product. The 7,716 firms that use agricultural products to produce malt beverages or directly import the product into the United States are denoted as brewers.ⁱⁱⁱ There are basically four types of brewing firms in the country. First, the major brewers – those that produce over 2 million barrels of malt beverages per year. These include the traditional names such as Anheuser-Busch, MillerCoors, and Yuengling, as well as a number of newer firms that began production after federal brewing laws were changed in the latter 1970s (The Boston Beer Company, or Sierra Nevada for example). In addition, while they may not brew beer in the U.S., many major international brewing companies like Heineken, Diageo and Constellation Brands Beer Division (Corona) also have substantial domestic sales and service operations that are included in the brewing figures.

Table 3
Direct Brewing Employment by Firm Type

Type	Firms	Percent	FTE Jobs	Percent	Jobs/Firm
Major	24	0.3%	30,260	43.3%	1,260.83
Importer	5	0.1%	2,494	3.6%	498.80
Regional	313	4.4%	7,833	11.2%	25.03
Micro	4,313	61.0%	18,383	26.3%	4.26
Brewpub	2,418	34.2%	10,956	15.7%	4.53
Total	7,073	100.0%	69,927	100.0%	9.89

There are also 300 regional brewers in the country, which are sizable and have national distribution, but generally produce less than 2 million barrels of malt beverages. These include a number of well-known companies like New Belgium Brewing Company, Dogfish Head Craft Brewery and F.X. Matt Brewing Company.

Finally, the last type of brewing firms, brewpubs and small micro-brewers, number in the

thousands and are located throughout America. These firms produce beer for a limited market – sometimes only for their own restaurant or retail establishment. All told, brewers employ 69,928 people in brewing or importing operations, sales, packaging and direct distribution. Most of the growth in establishments is coming from local and regional brewing operations.

It is interesting to note that while overall

The total number of brewing facilities has grown by 1,191 in two years – most being very small brewers or brewpubs

At the same time large and regional brewers account for about 58 percent of total employment, this is about the same as in 2016

volumes of beer sales are actually down by about 2.4 percent over 2016, brewing jobs have increased by 8.0 percent. This represents tremendous growth in micro and brewpub employment as well as growth in higher margin products from all brewers.

Wholesaling

Once malt beverages have been produced or imported, they enter the second tier of the brewing industry – the wholesale tier. JDA estimates that there are 4,829 firms involved in the wholesale supply of malt beverage products throughout the country (not including wholesale operations directly owned and operated by the major breweries).^{iv} Wholesalers, also called distributors, are involved in the transportation of malt beverages from the brewers or a bonded warehouse operated by importers, the sales of products to retailers, and the storage of products for a limited period of time.

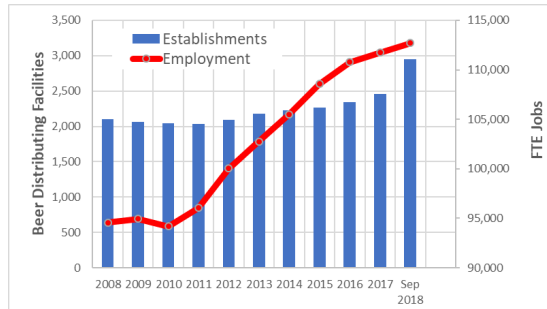
Based on the data, the wholesale tier of the industry directly employs 141,588 individuals throughout the country. Overall employment in beer distribution is up by more than 19.2 percent over the past decade according to the U.S. Department of Labor.^v

The growth in wholesale jobs can be attributed to the development of new malt beverage

products, substantial growth in imports and more regional and even national distribution by smaller producers, the wholesaling operation of which is included in the brewing impact figures.

- airlines
- amusement locales
- State stores where applicable

Figure 1
Growth in Beer Wholesaling Jobs

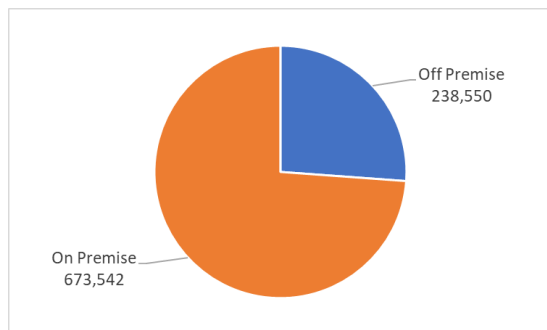


(US Department of Labor Data)

Retail

Finally, the third tier of the industry directly sells products to the consumer. This can either be through on-premises sales (as in the case of a restaurant or tavern), or for off-premise consumption (grocery stores, package stores, etc.) The nature of malt beverage retailing varies by state. In some states, liquor stores sell malt beverages, in some grocery stores sell malt beverages, and in others bars sell products for off-premises consumption.

Figure 2
Retailing Jobs by Segment



For this analysis, the retail tier is assumed to consist of firms in the following industries:

- restaurants and taverns
- retail stores
- hotels

While there are obviously other venues that may sell beer to the public – street vendors, cruise lines, non-profit groups, etc. – they are not included in the analysis due to limited data availability and the small amount of product that they handle. It is estimated that outlets selling malt beverages in the United States employ about 912,092 people. Beer retailing jobs are down slightly since 2016, which reflects a number of factors including reduced demand for malt beverages and general weakness in the retail economy. On-premise retail is up slightly over the prior study period, but this is offset by declines in off-premise retailing. This is reflective of more product being sold through local brewery taprooms and restaurants.

There continues to be a shift away from less expensive products to more expensive local and “craft” beers in bars and restaurants, as well as to imports. Consumers purchase smaller volumes of these higher priced beers than they do of less expensive domestic light lagers and pilsners, suggesting that fewer employees are required to serve beer in a given bar or tavern.

The direct components of the malt beverage industry have grown by about 1 percent since 2016 in spite of lower volumes

About 5,180 more people work in breweries than did in 2016

Nearly 7,300 additional beer wholesaling jobs were created in 2018 than there were in 2016

Suppliers

Other firms are related to the three tiers of the malt beverage industry as suppliers. These firms produce and sell a broad range of items including ingredients for the production process, fuel, packaging materials, sales displays or machinery. In addition, supplier firms provide a broad range of services, including personnel

services, financial services, advertising services, consulting services or even transportation services. Finally, a number of people are employed in government enterprises responsible for the regulation of the malt beverage industry. All told, it is estimated that suppliers to the malt beverage industry are directly responsible for about 436,650 jobs with supplier firms generating nearly \$101.91 billion in economic activity.

Induced Activity

An economic analysis of the malt beverage industry will also take additional linkages into account. While it is inappropriate to claim that suppliers to the supplier firms are part of the industry being analyzed,^{vi} the spending by employees of the industry, and those of supplier firms whose jobs are directly dependent on malt beverage sales and production, should surely be included. This spending on everything from housing, to food, to educational services makes up what is traditionally called the “induced impact” or multiplier effect of the malt beverage industry. In other words, this spending, and the jobs it creates, is induced by the production, distribution and sale of malt beverages. JDA estimates that the induced impact of the industry is nearly \$103.18 billion and generates close to 629,220 jobs.

The multiplier effect of the beer industry in 2018 was therefore 1.66, in line with the multiplier of about 1.65 the last time the study was conducted.^{vii}

Fiscal

An important part of an impact analysis is the calculation of the contribution of the industry to the public finances of the community. In the case of the beer industry, this contribution comes in two forms.

About 40 percent of the price of every beer goes toward taxes paid to the federal government, state governments and localities

First, the traditional direct taxes paid by the firms and their employees provided over \$46.3

Each job in the brewing industry generates 31 additional full-time equivalent jobs

2.02 jobs in beer wholesaling
13.04 jobs in beer retailing
1.28 other manufacturing jobs
0.73 jobs in farming

billion in revenues to federal, state and local governments. In addition, the consumption of beer generated \$4.8 billion in federal and state excise taxes, \$6.6 billion in state sales taxes and nearly \$816 million in other beer-specific local taxes. The \$816 million is comprised of local beer-specific taxes, such as city and county excise taxes. This is the minimum practical level for calculating taxes and consumption. As a result, there are likely additional local taxes imposed on malt beverages which are not included in this figure.^{viii}

**Table 4
Taxes Generated by the Beer Industry**

Tax Type	Federal	State & Local	Total
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Table 4 presents a summary of the tax revenues generated by the industry and its consumers in the United States. All told, nearly \$58.6 million in taxes at the federal, state and local level are directly attributable to the production, sale and consumption of beer, which represents almost 40.0 percent of overall sales.^{ix}

Methodology:

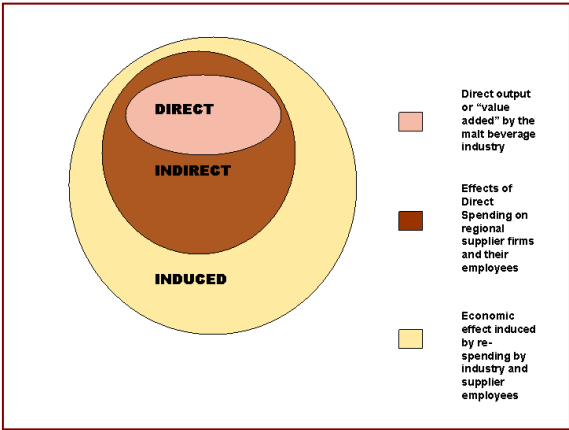
Every economic impact analysis begins with a description of the industry being examined. In the case of the beer industry model, the malt beverage industry is defined as the three tiers of the brewing industry.

Beer Serves America begins with an accounting of the direct employment in the various sectors. Brewing encompasses beer production and sales facilities as well as company-owned distribution operations, can production, other supply

operations and beer importers. Wholesaling includes the nationwide network of beer distributors and related warehouse and transportation operations. Retailing includes locations where beer is consumed “on premise,” such as bars, restaurants, sports and entertainment venues and airlines. “Off-premise” retail outlets are supermarkets, convenience stores, warehouse stores and similar locations. The data come from a variety of government and private sources.

It is sometimes mistakenly thought that initial spending accounts for all of the impact of an economic activity or a product. For example, at first glance it may appear that consumer expenditures for a beer are the sum total of the impact on the local economy. However, one economic activity always leads to a ripple effect whereby other sectors and industries benefit from this initial spending. This inter-industry effect of an economic activity can be assessed using multipliers from regional input-output modeling.

Figure 3
Model of Economic Impact Components



The economic activities of events are linked to other industries in the state and national economies. The activities required to produce a six-pack of beer from malting barley, to packaging, to shipping generate the direct effects on the economy. Regional (or indirect) impacts occur when these activities require purchases of goods and services such as building materials from local or regional suppliers. Additionally,

induced impacts occur when workers involved in direct and indirect activities spend their wages in the region. The ratio between total economic and direct impact is termed the multiplier. The framework in Figure 3 illustrates these linkages. This method of analysis allows the impact of local production activities to be quantified in terms of final demand, earnings and employment in the states and the nation as a whole.

Once the direct impact of the industry has been calculated, the input-output methodology discussed below is used to calculate the contribution of the supplier sector and of the re-spending in the economy by employees in the industry and its suppliers. This induced impact is the most controversial part of economic impact studies and is often quite inflated. In the case of the *Beer Serves America* model, only the most conservative estimate of the induced impact has been used.

Model Description and Data:

The *Beer Serves America* model was developed by JDA based on data provided by Infogroup, the Beer Institute, the NBWA, the Brewers Association, and state and federal governments. The analysis utilizes the IMPLAN model in order to quantify the economic impact of the malt beverage industry on the economy of the United States. The model adopts an accounting framework through which the relationships among different inputs and outputs across industries and sectors are computed. This model can show the impact of a given economic decision – such as a factory opening or operating a sports facility – on a pre-defined, geographic region. It is based on the national income accounts generated by the U.S. Department of Commerce, Bureau of Economic Analysis (BEA).^x

This model will incorporate firms in the following economic sectors:

- ❖ **Brewing:** Including firms that brew beer and other malt beverages, and firms that import (and directly market with their own staff) malt beverages for consumption in the United States. The brewing sector also

includes company-owned packaging and wholesaling operations. Brewers include major multi-state, multi-operational brewing companies, regional and craft brewers and brewpubs.

- ❖ **Wholesaling:** Including firms involved in the distribution and storage of malt beverages after they leave control of the manufacturer. Exporters as well as some smaller importers, are included in the wholesaling sector; however, the direct effects of company-owned wholesaling operations have been shifted to the brewing sector for this analysis.
- ❖ **Retailing:** This includes firms involved in both the on-premises and off-premises sale of malt beverages. This sector includes restaurants, bars, hotels, retail establishments (e.g. grocery stores, package shops, convenience stores, liquor stores), amusement places (e.g. amusement parks, beer gardens, bowling alleys) and airlines. Control state package stores that sell beer are included, however, model limitations preclude the inclusion of military stores, colleges or other government-owned outlets as part of the retailing sector. In addition, outlets that may sell minimal amounts of beer like book stores, or zoos, as well as cruise ships are not included in the model.

The IMPLAN model is designed to run based on the input of specific direct economic factors. It uses a detailed methodology (see Methodology section) to generate estimates of the other direct impacts, tax impacts and supplier and induced impacts based on these entries. In the case of the model used in *Beer Serves America*, direct employment in the malt beverage industry (as described above) is a base starting point for the analysis. Direct employment in each of the three components of the industry is – due to data limitations – estimated in two distinct ways. In the case of the brewing sector, establishment employment is based directly on data provided to JDA by Infogroup as of July 2018. Infogroup, is the leading provider of business and consumer data for the top search engines and leading in-car navigation systems in North America.

Infogroup gathers data from a variety of sources, by sourcing, refining, matching, appending, filtering, and delivering the best quality data. The company verifies its data at the rate of almost 100,000 phone calls per day to ensure absolute accuracy

These data are gathered at the facility level; therefore, a company with a brewery, warehouse and sales office would have three facilities, each with separate employment counts. Since the Infogroup data is adjusted on a continual basis, JDA staff scanned the brewery data for discrepancies. The data from Infogroup was merged with other data gathered from Beer Institute member records, survey data gathered directly from Beer Institute member companies, and 2018 data on individual breweries and brewing companies from the Brewers Association. This helped to ensure that all of the smaller breweries and non-brewing operations from larger firms were included. The database was then checked against company websites, or addresses looked up on Google maps to ensure that companies actually existed or were still in business.

Employment estimates were generally taken directly from the Infogroup data; however, employment figures for facilities were replaced where necessary with figures directly obtained from the companies themselves. In the case of brewpubs, if brewing employment counts were not available, industry employment is assumed to be three employees, reflecting only the brewing operations of what are essentially restaurants or taverns.^{xi} Where no data was available, employment at each location was estimated to be equal to the median value for similar sites in the same state, or was based on the volume of production in each of the facilities.

Wholesale employment is based directly on data provided to JDA by Infogroup as of July 2018 and the NBWA and Wine and Spirits Wholesalers of America (WSWA) as of November 2018. This data is gathered at the facility level; therefore, a company with a warehouse, truck repair shop and sales office would have three separate employment counts.

JDA staff verified the data using either company websites, or Google Maps. Where facilities handled products in other categories such as wine, spirits or soft drinks JDA staff assigned jobs based on data gathered by the NBWA, data gathered by the Wine and Spirits Wholesalers of America, or based on the predominant beverage distributed by the company. Jobs were split across categories based either on company-specific sales data or overall industry sales percentages in the specific state where the wholesale facility was located.

Employee counts for facilities with missing data or for facilities not included in the Infogroup lists are based on industry medians. Where the NBWA or the WSWA data differed from that calculated by JDA, the associations' numbers were used.

Data on the retail sectors start with raw employment data which are adjusted based on sales of beer, wine and spirits using either the industry multipliers and output per employee ratios included in the IMPLAN model for the retail components of the industry in order to estimate total employment in each sector, or using a calculation based on beer sales as a percentage of total alcohol sales.^{xii} These results were cross-checked against a wide variety of establishment data by state and were found to present a reasonable estimate of the employment in each sector generated solely by malt beverage sales. Retail data is adjusted to take into account dry counties and state regulations pertaining to beer sales in grocery and food stores.^{xiii}

It should be noted that some government-owned establishments selling malt beverages, including military post exchanges and commissary stores, will be underrepresented in this analysis as most of these facilities would not have Infogroup records, nor would some be licensed by state alcohol beverage licensing authorities. Where possible those government-owned stores in control states that sell malt beverages are included.

Once the initial direct employment figures have been established, they are entered into a model linked to the IMPLAN database. The IMPLAN

data are used to generate estimates of direct wages and output in each of the three sectors: brewing, wholesaling and retailing. Wages are derived from data from the U.S. Department of Labor's ES-202 reports that are used by IMPLAN to provide annual average wage and salary establishment counts, employment counts and payrolls at the county level. Since this data only covers payroll employees, it is modified to add information on independent workers, agricultural employees, construction employees and certain government employees. Data is then adjusted to account for counties where non-disclosure rules apply. Wage data include not only cash wages, but health and life insurance payments, retirement payments and other non-cash compensation. It includes all income paid to workers by employers. Distribution income and exercised stock options received by proprietors including sole proprietors, and distributions to partners of LLCs are also included in wage figures.

Total output is the value of production by industry in a given state. It is estimated by IMPLAN from sources similar to those used by the BEA in its RIMS II series. Where no census or government surveys are available, IMPLAN uses models such as the Bureau of Labor Statistics Growth model to estimate the missing output.

The model also includes information on income received by the federal, state and local governments, and produces estimates for the following taxes at the federal level: Corporate income, payroll, personal income, estate and gift, excise taxes, customs duties and fines, fees, etc. State and local tax revenues include estimates of: Corporate profits, property, sales, severance, estate and gift and personal income taxes, licenses and fees and certain payroll taxes. These *Business and Personal Taxes* are calculated based on models created prior to the implementation of the Tax Reform and Jobs Act of 2017. Data on the effects to the tax reform are not yet available from the IRS.

Indirect taxes paid due to the consumption of malt beverages in each state are also included in the analysis. These figures – while mostly

separate from the reported taxes paid – contain very small double counts. This is because individuals employed by the beer industry or its suppliers purchase malt beverages, and the sales taxes on beer as well as state and federal beer excise taxes paid by these people are already included in the direct taxes section. In addition, estimates of certain small beer-specific taxes – such as the Philadelphia County on-premise beverage tax or the New York City malt beverage excise tax – are included.

While IMPLAN is used to calculate the state level impacts, Infogroup data provide the basis for congressional district estimates. Publicly available data at the county and congressional district level is limited by disclosure restrictions, especially for smaller sectors of the economy like brewing and beer wholesaling. This model therefore uses actual physical location data provided by Infogroup in order to allocate jobs – and the resulting economic activity – by county. For counties entirely contained in a single congressional district, jobs are allocated based on the percentage of total sector jobs in each county. For counties that are broken by congressional districts, allocations are based on the percentage of total brewing and beer wholesaling jobs physically located in each segment of the county. Physical locations are based on either actual address of the facility, or the zip code of the facility, with facilities placed randomly throughout the zip code area. All supplier and indirect jobs are allocated based on the percentage of a state’s employment in that sector in each of the counties. Again, these percentages are based on Infogroup data.

While brewing, wholesaling and retail jobs are generally allocated in this manner, retailing jobs are restricted to only those counties that allow the retail sale of malt beverages. There are many localities and counties in the United States that are either wholly dry or partly dry.^{xiv} The congressional district breakdowns exclude retailing jobs from these counties. In addition, grocery store/convenience store jobs are included in those states that allow for such sales.

Malt beverage sales and consumption data are calculated by JDA and are based on on-premise

and off-premise volume splits provided by the Beer Institute and NBWA, personal consumption expenditures from the U.S. Department of Commerce Bureau of Economic Analysis, wholesale margins from the US Department of Commerce Bureau of Economic Analysis. Personal consumption expenditures allow for the measurement of the amount households in the country spend on goods and services such as beer and dining out. This data, along with estimated retail employment levels, are used to allocate the national malt beverage sales across each state. Sales and excise tax rates are accurate as of December 2018. The federal excise tax rates used in this model are based on the current tiered system and average \$16.75 per barrel.^{xv} Ex-dock brewers’ prices without any taxes are estimated to be about \$273.00 per barrel. Standard retail and wholesale margins are applied along with the taxes and fees in order to estimate total sales by product category, state and location.^{xvi}

All of the estimates of wages, output and tax rates other than beer excise taxes, beer sales taxes and other specific beer-based consumption taxes are derived from the IMPLAN input-output models.

Data and Modeling Considerations When Comparing 2018 with Earlier Studies:

There have been important changes to the economy, the beer industry and the data sources used in this model when compared to 2016.

First, and most importantly, the IMPLAN database that is used to develop all of the supplier and induced outputs, as well as the direct wage rates and output has undergone a major revision in relation to the brewing industry. The 2014 data tables were used in 2016, while this model uses the 2016 IMPLAN tables. The Input-Output tables are always released at least a year behind, and JDA updates its tables on the even numbered years.

Prior to the development of the 2014 IMPLAN Tables, neither the BEA, not the BLS included much data on regional or small breweries in their calculations. This began to change with the

development of the 2014 IMPLAN tables. As of that year, the BLS began to reflect the growth in brewing jobs at small breweries, and job numbers reported in the IMPLAN brewing sector increased considerably to nearly the level that JDA was calculating. At that time; however, the BEA did not adjust its output figures to account for the fact that these facilities are much less productive than the large national breweries. This means that the output per employee data that JDA uses to calculate the total economic impact of the industry, and industry sales and tax rates was greatly inflated in IMPLAN. At that time it was not possible to know that there was such a large overestimate because output per employee in the industry had been adjusted downward.

With the issuance of the 2016 IMPLAN tables, BEA had made the adjustments to output, reducing output per employee in the brewing sector by nearly 38 percent.

Prior to the creation of the 2018 *Beer Serves America* model, JDA split the industry into the brewing and the *other food manufacturing* sectors in order to take into account the fact that smaller brewers were not incorporated into the government data. Other food manufacturing was much less productive than brewing and this was reflected in JDAs output and sales calculations. Table 5 outlines the output per employee calculates for the three years.

Table 5
Output Per Employee from IMPLAN

IMPLAN			Other Food
Table Year	Brewing		Mfg.
2012	\$ 1,414,421	\$	332,707
2014	\$ 1,020,106	\$	327,397
2016	\$ 634,731	\$	342,255

In 2016, JDA changed its modeling approach to brewing because of these changes to the government data, and based on the assumption that the new data reflected the proper output per employee figures for breweries. In 2016, therefore, all brewing jobs were run through the *brewing sector* of the economy, with just the

brewing jobs at brewpubs run through the *other food manufacturing sector*. As such output calculations rose substantially.

JDA assumed that this increase was reflective of the more expensive beer being produced by smaller brewers, and correspondingly increased margins at retail to account for this. All of this resulted in an overestimate of beer production output, on-premise sales, and on-premise taxes, particularly sales taxes.

The 2016 IMPLAN tables used to calculate the 2018 version of *Beer Serves America*, reflect a 38 percent reduction in the output per employee figures, and all brewing jobs were run through the *brewing sector* of the economy. This change has led to much lower calculations for beer sales relative to those presented in the 2016 version of *Beer Serves America*.^{xvii}

The model to model reductions in brewing output, prices and sales figures are due almost entirely to these statistical changes, and not due to changes in the industry itself.

JDA believes that the 2018 *Beer Serves America* figures also reflect better data on both retailing and wholesaling, including the incorporation of data from control state operations where beer is handled and sold, as well as data directly obtained from many of the largest wholesaling companies.

Finally, in the brewing sector there continues to be significant growth in small marginal breweries. These breweries employ many people but their average wage rates and output per worker levels are much lower than the larger facilities that have traditionally dominated the industry. This means that employment is rising faster than either wages or economic output – particularly in those states where smaller “craft type” brewers dominate.

The 2018 *Beer Serves America* model reflects the best data and modeling techniques available now, and should provide a very accurate measure of the economic foot print of the industry today. Any errors are unintentional and are strictly those of John Dunham & Associates

and should not reflect on the quality of data provided by the funding associations.

IMPLAN Methodology:^{xviii}

Francoise Quesnay, one of the fathers of modern economics, first developed the analytical concept of inter-industry relationships in 1758. The concept was actualized into input-output analysis by Wassily Leontief during the Second World War, an accomplishment for which he received the 1973 Nobel Prize in Economics.

Input-Output analysis is an econometric technique used to examine the relationships within an economy. It captures all monetary market transactions for consumption in a given period and for a specific geography. The IMPLAN model uses data from many different sources – as published government data series, unpublished data, sets of relationships, ratios or as estimates. IMPLAN, Inc. gathers this data, converts it into a consistent format and estimates the missing components.

There are three different levels of data generally available in the United States: federal, state and county. Most of the detailed data is available at the county level, and as such there are many issues with disclosure, especially in the case of smaller industries, such as brewing. IMPLAN overcomes these disclosure problems by combining a large number of data sets and by estimating those variables that are not found from any of them. The data is then converted into national input-output matrices (Use, Make, By-products, Absorption and Market Shares) as well as national tables for deflators, regional purchase coefficients and margins.

The IMPLAN Make matrix represents the production of commodities by industry. The Bureau of Economic Analysis (BEA) Benchmark I/O Study of the U.S. Make Table forms the bases of the IMPLAN model. The Benchmark Make Table is updated to current year prices, and rearranged into the IMPLAN sector format. The IMPLAN Use matrix is based on estimates of final demand, value-added by sector and total industry and commodity output data as provided by government statistics or

estimated by IMPLAN. The BEA Benchmark Use Table is then bridged to the IMPLAN sectors. Once the re-sectoring is complete, the Use Tables can be updated based on the other data and model calculations of interstate and international trade.

In the IMPLAN model, as with any input-output framework, all expenditures are in terms of producer prices. This allocates all expenditures to the industries that produce goods and services. As a result, all data not received in producer prices is converted using margins which are derived from the BEA Input-Output model. Margins represent the difference between producer and consumer prices. As such, the margins for any good add to one. If, for example, 10 percent of the consumer price of beer is from the purchase of hops, then the hops margin would be 0.1.

Deflators, which account for relative price changes during different time periods, are derived from the Bureau of Labor Statistics (BLS) Growth Model. The BLS model is mapped to the sectors of the IMPLAN model. Where data is missing, deflators from BEA's Survey of Current Businesses are used. Finally, one of the most important parts of the IMPLAN model, the Regional Purchase Coefficients (RPCs) must be derived. IMPLAN is derived from a national model which represents the "average" condition for a particular industry. Since national production functions do not necessarily represent particular regional differences, adjustments need to be made.

Once the databases and matrices are created, they go through an extensive validation process. IMPLAN builds separate state and county models and evaluates them, checking to ensure that no ratios are outside of recognized bounds. The final data sets and matrices are not released before extensive testing takes place.

i Based on 2018 current-dollar GDP of \$20,891.4 billion. National Income and Product Accounts, *Gross Domestic Product Fourth Quarter and Annual 2018 (Initial Estimate)*, News Release. US Department of Commerce, Bureau of Economic Analysis, February 19, 2019.

ii Economic sectors based on IMPLAN sectors.

iii Throughout this study, the term “firms” actually refers to physical locations. One brewer, for example, may have breweries in 5 or 6 locations throughout the country. Each brewery is included in the count. This figure differs considerably from the 4,193 companies reported by the US Commerce Department in the Quarterly Census of Employment and Wages (3rd quarter 2018). There are two reasons for this. First the QCEW counts companies not facilities, and many of the larger brewers have dozens of facilities. Second, the QCEW tends to underestimate both the number of and employment from smaller firms as well as newer firms.

iv Physical locations. Many predominantly wine or spirits wholesalers also carry some beer. Jobs are allocated to beer wholesaling for these facilities based on the overall market share for beer as a percent of total beverage alcohol products handled by wine and spirits wholesalers. This eliminates double counting of jobs across the three product categories; however, most facilities actually handle at least some of all three products.

v US Department of Labor, Bureau of Labor Statistics, *Quarterly Census of Employment and Wages*, at: <https://www.bls.gov/cew/>. The QCEW tends to underestimate both the number of and employment from smaller firms as well as newer firms.

vi These firms would more appropriately be considered as part of the supplier firms’ industries.

vii Often economic impact studies present results with very large multipliers – as high as 4 or 5. These studies invariably include the firms supplying the supplier industries as part of the induced impact. John Dunham & Associates believes that this is not an appropriate definition of the induced impact and as such limits this calculation to only the effect of spending by direct and supplier employees.

viii Federal excise taxes are actually paid by the brewer and included in the price of the product. In this analysis, however, they are included as part of consumption taxes (but redistributed based on the location where the beer was sold).

ix Malt beverage industry sales are calculated at approximately \$120.6 billion including all taxes. This compares with \$158.9 billion in 2016 which was likely overestimated due to the issues with the output-employee statistics form BEA and

IMPLAN. Total sales in 2014 were estimated at \$124.5 billion.

x RIMS II is a product developed by the U.S. Department of Commerce, Bureau of Economic Analysis as a policy and economic decision analysis tool. IMPLAN was originally developed by the US Forest Service, the Federal Emergency Management Agency and the Bureau of Land Management. It was converted to a user-friendly model by IMPLAN in 1993.

xi Generally, most small breweries have a staff of between 2 and 7 people. The estimate used in this analysis is based on Industry Revealed, Institute for Brewing Studies, 1997. While this study is old, the figure appears to be accurate based on the direct examination of the websites of over 6,500 small brewers by JDA staff.

xii A number of different sources were used to calculate the percentage of overall sales due to beverage alcohol purchases. In most cases these sales represent a small part of the overall business. In the case of amusement establishments (bowling alleys, theaters, sporting venues, etc.) as well as on-premise food service establishments, the Economic Census of Accommodations and Food Services and the Economic Census of Arts, Entertainment and Recreation were used to determine the percentage of sales coming from alcohol. In the case of store-based retailers like grocery stores, convenience stores, package stores, etc. the figures come from the US Department of Commerce, Census of Retail Trade. For restaurants, bars and food stores. See: *Table 2.4.5U. Personal Consumption Expenditures by Type of Product*, US Department of Commerce, Bureau of Economic Analysis, Revised August 2018. Data are for 2018.

xiii The same employment counts for retailers were reported in an economic impact model of the beverage alcohol retailing industry produced by John Dunham & Associates for the American Beverage Licensees (2018), a trade association representing retailers of beverage alcohol products. See: <https://www.ablusa.org/americas-beer-wine-spirits-retailers-create-2-03-million-jobs-122-63-billion-in-direct-economic-impact/> Sales banned either on- or off-premise.

xiv The Tax Cuts and Jobs Act of 2017 dramatically changed the Federal excise tax on beer, creating a tiered rate. This analysis is based on a rate of \$3.50 per barrel for the initial 60,000 barrels produced by a single brewer, \$16 per barrel for the next 1,940,00 barrels for domestic brewers producing 2 million barrels per year or fewer.

xv All other brewers and importers are taxed at a rate of \$16 per barrel for the first 6 million barrels and \$18 per barrel thereafter. FET taxes are spread across states based on 2017 state sales and the weighted average FET in each state for

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2017 provided by the Beer Institute since 2018 FET data by state are not yet available. Wholesale and Retail margins are based on the Bureau of Economic Analysis, *Margins After Redefinitions 2007, Detail*, November 20, 2014. On-premise retail margins are calculated by John Dunham & Associates and are set to ensure that

xvii

total sales in each state equal estimated sales volumes.

Had JDA used the 2016 methodology, the output figures would be even smaller.

xviii

This section is paraphrased from IMPLAN Professional: Users Guide, Analysis Guide, Data Guide, Version 2.0, MIG, Inc., June 2000.