

The Potential Economic Impacts of a Significant Shift in U.S. Biopharmaceutical Industry Revenues

Policy Brief

Prepared by TEconomy Partners, LLC
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Introduction

At a time when the economic competitiveness at the national and state level is recognized to be strongly rooted in the capacity to advance innovation-based industries, the U.S. biopharmaceutical industry stands out as a leading research and development (R&D) and advanced manufacturing industry. Over the past 30 years, the U.S. has solidified its place as the preeminent location for biopharmaceutical innovation. Today, that global leadership is built upon a robust foundation of innovation-led U.S. companies that perform and support advanced R&D and sustain a diverse and large-scale supply chain for the development, production, and distribution of life-saving and quality-of-life-improving therapeutics to patients.

The U.S. biopharmaceutical industry and its closely-integrated supply chain represents a significant geographic footprint across the nation, is one of the nation's top performing industry innovation drivers, and contributes significant economic impacts. The U.S. biopharmaceutical industry contributes substantially to national, state, and local economies by employing more than 811,000 individuals. The industry further supports approximately 3.2 million additional U.S. jobs through its varied supply base and from the additional economic impacts stemming from industry and worker spending. Altogether, the U.S. biopharmaceutical industry directly and indirectly supports more than 4.0 million U.S. jobs, resulting in an industry employment multiplier of 4.98.¹

In addition to the significant job generator that the U.S. biopharmaceutical industry represents, the industry sector also contributes \$560 billion in direct output annually, and with the ripple effect of this production throughout the U.S. economy, an additional \$589 billion in output was generated by suppliers and other sectors of the economy. Combined, the total economic impact of the U.S. biopharmaceutical industry was more than \$1.1 trillion. These economic impacts are underpinned by the significant level of research and development (R&D) undertaken by biopharmaceutical enterprises. In 2017, biopharmaceutical companies invested more than \$90 billion in U.S.-based R&D—more than any other industry in America.²

Economic Impact Primer

Input/output (I/O) analysis models the financial flows that originate from direct biopharmaceutical sector expenditures in the economy and the ongoing ripple (multiplier) effect of these expenditures. I/O analysis represents the generally accepted standard for measurement of economic impacts.

Impacts consist of three types of effects: **direct effect** (the specific effect of biopharmaceutical industry expenditures in the first round of spending), **indirect effect** (the effects of expenditures by suppliers to the biopharmaceutical industry), and **induced effect** (the additional economic effects of the spending of biopharmaceutical industry employees and suppliers' employees in the overall economy that can be attributed to the direct industry expenditures). The three types—direct, indirect, and induced—taken together, are considered the **total impacts**. The ratio of the direct effect to total impacts is referred to as the **impact multiplier**.

¹ These results are detailed in the primary report of this analysis effort prepared by TEconomy Partners, LLC for the Pharmaceutical Research and Manufacturers of America (PhRMA), *The Economic Impact of the U.S. Biopharmaceutical Industry 2017: National and State Estimates*, forthcoming.

² Research!America, U.S. Investments in Medical and Health Research and Development, 2013-2017, Arlington, VA. https://www.researchamerica.org/sites/default/files/Policy_Advocacy/2013-2017InvestmentReportFall2018.pdf

Estimating Economic Impact Shifts Due to Policy Changes or Other Significant Economic Events

The biopharmaceutical industry's significant and broad-based economic contributions to the U.S. economy are subject to increases and decreases resulting from shifts in the demand for biopharmaceutical goods that ultimately generate changes in revenue derived from overall biopharmaceutical sales (output). These potential revenue changes can come from a variety of sources including: public policy changes affecting coverage and payment; competition in the marketplace; significant revenue declines due to the loss of intellectual property and regulatory protections; changes in the ability of U.S. suppliers to meet the needs of the industry; shifts in the costs of compliance with ever evolving state and federal regulations; and a host of market forces and other public policies impacting the costs of doing business at the state and federal levels.

It is well known that shifts in any of the areas can have a substantial impact not just on an individual company's financial stability but on the industry as a whole. To better assess how potential changes in the economic conditions in which the U.S. biopharmaceutical industry operates may effect the size, strength, and vitality of the industry,³ the Pharmaceutical Research and Manufacturers of America contracted with TEconomy Partners, LLC (TEconomy) to estimate potential economic impacts of a large-scale shift in revenue. TEconomy performed a set of impact analyses for a hypothetical \$20 billion "discrete economic event" on the nation's biopharmaceutical industry output.

Impact results, as estimated by the analytical model, are annual, linear, and absolute values. This paper focuses on the impact of a major policy, regulatory, or other change in the environment that could have a substantial positive impact on industry in the amount of a \$20 billion increase or shift in revenues. A negative \$20 billion U.S. economic event on the biopharmaceutical industry would elicit the same "absolute value" impacts in the form of employment, output, and fiscal impact reductions.

As shown in Table 1, a potential \$20 billion shift in U.S. biopharmaceutical industry revenues would generate a direct employment effect (either positive or negative) of nearly 29,000 jobs in the biopharmaceutical sector, leading to an overall U.S. employment impact of more than 144,000 jobs. Overall U.S. output could be increased (or decreased) by nearly \$41 billion as a result.

Definition of Impact Variables

Employment: The number of individuals whose employment is due, totally (direct employment) or in part (indirect or induced employment) to the economic effects of the industry.

Labor (Personal) Income: Salaries, wages, and the full cost of benefits including non-cash payments received by individuals in the economy. Includes employee compensation and sole proprietor income.

Value-Added: The difference between an industry's total output and the cost of its intermediate inputs; sometimes referred to as the industry's "Contribution to GDP".

Output: The dollar value of production (i.e., sales).

Personal Tax Revenue: The dollar value of taxes generated due to the creation of personal income; includes company paid portion of social security taxes.

³ Both the primary analysis and this supplemental discrete economic event analysis made use of 2017 IMPLAN input/output models for the U.S., individuals states, the District of Columbia, and Puerto Rico.

Table 1. Discrete Economic Event - \$20 Billion Direct Biopharmaceutical Industry Effect: Economic Impacts, 2017

Impact Type	Employment	\$ in Millions				
		Labor Income	Value Added	Output	State/Local Personal Tax Revenue	Federal Personal Tax Revenue
Direct Effect	28,922	\$3,661.1	\$10,487.5	\$20,000.0	\$106.8	\$707.8
Indirect Effect	50,697	\$3,963.0	\$5,963.9	\$10,541.8	\$105.1	\$738.1
Induced Effect	64,390	\$3,350.7	\$5,892.7	\$10,443.8	\$89.9	\$626.3
Total Impacts	144,010	\$10,974.8	\$22,344.1	\$40,985.7	\$301.8	\$2,072.2
Multiplier	4.98	3.00	2.13	2.05		

Source: TEconomy analysis; IMPLAN U.S. 2017 Model

These results further illustrate the high returns to the overall U.S. economy from the U.S. biopharmaceutical industry resulting from the industry’s strong overall multiplier effects.

Due to the biopharmaceutical industry’s importance as an economic engine in many state economies, the impact of a \$20 billion increase in revenues would be expected to generate significant impacts across the country. Table 2 provides a summary of the state-level direct effects and total impacts, stemming from the \$20 billion effect. While impacts would be distributed across all 50 states, Puerto Rico, and the District of Columbia, the impact in several states with a large concentration of biopharmaceutical industry employment would be pronounced. For example, California, due to its significant biopharmaceutical industry, would generate nearly \$3.8 billion of the total \$20 billion in “direct” output through an industry-wide shift in revenues.

Table 2. Economic Impact of a \$20 Billion (Positive) Shift in Biopharmaceutical Industry Revenue, 2017

States	Output Impact (\$M)		Employment Impact		State/Local Personal Income Tax Impact (\$M)		Federal Personal Income Tax Impact (\$M)	
	Direct	Total	Direct	Total	Direct	Total	Direct	Total
Totals, U.S. & PR Totals	\$20,000.0	\$40,985.7	28,922	144,010	\$106.8	\$301.8	\$707.8	\$2,072.2
Alabama	\$81.9	\$144.0	125	513	\$0.2	\$0.6	\$2.0	\$5.4
Alaska	\$1.4	\$2.7	6	13	\$0.0	\$0.0	\$0.1	\$0.1
Arizona	\$126.3	\$325.9	300	1,481	\$0.4	\$1.4	\$4.7	\$16.8
Arkansas	\$17.7	\$36.3	29	136	\$0.0	\$0.2	\$0.4	\$1.5
California	\$3,798.0	\$8,215.4	4,979	27,090	\$31.5	\$91.2	\$149.4	\$446.5
Colorado	\$155.9	\$400.0	307	1,631	\$0.9	\$2.9	\$6.1	\$22.3
Connecticut	\$152.5	\$321.3	320	1,263	\$2.1	\$3.8	\$13.2	\$24.9
Delaware	\$62.2	\$136.3	177	612	\$0.6	\$1.1	\$4.5	\$8.7
District of	\$9.0	\$15.6	23	53	\$0.1	\$0.1	\$0.5	\$1.0
Florida	\$413.9	\$1,034.9	918	4,667	\$0.6	\$1.9	\$15.3	\$54.4
Georgia	\$200.5	\$475.9	414	2,032	\$1.1	\$3.4	\$7.4	\$23.5
Hawaii	\$7.1	\$17.2	32	92	\$0.1	\$0.1	\$0.4	\$0.9
Idaho	\$16.2	\$32.4	33	138	\$0.1	\$0.2	\$0.6	\$1.5
Illinois	\$1,224.9	\$2,602.6	1,453	8,798	\$5.4	\$15.6	\$45.7	\$136.1
Indiana	\$1,297.2	\$1,983.2	879	4,990	\$3.4	\$8.4	\$27.3	\$67.7
Iowa	\$116.5	\$210.1	199	778	\$0.6	\$1.4	\$3.6	\$8.8

States	Output Impact (\$M)		Employment Impact		State/Local Personal Income Tax Impact (\$M)		Federal Personal Income Tax Impact (\$M)	
	Direct	Total	Direct	Total	Direct	Total	Direct	Total
Kansas	\$113.8	\$246.6	207	984	\$0.3	\$1.1	\$3.3	\$11.1
Kentucky	\$79.3	\$156.5	188	685	\$0.5	\$1.2	\$2.8	\$7.1
Louisiana	\$38.0	\$75.2	98	332	\$0.1	\$0.3	\$1.2	\$3.1
Maine	\$79.7	\$184.0	162	825	\$0.4	\$1.2	\$3.3	\$9.2
Maryland	\$576.5	\$1,205.5	1,089	4,628	\$5.8	\$13.9	\$28.5	\$69.0
Massachusetts	\$1,055.9	\$2,527.8	2,166	10,139	\$9.2	\$24.1	\$63.8	\$171.8
Michigan	\$378.2	\$812.3	570	3,084	\$1.5	\$4.8	\$12.1	\$39.8
Minnesota	\$136.5	\$349.0	271	1,430	\$1.0	\$3.4	\$5.8	\$20.2
Mississippi	\$45.0	\$80.7	64	285	\$0.1	\$0.3	\$0.8	\$2.6
Missouri	\$252.0	\$575.5	437	2,355	\$1.1	\$3.5	\$8.2	\$27.7
Montana	\$10.2	\$20.5	30	100	\$0.1	\$0.1	\$0.4	\$1.0
Nebraska	\$76.0	\$148.0	111	522	\$0.2	\$0.7	\$1.9	\$6.0
Nevada	\$37.2	\$85.4	76	352	\$0.0	\$0.1	\$1.2	\$4.5
New	\$42.1	\$96.6	86	400	\$0.0	\$0.1	\$1.9	\$5.6
New Jersey	\$1,329.5	\$2,975.0	2,165	10,884	\$10.2	\$24.8	\$77.8	\$198.8
New Mexico	\$45.0	\$93.2	127	445	\$0.2	\$0.4	\$2.3	\$4.7
New York	\$1,099.8	\$2,392.7	1,967	8,230	\$9.0	\$28.7	\$39.9	\$132.2
North Carolina	\$1,397.0	\$2,655.0	1,603	8,951	\$5.4	\$16.3	\$35.5	\$112.4
North Dakota	\$4.2	\$7.4	10	29	\$0.0	\$0.0	\$0.1	\$0.3
Ohio	\$373.7	\$786.7	745	3,238	\$2.0	\$5.5	\$12.6	\$35.9
Oklahoma	\$44.1	\$91.2	99	388	\$0.2	\$0.5	\$1.4	\$3.8
Oregon	\$59.7	\$137.4	149	617	\$0.5	\$1.6	\$2.5	\$7.6
Pennsylvania	\$1,076.9	\$2,399.9	1,670	9,052	\$5.5	\$17.2	\$41.1	\$130.9
Puerto Rico	\$1,728.8	\$2,055.3	638	2,781	\$0.1	\$0.4	\$5.4	\$15.2
Rhode Island	\$56.8	\$130.3	69	473	\$0.3	\$0.9	\$1.9	\$7.0
South Carolina	\$131.6	\$243.2	183	880	\$0.4	\$1.1	\$2.9	\$9.3
South Dakota	\$2.8	\$6.4	11	35	\$0.0	\$0.0	\$0.2	\$0.4
Tennessee	\$167.8	\$372.7	433	1,656	\$0.2	\$0.5	\$6.9	\$19.3
Texas	\$897.4	\$1,918.1	1,356	6,997	\$1.2	\$3.7	\$25.2	\$85.2
Utah	\$250.8	\$617.4	440	2,611	\$1.0	\$4.0	\$6.6	\$27.1
Vermont	\$20.4	\$40.3	41	167	\$0.1	\$0.2	\$0.7	\$1.9
Virginia	\$155.2	\$353.0	346	1,448	\$0.9	\$2.6	\$6.7	\$19.7
Washington	\$197.7	\$481.1	549	2,033	\$0.7	\$1.7	\$11.7	\$30.9
West Virginia	\$165.5	\$268.5	167	810	\$0.5	\$1.3	\$3.2	\$8.9
Wisconsin	\$184.6	\$429.2	390	1,837	\$1.0	\$3.0	\$6.7	\$21.8
Wyoming	\$9.2	\$14.1	11	39	\$0.0	\$0.0	\$0.2	\$0.4

Source: TEconomy analysis; IMPLAN State-Specific 2017 Models

Comparing Shifts in Biopharmaceutical Industry Impacts to a Consumer Spending Benchmark

To gauge the sensitivity of the overall U.S. economy to a \$20 billion shift in revenues for the biopharmaceutical industry, TEconomy compared the potential effects against a similar amount of general consumer spending on the overall U.S. economy.

To accomplish this, TEconomy modeled a hypothetical \$20 billion direct consumer spending “stimulus”—the effect of consumers directly spending an additional \$20 billion within the U.S. economy (spread among income groups based upon 2017 U.S. Census estimates).⁴ Similar to the biopharmaceutical “event”, this economic effect can also be interpreted as “absolute values”. While the calculations show results of a positive \$20 billion economic shift, a negative \$20 billion economic shift will have the same numerical results, though in the negative direction.

The comparative results are illustrated in Table 3. The findings indicate that the total impact of a \$20 billion shift in consumer spending would result in \$32 billion in total economic impact in comparison to the \$41 billion impact of the biopharmaceutical industry from the same economic disruption.

Table 3. Comparative Effect on U.S. Economy of a \$20 Billion Change in U.S. Biopharmaceutical Industry Revenues versus a \$20 Billion Change in Overall Consumer Spending, 2017

\$20 Billion Economic Shift Comparative Total Impacts	
<p>Biopharmaceutical Industry Impacts</p> <p><i>Total Economic Impact Changes</i></p> <ul style="list-style-type: none"> ➤ \$41.0 Billion in Output ➤ \$11.0 Billion in Personal Income 	<p>Consumer Spending Impacts</p> <p><i>Total Economic Impact Changes</i></p> <ul style="list-style-type: none"> ➤ \$31.8 Billion in Output ➤ \$10.2 Billion in Personal Income

Source: TEconomy Partners analysis; IMPLAN U.S. 2017 Model

Due to the high value-added nature of the biopharmaceutical industry, its extensive supply chain relationships, and its higher wage jobs, the U.S. biopharmaceutical industry has a significant multiplier effect—generating higher impacts to the U.S. economy than would a similar amount of general consumer spending.

Example Impact from a Policy Change Affecting Biopharmaceutical Industry Revenues

Congress is currently considering a range of policy proposals to address the price and cost of prescription medicines, including some that could have a significant and sustained impact on

⁴ Source: U.S. Census Bureau, Current Population Survey, 2018 Annual Social and Economic Supplement. Table HINC-06. Income Distribution to \$250,000 or More for Households: 2017.

Note: The hypothetical consumer “effects” are modeled as change in direct consumer spending of \$20 billion as opposed to simply a personal income change of \$20 billion. Modeling the effect as an personal income change would result in significantly lower overall economic impacts simply from the resulting local, state, and federal income tax reductions to the \$20 billion as personal income.

biopharmaceutical industry revenues. For example, H.R. 3 – *the Lower Drug Costs Now Act of 2019*⁵ – proposed in September, 2019 has been projected to reduce biopharmaceutical industry revenues by \$1 trillion over a ten-year period,⁶ with industry warning the impact could be as large as \$2 trillion.⁷

The results of the 2017 event-based analysis just described can be combined with estimates of the biopharmaceutical industry’s total economic footprint in 2017 to approximate the potential economic impact of H.R. 3.⁸ For example, a revenue reduction of \$150 billion annually over ten years (i.e., \$1.5 trillion, the midpoint of the range of estimates described above) could result in a loss of more than 1.0 million jobs, including jobs in other sectors supported by the biopharmaceutical industry, and over \$300 billion annually in total economic output (Table 4). State-level impacts for the full range of industry-estimated revenue impacts – \$1 trillion, \$1.5 trillion, and \$2.0 trillion over ten years – are included in the Appendix.

Table 4. Specific Policy Event: Estimated Impact of a Sustained \$150 Billion Annual Decrease in Biopharmaceutical Industry Revenues

Impact Type	Employment	\$ in Millions (2017 dollars)				
		Labor Income	Value Added	Output	State/Local Personal Tax Revenue	Federal Personal Tax Revenue
Direct Effect	-216,912	(\$27,458)	(\$78,656)	(\$150,000)	(\$801)	(\$5,309)
Indirect Effect	-380,231	(\$29,722)	(\$44,729)	(\$79,064)	(\$788)	(\$5,535)
Induced Effect	-482,928	(\$25,130)	(\$44,196)	(\$78,329)	(\$674)	(\$4,698)
Total Impacts	-1,080,071	(\$82,311)	(\$167,581)	(\$307,392)	(\$2,263)	(\$15,542)

Source: TEconomy analysis; IMPLAN U.S. 2017 Model. Dollar values in this estimate are in 2017 dollars.

These impact estimates indicate that a policy change targeted at biopharmaceutical industry revenue causes a significant change in the operating characteristics of the industry, resetting the level of economic impacts across all types, including the loss of both industry and supplier employment, purchases from supporting industries, and investments in R&D and process improvements.

Conclusion

The use of a \$20 billion revenue shift to understand the economic impacts of potential policy decisions demonstrates a shift of even \$20 billion, or just 3.6 percent of the 2017 direct output of the industry, shows significant and measurable changes to the direct and total impact employment, personal income, and value added impacts of the U.S. biopharmaceutical industry. The output multiplier of 2.05 indicates that for every \$1 dollar change in direct industry revenue total economic impacts will be changed (increased or reduced) by an additional \$1.05 in the U.S. economy.

⁵ See <https://www.congress.gov/bill/116th-congress/house-bill/3/text>

⁶ Avalere, Impact of HR3 on Federal Spending and Drug Manufacturer Revenues, October 14, 2019. <https://avalere.com/insights/impact-of-hr3-on-federal-spending-and-drug-manufacturer-revenues>

⁷ PhRMA, Internal Analysis, October 2019.

⁸ TEconomy Partners has not made its own estimates of the revenue impact from H.R. 3.

These impacts not only have implications at the overall U.S. biopharmaceutical industry level, but due to the presence of the industry across the nation, many individual states could be significantly impacted by economic shifts stemming from changes in public policy.

More specifically, revenue shifts of the magnitude projected for current policy proposals can significantly alter the operating basis and economic impacts of the U.S. biopharmaceutical industry, a key innovation engine of the nation.

Appendix: Potential State-level Policy Impacts

The following table provides estimates of state level impacts (direct biopharmaceutical employment, total biopharmaceutical industry supported employment impacts, and total biopharmaceutical industry supported output impacts) for the \$150 billion annual revenue decline (\$1.5 trillion over 10 years) discussed in this policy brief, as well as impacts related to the full range discussed, i.e., \$100 billion (\$1.0 trillion over 10 years) to \$200 billion (\$2.0 trillion over 10 years).

Table A1. Specific Policy Event: Estimated State-level Impacts of a Sustained \$100 Billion, \$150 Billion. Or \$200 Billion Annual Decrease in Biopharmaceutical Industry Revenues

States	Annual \$100 Billion Decline in Industry Revenue			Annual \$150 Billion Decline in Industry Revenue			Annual \$200 Billion Decline in Industry Revenue		
	Direct Biopharma Jobs Impact	Total Biopharma Supported Jobs Impact	Biopharma Supported Output Impact (\$M)	Direct Biopharma Jobs Impact	Total Biopharma Supported Jobs Impact	Biopharma Supported Output Impact (\$M)	Direct Biopharma Jobs Impact	Total Biopharma Supported Jobs Impact	Biopharma Supported Output Impact (\$M)
Totals, U.S. & PR Totals	-144,608	-720,048	(\$204,928)	-216,912	-1,080,071	(\$307,392)	-289,217	-1,440,095	(\$409,857)
Alabama	-625	-2,565	(\$720)	-938	-3,848	(\$1,080)	-1,250	-5,130	(\$1,440)
Alaska	-29	-64	(\$13)	-43	-96	(\$20)	-57	-128	(\$27)
Arizona	-1,499	-7,404	(\$1,630)	-2,248	-11,107	(\$2,444)	-2,998	-14,809	(\$3,259)
Arkansas	-147	-682	(\$181)	-220	-1,023	(\$272)	-293	-1,364	(\$363)
California	-24,896	-135,448	(\$41,077)	-37,344	-203,171	(\$61,616)	-49,792	-270,895	(\$82,154)
Colorado	-1,537	-8,153	(\$2,000)	-2,305	-12,229	(\$3,000)	-3,074	-16,306	(\$4,000)
Connecticut	-1,598	-6,317	(\$1,607)	-2,397	-9,475	(\$2,410)	-3,196	-12,634	(\$3,213)
Delaware	-885	-3,062	(\$681)	-1,327	-4,593	(\$1,022)	-1,770	-6,124	(\$1,363)
District of Columbia	-114	-265	(\$78)	-170	-397	(\$117)	-227	-529	(\$156)
Florida	-4,592	-23,337	(\$5,175)	-6,888	-35,005	(\$7,762)	-9,184	-46,673	(\$10,349)
Georgia	-2,070	-10,159	(\$2,380)	-3,105	-15,238	(\$3,569)	-4,140	-20,317	(\$4,759)
Hawaii	-161	-461	(\$86)	-241	-692	(\$129)	-322	-922	(\$172)
Idaho	-167	-689	(\$162)	-251	-1,034	(\$243)	-334	-1,378	(\$324)
Illinois	-7,267	-43,989	(\$13,013)	-10,901	-65,984	(\$19,520)	-14,534	-87,978	(\$26,026)
Indiana	-4,396	-24,949	(\$9,916)	-6,594	-37,423	(\$14,874)	-8,792	-49,897	(\$19,832)
Iowa	-997	-3,889	(\$1,051)	-1,495	-5,834	(\$1,576)	-1,993	-7,778	(\$2,101)
Kansas	-1,035	-4,919	(\$1,233)	-1,552	-7,379	(\$1,850)	-2,070	-9,838	(\$2,466)
Kentucky	-942	-3,424	(\$783)	-1,413	-5,137	(\$1,174)	-1,884	-6,849	(\$1,565)
Louisiana	-490	-1,662	(\$376)	-736	-2,493	(\$564)	-981	-3,325	(\$752)
Maine	-810	-4,124	(\$920)	-1,215	-6,187	(\$1,380)	-1,620	-8,249	(\$1,840)
Maryland	-5,446	-23,138	(\$6,028)	-8,169	-34,707	(\$9,041)	-10,893	-46,276	(\$12,055)

States	Annual \$100 Billion Decline in Industry Revenue			Annual \$150 Billion Decline in Industry Revenue			Annual \$200 Billion Decline in Industry Revenue		
	Direct Biopharma Jobs Impact	Total Biopharma Supported Jobs Impact	Biopharma Supported Output Impact (\$M)	Direct Biopharma Jobs Impact	Total Biopharma Supported Jobs Impact	Biopharma Supported Output Impact (\$M)	Direct Biopharma Jobs Impact	Total Biopharma Supported Jobs Impact	Biopharma Supported Output Impact (\$M)
Massachusetts	-10,828	-50,694	(\$12,639)	-16,242	-76,041	(\$18,959)	-21,656	-101,388	(\$25,278)
Michigan	-2,849	-15,418	(\$4,062)	-4,274	-23,127	(\$6,093)	-5,698	-30,836	(\$8,123)
Minnesota	-1,355	-7,151	(\$1,745)	-2,032	-10,726	(\$2,618)	-2,710	-14,302	(\$3,490)
Mississippi	-321	-1,427	(\$404)	-481	-2,141	(\$605)	-642	-2,854	(\$807)
Missouri	-2,187	-11,776	(\$2,878)	-3,281	-17,664	(\$4,316)	-4,375	-23,552	(\$5,755)
Montana	-151	-502	(\$102)	-226	-753	(\$153)	-302	-1,003	(\$205)
Nebraska	-556	-2,609	(\$740)	-834	-3,913	(\$1,110)	-1,112	-5,218	(\$1,480)
Nevada	-382	-1,761	(\$427)	-574	-2,642	(\$640)	-765	-3,523	(\$854)
New Hampshire	-429	-2,002	(\$483)	-643	-3,002	(\$724)	-857	-4,003	(\$966)
New Jersey	-10,824	-54,420	(\$14,875)	-16,236	-81,630	(\$22,313)	-21,648	-108,840	(\$29,750)
New Mexico	-637	-2,226	(\$466)	-956	-3,338	(\$699)	-1,275	-4,451	(\$932)
New York	-9,834	-41,150	(\$11,963)	-14,751	-61,725	(\$17,945)	-19,668	-82,299	(\$23,927)
North Carolina	-8,017	-44,756	(\$13,275)	-12,025	-67,135	(\$19,912)	-16,034	-89,513	(\$26,550)
North Dakota	-50	-145	(\$37)	-76	-218	(\$55)	-101	-290	(\$74)
Ohio	-3,725	-16,190	(\$3,934)	-5,587	-24,285	(\$5,901)	-7,449	-32,380	(\$7,867)
Oklahoma	-494	-1,941	(\$456)	-741	-2,912	(\$684)	-988	-3,882	(\$912)
Oregon	-746	-3,085	(\$687)	-1,119	-4,628	(\$1,031)	-1,491	-6,171	(\$1,374)
Pennsylvania	-8,349	-45,260	(\$11,999)	-12,523	-67,890	(\$17,999)	-16,697	-90,519	(\$23,999)
Puerto Rico	-3,191	-13,906	(\$10,276)	-4,787	-20,859	(\$15,415)	-6,383	-27,812	(\$20,553)
Rhode Island	-344	-2,363	(\$651)	-516	-3,544	(\$977)	-688	-4,726	(\$1,303)
South Carolina	-916	-4,401	(\$1,216)	-1,374	-6,601	(\$1,824)	-1,832	-8,801	(\$2,432)
South Dakota	-57	-176	(\$32)	-86	-264	(\$48)	-114	-352	(\$64)
Tennessee	-2,165	-8,278	(\$1,863)	-3,247	-12,417	(\$2,795)	-4,329	-16,556	(\$3,727)
Texas	-6,781	-34,987	(\$9,591)	-10,172	-52,481	(\$14,386)	-13,563	-69,975	(\$19,181)
Utah	-2,198	-13,054	(\$3,087)	-3,298	-19,581	(\$4,630)	-4,397	-26,107	(\$6,174)
Vermont	-206	-836	(\$201)	-309	-1,254	(\$302)	-413	-1,672	(\$403)
Virginia	-1,730	-7,241	(\$1,765)	-2,596	-10,861	(\$2,648)	-3,461	-14,482	(\$3,530)
Washington	-2,745	-10,165	(\$2,405)	-4,118	-15,247	(\$3,608)	-5,490	-20,330	(\$4,811)
West Virginia	-835	-4,049	(\$1,343)	-1,253	-6,073	(\$2,014)	-1,670	-8,097	(\$2,685)
Wisconsin	-1,949	-9,185	(\$2,146)	-2,923	-13,777	(\$3,219)	-3,897	-18,370	(\$4,292)
Wyoming	-54	-195	(\$70)	-81	-292	(\$106)	-108	-390	(\$141)

Source: TEconomy analysis; IMPLAN State-Specific 2017 Models. Dollar values in these estimates are in 2017 dollars.