

2017 Economic Impact Study of the Dairy Products Industry

Methodology and Documentation

Prepared for

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The Dairy Products Industry Economic Contribution Study: 2017

Summary Results:

The Dairy Products Industry Economic Impact study measures the combined impact of the dairy products industry, as defined by the production of fluid milk products (including cream, sour cream, cottage cheese, yogurt), butter, cheese, dried products, ice cream, and whey, the wholesaling and distribution of dairy products, and the retailing of dairy products, both in food stores, and in restaurants and ice cream scoop shops, on the entire economy of the United States in 2017. The industry contributes about \$628.27 billion in output or just under 1.09% percent of GDP and, through its production and distribution linkages, impacts firms throughout the US economy.¹ The production process (as defined in this study) begins in one of three ways. Agricultural producers who maintain separate operations producing say goat cheese, or bottled milk are included as direct dairy producers. In other cases, larger dairy operations using milk produced by their own farms, contracted from independent farmers or purchased as a commodity, produce and package products in independent facilities. Finally, some facilities produce dairy products (like ice cream) from other dairy products supplied by other dairy manufacturers.

There are about 2,026 firms that use agricultural products to produce dairy products.² All told, these firms employ almost 168,401 people in production operations, sales, packaging, and direct distribution.

Once dairy products have been produced or imported, they enter the wholesaling tier. We estimate that firms involved in the wholesale supply of dairy products throughout the country (not including wholesaling operations directly owned and operated by producers) and general grocery wholesalers employ around 70,233 individuals and are present in every state in the country.

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 a scoop shop), or for off-premises consumption (grocery stores, pharmacies, convenience stores, etc.) For this analysis, the retail tier is assumed to consist of firms in the following industries: Restaurants, amusement parks, ice cream scoop shops (which may or may not manufacture their own ice cream) and retail stores.³ While there are obviously other venues that may sell dairy products to the public – street vendors, cruise lines, non-profit groups, etc. they are not included in the analysis due to limited data availability or the small amount of product that they handle. We estimate that there are approximately 739,093 employees whose jobs depend on the sale of dairy products to the public.

Other firms are related to the three tiers of the dairy products 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 dairy products industry. All told, we estimate that the dairy products industry is responsible for 1,023,481 supplier jobs with these firms generating over \$258.65 billion in economic activity.

An economic analysis of the dairy products 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,⁴ the spending by employees of the industry and those of supplier firms whose jobs are directly dependent on

¹ Based on Gross Domestic Product of \$19.03 trillion from the 1st Quarter of 2017. Available from the Bureau of Economic Analysis at: <http://bea.gov/national/xls/gdplev.xls>.

² Throughout this study, the term “firms” actually refers to physical locations. One dairy, for example, may have facilities in 5 or 6 locations throughout the country. Each of these facilities is included in the 2,026 count.

³ Note that restaurant jobs are calculated based on the percent of inputs that are dairy products. In this case about 3.7 percent of the cost of inputs to restaurants comes from dairy based products.

⁴ These firms would more appropriately be considered as part of the supplier firms’ industries.

dairy products sales and production should surely be included. This spending on everything from housing, to food, to educational services and medical care makes up what is traditionally called the “induced impact” or the multiplier effect of the industry. In other words, this spending, and the jobs it creates is induced by the production, distribution and sale of dairy products. We estimate that the induced impact of the industry is about \$162.73 billion, and generates 962,702 jobs, for a multiplier of about 0.79.⁵

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 dairy products industry, this contribution comes in two forms. First, the traditional direct taxes paid by the firms and their employees provide over \$64.39 billion in revenues to the federal, state and local governments. This does not include sales taxes paid by consumers who purchase dairy products.

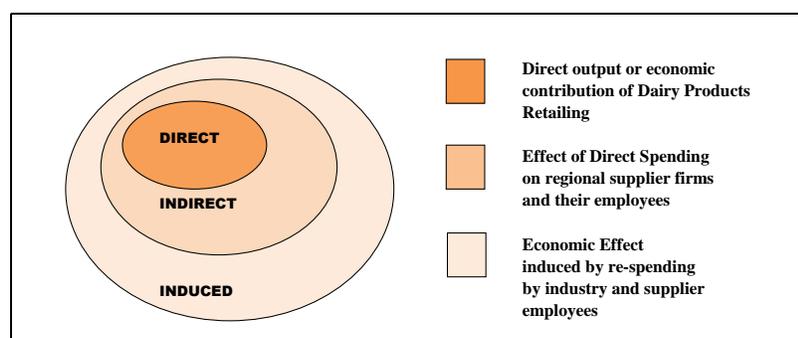
Table 1 below presents a summary of the total economic impact of the industry in the United States in 2017.

Table 1: Economic Impact of the Dairy Products Industry: 2017

(\$ In Billions)	Direct	Supplier	Induced
Output	\$206.889	\$258.648	\$162.733
Jobs	977,727	1,023,481	962,702
Wages	\$39.464	\$70.988	\$50.739
Business Taxes			\$64.4B

Methodology

The Economic Impact of the Dairy Products Industry starts with an accounting of the direct employment in the various sectors. Dairy product manufacturing encompasses companies that produce fluid milk products (including cream, sour cream, cottage cheese, yogurt), butter, cheese, dried products, ice cream, and whey. Wholesaling includes both dairy products wholesalers and related warehouse and transportation operations as well as a percentage of general food wholesaling operations related to dairy. Retailing includes locations where dairy products are consumed “on-premise,” such as restaurants, ice-cream scoop shops (which may or may not manufacture their own ice cream) and amusement parks. “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 product are the sum total of the impact on the local economy. However, this initial spending one economic activity always leads to a

ripple effect that benefits other sectors and industries. This inter-industry effect of an economic activity can be assessed using multipliers from regional input-output modeling.

The economic activities of events are linked to other industries in the state and national economies. The activities required to produce a block of cheese or a tub of yogurt, from packaging to shipping, generate

⁵ 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 and 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.

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. Additional induced impacts occur when workers involved in direct and indirect activities spend their wages in the region. The ratio between total economic and direct impacts is termed the multiplier. The framework in the chart on the prior page 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 IDFA model, only the most conservative estimate of the induced impact has been used.

Model Description and Data

This Dairy Products Industry Economic Impact Model (Model) was developed by John Dunham and Associates based on data provided Infogroup,⁶ the International Dairy Foods Association, and state and federal governments. The analysis utilizes the IMPLAN Model in order to quantify the economic impact of the dairy products industry on the economy of the United States. The model adopts an accounting framework through which the relationships between 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 US Department of Commerce, Bureau of Economic Analysis (BEA).⁷

- ❖ Producer employment is based on employment at specific locations reported to Infogroup by the companies as of April 2017. The data are modified to reflect job numbers for certain facilities provided by the IDFA.
- ❖ Wholesale employment is employment at specific locations identified solely as dairy product wholesalers reported to Infogroup as of April 2017. In addition, data for general grocery and food wholesalers are included based on zip code level data provided by Infogroup and adjusted to reflect the percentage of sales from dairy products using data from the 2012 Economic Census.⁸
- ❖ These data are adjusted to reflect company employment by location provided by IDFA.
- ❖ Data on the retail sectors are all based on sales of dairy products in each of the 50 states and the District of Columbia. These amounts are multiplied by either the dairy products 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 a calculation based on dairy products sales as a percentage of total retail sales.⁹ These results were cross-checked against a wide variety of

⁶ Job numbers are from Infogroup 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. Infogroup verifies its data at the rate of almost 100,000 phone calls per day to ensure absolute accuracy.

⁷ The IMPLAN model is based on a series of national input-output accounts known as RIMS II. These data are developed and maintained by the U.S. Department of Commerce, Bureau of Economic Analysis as a policy and economic decision analysis tool.

⁸ *2012 Economic Census, Wholesale Trade: Subject Series – Product Lines Statistics by Industry for the U.S. and States: 2012*, March 15, 2016, US Department of Commerce, Bureau of the Census, at: https://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=ECN_2012_US_42SLLS1&prodType=table

⁹ *2012 Economic Census, Retail Trade: Subject Series – Product Lines Statistics by Industry for the U.S. and States: 2012*, January 26, 2016, US Department of Commerce, Bureau of the Census, at:

establishment data by state and were found to present a reasonable estimate of the employment in each sector generated solely by dairy products sales.

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: production, wholesaling and retailing. 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 the Minnesota IMPLAN Group in 1993. The IMPLAN data and model closely follow the conventions used in the “Input-Output Study of the US Economy,” which was developed by the BEA.

- ❖ **Wages:** Data from the US Department of Labor’s ES-202 reports are used 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 are 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. They include all income paid to workers by employees. Further details are available from IMPLAN at <http://www.implan.com>.
- ❖ **Output:** 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.
- ❖ **Taxes:** The model includes information on income received by the Federal, State and Local Governments. The model produces estimates for the following taxes at the Federal Level: Corporate Income, Payroll, Personal Income, Estate, Gift, and Excise Taxes; Customs Duties; and Fines, Fees, etc. State and Local tax revenues include estimates of: Corporate Profits, Property, Sales, Severance, Estate, Gift and Personal Income Taxes; Licenses; Fees; and certain Payroll Taxes.

The 2017 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.

IMPLAN Methodology:¹⁰

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. The Minnesota IMPLAN group gathers this data, converts them 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.

https://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=ECN_2012_US_44SLLS1&prodType=table

¹⁰ This section is paraphrased from IMPLAN Professional: Users Guide, Analysis Guide, Data Guide, Version 2.0, MIG, Inc., June 2000.

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. IMPLAN overcomes these disclosure problems by combining a large number of datasets 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 US 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 cheese is from the purchase of electricity, then the electricity 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 224 sector BLS model is mapped to the 536 sectors of the IMPLAN model. Where data are 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. Regional trade flows are estimated based on the Multi-Regional Input-Output Accounts, a cross-sectional database with consistent cross interstate trade flows developed in 1977. These data are updated and bridged to the 536 sector IMPLAN model.

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 datasets and matrices are not released before extensive testing takes place.