



TRADE AND TRANSPORT MARGINS IN PHARMACEUTICALS AND OTHER R&D-INTENSIVE INDUSTRIES

RESEARCH NOTE

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EXECUTIVE SUMMARY

Spending for prescription and over-the-counter pharmaceutical products totaled \$413 billion in 2012 according to the Bureau of Economic Analysis' (BEA) trade and transports margin data. Just over half of this spending (52%) accrued to the pharmaceutical companies that produced the medicines, while the remainder was divided between transport and wholesale margins (21%) and retail margins (26%).

Compared to other research and development (R&D)-intensive manufacturing industries with significant consumer sales, the pharmaceutical and medicines manufacturing industry ranks second in terms of R&D intensity behind communications equipment, and receives the second lowest producers' share of total spending after other miscellaneous manufacturing. Thus, the pharmaceutical industry is unique among manufacturing industries in that it devotes a large share of its revenue to R&D, despite receiving a considerably smaller share of total spending.

1. INTRODUCTION

A key factor in understanding pharmaceutical prices in the United States is how the amount paid for pharmaceuticals is ultimately dispersed among the various entities in the pharmaceutical supply chain. These include manufacturers, wholesalers, and retailers, as well as other entities such as government, insurers, and hospitals.

Following the flow of pharmaceutical payments is made difficult by the notoriously complex billing structure for prescription medication. However, prior research using detailed industry-specific databases suggests that nearly half of all prescription drug spending in the US is retained by entities other than manufacturers.¹

In order to better understand how pharmaceutical margins compare with other research-intensive industries, Oxford Economics has undertaken the analysis detailed in this research note. Specifically, our research uses industry-level trade and transport margins data published by the Bureau of Economic Analysis (BEA), based on data collected in the Economic Census, to (1)

estimate the share of spending that accrues to pharmaceutical manufacturers vs. other supply chain entities; and (2) compare the manufacturers' share in the pharmaceutical industry to that in other research-intensive manufacturing industries. As measured in the trade and transport margins data, total spending reflects the prices paid by purchasers, net of any rebates and discounts.²

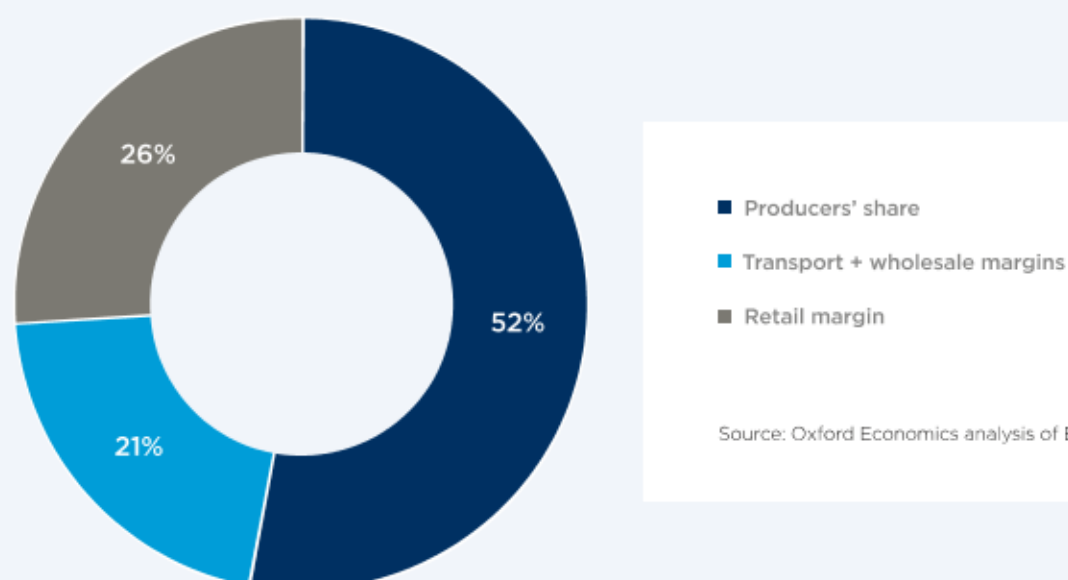
These Economic Census data offer advantages and disadvantages for this type of analysis. They come from an authoritative government source, and are consistently available across industries, allowing cross-industry comparisons to be made. At the same time, they are limited in their degree of industry detail. In particular, they only report on prescription and over-the-counter pharmaceutical products jointly.³ Additionally, these data are only available in Economic Census years (those ending in 2 and 7), with the most recently available data currently from 2012.

- 1 See: Berkeley Research Group (2017). "The Pharmaceutical Supply Chain: Gross Drug Expenditures Realized by Stakeholders." <https://www.thinkbrg.com/newsroom-publications-pharma-supply-chain.html>. And: Berkeley Research Group (2020). "Revisiting the Pharmaceutical Supply Chain: 2013-2018." <https://www.thinkbrg.com/newsroom-publications-revisit-pharma-supply-chain.html>. They conclude that, in 2018, manufacturers of prescription drugs received approximately 54% of the total point-of-sale spending on prescription drugs, with supply chain and other entities receiving the other 46%. These BRG studies, like the present Research Note, were commissioned by the Pharmaceutical Research and Manufacturers of America (PhRMA).
- 2 See <https://www.bea.gov/products/industry-economic-accounts/underlying-estimates>. All results presented in this report use the margin detail tables before industry redefinitions, although results are not very sensitive to this choice.
- 3 The pharmaceutical industry is defined for these purposes by the North American Industry Classification System (NAICS) code 325412, "Pharmaceutical Preparation Manufacturing." See <https://www.census.gov/cgi-bin/sssd/naics/naicsrch?code=325412&search=2012%20NAICS%20Search>. In addition to prescription and over-the-counter pharmaceuticals, which make up the vast majority of the industry's output, this definition also includes a small number of products not typically considered pharmaceuticals, such as lip balm, vitamins, and water purification tablets.

2. TRADE AND TRANSPORT MARGINS IN THE PHARMACEUTICAL SECTOR

According to the BEA's trade and transports margin data, total spending on prescription and over-the-counter pharmaceutical products totaled \$413 billion in 2012. Just over half of this spending (52%) accrued to producers.⁴ The remaining trade and transport margins (48%) were divided between transport and wholesale margins (21%), and retail margins (26%).⁵

Fig. 1. Trade and transport margins on US pharmaceutical spending, 2012



4 The BEA refers to the pre-margin cost as "producers' value," in contrast to the post-margin "purchasers' value." The producers' value includes both domestically produced as well as imported pharmaceutical products, with the latter valued at their Cost, Insurance and Freight (CIF) value at US ports of entry. See "Concepts and Methods of the U.S. Input-Output Accounts" (<https://www.bea.gov/resources/methodologies/concepts-methods-io-accounts>) chapters 7 and 8 for more details on the handling of imported products.

5 The BEA data break out wholesale and transport margins. For pharmaceuticals, transport margins are approximately 1% of total value, and so for simplicity we combine them with wholesale margins here. Note that totals add to 99% because of rounding.

2.1 Rebates and discounts

The pharmaceutical industry is unusual in the significant scale of manufacturer rebates and discounts made to payers, patients, and entities in the pharmaceutical supply chain.⁶ It is important, therefore, to understand how such rebates are handled in the BEA data.

While there is inevitably some uncertainty as to how individual respondents interpreted such payments, the instructions for the Economic Census are to exclude all discounts and rebates when calculating the value of goods sold.⁷ Thus, total spending in the BEA data represent purchasers' **spending net of rebates and discounts paid to patients, payers (e.g., insurance companies**

or pharmacy benefit managers), and distribution chain entities.

However, the value of payments made to other entities, such as governments and hospitals, not paying for the pharmaceutical products themselves should generally be included in the category of the entity responsible for paying these fees. For example, an administrative fee to a pharmacy benefit manager (i.e., not a rebate on a specific product) paid by a biopharmaceutical manufacturer would be included as part of the producers' share, whereas if a similar fee were paid by a pharmacy, its value would be part of the retail margin.

6 For a discussion of some of these rebate structures, see: Fein, Adam (April 3, 2019). "The Gross-to-Net Bubble Reached a Record \$166 Billion in 2018." Drug Channels Blog. <https://www.drugchannels.net/2019/04/the-gross-to-net-bubble-reached-record.html>; and Yu, Nancy L., Preston Atteberry, and Peter B. Bach (July 31, 2018). "Spending on Prescription Drugs in the US: Where does all the Money Go?" Health Affairs Blog. <https://www.healthaffairs.org/doi/10.1377/hblog20180726.670593/full/>; as well as the BRG references in footnote 1.

7 "Report the value of the products shipped and services performed at the net selling value, f.o.b. plant to the customer; i.e., after discounts and allowances, and exclusive of freight charges and excise taxes." Quotation from page 13 of Economic Census form MC-32520: <https://www2.census.gov/programs-surveys/economic-census/2012/questionnaires/forms/mc32520.pdf>. This reference was provided by BEA staff in response to a query on this topic from Oxford Economics. See also the BEA reference document "Concepts and Methods of the U.S. Input-Output Accounts (<https://www.bea.gov/resources/methodologies/concepts-methods-io-accounts>), and its discussion regarding sales and excise taxes. Except in the case of tobacco and liquor, where excise taxes are allocated to the manufacturer's value, such taxes on goods are incorporated in the margin of the entity paying (e.g. wholesale or retail).

3. COMPARISON WITH OTHER HIGH-R&D INDUSTRIES

One of the principal advantages of the BEA trade and transport margin data is that they allow comparisons to be made between industries. To select appropriate comparison industries for pharmaceuticals, we focus on manufacturing industries that spend a high share of their domestic net sales on research and development (R&D)—which we label **R&D intensity**—as measured by the National Science Foundation's (NSF) Business Research and Development: 2017 data.⁸ Not surprisingly, pharmaceutical and medicine manufacturing has one of the highest R&D intensities, at 14%.⁹

Another notable characteristic of the pharmaceutical industry is that a large share of its output (85%) is sold to consumers, as opposed to other final uses such as exports and fixed investments, or to being used as an intermediate input by other industries.¹⁰ To identify an appropriate comparison group, we restrict our attention to manufacturing industries that sell at least 10% of their output to consumers. Industries that produce goods primarily for consumer consumption operate under fundamentally different distribution models than other industries.¹¹

Fig. 2. Trade and transport margins on US pharmaceutical spending, 2012

Industry category	Industry title	R&D intensity	INDUSTRY SALES		Producers' supply chain share
			\$ billions	% of broad industry	
Narrow	Pharmaceutical preparation		\$413	82%	52%
	Medicinal and botanical		\$18	4%	69%
	In-vitro diagnostic substance		\$17	3%	71%
	Biological product (except diagnostic)		\$53	11%	70%
Broad	Pharmaceutical and medicine manufacturing	14%	\$501	100%	55%

Source: Oxford Economics, BEA, and NSF

8 See <https://nces.nsf.gov/pubs/nsf20311>. Specifically, we use data table 17: "Domestic R&D paid for by the company and others and performed by the company as a percentage of domestic net sales, by industry and company size: 2017."

9 Note that the NSF calculates R&D spending as a share of domestic net sales at the *company* level, that is, based on the principle industry code of the company. Macroeconomic data on industry output from the BEA, by contrast, are compiled by industry at the *establishment* level, so sales numbers for the pharmaceutical industry in the NSF and BEA data do not match. Thus, estimates published elsewhere for pharmaceutical R&D intensity based on BEA output data will not match those presented here, although any version of this analysis will conclude that pharmaceutical manufacturing is among the most R&D intensive of industries. For the cross-industry comparison being made in this analysis, we believe the NSF-based figures are the most appropriate.

10 The remaining 15% of pharmaceutical sales are as other types of final consumption, mainly exports (9%), or as an intermediate input for other industries, mainly hospitals, physicians offices, and veterinary services (6%). For many other high-R&D industries, such as semiconductor manufacturing, a much larger share of sales are as an input into other industries' production.

11 Note that the excluded industries, i.e. those that sell little to none of their output directly to consumers, will tend to have a *higher* producers' share because their retail margins are typically lower. Thus, the effect here is not to exaggerate the pharmaceutical industry's low producers' share, but rather to provide a more reasonable comparison group.

Note that the industry definitions used in the NSF survey to measure R&D intensity are broader than those in the BEA data, including for the pharmaceutical industry. The pharmaceutical preparation manufacturing industry, which is the focus of this research note, represents 82% of the total sales of the broader pharmaceutical and medicine manufacturing industry as defined by the NSF survey (see Fig. 2).¹² Note that the broader pharmaceutical and medicines manufacturing industry has a slightly larger producers' share of total spending, 55%, than

the share for the narrower pharmaceutical preparation manufacturing industry, 52%.

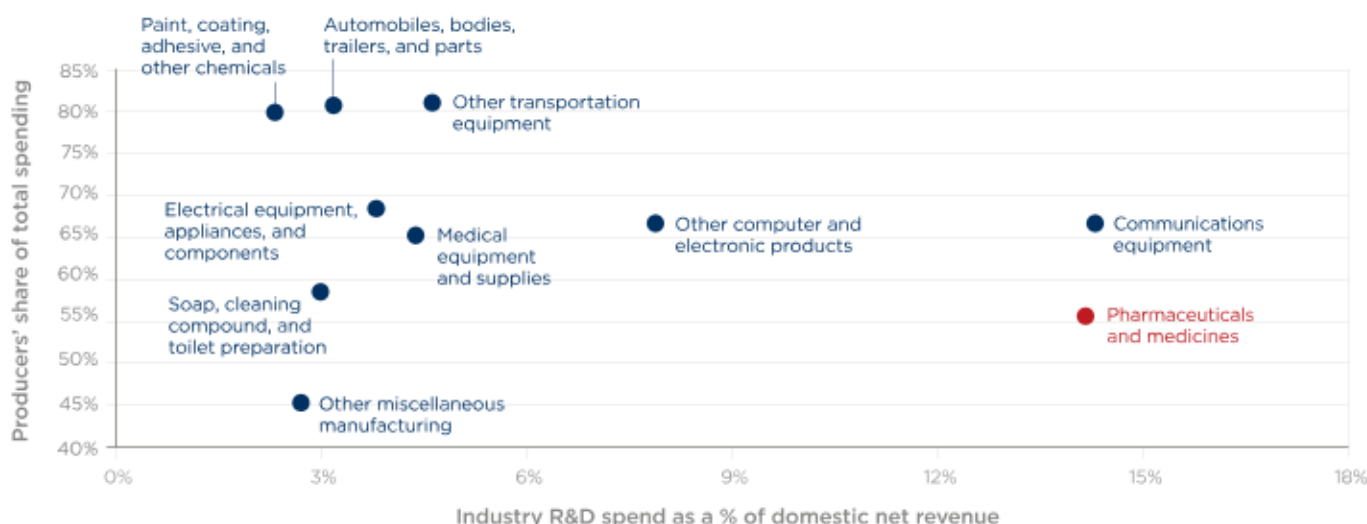
Because of this broad/narrow industry complication, we first consider a comparison of pharmaceuticals to other industries, broadly-defined, in section 3.1 immediately below, and then repeat the analysis using the narrow industry definitions in section 3.2. **A full list of manufacturing industries in declining order of R&D intensity is given in the appendix.**

3.1 Broad industry comparison

At this broader level of aggregation, the pharmaceutical and medicine manufacturing industry has both the second highest R&D

intensity of any of the manufacturing industries considered, at 14%, and also the second lowest producers' share of total spending, at 55%.¹³

Fig. 3. Producers' share of total spending by R&D intensity, top 10 most R&D intensive manufacturing industries with significant consumer sales



Source: Oxford Economics

¹² For industry definitions, see <https://www.census.gov/cgi-bin/sssd/naics/naicsrch?code=32541&search=2012%20NAICS%20Search>.

¹³ Two additional industries, semiconductor machinery manufacturing and semiconductor and other electronic components manufacturing, have higher R&D intensities (18% and 14% respectively), but sell almost none of their output to consumers. Also, two additional industries, textile, apparel, and leather products, and furniture and related products have lower producers' shares (44% and 51% respectively) but have much lower R&D intensities than the industries considered here.

The industry with the highest R&D intensity, communications equipment manufacturing, has a much higher producers' share (67%), and the industry with the lowest producers' share, other miscellaneous manufacturing, has a much lower R&D intensity (3%).

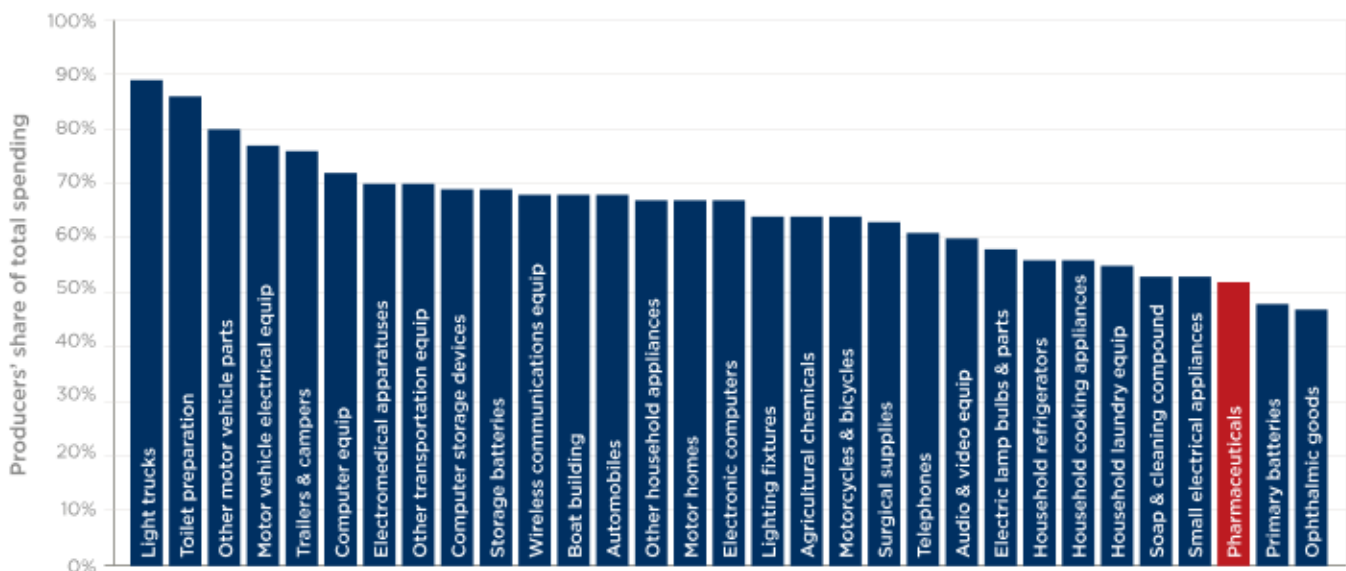
In other words, the pharmaceutical industry is unique in that it devotes a much larger share of its revenue to R&D, despite retaining a considerably smaller share of total spending. We will see in section 3.2 that this same pattern holds at a more detailed industry level as well.

3.2 Narrow industry comparison

Next, we focus our attention on those narrowly defined manufacturing industries which sell at least 10% of their output to consumers, and which are contained within broader industry categories with an R&D intensity of at least 3%. This yields the 31 manufacturing industries in Fig. 4 below. Of these, pharmaceutical manufacturing has the third lowest producer's share at 52%, after primary batteries (48%), and ophthalmic goods

(47%). While pharmaceutical manufacturing is a subgroup of the pharmaceutical and medicine manufacturing industry, which has an R&D intensity of 14%, the two industries with lower producers' shares are part of broader industries with R&D expenses of around 4%. Thus, again, pharmaceutical manufacturing is unique in having both among the lowest producers' share and the highest R&D intensities of all industries.

Fig. 4. Producers' share of total spending among high-R&D manufacturing industries with direct sales to consumers



Source: Oxford Economics

4. CONCLUDING REMARKS

This research note has explored trade and transport margins in the pharmaceutical sector using macroeconomic data from the BEA, sourced from the 2012 Economic Census. According to these data, of every dollar in purchasers' spending on pharmaceutical products, 52¢ ultimately went to producers, with 21¢ going to wholesale and transport margins, and 26¢ to retail margins.

A principal advantage of the BEA data used in this analysis is that they are broadly and consistently available across industries, allowing comparisons to be made between pharmaceuticals and other high-R&D intensive industries.

Overall, at 52%, the pharmaceutical industry has a much lower producers' share than other high-R&D industries, such as telephone apparatus manufacturing (61%), electromedical and electrotherapeutic apparatus manufacturing (70%), and electronic computer manufacturing (67%).

At 14% of domestic net sales, the R&D intensity of the pharmaceutical industry is far higher than that of other industries that retain a similarly low share of total spending, such as ophthalmic goods and certain electrical equipment, appliances, and components manufacturing industries, which have R&D intensities of about 4% of sales.

The pharmaceutical industry is thus unique in that it devotes a much larger share of its revenue to R&D, despite retaining a considerably smaller share of total spending on its products. The high R&D costs that are a defining feature of the pharmaceutical industry, therefore, must be borne out of the relatively small share of spending that accrues to pharmaceutical producers. These two factors, high R&D costs, and high distribution costs (trade and transport margins) that accrue to supply chain entities rather than to manufacturers, provide important context for understanding the costs Americans pay for pharmaceutical products.

APPENDIX

Manufacturing industries by R&D intensity

Broad industry	Broad NAICS	R&D intensity	Detailed NAICS	Detailed NAICS	Industry sales (\$ billion)	Share sold directly to consumers (PCE)	SUPPLY CHAIN SHARES		
							Retail	Wholesale + transport	Producers
Semiconductor machinery	333242	18.4%	Semiconductor machinery	333242	\$17.7	0%	0%	17%	83%
Semiconductor and other electronic components	3344	17.5%	Semiconductor and related device	334413	\$84.4	0%	0%	15%	85%
			Printed circuit assembly (electronic assembly)	334418	\$19.6	1%	0%	14%	85%
Communications equipment	3342	14.3%	Telephone apparatus	334210	\$34.3	10%	7%	32%	61%
			Broadcast and wireless communications equipment	334220	\$139.5	14%	6%	26%	68%
			Other communications equipment	334290	\$8.4	1%	0%	32%	68%
Pharmaceuticals and medicines	3254	14.2%	Medicinal and botanical	325411	\$17.8	0%	0%	31%	69%
			Pharmaceutical preparation	325412	\$412.7	85%	26%	21%	52%
			In-vitro diagnostic substance	325413	\$16.7	0%	0%	29%	71%
			Biological product (except diagnostic)	325414	\$53.3	0%	0%	30%	70%
Navigational, measuring, electromedical, and control instruments	3345	8.6%	Electromedical and electrotherapeutic apparatus	334510	\$50.8	12%	5%	25%	70%
			Search, detection, and navigation instruments	334511	\$58.7	0%	0%	12%	87%
			Automatic environmental control	334512	\$4.1	0%	0%	13%	87%
			Industrial process variable instruments	334513	\$17.9	0%	0%	12%	88%
			Totalizing fluid meter and counting device	334514	\$9.8	0%	0%	13%	86%
			Electricity and signal testing instruments	334515	\$20.6	0%	0%	15%	85%
			Analytical laboratory instrument	334516	\$21.5	0%	0%	14%	86%
			Irradiation apparatus	334517	\$15.6	0%	0%	23%	77%

Broad industry	Broad NAICS	R&D intensity	Detailed NAICS	Detailed NAICS	Industry sales (\$ billion)	Share sold directly to consumers (PCE)	SUPPLY CHAIN SHARES		
							Retail	Wholesale + transport	Producers
Other computer and electronic products	other 334	7.9%	Electronic computer	334111	\$99.1	28%	11%	23%	67%
			Computer storage device	334112	\$24.0	33%	9%	22%	69%
			Computer terminals and other computer peripheral equipment	334118	\$61.1	30%	9%	19%	72%
			Audio and video equipment	334300	\$72.0	68%	23%	17%	60%
			Manufacturing and reproducing magnetic and optical media	334610	\$4.7	4%	3%	10%	86%
Aerospace products and parts	3364	7.5%	Aircraft	336411	\$117.5	1%	0%	5%	95%
			Aircraft engine and engine parts	336412	\$57.2	0%	0%	5%	95%
			Other aircraft parts and auxiliary equipment	336413	\$49.2	0%	0%	5%	95%
			Guided missile and space vehicle	336414	\$18.8	0%	0%	4%	96%
Engine, turbine, and power transmission equipment	3336	5.8%	Turbine and turbine generator set units	333611	\$28.0	0%	0%	17%	83%
			Speed changer, industrial high-speed drive, and gear	333612	\$10.7	0%	0%	17%	83%
			Mechanical power transmission equipment	333613	\$8.6	0%	0%	18%	82%
			Other engine equipment	333618	\$50.8	1%	1%	17%	82%
Pesticide, fertilizer, and other agricultural chemicals	3253	5.2%	Fertilizer	325310	\$59.1	1%	0%	33%	66%
			Pesticide and other agricultural chemical	325320	\$25.3	16%	5%	31%	64%
Other transportation	other 336	4.6%	Railroad rolling stock	336500	\$21.0	0%	0%	7%	93%
			Ship building and repairing	336611	\$23.5	0%	1%	5%	95%
			Boat building	336612	\$11.4	63%	29%	3%	68%
			Motorcycle, bicycle, and parts	336991	\$17.5	71%	23%	13%	64%
			All other transportation equipment	336999	\$10.5	59%	26%	4%	70%

Broad industry	Broad NAICS	R&D intensity	Detailed NAICS	Detailed NAICS	Industry sales (\$ billion)	Share sold directly to consumers (PCE)	SUPPLY CHAIN SHARES		
							Retail	Wholesale + transport	Producers
Medical equipment and supplies	3391	4.4%	Surgical and medical instrument	339112	\$63.2	1%	1%	26%	73%
			Surgical appliance and supplies	339113	\$71.0	32%	15%	23%	63%
			Dental equipment and supplies	339114	\$7.8	0%	0%	27%	73%
			Ophthalmic goods	339115	\$23.1	93%	41%	11%	47%
			Dental laboratories	339116	\$6.2	0%	0%	27%	73%
Electrical equipment, appliances, and components	335	3.8%	Electric lamp bulb and part	335110	\$7.3	42%	25%	17%	58%
			Lighting fixture	335120	\$29.2	19%	9%	26%	64%
			Small electrical appliance	335210	\$25.6	76%	25%	22%	53%
			Household cooking appliance	335221	\$14.9	66%	28%	16%	56%
			Household refrigerator and home freezer	335222	\$13.9	63%	28%	16%	56%
			Household laundry equipment	335224	\$10.6	86%	29%	16%	55%
			Other major household appliance	335228	\$9.0	31%	14%	19%	67%
			Power, distribution, and specialty transformer	335311	\$11.1	0%	0%	22%	78%
			Motor and generator	335312	\$27.7	1%	2%	22%	76%
			Switchgear and switchboard apparatus	335313	\$18.8	1%	1%	21%	77%
			Relay and industrial control	335314	\$22.3	0%	0%	22%	78%
			Storage battery	335911	\$14.6	45%	19%	13%	69%
			Primary battery	335912	\$10.4	89%	38%	14%	48%
			Communication and energy wire and cable	335920	\$27.0	0%	1%	21%	78%
			Wiring device	335930	\$21.0	0%	19%	10%	71%
			Carbon and graphite product	335991	\$4.9	0%	0%	9%	91%
			All other miscellaneous electrical equipment and component	335999	\$21.8	4%	1%	20%	79%

Broad industry	Broad NAICS	R&D intensity	Detailed NAICS	Detailed NAICS	Industry sales (\$ billion)	Share sold directly to consumers (PCE)	SUPPLY CHAIN SHARES		
							Retail	Wholesale + transport	Producers
Agricultural implement	33311	3.4%	Farm machinery and equipment	333111	\$61.3	0%	0%	28%	72%
			Lawn and garden equipment	333112	\$21.4	8%	52%	14%	34%
Automobiles, bodies, trailers, and parts	3361-63	3.2%	Automobile	336111	\$213.2	44%	14%	19%	68%
			Light truck and utility vehicle	336112	\$276.8	51%	9%	2%	89%
			Heavy duty truck	336120	\$47.3	0%	0%	5%	95%
			Motor vehicle body	336211	\$10.0	0%	1%	27%	73%
			Truck trailer	336212	\$12.3	0%	0%	27%	73%
			Motor home	336213	\$3.9	74%	29%	4%	67%
			Travel trailer and camper	336214	\$14.1	65%	21%	4%	76%
			Motor vehicle gasoline engine and engine parts	336310	\$54.9	6%	8%	12%	80%
			Motor vehicle electrical and electronic equipment	336320	\$43.1	15%	12%	11%	77%
			Motor vehicle transmission and power train parts	336350	\$64.4	6%	7%	12%	81%
			Motor vehicle seating and interior trim	336360	\$33.2	0%	0%	12%	88%
			Motor vehicle metal stamping	336370	\$32.7	0%	0%	13%	87%
Soap, cleaning compound, and toilet preparation	3256	3.0%	Soap and cleaning compound	325610	\$67.0	53%	19%	8%	73%
			Toilet preparation	325620	\$79.0	86%	34%	19%	47%
Nonmetallic mineral products	327	2.9%	Clay product and refractory	327100	\$20.8	20%	12%	24%	64%
			Glass and glass product	327200	\$42.1	15%	5%	25%	70%
			Cement	327310	\$8.3	0%	0%	25%	75%
			Ready-mix concrete	327320	\$31.0	0%	20%	16%	64%
			Concrete pipe, brick, and block	327330	\$8.3	0%	19%	16%	65%
			Other concrete product	327390	\$11.7	0%	2%	17%	80%

Broad industry	Broad NAICS	R&D intensity	Detailed NAICS	Detailed NAICS	Industry sales (\$ billion)	Share sold directly to consumers (PCE)	SUPPLY CHAIN SHARES		
							Retail	Wholesale + transport	Producers
			Lime and gypsum product	327400	\$8.1	0%	2%	24%	74%
			Abrasive product	327910	\$9.0	4%	1%	24%	75%
			Cut stone and stone product	327991	\$8.6	53%	11%	17%	72%
			Ground or treated mineral and earth	327992	\$5.4	9%	3%	29%	68%
			Mineral wool	327993	\$6.8	0%	0%	20%	80%
			Miscellaneous nonmetallic mineral products	327999	\$5.6	0%	0%	19%	81%
Military armored vehicle, tank, and tank component	336992	2.9%	Military armored vehicle, tank, and tank component	336992	\$6.9	0%	0%	5%	95%
Other machinery	other 333	2.7%	Construction machinery	333120	\$71.4	0%	0%	25%	75%
			Mining and oil and gas field machinery	333130	\$45.5	0%	0%	25%	75%
			Optical instrument and lens	333314	\$12.4	0%	0%	20%	80%
			Photographic and photocopying equipment	333316	\$6.6	31%	15%	49%	36%
			Other commercial and service industry machinery	333318	\$37.7	1%	3%	33%	64%
			Industrial and commercial fan and blower and air purification equipment	333413	\$10.0	0%	0%	22%	78%
			Heating equipment (except warm air furnaces)	333414	\$9.1	27%	17%	21%	63%
			Air conditioning, refrigeration, and warm air heating equipment	333415	\$55.8	4%	11%	21%	68%
			Industrial mold	333511	\$9.8	0%	0%	17%	83%
			Special tool, die, jig, and fixture	333514	\$11.4	0%	0%	17%	83%
			Machine tool	333517	\$17.9	1%	1%	16%	83%
			Air and gas compressor	333912	\$15.0	0%	0%	17%	83%

Broad industry	Broad NAICS	R&D intensity	Detailed NAICS	Detailed NAICS	Industry sales (\$ billion)	Share sold directly to consumers (PCE)	SUPPLY CHAIN SHARES		
							Retail	Wholesale + transport	Producers
Other miscellaneous manufacturing	3399	2.7%	Material handling equipment	333920	\$42.0	0%	0%	16%	84%
			Power-driven handtool	333991	\$14.9	36%	42%	10%	48%
			Packaging machinery	333993	\$9.4	0%	0%	16%	84%
			Industrial process furnace and oven	333994	\$3.9	0%	0%	16%	84%
			Jewelry and silverware	339910	\$61.0	78%	34%	24%	42%
			Sporting and athletic goods	339920	\$37.8	81%	30%	25%	45%
			Doll, toy, and game	339930	\$50.1	95%	42%	21%	37%
			Office supplies (except paper)	339940	\$7.5	56%	18%	16%	65%
			Sign	339950	\$11.8	0%	0%	31%	69%
			All other miscellaneous	339990	\$82.1	52%	22%	30%	48%
Paint, coating, adhesive, and other chemicals	3255, 3259	2.3%	Paint and coating	325510	\$31.9	11%	11%	13%	76%
			Adhesive	325520	\$14.2	13%	4%	9%	87%
			Printing ink	325910	\$6.2	0%	0%	18%	82%
Plastics and rubber products	326	2.0%	Plastics packaging materials and unlaminated film and sheet	326110	\$53.3	9%	4%	13%	83%
			Plastics pipe, pipe fitting, and unlaminated profile shape	326120	\$21.1	0%	12%	12%	76%
			Laminated plastics plate, sheet (except packaging), and shape	326130	\$4.2	0%	0%	14%	85%
			Polystyrene foam product	326140	\$12.2	13%	5%	31%	64%
			Urethane and other foam product (except polystyrene)	326150	\$16.0	10%	8%	35%	57%
			Plastics bottle	326160	\$15.9	0%	0%	17%	83%
			Other plastics product	326190	\$136.7	14%	14%	12%	75%
			Tire	326210	\$57.2	52%	25%	14%	61%
			Rubber and plastics hoses and belting	326220	\$10.9	10%	9%	16%	74%

Broad industry	Broad NAICS	R&D intensity	Detailed NAICS	Detailed NAICS	Industry sales (\$ billion)	Share sold directly to consumers (PCE)	SUPPLY CHAIN SHARES		
							Retail	Wholesale + transport	Producers
Fabricated metal products	332	2.0%	Other rubber product	326290	\$26.4	11%	6%	17%	78%
			Custom roll forming	332114	\$9.3	0%	1%	11%	89%
			Metal crown, closure, and other metal stamping (except automotive)	332119	\$14.9	6%	2%	18%	80%
			Cutlery and handtool	332200	\$28.9	47%	22%	23%	55%
			Plate work and fabricated structural product	332310	\$48.2	0%	2%	12%	86%
			Ornamental and architectural metal products	332320	\$49.4	0%	17%	10%	73%
			Power boiler and heat exchanger	332410	\$11.0	0%	0%	23%	76%
			Metal tank (heavy gauge)	332420	\$11.1	0%	0%	8%	92%
			Metal can, box, and other metal container (light gauge)	332430	\$21.4	1%	0%	11%	89%
			Hardware	332500	\$21.0	7%	9%	27%	64%
			Spring and wire product	332600	\$8.5	2%	2%	11%	87%
			Machine shops	332710	\$40.9	0%	0%	2%	97%
			Turned product and screw, nut, and bolt	332720	\$39.0	2%	1%	16%	83%
			Coating, engraving, heat treating and allied activities	332800	\$28.0	0%	0%	3%	97%
			Plumbing fixture fitting and trim	332913	\$7.6	0%	25%	19%	56%
			Ball and roller bearing	332991	\$12.6	0%	0%	19%	81%
			Fabricated pipe and pipe fitting	332996	\$10.1	0%	2%	18%	80%
			Other fabricated metal	332999	\$29.6	11%	6%	17%	77%
Basic chemicals	3251	1.6%	Petrochemical	325110	\$127.1	0%	0%	10%	90%
			Industrial gas	325120	\$9.4	1%	1%	20%	79%
			Synthetic dye and pigment	325130	\$13.1	0%	0%	13%	87%
			Other Basic Inorganic Chemical	325180	\$56.9	0%	0%	13%	87%

Broad industry	Broad NAICS	R&D intensity	Detailed NAICS	Detailed NAICS	Industry sales (\$ billion)	Share sold directly to consumers (PCE)	SUPPLY CHAIN SHARES		
							Retail	Wholesale + transport	Producers
			Other basic organic chemical	325190	\$177.3	1%	0%	10%	90%
Resin, synthetic rubber, and artificial synthetic fibers and filaments	3252	1.4%	Plastics material and resin	325211	\$111.2	0%	0%	11%	89%
Textile, apparel, and leather products	313-16	1.1%	Fiber, yarn, and thread mills	313100	\$6.8	5%	3%	15%	82%
			Fabric mills	313200	\$22.6	16%	10%	13%	77%
			Textile and fabric finishing and fabric coating mills	313300	\$12.6	8%	5%	14%	81%
			Carpet and rug mills	314110	\$26.8	55%	37%	21%	42%
			Curtain and linen mills	314120	\$39.3	77%	46%	16%	38%
			Other textile product mills	314900	\$32.5	36%	17%	30%	53%
			Apparel	315000	\$276.1	95%	45%	15%	39%
			Leather and allied product	316000	\$107.1	88%	37%	19%	45%
Furniture and related products	337	1.0%	Wood kitchen cabinet and countertop	337110	\$21.6	0%	38%	9%	54%
			Upholstered household furniture	337121	\$26.2	92%	35%	17%	48%
			Nonupholstered wood household furniture	337122	\$31.2	90%	41%	15%	44%
			Institutional furniture	337127	\$14.6	1%	5%	25%	70%
			Showcase, partition, shelving, and locker	337215	\$16.6	7%	5%	26%	69%
			Other furniture related product	337900	\$28.4	90%	44%	17%	39%
Paper	322	0.8%	Pulp mills	322110	\$11.5	0%	0%	8%	92%
			Paper mills	322120	\$73.8	29%	12%	12%	75%
			Paperboard mills	322130	\$36.0	0%	0%	16%	84%
			Paperboard container	322210	\$61.6	2%	1%	13%	86%
			Paper Bag & Coated & Treated Paper	322220	\$29.9	11%	8%	12%	80%
			Stationery product	322230	\$9.6	12%	7%	12%	81%
			Sanitary paper product	322291	\$22.0	71%	41%	8%	51%

Broad industry	Broad NAICS	R&D intensity	Detailed NAICS	Detailed NAICS	Industry sales (\$ billion)	Share sold directly to consumers (PCE)	SUPPLY CHAIN SHARES		
							Retail	Wholesale + transport	Producers
Primary metals	331	0.8%	All other converted paper product	322299	\$7.5	20%	7%	14%	79%
			Iron and steel mills and ferroalloy	331110	\$189.2	0%	0%	12%	88%
			Steel product from purchased steel	331200	\$16.5	4%	7%	10%	83%
			Alumina refining and primary aluminum production	331313	\$21.3	0%	0%	10%	89%
			Nonferrous metal (except aluminum) smelting and refining	331410	\$54.3	0%	0%	11%	89%
			Copper rolling, drawing, extruding and alloying	331420	\$28.7	0%	0%	11%	89%
			Nonferrous metal (except copper and aluminum) rolling, drawing, extruding and alloying	331490	\$18.1	0%	0%	10%	90%
			Ferrous metal foundries	331510	\$22.3	0%	0%	11%	89%
			Nonferrous metal foundries	331520	\$14.2	0%	0%	11%	89%
Food	311	0.7%	Dog and cat food	311111	\$32.9	83%	29%	11%	60%
			Other animal food	311119	\$58.2	9%	3%	33%	65%
			Flour milling & malt	311210	\$27.3	26%	6%	17%	77%
			Wet corn milling	311221	\$20.4	6%	1%	18%	80%
			Soybean and other oilseed processing	311224	\$53.6	5%	1%	17%	81%
			Fats and oils refining and blending	311225	\$24.7	35%	9%	14%	77%
			Breakfast cereal	311230	\$15.9	92%	24%	12%	64%
			Sugar and confectionery product	311300	\$58.3	62%	17%	12%	71%
			Frozen food	311410	\$50.2	79%	21%	13%	66%
			Fruit and vegetable canning, pickling, and drying	311420	\$64.2	66%	18%	13%	69%
			Cheese	311513	\$50.4	44%	13%	10%	77%
			Dry, condensed, and evaporated dairy product	311514	\$28.5	47%	12%	13%	74%

Broad industry	Broad NAICS	R&D intensity	Detailed NAICS	Detailed NAICS	Industry sales (\$ billion)	Share sold directly to consumers (PCE)	SUPPLY CHAIN SHARES		
							Retail	Wholesale + transport	Producers
Food and beverage products	312	0.7%	Ice cream and frozen dessert	311520	\$9.3	33%	11%	11%	79%
			Poultry processing	311615	\$76.2	65%	19%	5%	76%
			Seafood product preparation and packaging	311700	\$18.8	45%	14%	8%	78%
			Bread and bakery product	311810	\$76.5	88%	24%	12%	65%
			Snack food	311910	\$51.1	81%	22%	11%	67%
			Coffee and tea	311920	\$20.0	54%	14%	13%	73%
			Flavoring syrup and concentrate	311930	\$15.4	3%	2%	14%	84%
			Seasoning and dressing	311940	\$30.0	61%	17%	12%	71%
			All other food	311990	\$43.5	73%	20%	13%	68%
			Soft drink and ice	312110	\$74.3	89%	24%	12%	64%
			Breweries	312120	\$65.9	81%	21%	26%	53%
			Wineries	312130	\$45.8	78%	19%	32%	49%
			Distilleries	312140	\$41.8	56%	14%	26%	60%
			Tobacco product	312200	\$100.8	94%	15%	27%	58%
Wood products	321	0.6%	Sawmills and wood preservation	321100	\$36.7	0%	0%	17%	82%
			Veneer, plywood, and engineered wood product	321200	\$27.3	0%	7%	15%	79%
			Millwork	321910	\$27.4	0%	19%	11%	70%
Printing and related support activities	323	0.6%	Printing	323110	\$81.7	14%	8%	11%	80%
			Support activities for printing	323120	\$4.9	0%	0%	5%	94%
Petroleum and coal products	324	0.1%	Petroleum refineries	324110	\$1,091.1	38%	7%	15%	78%
			Asphalt paving mixture and block	324121	\$16.5	0%	13%	7%	80%
			Asphalt shingle and coating materials	324122	\$12.0	0%	0%	12%	88%
			Other petroleum and coal products	324190	\$43.8	25%	8%	11%	81%

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