Benchmarking the Journey of the World's 30 Most Productive Companies

The COO's Guide to Profitable Growth through Leadership, Strategy, & Culture

Executive Summary: Inaugural Report and Industrial Productivity Index Results

LNS Research

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Section 1

President's Letter

President's Letter

Productivity growth is the engine and enduring gift of our capitalist system, where limited resources, competition, and innovation form a symbiotic relationship that powers cycles of incremental and step change improvements.

For our economy, productivity and population growth are the only two ways to grow Gross Domestic Product (GDP), and productivity growth is the only way to improve our society's standard of living.

For companies, productivity growth is the only way for operations to sustainably grow the value delivered to customers, shareholders, and other stakeholders.

Unfortunately, the global industrial sector has been in the throes of a multi-decade productivity decline despite significant investment in new plants, equipment, and technology.

- Labor productivity growth has been anemic across North America and Europe. The United States, the world's second-largest manufacturing economy, has seen a net decline in productivity since the end of the 2008 global financial crisis.
- Labor productivity growth has dramatically slowed in China, the world's largest manufacturing economy. Since the onset of COVID-19, free trade, demographics, capacity, infrastructure, and local demand have all turned from tailwinds to headwinds.
- Overall industrial productivity has declined even more precipitously. The LNS Research industrial productivity Index shows a decline of 39% from 2004 to 2020.

LNS Research's mission is to empower COOs to transform their organizations, and our vision is one where industrial companies become agile, autonomous, and sustainable. In pursuit of this mission, *Productivity Pathfinders* - our yearly study to identify the world's most productive companies – shows there are a select few companies bucking the trend and making this vision a reality.

Productivity growth is the only way for COOs to sustainably grow the value delivered to customers, shareholders, and other stakeholders. Unfortunately, the global industrial sector has been in the throes of a multi-decade productivity decline despite significant investment in new plants, equipment, and technology.

President's Letter (Cont.)

Compared to other companies in the past six years, Productivity Pathfinders have enjoyed similar revenue growth as other companies, but unlike other companies, turned that revenue growth into dramatic increases in operating margin, free cash flow, and market cap growth.

Key Financial Metrics
2017-2023 Median Performance

	Revenue Growth	Operating Margin Growth	Free Cash Flow Growth	Market Cap Growth
Productivity Pathfinders	33.2%	33.0%	44.21%	55.8%
All Others	33.0%	-2.4%	26.8%	18.6%

The performance of these Pathfinders is inspiring. They have proven dramatic and sustained productivity growth is possible, is a direct path to profitable growth, and materially impacts both free cash flow and enterprise value.

With the pace of technology innovation and pledged capital investment, I am incredibly bullish on the long-term potential for Chief Operating Officers to drive change and be an engine of growth for our companies, economies, and society.

I hope you find this inaugural research inspiring, insightful, and impactful on your company's Industrial Transformation journey.

Regards,

Matthew Littlefield
President, LNS Research

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Section 2

Executive Summary

Executive Summary

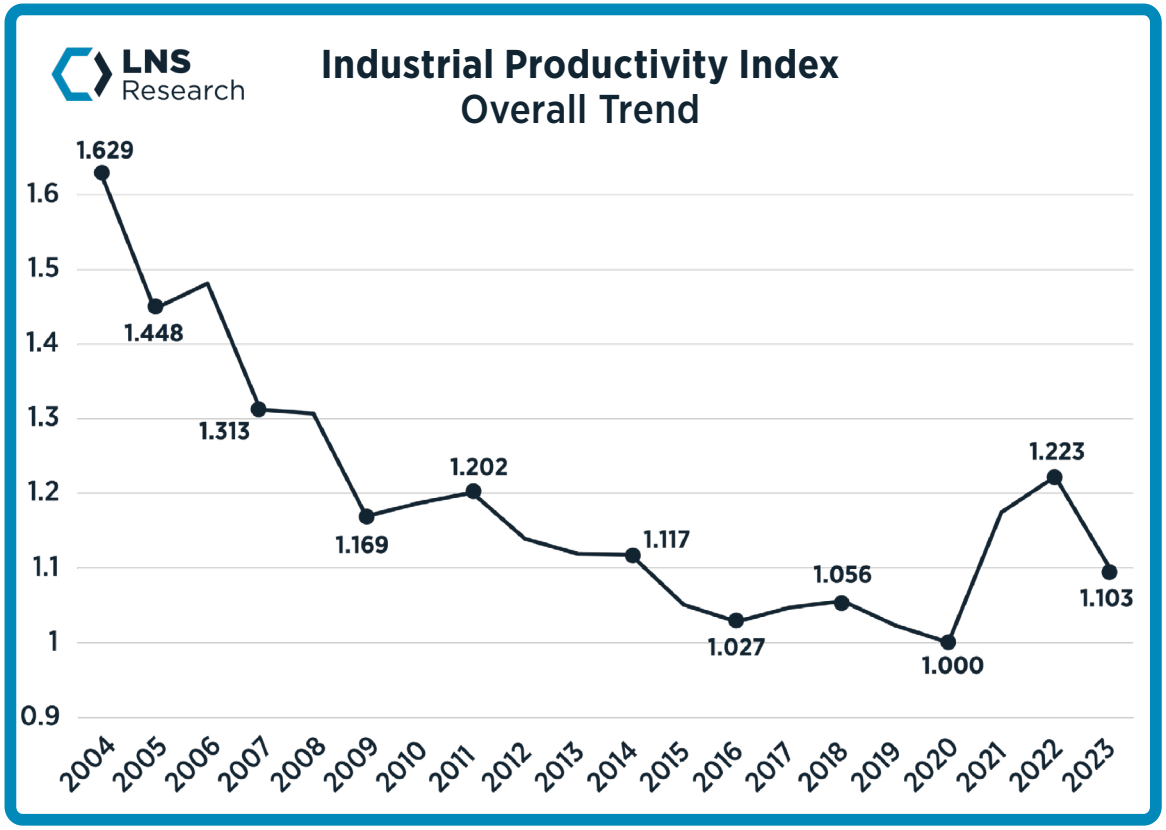
The LNS Research Industrial Productivity Index, which tracks productivity in over 330 publicly traded companies across 10 verticals, shows a steady and precipitous decline for most of the past 20 years.

From 2004 to 2016, industrial productivity declined 37.0%, averaging an over 3% yearly decline. From 2016 to 2020, the declines began to flatten, with annual decreases averaging under 1%. Fortunately, the trend finally broke in 2020, and from 2021 to 2022, productivity increased by over 22%.

Does this reversal represent the start of a new industrial productivity paradigm in earnest? Will the AI revolution power companies to never-before-seen levels of efficiency and effectiveness? Only time will tell, but we know several things for sure.

The first thing we know is that the path forward won't be a straight line up, and 2024 will be a pivotal year.

Industrial companies have already given back half of the previous two years' gains in 2023. They have also spent much of 2024 responding by restructuring and reorganizing their businesses. Will these efforts pay off? It depends on multiple factors, both internal and external.

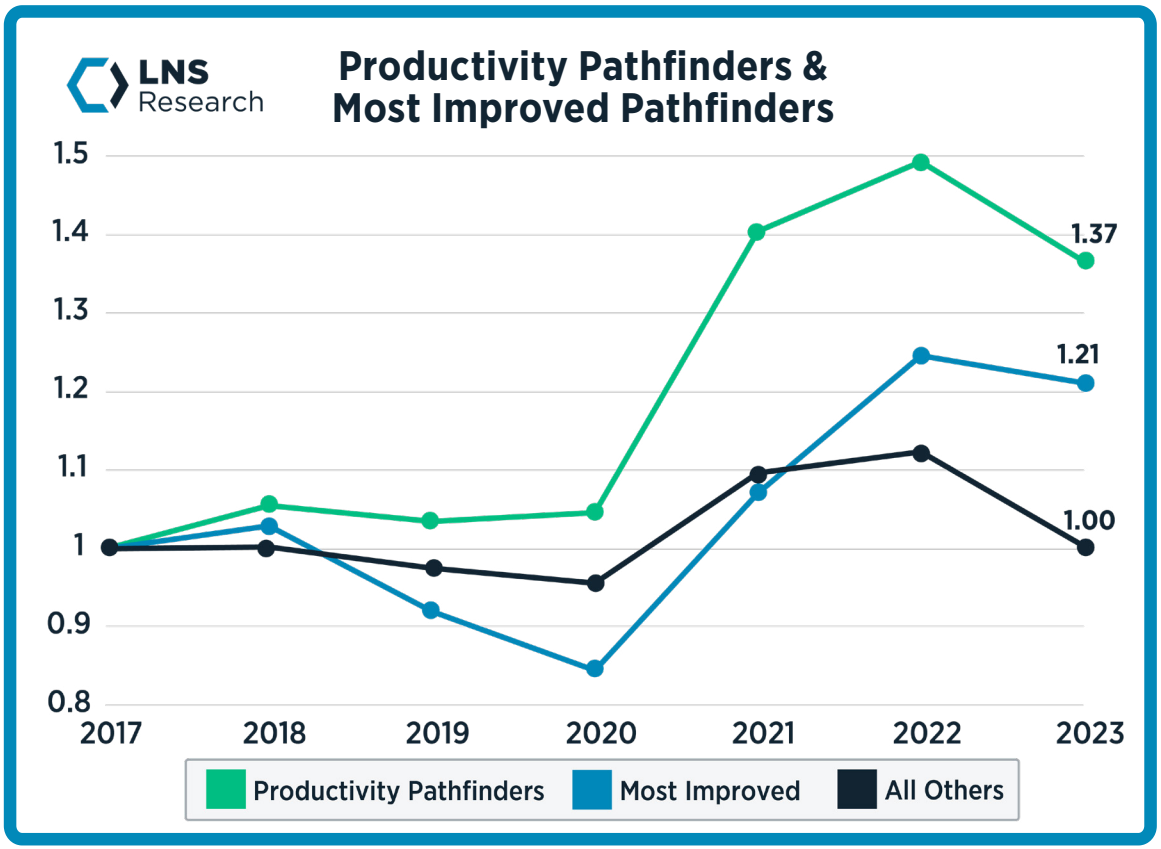


Executive Summary (Cont.)

Internally, were these restructuring and reorganization efforts transformative to the business? Did they enable resources to be better allocated? Did they improve employees' ability to make more effective decisions more quickly? Or were they primarily cost-cutting efforts that pushed the answers to these questions to the negative?

Externally, there is evidence that economic tailwinds are returning, with central banks across most regions moving to a more accommodating stance. Many economists contend we are in a Goldilocks period of balancing economic growth, price stability, and labor market stability. If this viewpoint proves true, and we avoid an economic recession, cyclic and capital-intensive industries like the industrial sector are well positioned to grow.

The second thing we know is that productivity gains are not evenly distributed across all firms. When individual companies are examined, we see that the top three performers in each industry dramatically outperform other companies.



Executive Summary (Cont.)

Productivity Pathfinders – The 30 companies, three per industry, with the highest industrial productivity growth over the past three years and above average growth the three years prior – grew productivity 37% more than the other 300+ companies in the index since 2017.

Executive Summary (Cont.)

Most Improved Pathfinders – The 30 companies, three per industry, with the highest industrial productivity growth over the past three years and below average growth the three years prior – grew productivity 21% more than the non-Pathfinder companies in the index since 2017.

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Section 3

Appendix A: The Industrial Productivity Index

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The world of operational and financial performance is inextricably linked, and the relationship is nowhere more pronounced than with productivity and profitability.

Profitability directly impacts earnings per share (EPS) and market cap, with growth in these metrics often directly tied to C-Suite compensation. Profitability is relatively easy to grow in the short-term and there is not a CEO or CFO of a publicly traded company that doesn't have a deep and complete understanding of their operating margin, where it has been in the past, and where they forecast it to be in the future.

Unfortunately, the same can't be said for productivity or long-term profitability growth. It can be very challenging to grow productivity in the long-term without significant investments in continuous improvement, transformation, and innovation. There are also very few COOs that consistently measure, report on, and improve industrial productivity.

Defining Productivity and Profitability

Productivity is calculated as Output / Input. Profitability is calculated as Output – Input / Output; where productivity is typically measured in terms of operational performance and profitability is typically measured in terms of financial performance.

Productivity, within operations, can be measured in many different terms but most commonly is measured as labor productivity or labor hours per unit of output. Profitability, within finance, can also be measured in many different terms, and most often as either Gross Margin (inputs = COGS), Operating Margin (inputs = GOGS + SG&A), or Net Profit Margins (inputs = COGS +SG&A + ITDA).

All else being equal, in theory, if productivity and profitability are both measured in common and constant terms, any increase in productivity on the operations side will result in an increase in profitability on the finance side.

In practice, things are never that simple.

Everyone intuitively understands productivity and grasps the idea that if I can get more out of a system for the same or less than I put into that system, it is a good thing, and this change is productivity growth.

However, things can quickly get complicated, especially when we look beyond a single input.

The typical measure of productivity is labor productivity and improving labor productivity is straightforward. In fact, economists define three ways to improve productivity:

- Capital Intensity (i.e., better assets)
- Labor Composition (i.e., more skilled and experienced employees)
- Multifactor Productivity (i.e., better leadership, technology, strategy, culture, etc.)

So, we can improve labor productivity. But labor is just one input. Materials, energy, assets, and transportation also are required inputs to deliver a product to a customer.

Appendix A: The Industrial Productivity Index (Cont.)

So, how do we measure and balance the mix of inputs across these categories to maximize productivity growth across all inputs and outputs?

Price, of course, is the answer. It is the only measure that easily goes across all inputs. Trying to optimize labor hours worked, pounds of materials consumed, kilowatts of energy consumed, assets depreciated, and trucks-rolled per unit of output is a fool's errand. And using price neatly moves productivity from an operational to a financial metric

But price introduces its own complications.

Non-price measures never vary. A metric ton of steel is always a metric ton of steel. A kilowatt-hour (kWh) of energy is always a kilowatt-hour of energy. But $500 of metric ton steel in 2024 is not equal to $500 of metric ton steel in 2023, and $1000 of kWh energy in 2024 is not equal to $1000 kWh of energy in 2023.

So, to effectively measure overall industrial productivity, we have to account for pricing changes across all inputs and outputs, which is why it is entirely possible for a company in the same year to both decrease productivity and increase in profitability – or vice versa; this is not a simple or intuitive concept to grasp.

Defining the Industrial Productivity Index

To study, benchmark, and improve productivity, we need a measure of productivity that can be both scaled up to the macro and the entire industrial economy, as well as down to the micro and a specific firm.

Enter LNS Research's Industrial Productivity Index.

For this index, we have identified 330+ publicly traded (listed on NASDAQ or NYSE) global companies across 10 verticals that have significant internal industrial operations. We have then, using CPI and PPI indexed prices in 100+ product categories, estimated the mix of inputs and outputs for each company across labor, materials, energy, assets, and delivery, creating a price adjusted COGS and Revenue for each company for each year for the past 20 years.

We then divide indexed and adjusted COGS by indexed and adjusted Revenue and create a weighted average by indexed and adjusted Revenue, across all these companies, giving us the following results:

Figure 14 - Industrial Productivity Index

Appendix A: The Industrial Productivity Index (Cont.)

It may not be a surprise to some, but this is the first research to show that the global industrial base has been in a secular decline for the better part of the past two decades, hitting its low in our index year of 2020.

Yes, there are some caveats. This index is based on US-listed companies (ADRs are included), which broadly reflects North American, South America, European, Japanese, and Australian companies. It also includes significant operations across Asia, including China, but excludes state owned enterprises from across Asia and the Middle East.

Nevertheless, no degree of financial engineering can hide the fact that from 2004 to 2020 productivity declined dramatically (38.6%) for many reasons, including:

- Loss of skilled labor
- Aging infrastructure
- Stagnation of continuous improvement initiatives
- Lacking investment in R&D and innovation
- Lack of new approaches to uniquely leverage new technology

The picture is even worse in some industries.

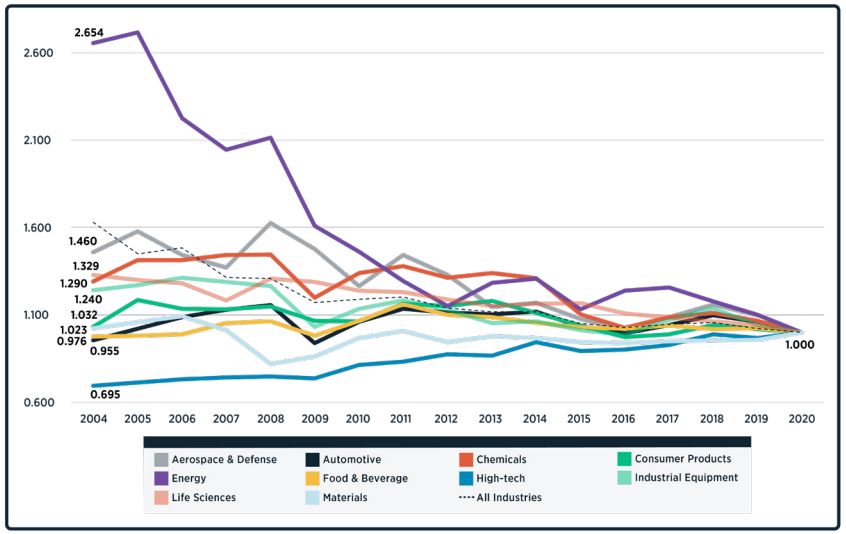

Figure 15 - Industrial Productivity Index by Vertical, 2004 - 2020

The energy industry has been by far the worst performer when compared to other industries and is a clear drag on the overall index. The vertical is the prototypical example of being profitable and unproductive. But the industry at large also faces unique challenges – with its more pronounced boom and bust cycles as compared to other industries and especially on the regulatory and asset investment fronts – both of which are intertwined in complicated ways and limit productivity growth.

Appendix A: The Industrial Productivity Index (Cont.)

The aerospace and defense industry is another industry that has clearly struggled historically with productivity. Although the industry has a legacy of engineering, manufacturing, and quality excellence, this heritage has degraded over the past few decades. Further, the industry is highly concentrated, often has huge order book backlogs, and still uses cost-plus contract structures with federal agencies that do not properly measure or reward productivity gains – all significant headwinds.

But not all industries have struggled. In fact, there are three industries that have grown productivity from 2004 to 2020. Most notably, the high-tech industry has grown productivity 45% over that time. The trends of specialization in manufacturing as a service, collaboration and information sharing across the supply chain, delivered quality improvements, and leveraging relatively lower cost higher skilled workforces are clearly yielding results.

Although not nearly as dramatic, the food and beverage and automotive industries have also been bright spots in productivity, with modest productivity improvements from 2004 to 2020. These industries have also invested in more outsourced manufacturing and improved collaboration and information sharing across the supply chain. They also have maintained strong delivered quality cultures and, particularly in automotive, have a focus on excellence programs like Lean, TPS, and WCM.

2020 – A Trend Reversal?

The world stopped in March 2020, and nothing has been the same since. This has played out in almost every aspect of our personal and professional lives. It has also played out in manufacturing operations. The workforce isn't the same. The technology landscape isn't the same. Productivity performance isn't the same.

During, and in the immediate aftermath of the pandemic, productivity growth made a dramatic pivot from negative to positive. Demand was up, input costs were stable, investment in advanced digital technology was high, and total workforce headcount was down (but people were focused). These conditions were a recipe for dramatic productivity growth – in fact, 22.3% from 2020 to 2022.

But it was not to last. Supply shortages for materials and labor meant both inflation and disruptions. At the same time, the increasing availability and demand for the service economy and the reduction of fiscal stimulus led to an overall decrease in demand for goods and the industrial sector gave back half the productivity gains from the past two years.

So, the big question is, was 2020 a major trend reversal or a blip on the larger downward cycle? The verdict is still out.

Moreover, 2024 has competing macro forces pushing in competing directions and many of the decisions made this year have not fully played out.

Appendix A: The Industrial Productivity Index (Cont.)

At the macro-level, many manufacturers are still facing soft demand, still have a lack of skilled labor, and are still working through inventory imbalances due to the pandemic. But to the positive, central banks have moved to an accommodative posture to bolster demand; there have been largely unforeseen and rapid improvements in AI and the ability to drive automation and improved decision-making.

There are also pockets of strength by industry. High-tech and life sciences, which haven't been hit as hard as other industries by labor and demand issues, were largely flat from 2022 to 2023, happily avoiding the dramatic declines experienced by some industries, like energy, materials, automotive and aerospace and defense, which have been more susceptible to labor challenges and interest rate sensitive demand reductions, respectively.

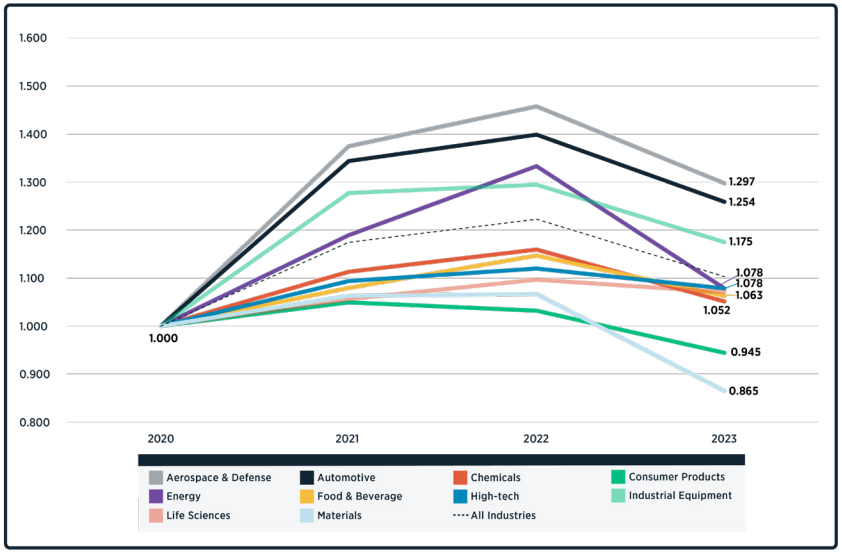

Figure 16 - Industrial Productivity Index by Vertical, 2020 - 2023

At the micro-level, many manufacturers spent 2023 and 2024 reorganizing, spinning off, and cost-cutting. There was surely some fat to trim from the go-go days of 2021 and 2022, but did we cut into lean tissue and bone? We should know by mid-2025. Early signs show profitability growth is solid in the second half of 2024 – but we still don't know if it was driven by simple cost-cutting or meaningful productivity growth, and if it is sustainable in the long-term.

One thing we do already know for sure, despite what happens across the industrial economy, there is a subset of firms that are bucking these broader trends and well positioned to grow productivity either way – Pathfinders.

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Section 4

Appendix B: Industrial Productivity Index Research Methodology

Appendix B: Industrial Productivity Index Research Methodology and Definitions

Industrial Productivity Index Definitions

Industrial Productivity Growth is defined by LNS Research as the year over year change in Revenue / COGS, where we estimate and price-adjust the mix of each across energy, materials, assets, labor, delivery, and products.

The Industrial Productivity Index is then created as a price-adjusted weighted average, by revenue, across all major firms, with significant industrial operations, that are audited and publicly traded on major US-based stock exchanges (NYSE and NASDAQ).

Data Collection and Tools

For the Industrial Productivity Index and Pathfinders research, LNS Research leverages a broad set of tools and data sets, both third-party and proprietary.

Data sources include, but are not limited to: LNS Research survey results, LNS Research member maturity assessments, LNS Research vendor briefings, LNS Research event presentations, annual reports, sustainability reports, press releases, company websites, investor relations, US Bureau of Labor Statistics (CPI, PPI), US Federal Reserve Board, Federal Reserve Bank of St. Louis, IMF, and World Bank.

Tools include, but are not limited to: YCharts, ChatGPT 4.0 Enterprise, Otter.ai, Statista, and Qualtrics.

Appendix B: Industrial Productivity Index Research Methodology and Definitions (Cont.)

Product Category Definitions

The Industrial Productivity Index and Pathfinder analysis is based on a comprehensive assessment of over 300 companies, 10 industries, and more than 100 product pricing categories. The product categories and company industry assignments are based on multiple factors, such as the company's specific focus within the industry, the type of products produced, and its role in the value chain, among others.

The study also accounts for uniqueness across companies, including conglomerates with multiple product categories/industries, vertical integration, spinoffs, divestitures, mergers, and acquisitions.

Product industries and associated pricing categories include, but are not limited to:

- **Aerospace & Defense:** The aerospace and defense companies were grouped based on production focus, ranging from OEM providers (aircraft, shipbuilding) to suppliers of control systems, engines, and defense systems. We also accounted for certain diversified companies with footprints in multiple categories:
  - Aircraft
  - Defense and military systems (armored vehicles, ships and boats, weapon systems, etc.)
  - Aircraft parts (control systems, engine and components, etc.)
- **Automotive:** The Automotive sector was split by vehicle types (electric, gas-powered, heavy duty) and a wide range of suppliers differentiated by components, like powertrains, interiors, exteriors, electronics, and tires:
  - Electric vehicles
  - Gas-powered vehicles
  - Heavy-duty and motorcycles
  - Aftermarket parts
  - Electrical and electronics components
  - Exterior and chassis components
  - Interiors
  - Powertrain and transmission
  - Tires
- **Chemicals:** Chemicals were organized by product specialization, including basic chemicals, specialty chemicals, agrichemicals, and industrial applications, like water treatment and coatings:
  - Agrichemicals
  - Basic and commodity chemicals
  - Industrial gases
  - Paint and coatings
  - Specialty chemicals (plastics materials and resin, miscellaneous, etc.)
  - Water treatment

Appendix B: Industrial Productivity Index Research Methodology and Definitions (Cont.)

- **Consumer Products:** The consumer products sector was based on product type, focusing on durable goods, sporting goods, fast-moving consumer goods, including personal care and tobacco products:
  - Consumer durable goods
  - Home and personal care
  - Sporting goods
  - Tobacco
- **Energy:** The Energy industry was divided by energy sources (coal, oil, natural gas) and the value chain, including upstream, midstream, and downstream oil operations and electric power generation:
  - Coal
  - Electric power
  - Natural gas
  - Oil and gas (extraction, transportation, refineries)
- **Food & Beverage:** Categories in this industry were based on product type, with a split between alcoholic and non-alcoholic beverages, agricultural products, and a range of packaged foods like snacks, dairy, and confectionery. Several of the packaged food companies had different levels of vertical integration, which was accounted for, in addition to product type mixes:
  - Agricultural commodities and products
  - Beverages
  - Ingredients and flavors
  - Packaged (cereal, confectionery, dairy, etc.)
- **High-tech:** The sub-industries were divided between equipment manufacturing, including computing and connectivity equipment, and component production (solar panels). We also accounted for differences between semiconductor fabs and electronic manufacturing services (EMS) companies:
  - Connectivity equipment
  - Personal computing equipment
  - Semiconductor chips and printed circuit boards assembly
  - Solar panels
- **Industrial Equipment:** The Industrial equipment sector was grouped by equipment type, covering areas such as construction and agricultural machinery, industrial automation, HVAC, power systems, and specialty machinery. This category also includes conglomerates that have businesses sprawling across multiple sectors:
  - Agricultural and construction machinery
  - Automation and electrical equipment
  - Elevators and escalators
  - Fluid power systems
  - HVAC and refrigeration systems
  - Industrial Conglomerates
  - Power generation equipment
  - Semiconductor components
  - Specialty machinery and equipment

Appendix B: Industrial Productivity Index Research Methodology and Definitions (Cont.)

- **Life Sciences:** The Life Sciences industry was split by the type of health and medical focus, including biotech, pharmaceuticals, medical devices, and contract manufacturers. The pharmaceutical industry accounts for pricing differences between specialized pharma companies and the larger, more diversified ones, with scope to further differentiate based on the type of drugs and diseases targeted:
  - Biotech
  - CDMO and distributors
  - Medical devices
  - Pharmaceuticals (diversified across disease areas)
  - Pharmaceuticals (specialized disease areas)
- **Materials:** The diverse materials industry includes an assortment of companies, ranging from metals, mining, and minerals companies that refine, process, and mine metals, accounting for price changes across specific metals like Aluminum, Copper, Gold, Steel, etc. Additionally, the industry also includes several types of building material companies, packaging, and specialty materials that account for price changes based on their products:
  - Building materials (aggregates and construction, home improvement, roofing, etc.)
  - Metals and mining (Aluminum, Copper, Gold, etc.)
  - Packaging (glass, metal, plastic, etc.)
  - Specialty materials

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