The Vapor Industry
Economic Impact Study

Methodology and Documentation
Prepared for:

By

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Executive Summary:

The 2021 Vapor Industry Economic Impact Study estimates the economic contributions made by the nicotine vapor industry (which includes E-liquids, coils, box mods and other nicotine vapor products) to the U.S. economy in 2021. John Dunham & Associates conducted this research, which was funded by the Vapor Technology Association. This work used standard econometric models first developed by the U.S. Forest Service, and now maintained by IMPLAN Inc. Data came from industry sources, government publications and Data-Axle.[1]

The study measures the number of jobs in the nicotine vapor industry; the wages paid to employees, the value added and total output. In addition, it measures the economic impact of the suppliers that support the vapor industry, as well as those industries supported by the induced spending of direct and supplier industries.

Industries are linked to each other when one industry buys from another to produce its own products. Each industry in turn makes purchases from a different mix of other industries, and so on. Employees in all industries extend the economic impact when they spend their earnings. Thus, economic activity started by the nicotine vapor industry generates output (and jobs) in hundreds of other industries, often in states far removed from the original economic activity. The impact of supplier firms, and the "Induced Impact" of the re-spending by employees of industry and supplier firms, is calculated using an input/output model of the United States. The study calculates the impact on a national basis, by state, by Congressional district, and by state legislative districts.

The study also estimates taxes paid by the industry and its employees. Federal taxes include industry-specific excise and sales taxes, business and personal income taxes, FICA, and unemployment insurance. State and local tax systems vary widely. Direct retail taxes include state and local sales taxes, license fees, and applicable gross receipt taxes. Retailers pay real estate and personal property taxes, business income taxes, and other business levies that vary in each state and municipality. All entities engaged in business activity generated by the industry pay similar taxes.

The nicotine vapor industry is a dynamic part of the U.S. economy, accounting for about $22.09 billion in output or about 0.10 percent of GDP. It employs approximately 133,573 Americans who earned wages and benefits of about $7.00 billion.

Members of the industry and their employees paid $2.83 billion in federal, state and local taxes. This does not include state and local sales taxes or excise taxes that may apply for specific retail purchases which are estimated to total $1.88 billion.

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[1] Data-Axle is the leading provider of business and consumer data for the top search engines and leading in-car navigation systems in North America. Data-Axle gathers data from a variety of sources, by sourcing, refining, matching, appending, filtering, and delivering the best quality data. Data-Axle verifies its data at the rate of almost 100,000 phone calls per day to ensure absolute accuracy.

Summary Results

The nicotine vapor industry (as defined in this study) includes manufacturers of E-liquids, coils, box mods and other nicotine vapor products, wholesalers, and retailers that sell vapor products such as; vape stores, tobacco shops, convenience stores, supermarkets, gasoline stations, pharmacies and drug stores, warehouse clubs and supercenters. The vapor industry reaches into all corners of the United States, employing 66,364 and generating $2.74 billion in wages. Vapor businesses directly generate $8.09 billion in economic activity nationally.

Table 1 – Economic Contribution of the Nicotine Vapor Industry

	Direct	Indirect	Induced	Total
Jobs	66,364	28,098	39,111	133,573
Wages	$2,741,178,400	$2,018,273,300	$2,243,794,900	$7,003,246,600
Economic Impact	$8,087,436,700	$6,879,165,500	$7,124,240,600	$22,090,842,800
State and Local Taxes				$3,234,123,300
Federal Taxes				$1,480,211,500

Other firms are related to the vapor industry as suppliers. These firms produce and sell a broad range of items including e-liquid, coils, batteries, and all of the merchandise needed to maintain vapor businesses. In addition, supplier firms provide a broad range of services, including personnel services, financial services, advertising services, consulting services or transportation services. Finally, a number of people are employed in government enterprises responsible for the regulation of the industry. All told, we estimate that the industry is responsible for 28,098 supplier jobs. These firms generate about $6.88 billion in economic activity.[2]

An economic analysis of the vapor industry will also take additional linkages into account. While it is inappropriate to claim that suppliers to the industry's indirect firms are part of the industry being analyzed,[3] the spending by employees of the industry, and that of indirect firms whose jobs are directly dependent on the vapor industry, should be included. This spending - on everything from housing, to food, to education and medical care - makes up what is traditionally called the "induced impact," or multiplier effect, of the vapor industry. For 2021, the induced impact of the industry generates 39,111 jobs and $7.12 billion in economic impact, for a multiplier of 0.88.[4]

Table 1 presents a summary of the total economic impact of the nicotine vapor industry in the United States. Summary tables for the United States, individual states, Congressional districts, and state legislative districts are included in the output model, which is discussed in the following section.

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[2] Throughout this study, the term "firms" refers to physical locations. One manufacturer, for example, may have facilities in 5 or 6 locations throughout the country.

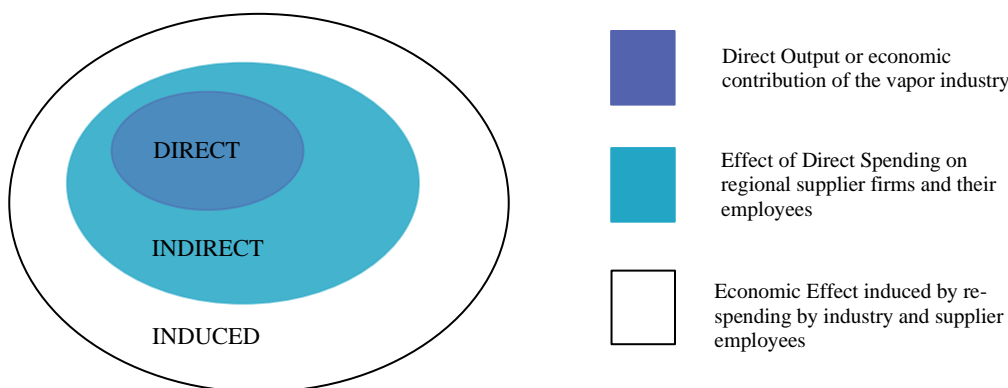[3] These firms would more appropriately be considered as part of the indirect firm's industries.

[4] Often economic impact studies present results with very large multipliers – as high as 4 or 5. These studies invariably include the firms supplying the induced 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 only to the effect of spending by direct and indirect employees.

Table 2 – Fiscal Contribution of the Nicotine Vapor Industry

Tax Type	Federal	State/Local	Total
Individual Income	$536,380,600	$139,348,000	$675,728,600
Social Security/Social Insurance	$724,359,100	$11,879,300	$736,238,400
Property		$499,667,200	$499,667,200
Business/Employee Paid Sales Taxes		$544,313,900	$544,313,900
Corporate Income	$70,087,700	$30,681,800	$100,769,500
Other Personal and Business Taxes	$149,384,100	$125,900,000	$275,284,100
Federal Excise Taxes	$0		$0
State Excise Taxes		$905,923,800	$905,923,800
State Sales Taxes		$681,311,700	$681,311,700
Other State and Local Taxes		$295,097,600	$295,097,600
Total	**$1,480,211,500**	**$3,234,123,300**	**$4,714,334,800**

Another important part of an impact analysis is the calculation of the contribution of the industry to the public finances of the country. In the case of the vapor industry, the taxes paid by firms and their employees provide $1.48 billion to the federal government and $3.23 billion to state and local governments including income taxes, property taxes, profits taxes, etc. These figures also include state and local sales and excise taxes that are paid by consumers when they purchase vapor products. These sales based taxes total $1.88 billion. (See Table 2)

Economic Impact Modeling – Summary

■ (dark blue)	Direct Output or economic contribution of the vapor industry
■ (teal)	Effect of Direct Spending on regional supplier firms and their employees
□ (white)	Economic Effect induced by re-spending by industry and supplier employees

The Economic Impact Study begins with an accounting of the direct employment in the vapor industry. The data comes 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, a single economic activity leads to a ripple effect wherein 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.

The economic activities of events are linked to other industries in the state and national economies. Activities related to nicotine vapor represent the direct effects on the economy. Indirect impacts occur when these activities require purchases of goods and services such as

advertising services or merchandising material from local or regional indirect firms. Additional induced impacts occur when workers involved in direct and indirect activities spend their wages. The ratio between induced output and direct output is termed the multiplier.

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 indirect sector and of the re-spending in the economy by employees in the industry and its indirect firms. This induced impact is the most controversial part of economic impact studies and is often quite inflated. In the case of the nicotine vapor model, only the most conservative estimate of the induced impact has been used.

Model Description and Data

This economic impact analysis was developed by JDA based on data provided by the Vapor Technology Association., Data-Axle, the Food and Drug Administration, and Centers for Disease Control and Prevention (CDC), and Federal and state governments. The analysis utilizes the IMPLAN model in order to quantify the economic impact of the vapor industry on the economy of the United States, as well as individual states, Congressional districts, and state legislative districts.[5] 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).[6]

Every economic impact analysis begins with a description of the industry being examined. In the case of the vapor industry it is defined as the three components of the United States' nicotine vapor industry. These are further broken out by business type.

This will incorporate firms in the following economic sectors:

❖ Manufacturers: E-Liquid, coils, and component manufacturers (which includes box mods, batteries, and other vapor products).

❖ Wholesalers: Includes firms involved in the distribution and storage of vapor products.

❖ Retailers: Includes firms involved in the sale of vapor products. This sector includes retail establishments (e.g. tobacco stores, convenience stores, gas stations, vape stores, etc.)

❖ Data on vape shops that make their own liquid has been split to reflect a portion of the employees as manufacturers and a portion as retailers.

Based on the analysis, there are 10,257 firms directly involved in the vapor industry, not including wholesalers and retailers where nicotine vapor products are but a small segment of their business. Of these, 8,328 are local retailing firms, while 1,779 manufacture vapor liquids or components. (Table 3)

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[5]   The model uses 2018 input/output accounts.
[6]   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.

Table 3 – Firms by Type

	Number of Firms	% of Total Firms
Vape Shop	8,328	81.19%
Blending Vape Shop	1,519	14.81%
E-liquid Manufacturer	208	2.03%
Wholesaler	140	1.36%
Component manufacturer	45	0.44%
Coil Manufacturer	7	0.07%
Online Retail	10	0.10%
Total	**10,257**	**100.00%**

The IMPLAN model is designed to run based on the input of specific direct economic factors. It uses a detailed methodology (see IMPLAN Methodology section) to generate estimates of the other direct impacts, tax impacts and indirect and induced impacts based on these entries. In the case of the vapor model, direct employment in the vapor industry is a starting point for the analysis. Direct employment is based on data provided to John Dunham & Associates by Data-Axle, the Vapor Technology Association and the Centers for Disease Control and Prevention as of May of 2021. Data-Axle data are recognized nationally as a premier source of micro industry data. Data-Axle is the leading provider of business and consumer data for the top search engines and leading in-car navigation systems in North America. Data-Axle gathers data from a variety of sources, by sourcing, refining, matching, appending, filtering, and delivering the best quality data. Data-Axle verifies its data at the rate of almost 100,000 phone calls per day to ensure absolute accuracy.

Additionally, employment in non-vape-store retail (such as those jobs supported by the sale of nicotine vapor products at convenience stores, grocery stores, and so on) and non-vapor-specific wholesalers (such as jobs supported by vapor distribution at grocery distributors or other general wholesalers) is modeled using data from the *Economic Census of Retail Trade* and the *Economic Census of Wholesale Trade*.[7] The percentage of sales attributable to these products is applied to the employment in the NAICS sector to approximate jobs supported by nicotine vapor sales. For example, if 5 percent of convenience store sales are attributed to vapor sales, then 5 percent of convenience store jobs would be assumed to be vapor dependent. In some cases, vapor sales are not explicitly specified in The Economic Census, so tobacco sales are used as a proxy and a further break, based off wholesale sales data, is applied to obtain the vapor estimate. Table 4 on the following page summarizes the direct industry employment estimates.

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[7] U.S. Census Bureau, 2017 Economic Census, *All Sectors: Industry by Products for the U.S. and States: 2017*, data accessed January 2021. Available online at
https://data.census.gov/cedsci/table?q=ECNNAPCSIND2017.EC1700NAPCSINDPRD&n=42&tid=ECNNAPCSIND2017.EC1700NAPCSINDPRD&hidePreview=true

Table 4 – Direct Jobs by Industry Sector

Product Category	Direct Jobs	% of Total Jobs
Retail Vapor	53,212	80.18%
E-liquid Manufacturer	3,117	4.70%
Wholesaler	6,937	10.45%
Component Manufacturer	2,904	4.38%
Coil Manufacturer	194	0.29%
Total:	66,364	100.00%

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. 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 workers, 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. It includes all income paid to workers by employers.

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.

While IMPLAN is used to calculate the state level impacts, Data-Axle data provide the basis for legislative district level estimates. Publicly available data at the county and Legislative district level is limited by disclosure restrictions, especially for smaller sectors of the economy. Our model therefore uses actual physical location data provided by Data-Axle in order to allocate jobs – and the resulting economic activity – by physical address or when that is not available, zip code. For zips entirely contained in a single congressional district, jobs are allocated based on the percentage of total sector jobs in each zip. For zips that are broken by congressional districts, allocations are based on the percentage of total jobs physically located in each segment of the zip. 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.

Data and Modeling Considerations When Comparing 2020 with Earlier Studies

In 2018, the Vapor Technology Association contracted John Dunham & Associates for the first version of the Vapor Industry Economic Impact Study. In the years since, there have been several regulations which have severely limited the scope of products available. As such, there is

a large swing in some of the economic measures – particularly in the vapor store retail space. In addition to legislative and regulatory effects, modeling is dependent on the datasets used, which are often lagged. In such a young, innovative, often volatile industry this means that by the time data is published, it reflects a picture of the market that is no longer accurate or representative. Comparisons with previous versions of the model should be viewed with these circumstances and limitations in mind. Table 5 below highlights some of the differences in model results between the two years.

Table 5 – Top Line Comparison, 2018 and 2021 Models

	Jobs		Wages		Output	
	2018	2021	2018	2021	2018	2021
Component Manufacturing	3,077	3,098	$ 185,356,300	$ 192,071,400	$ 546,823,800	$ 560,328,600
E-Liquid Manufacturing	4,590	3,117	$ 540,099,500	$ 383,590,000	$ 2,958,339,100	$ 2,026,926,000
Wholesale	9,564	6,937	$ 813,597,600	$ 581,955,100	$ 2,346,359,600	$ 2,259,707,200
Vape Store Retail	56,458	34,957	$ 1,292,602,700	$ 945,782,500	$ 2,334,389,000	$ 1,818,720,200
All Other Retail	13,892	18,255	$ 445,564,300	$ 637,779,400	$ 965,300,200	$ 1,421,754,700
Total Direct	87,581	66,364	$ 3,277,220,400	$ 2,741,178,400	$ 9,151,211,700	$ 8,087,436,700
Total Supplier	29,427	28,098	$ 2,092,844,100	$ 2,018,273,300	$ 7,272,386,500	$ 6,879,165,500
Total Induced	48,999	39,111	$ 2,527,825,000	$ 2,243,794,900	$ 8,033,914,100	$ 7,124,240,600
Total	166,007	133,573	$ 7,897,889,500	$ 7,003,246,600	$ 24,457,512,300	$ 22,090,842,800

IMPLAN Methodology[8]

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 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 are available at the county level, but 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

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

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.

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, the Regional Purchase Coefficients (RPCs) – essential to the IMPLAN model – 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 until extensive testing takes place.