

Diversified Chemicals Industry

April 21, 2021

Materials

Industry Rating

Overweight

Investment Thesis

We recommend an **OVERWEIGHT** rating for the diversified chemicals industry over the next year. As the automobile, construction, manufacturing markets have gradually recovered from the pandemic, we expect the increasing demands from these end markets will contribute 10-years CAGR of 5.07% ^[11] for this industry.

Short-term tailwind will help this industry back to the pre-pandemic level. Compared to other sub-industries in the chemicals industry, the diversified chemicals industry is at the advantage of offsetting the risk exposure of the end markets by adjusting their multiple product portfolios. We expect this industry will outperform during the particular time.

Drivers of Thesis

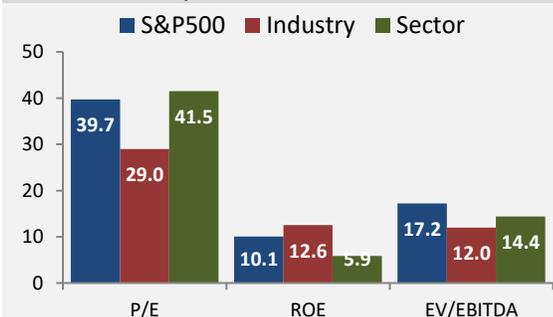
- Manufacturing PMI rebounded this April and is expected to continue going up, which indicates the recovery of the economy and manufacturing activities, providing a hopeful economic outlook for the industry.
- The principal end markets (automobile and household markets) of the diversified chemical industry are expected to grow by 12.2% and 2.3%, respectively, which will correspondingly increase the sales of chemical products, like interlayers, coatings, and paintings.
- Traded weighted index for the next year is projected to decrease, which will provide an advantage for the export of U.S. chemical companies exposed to global markets.

Risks to Thesis

- The volatile crude oil price, inflation rate, electricity results in difficulty to control the cost of production for companies in the industry.
- Stricter environment regulations for the pursuit of environmental sustainability will increase the companies' costs and diminish their profitability.

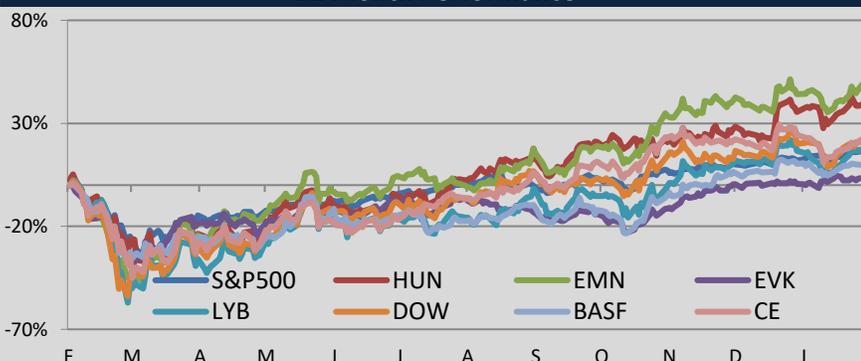
Key Industry Statistics

Market Cap (Millions)	Data Source: FactSet
BASF	74,620
Dow	43,795
LyondellBasell Industries	32,246
Evonik Industries	15,654
Eastman Chemical	15,198
Celanese	15,293
Huntsman Corporation	6,368
Gross Margin	
BASF	25.5%
Dow	12.5%
LyondellBasell Industries	11.8%
Evonik Industries	27.6%
Eastman Chemical	23.7%
Celanese	22.6%
Huntsman Corporation	18.3%
D/E Ratio	
BASF	62.8%
Dow	153.1%
LyondellBasell Industries	219.4%
Evonik Industries	47.9%
Eastman Chemical	96.2%
Celanese	112.5%
Huntsman Corporation	73.4%



Source: NetAdvantage

12 Month Performance



(Source: NetAdvantage)

Industry Description

Major diversified chemicals industry includes chemicals manufacture companies that operate various product lines -- commodity, specialty, fertilizers & agricultural, packaging chemicals and so forth. As a result, they also serve worldwide end markets from automobiles to cosmetics. By the nature of diversification, firms' product lines will overlap with some others but will not be ultimately the same.

EXECUTIVE SUMMARY

By seeing a short-term tailwind like the speed-up vaccine rollout, we feel confident that the diversified chemicals industry will be back to the pre-pandemic level in 2021.

Meanwhile, the industry's primary end markets (manufacturing, household, and automobile) have shown an increase in the earlier time of 2021 and are expected to contribute a long-term CAGR of 5.06% for the diversified industry.

From the long-term perspective, we can see companies in the industry are also trying to innovate new products and pursue sustainable development.

Overall, we recommend **Overweight** be taken for this industry.

INDUSTRY DESCRIPTION

Companies' Sizes

Top 10 Companies (Million)	Market Cap
Saudi Basic Industries Corp.	95,514.90
BASF SE	78,572.84
DuPont de Nemours, Inc.	41,420.34
Formosa Chemicals & Fibre Corporation	19,330.45
Evonik Industries AG	16,849.48
Eastman Chemical Company	15,610.61
Asahi Kasei Corporation	15,246.04
Mitsubishi Chemical Holdings Corporation	10,749.65
Arkema SA	9,698.05
Johnson Matthey Plc	8,546.65

(Source: FactSet ^[1])

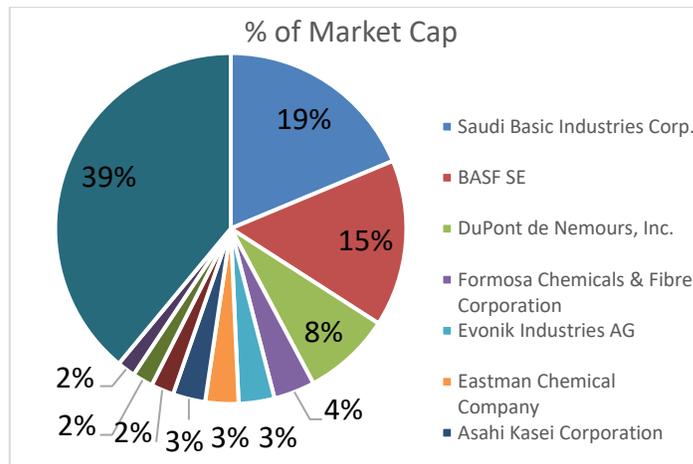
The table above presents the top 10 companies in the diversified chemical industry by Market capitalization. We can see the difference in market capitalization between these companies is very significant, indicating that companies in this industry have different sizes.

From the pie chart below, we can more clearly examine each company's proportion of total market capitalization.

The top 10 companies by market capitalization take up 61% of the total market capitalization, while other unlisted companies take up 39%. Saudi Basic Industries Corp

constitutes the most significant proportion, BASF constitutes the second, Dupont includes the third, and companies only take up a small proportion.

Overall, we think the diversified chemical industry is relatively fragmented as the sum of the top three players' proportion does not exceed 50%.



(Source: FactSet ^[1])

Companies' Profitability

The table below presents each companies' sales scales and operating margins. We can find the difference in sale scales between each company is significant.

Their operating margins vary based on different companies. Except for Johnson Matthey Plc, other companies in the industry gain over 10% operating margin.

Besides, the table indicates there is no direct relationship between companies' sizes and profitability. The average margin of the top 10 companies is 14.66%, a relatively high margin compared to low margin industries like chicken and groceries industries.

Top 10 Companies	Sales (Million)	Operating Margin
BASF SE	67,428.34	12.02%
Mitsubishi Chemical Holdings Corporation	32,931.57	11.91%
Saudi Basic Industries Corp.	31,167.01	16.39%
DuPont de Nemours, Inc.	20,397.00	24.51%
Asahi Kasei Corporation	19,789.66	13.74%

Johnson Matthey Plc	18,511.38	4.83%
Evonik Industries AG	13,906.55	15.46%
Arkema SA	8,987.56	14.92%
Formosa Chemicals & Fibre Corporation	8,602.44	12.77%
Eastman Chemical Company	8,464.00	20.07%

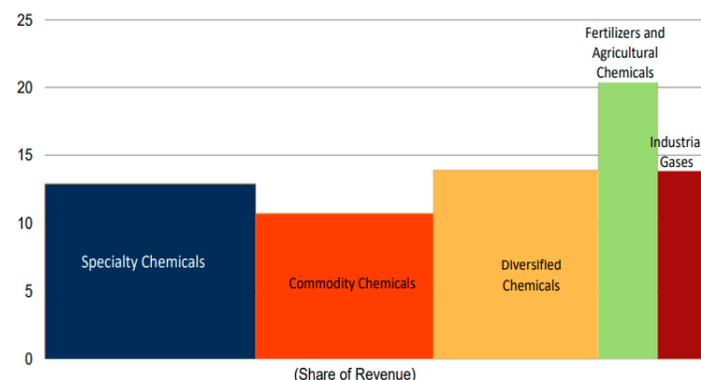
(Source: FactSet ^[1])

Besides, from the graph below, we can see the operating margin of the diversified chemical industry is slightly higher than the specialty and commodity chemicals industry.

Only the sub-industry, fertilizers and agricultural chemicals, has higher profitability than the diversified chemical industry. Therefore, compared to other sub-industries, we think the diversified chemicals industry may be more welcome for investors as relatively high profitability.

Moreover, we think it indicates that companies in this diversified industry are at an advantage to build better product portfolios by combining both specialty and commodity chemical productions.

PROFIT SHARE MAP OF CHEMICALS SUB-INDUSTRIES (2015-2019 AVERAGE)
(Operating Margin EBIT, in percent)



Source: CFRA, S&P Global Market Intelligence.

(Source: CFRA Chemicals Industry Research ^[2])

Overall, we believe the diversified chemical industry is relatively fragmented, and companies in the diversified chemical industry can vary in size and profitability.

On an average level, the diversified chemicals industry gains a reasonable operating margin.

There are no apparent economies of scale in the industry as Saudi Basic industries have the most important

proportion of total market capitalization but a medium level of profitability among these ten companies.

Products Produced in the Industry

BASF SE mainly supplies non-energy materials, including organic and petrochemical products, additives manufacturing, adhesive, coating and paint products, agrochemical products, performance chemical manufacturing, performance fibers and polymer products, and so forth ^[3].

Mitsubishi Chemical Holdings Corporation mainly supplies non-energy materials, including petrochemicals and alternative fuels, industrial gas, and mixed specialty and commodity chemical products ^[3].

Saudi Basic Industries Corp only supplies non-energy materials, including organic and petrochemical products and agrochemical products ^[3].

DuPont de Nemours, Inc mainly provides non-energy materials, including additives, sanitizing products, performance products, fibers, and polymer products, plastic products, and textile products ^[3].

Asahi Kasei Corporation's half revenues come from non-energy materials, including plastic and rubber materials, performance chemicals, and so forth. Other revenues come from miscellaneous retail and biopharmaceuticals ^[3].

Johnson Matthey Plc mainly supplies non-energy materials, including additives, adhesive, coating and paint products, and primary metals products ^[3].

Evonik Industries AG mainly supplies non-energy materials, including plastic and rubber materials, performance chemicals like additives, adhesive, fibers, and polymer ^[3].

Arkema SA only operates in non-energy materials, supplying organic and petrochemical products, additives, adhesive, coating and paint products, fibers, and polymer ^[3].

Formosa Chemicals & Fibre Corporation only supplies non-energy materials, including organic and petrochemical products, fibers, and polymer, textile and mixed specialty and commodity chemical products ^[3].

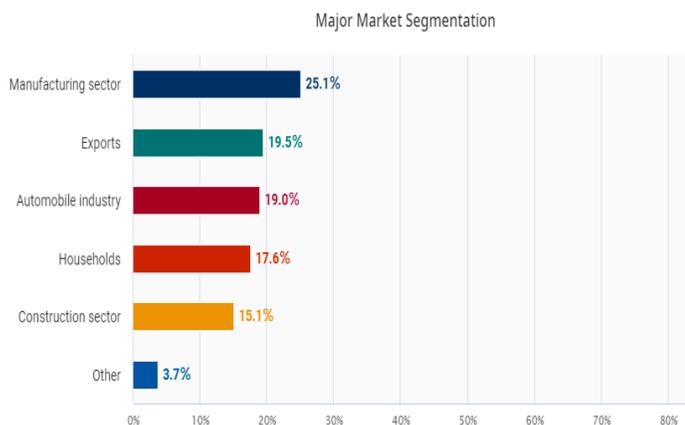
Eastman Chemical Company only supplies non-energy materials, including petrochemical products, additives, agrochemical products, plastic, fibers, polymer, and textile [3].

According to the introduction of these ten companies' products, we can find companies in this industry mainly supply non-energy materials, with different proportions of commodity and specialty chemical products.

The standard commodity chemical products we see here are organic and petrochemical. The specialty chemical products involve more diversified categories, like performance fibers and polymer, textile, additives, plastic, etc.

Companies in this industry usually supply their products to multiple end markets, including building and construction, transportation, agriculture, consumables, health and wellness, packaging, filtration media, and so forth.

Specifically, from the graph below, we can see the critical segmentation, showing manufacturing, exports, automobile industry, households, and construction markets are the main customers for chemical products. Whether these markets active directly decide the demands for chemical products.



(Source: IBIS World [4])

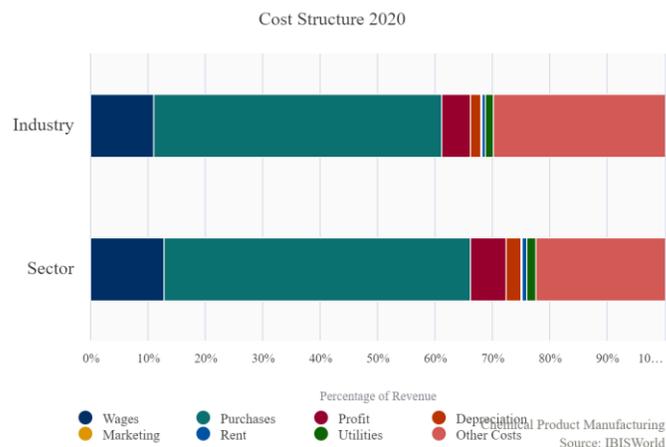
Cost Structure

The graph below presents the cost structure of the chemical industry. We can see that the purchase of raw materials takes up the largest component of industry spending, representing an estimated 50.1% of revenue in 2020.

We would think of the inflation rate as an indicator for the change in raw materials' price. That's because raw materials' prices can be easily affected by the increasing inflation rate if companies cannot pass through the price effect by contracts.

Other costs, consisting of various expenses such as professional, business, and legal fees, are anticipated to account for 29.8 % of industry revenue in 2020, the second proportion of total costs. We would use the potential lawsuit and compensation as indicators for other costs.

Wage is also an essential component for industry spending, estimated at 11.1% of industry revenue in 2020. Wage directly relates to how my employee is hired in the company. Usually, larger companies will hire more people. We will monitor the Wage payment by seeing if the company will set up new facilities in the future.



(Source: IBIS World [4])

INDUSTRY TRENDS

Plastics Ban

There are rising plastic banning trends globally and enforcing recycling regulations, becoming a big concern for the market's future growth. For example, as one of the world's most significant users of plastic, China has announced a ban on non-degradable bags in major cities by the end of 2020 and in all cities and towns by 2025 [5].

According to a report by the United Nations Environment Programme and the World Resources Institute (WRI), as of July 2018, at least 127 countries (192 under review) had passed some form of legislation to regulate plastic bags.

We can see that degradable or recycled plastics will be more prevalent in the future. Besides, we believe that bioplastics technology and mechanical and molecular recycling technology will be more commonplace in the future in terms of the technologies.

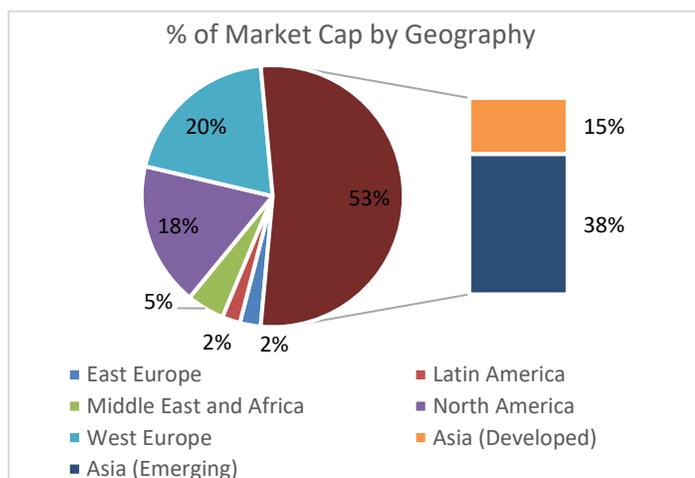
Stricter Regulations

Biden reported that he would propose focusing on improving water quality by limiting PFAS and designating PFAS as a hazardous substance. Plus, Biden will likely strengthen the current Toxic Substances Control Act (TSCA) program. Meanwhile, other countries' regulations have been more restricting for fighting environmental issues like climate change; we can predict higher operating costs for companies in the chemicals industry with heavier regulations in the future [6].

Technological changes

With the increasing concern on the current volume of non-degradable plastics globally, technologies in mechanical (collecting waste plastic remelting and using it to make other products) and molecular recycling (decomposition into component molecules) will be more popular. These technologies can convert waste plastics into plastic resins, the materials of plastics, and decomposes the plastics into component molecules to recycle. We have noticed that a handful of chemical companies have worked on producing recyclable plastics and renewable fibers. The technologies they use will be a long-term tailwind for them.

Emerging Markets



(Source: Bloomberg)

At present, the U.S. chemical market is at a mature stage, as shown by the declined demand for chemical products, restricted technological innovation in recent years, clearly defined product groups and users, and increased mergers and acquisitions in some sub-industries.

In contrast, we can see potential new opportunities in the emerging markets as high demands in house, transportation, and so forth from fast population growth.

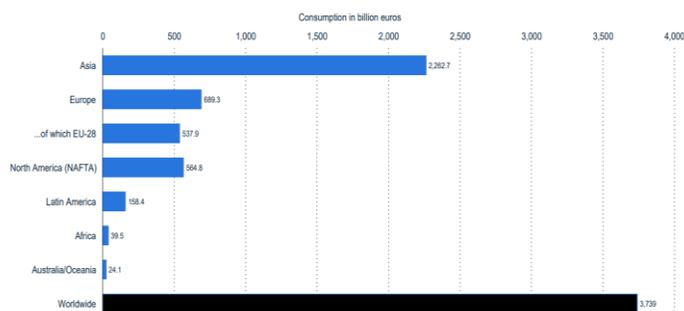
From the pie chart above, we can see Asian market accounts for 53% of the total market capitalization, and from the graph below, we can see that the Asia market also consumed most of the chemicals.

Therefore, we reasonably believe that emerging markets, including Asian, Latino America & Caribbean, and Middle East & Africa, will be a more active and profitable geographical market for this industry in the future.

Besides, we can see the future competition in the industry will focus on how competitors will expand their business in the emerging markets while maintaining current positions in their primary markets.

Global consumption of chemicals in 2019 by region (in billion euros)

Consumption of chemicals by world region 2019



(Source: Statista [7])

M&A activity within the industry

Companies in the diversified chemicals industry usually expand their product lines or enter other sub-industries by merger and acquisition activity.

Recently, companies within the industry try to construct the best product portfolio against the market's volatility.

The table below represents the number of M&A activities of companies within the industry.

We can see the number of acquisitions in the industry is considerable, indicating the industry has not consolidated. Besides, we can see BASF has done the most acquisition activities. Thus, we expect BASF to maintain its relatively strong market position and become a significant leader in the industry by organic and non-organic growth.

Company Name	Period	Number of M&A Deals
BASF	1992-2021	364
Eastman Chemical	2013-2019	86
Hunsmann	1992-2020	69
Celanese	1992-2020	65
Evonik Industries	2017-2020	57
LyondellBasell Inds	2000-2020	55
Dow	1996-2020	9

(Source: FactSet)

Market Drivers

Oil and gas Price

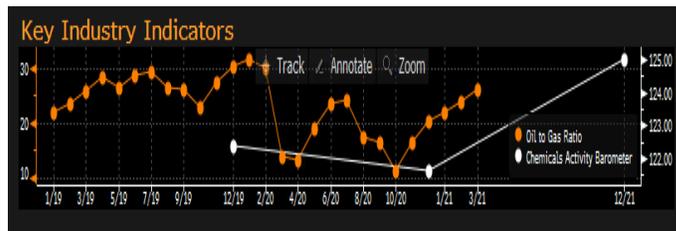
Ethylene and propylene are two of the most commonly used commodity chemicals and raw materials for versatile specialty chemicals, isolated from naphtha refined from crude oil or ethane, the second-largest natural gas component. That is why the oil and gas price has been a primary drive to the whole chemicals industry.

Historically, the U.S commodity chemicals companies have had the advantage in their low production cost for over a decade since the price of natural gas in the U.S is seven times lower than the crude oil price.

The graph below shows that the oil/gas ratio has bounced since December 2020 and is projected to continue increasing in the future as the demand for oil has risen since traveling is going back, and lots of airplanes will need the oil as fuels.

The increasing oil/gas ratio would be good news for EMN and other U.S chemical manufacturers because most of them extract their raw materials from gas, which is much cheaper than oil.

Therefore, they will be more advantaged than other chemical manufacturers outside of the U.S. or who heavily rely on the oil price.



(Source: Bloomberg)

GDP Growth Rate

The table below shows the International Monetary Fund (IMF)'s projection in the next two years -- that potential 5.5% global GDP in 2021, 6.3% in emerging markets, and 4.3% in developed markets.

Therefore, we can see that, besides the U.S economy, other areas in the world are also moderately recovering from the pandemic.

The economic recovery will benefit the diversified chemicals industry from the robust growth of various end markets.

	Actual	Estimate	Projections	
(real GDP, annual percent change)	2019	2020	2021	2022
World Output	2.8	-3.5	5.5	4.2
Advanced Economies	1.6	-4.9	4.3	3.1
United States	2.2	-3.4	5.1	2.5
Euro Area	1.3	-7.2	4.2	3.6
Japan	0.3	-5.1	3.1	2.4
United Kingdom	1.4	-10.0	4.5	5.0
Canada	1.9	-5.5	3.6	4.1
Emerging Market and Developing Economies	3.6	-2.4	6.3	5.0
Emerging and Developing Asia	5.4	-1.1	8.3	5.9
Emerging and Developing Europe	2.2	-2.8	4.0	3.9
Latin America and the Caribbean	0.2	-7.4	4.1	2.9
Middle East and Central Asia	1.4	-3.2	3.0	4.2
Sub-Saharan Africa	3.2	-2.6	3.2	3.9

Source: IMF, World Economic Outlook Update, January 2021

(Source: IMF ^[9])

End Markets

The automotive industry is a significant consumer of various chemicals. U.S. auto sales are expected to see a 12.2% growth rate in 2021, driven by improving consumer sentiment and low interest rates ^[2].

In December 2020, the number of homes was estimated to grow at an annualized rate of 2.3% over the last five years. With the low mortgage rates, the home building will continue to grow in the future ^[2].

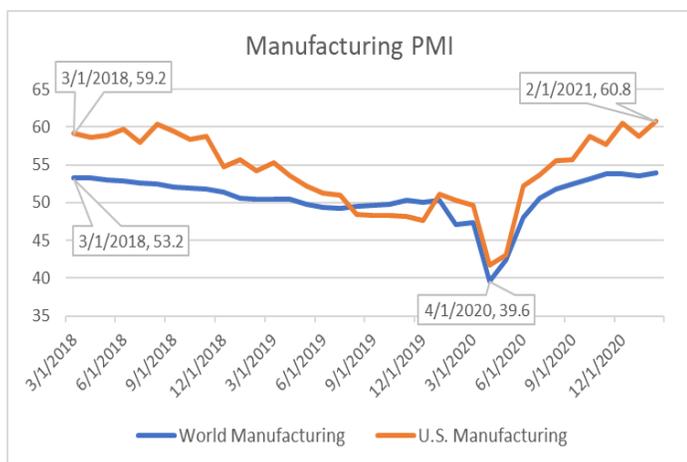
With the more active end markets, we estimate the diversified chemical industry will see substantial growth in the future.

Manufacture PMI

From the graph below, we can see that the PMI of the manufacturing industry in the United States and the world rebounded after June 2020, reaching 60.8 in early 2021.

Given by these figures, we believe that residential building and construction will expand next year and provide higher demand for diversified chemicals in contact with building materials, including polyurethane insulation, special plastics, adhesives ^[4].

When people begin to come back to work or travel in person, we can predict that the recovery of traffic trends will herald the various chemicals that support the automotive industry, including refrigerants, tire additives, polyurethane, and coatings.



(Source: Bloomberg)

Trade-weighted index

The trade-weighted index (TWI) measures the value of the U.S. dollar relative to other currencies. Higher TWI indicates more substantial dollars, which undermines exports but benefits to import and verse versa.

The line chart below shows that TWI will start to decrease after 2020, which means a positive effect on U.S. exports. Therefore, companies in the diversified chemicals industry, who are U.S. companies and sell products overseas, may benefit from the weaker dollars.



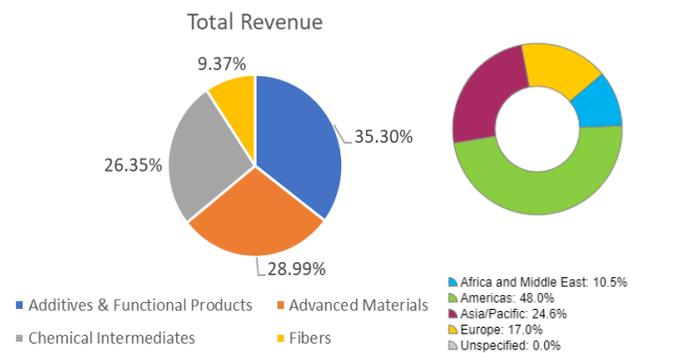
(Source: IBIS World ^[4])

MARKETS AND COMPETITION

Eastman Chemicals

EMN is an American company that engages in the provision of both commodity and specialty chemicals. From the pie chart below on the left, we can see EMN operates four main product lines – additives & functional products (35.3% of total revenue), advanced materials (28.99%), chemical intermediates (26.35%), and fibers (9.37%).

From the chart below on the right, we can see that America is the primary market of EMN (48% of total revenue), Asia/Pacific is the second market of EMN (24.6%), and the most miniature market in Africa and the Middle East.



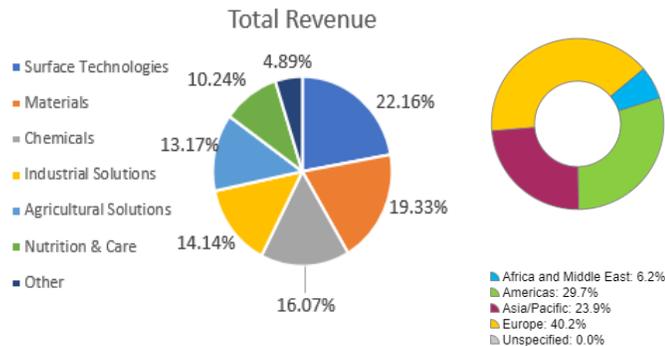
(Source: FactSet)

BASF SE

BASF, a German company, engages in the provision of both commodity and specialty chemicals as well. From the

graph below, we can see there are six primary business segments in BASF.

In terms of its geographical revenue distribution, we can see that BASF's primary market is Europe (40.2%), the second market in the Americas (29.7%), and the least in Africa and Middle East (6.2%).



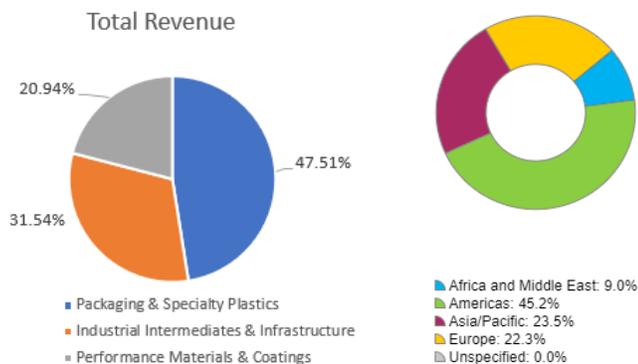
(Source: FactSet)

Dow, Inc.

DOW, a materials science company in the U.S., combining science and technology to develop innovative solutions.

It operates through three business segments: Performance Materials & Coatings (20.94%), Industrial Intermediates & Infrastructure (31.54%), and Packaging & Specialty Plastics (47.51%).

Meanwhile, DOW generates 45.2% of total revenue from the Americas, its primary market, 23.5% from Asia/Pacific, and 9.0% from Africa and the Middle East.

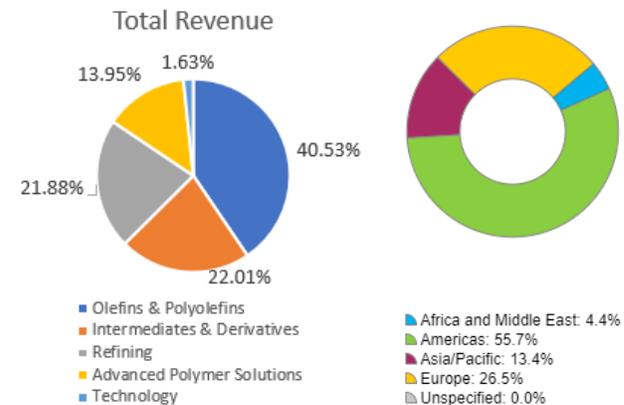


(Source: FactSet)

LyondellBasell Industries NV

LYB is an independent chemical company in the U.K., which engages in the refinery and production of plastic resins and other chemicals.

LYB targets the American market as the main area to sell products, generating 55.7% revenue from the market. LYB generates the most negligible revenue from Africa and the middle east (4.4%).

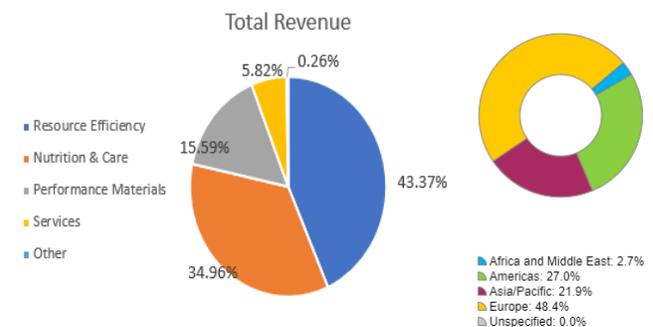


(Source: FactSet)

Evonik Industries AG

EVK is a German company, which engages in the manufacture of specialty chemical products. It operates through the following segments: Nutrition and Care, Resource Efficiency, Performance Materials, Services, and Other Operations.

EVK focuses more on the European market, which generates 48.4% of EVK's total revenue, and income from the American market is slightly higher than the Asian market.



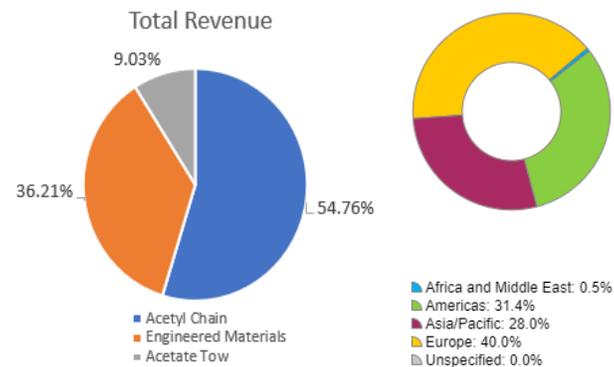
(Source: FactSet)

Celanese Corp

CE is a U.S company engaging in the provision of technology and specialty materials businesses.

It operates through the following segments: Engineered Materials (9.03%), Acetate Tow (54.76%), Acetyl Chain, and Other Activities (36.21%).

CE's primary market is Europe, which generates 40% of total revenue, and the second market is the American market, reaching 31.4% of total revenue.

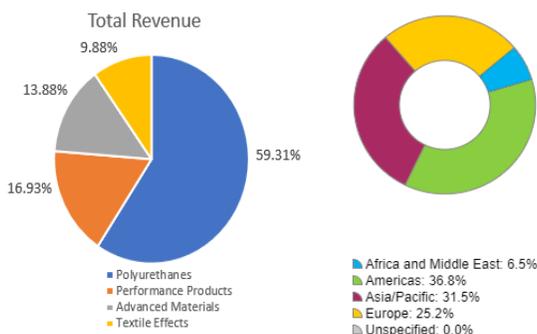


(Source: FactSet)

Huntsman Corp

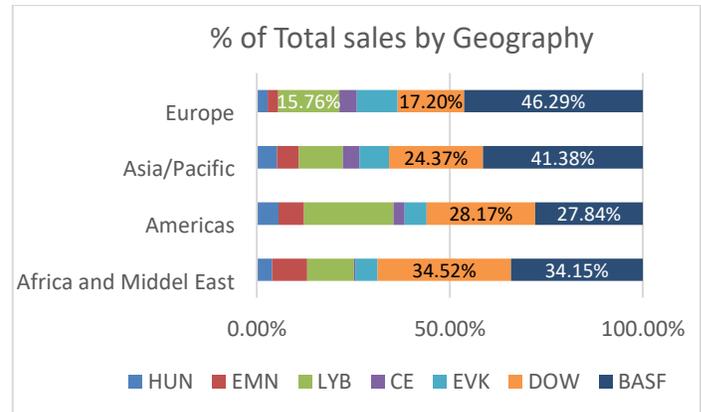
HUN is a U.S company that engages in manufacturing chemicals for the plastics, automotive, and construction industries.

Americas market is HUN's primary market as it generates 36.8% of its total revenue. HUN makes minor sales from Africa and the Middle East market.



(Source: FactSet)

Comparison by Geography



(Source: FactSet ^[10])

The chart above presents each companies' proportion of total sales by geography. We can see that BASF generates the most significant revenue in both the Europe and Asia/Pacific markets. Meanwhile, BASF faces the challenge from DOW due to its considerable proportions in these two markets.

On the other hand, DOW gains the most sales in the Americas, and Africa and Middle East markets. DOW also is threatened by very close proportions of BASF in these two markets.

Therefore, we can say DOW and BASF are the major rivals to each other in the global market.

Peer Comparisons

Profitability metrics

	Sales	Gross Margin	Net Margin
BASF	59316	27.23%	14.20%
DOW	42951	13.87%	-3.16%
LYB	34727	15.73%	9.76%
EVK	13108	28.19%	16.07%
EMN	9273	23.23%	8.19%
CE	6297	25.09%	13.53%
HUN	6797	20.33%	8.27%

(Source: FactSet & 10-K & NetAdvantage)

From the table above, we can see that BASF has the highest sales (\$59,316 million), which is approximately nine times higher than the lowest sales in HUN (\$6,797 million). The difference is mainly due to the two

companies' scales – HUN is a relatively small chemical company hiring 9000 employees and owning 70 manufacturing sites. But BASF is hiring 117,628 employees and owning 352 production sites.

In terms of the income metrics, we can see that EVK has the highest gross margin (28.19%) and net margin (16.07%), which indicates its ability to control its cost of production and high profitability; BASF has slightly lower gross margin (27.23%) and net margin (14.2%).

In conclusion, although EVK has better profit margins than BASF, we think BASF is still advantage at the sales scale and considerate profitability in the industry.

Solvency/Debt metrics

	D/E Ratio	Debt
BASF	0.62	A
DOW	1.46	BBB-
LYB	2.08	BBB-
EVK	0.55	BBB+
EMN	0.98	BBB-
CE	1.02	BBB-
HUN	0.7	BB+

(Source: FactSet & 10-K & NetAdvantage)

From the table above, we can see that EVK has the lowest D/E ratio (0.55), And BASF has the second-lowest D/E ratio (0.62). Correspondingly, the debt rating of EVK and BASF is better than other companies as well, which implies these two companies have better solvency than other companies. Overall, according to these financial metrics, we think BASF has the most powerful financial position among these competitors.

Operating metrics

	Inventory turnover	Working capital turnover	Sales per Employee
LYB	5.87	8.1	1.63
DOW	5.66	9	0.95
HUN	5.57	3.9	0.59
BASF	4.4	5.1	0.4
CE	4.29	6.2	0.43
EMN	4.28	6	0.57
EVK	3.71	4.1	0.5

(Source: FactSet & 10-K)

From the table, we can see that LYB has the highest inventory turnover (5.87), which implies that LYB can sell

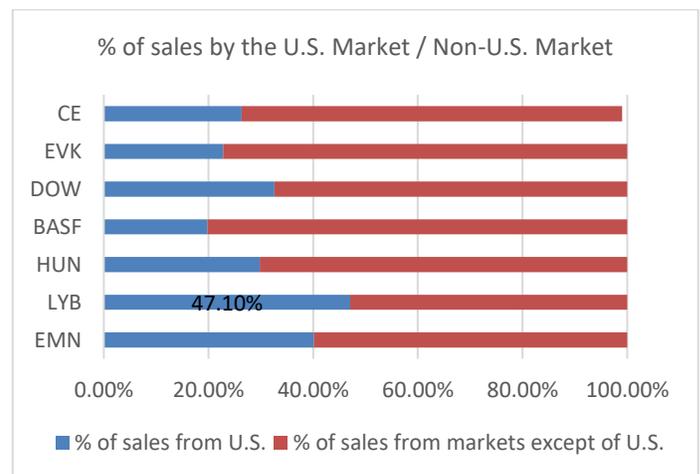
inventories approximately six times a year, showing a better operation ability than other companies. BASF is about at a medium level in terms of this metric.

For the working capital turnover, the highest number can be seen in DOW (9), indicating that DOW is more efficient in using its short-term assets and liabilities to support sales. Noticeably, LYB has the second-highest working capital turnover (8.1).

Moving on, LYB generates 1.63 dollars per employee, indicating a high business efficiency while BASF generates the least dollar per employee.

Overall, we think LYB has shown a best operating and management ability compared to its competitors. However, BASF seems less competitive for the operating metrics.

Sales in the U.S. market and non-U.S. Market



(Source: FactSet & 10-K)

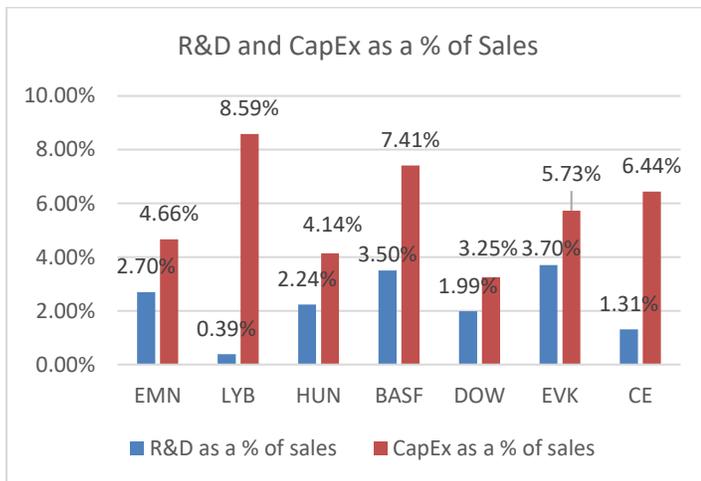
From the graph above, we can see that its percentage of sales from markets except the U.S. market is more significant than from U.S. markets. We think it indicates the globalization trends in the industry.

R&D and CapEX

From the graph below, we can see that BASF and EVK have invested most of their sales in R&D, which reach 3.7% of sales and 3.5%, respectively.

Furthermore, LYB invests most of its sales in capital expenditure (8.59% of total sales), implying the increasing investment in property, plant building, technology, or

equipment, which may bring potential profits in the future. One more reason behind it is LYB is in a growth state. However, as a company that has developed for hundreds of years, BASF still invests a considerable rate of its sales in capital expenditure (7.41%). We think BASF will be able to expand its position in the market by doing so.



(Source: FactSet & 10-K)

In conclusion

By comparing the sales by geography, financial metrics, operating metrics, and other metrics, we would consider BASF a leader in the diversified chemical industry. It has shown a grand sales scale in the global market, solid profitability, and adequate investment in R&D and CapEX for future development. One concern for BASF is if its ability to manage assets and employees can keep pace with expansion. Generally, we feel confident about BASF's future development.

Industry Landscape

Porter's 5-Forces Analysis

Degree of rivalry/competition (Medium)

Companies in the diversified chemical industry will compete with different competitors in different chemical products. Therefore, the competition can vary according to the specific product lines. Broadly speaking, although companies try to differentiate themselves by operating other products or operating in different niche markets, the number of competitors in each sub-industry is still considerable. Therefore, we think the degree of rivalry is medium.

Bargaining Power of Customers (Medium)

Companies supply both commodity and specialty chemicals in this industry. For commodity chemicals, customers have a strong bargaining power since they can easily find alternatives for these chemicals.

In contrast, customers may have relatively weak bargaining power with specialty chemicals because they can find it challenging to find alternative products.

To consider both scenarios, customers in the diversified chemical industry tend to have moderate bargaining power.

Bargaining Power of suppliers (Low)

One important characteristic that companies in the diversified chemicals industry are companies can realize complementarity between products by adjusting the product lines.

Although not all companies can realize upstream vertical integration, some companies can produce the raw materials for their specialty products, which decreases their reliance on the suppliers. From this point, we argue that the industry's bargaining power of suppliers is relatively low.

EMN has realized upstream vertical integration in the CI segment, allowing it to directly produce the raw materials needed and support growth in specialty product lines throughout the company. Hence, its bargaining power of suppliers is relatively low compared to the level of the industry.

Threat of substitution (Low)

Generally, commodity chemical products in the industry tend to be easier to be replaced, while the specialty industry is more difficult to be replaced. To sum up, the diversified chemical industry has faced a medium threat of substitution.

Threat of entrants (Low)

The diversified chemicals industry has a higher barrier for new entrants. Segments like compound resin, photographic films, plates, and paper manufacturing included in the diversified sector require entrants to have the facilities, equipment, and technical expertise to remain competitive.

The ability to access competitively priced raw materials and inputs, including base resins, can also be a significant barrier. Overall, the threat of entrants is between low and medium.

Overall, we think the future competition in the industry will focus on the companies' positions in profitable niche markets or geographical markets, abilities to set up or merge new product lines, and abilities to control costs.

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