



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

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

Inaugural Report and Industrial Productivity Index Results

# Pathfinders 2024 – Benchmarking the Journey of the World's 30 Most Productive Companies

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

Inaugural Report and Industrial Productivity Index Results



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## **Section 1**

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# **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

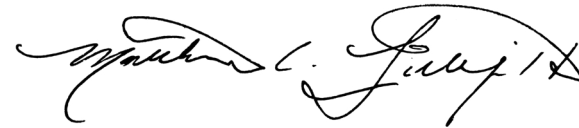
|                          | Revenue Growth | Operating Margin Growth | Free Cash Flow Growth | Market Cap Growth |
|--------------------------|----------------|-------------------------|-----------------------|-------------------|
| Productivity Pathfinders | 33.2%          | 33.0%                   | 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



## **Section 2**

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# **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.

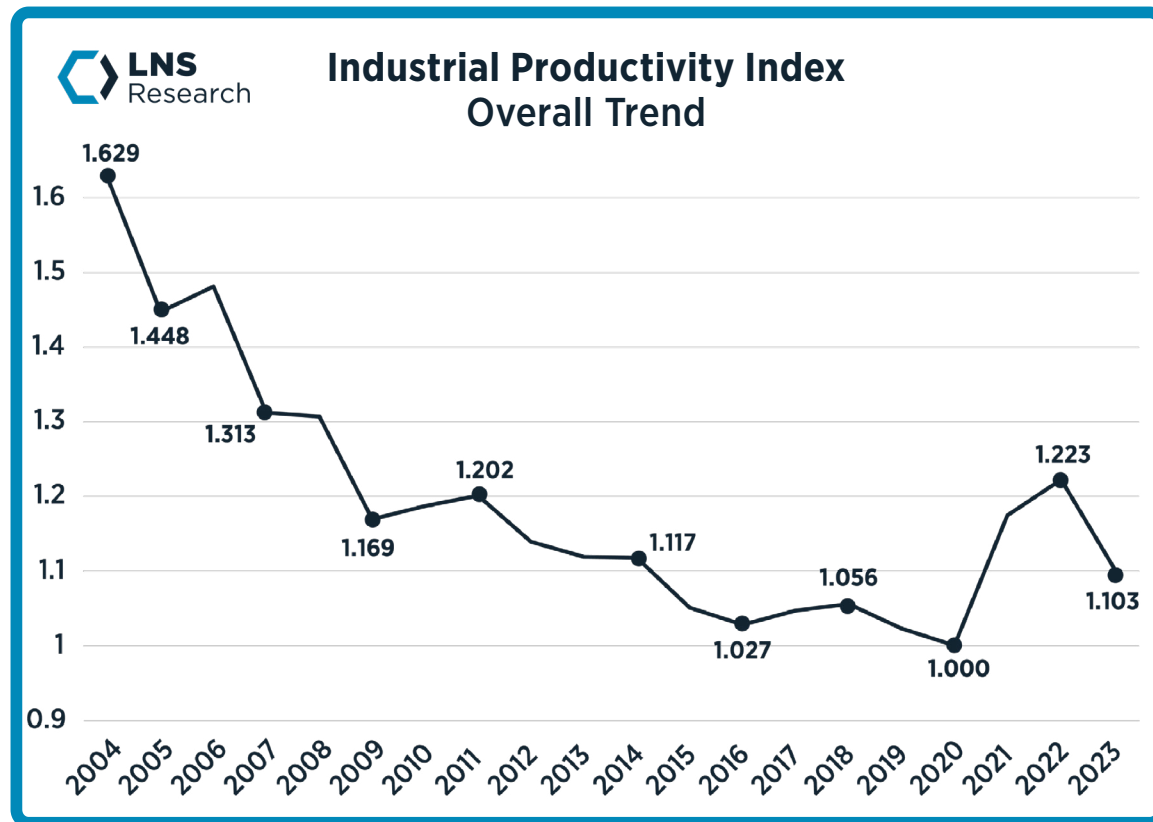
From 2004 to 2016, industrial productivity declined 37.0%, averaging an over 3% yearly decline. From 2016 to 2020, the declines began to flatten, with annual decreases averaging under 1%. Fortunately, the trend finally broke in 2020, and from 2021 to 2022, productivity increased by over 22%.

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.



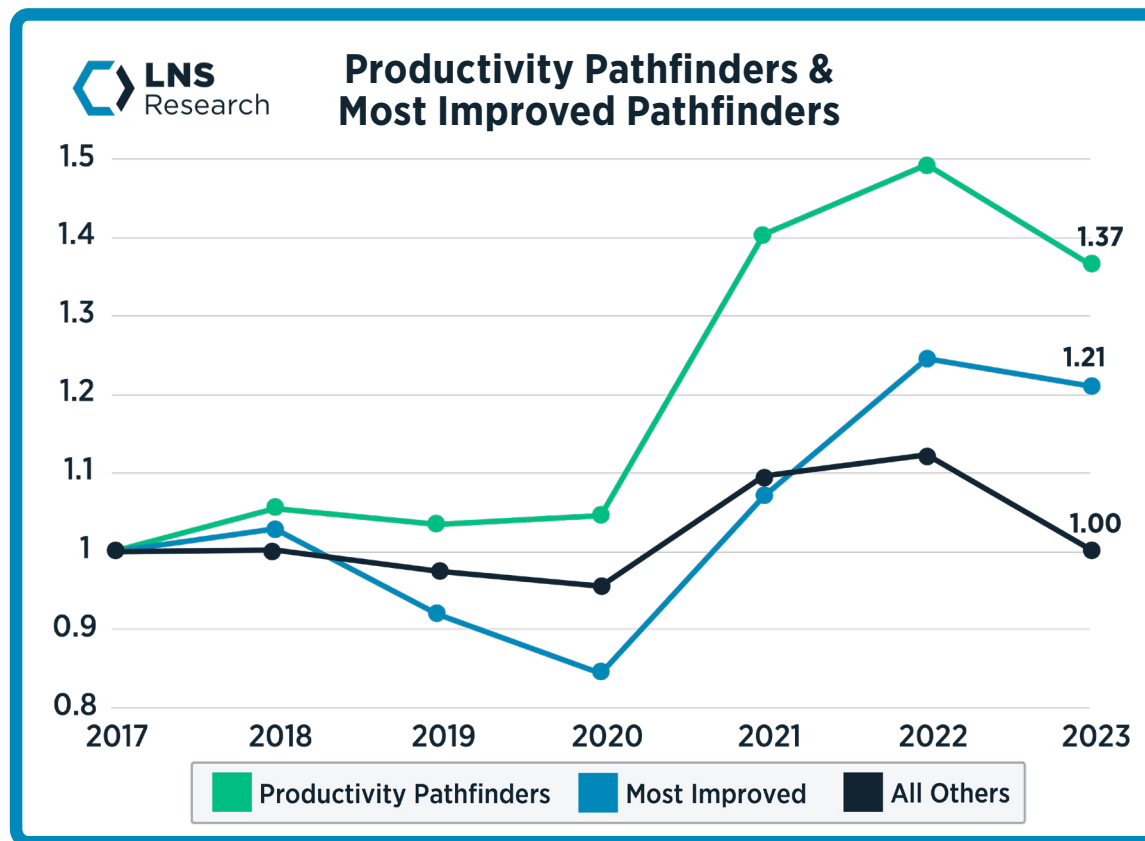
## Executive Summary (Cont.)

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.





## **Section 3**

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# **2024 Productivity Pathfinders**

## 2024 Productivity Pathfinders

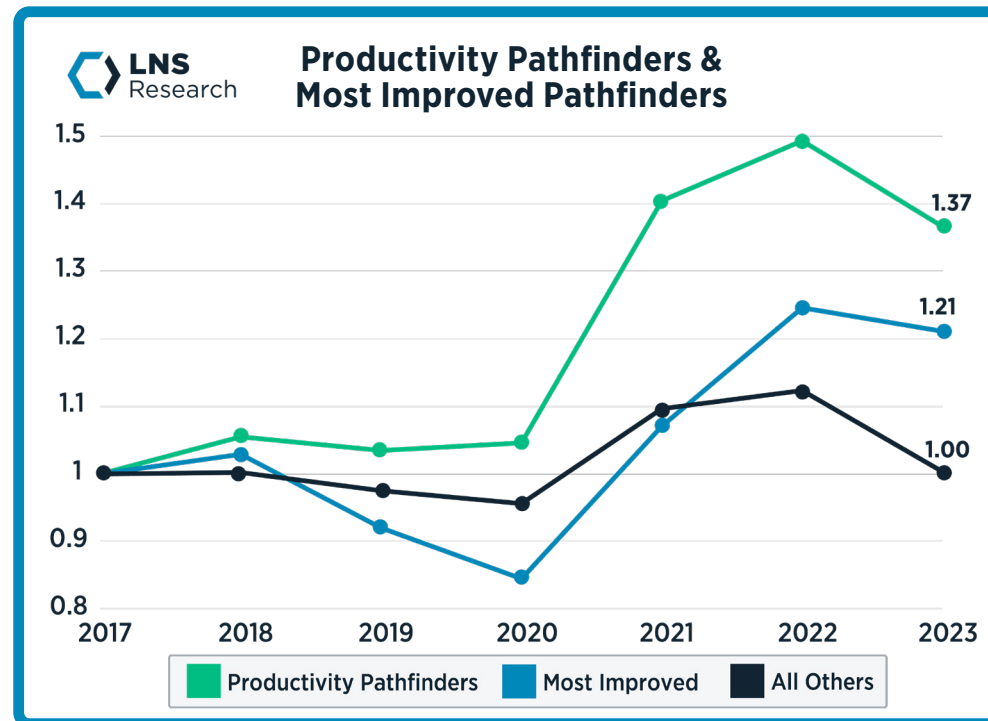
Productivity and productivity growth are well-recognized as critical factors to any organization's operational success. When we analyze the Industrial Productivity Index by the degree to which companies drive productivity growth, we see dramatic differences in their performance.

However, identifying the world's most productive companies is not straightforward. Most companies don't directly measure productivity, and often, proxies like Perfect Order, Overall Equipment Effectiveness, First Pass Yield, Material Yield Variance, or Energy Intensity are only tangentially related. Besides a lack of well-defined productivity metrics, there are many other considerations regarding how to assess and compare

different companies across different industries and balance past relative performance vs. growth, including:

- **Should productivity or productivity growth be more or less considered?** Having a high degree of productivity is great – but it can vary greatly depending on industry, competition, intellectual property, and more.
- **Should different productivity inputs be considered more or less?** Labor productivity is arguably the most measured aspect of productivity, but assets, materials, and energy are becoming more and more critical aspects, as well.
- **To what degree should producing physical goods be considered more or less?**

Services are becoming a more significant portion of the overall economy and a growing portion of many manufacturers' revenue mix.



## 2024 Productivity Pathfinders (Cont.)

There aren't right or wrong answers to these questions and the countless other questions that had to be answered in defining what it means to be a Pathfinder company.

In the end, LNS Research defines all Pathfinders as having significant internal industrial operations (a network of productive plant, equipment, and property assets that substantively contribute to revenue) that meet the following qualifications:

**Productivity Pathfinders** are the Top 3 companies by industry with the highest industrial productivity growth over the past three years and above-average growth the three years prior.

This definition eliminates companies that may have made gains from relatively low productivity levels. Moreover, it identifies the companies that can be held up as exemplars for being highly productive and growing productivity relative to direct competitors over the medium to long term.

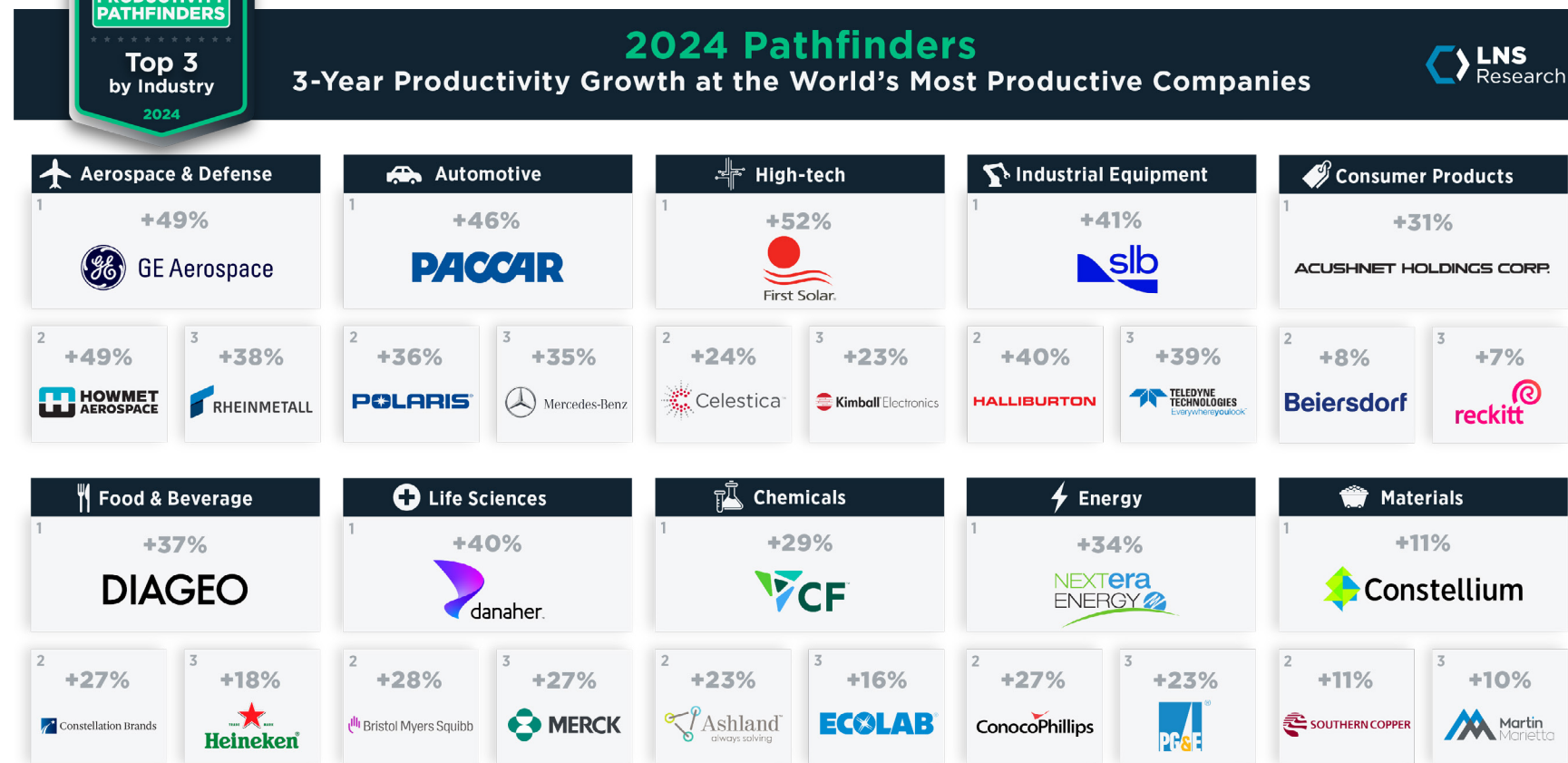


Figure 1 - 2024 Productivity Pathfinders, Top 3 by Industry

## 2024 Productivity Pathfinders (Cont.)

Overall, this analysis shows that most Productivity Pathfinder companies across most industries have achieved step change, or 10%+, yearly productivity gains over the past three years. However, even for Productivity Pathfinders, this performance is out of the ordinary. For the three years prior, these same companies barely grew productivity by 1% per year, while non-Pathfinder companies lost over 1% per year, on average.

There are also some industry trends to note. Pathfinders from industries downstream in the value chain—namely, discrete and batch industries—have been more successful at growing productivity than process industries.

Additionally, very few Pathfinder companies have been able to buck the overall trend of negative productivity growth in 2023. Only seven of the 30 Productivity Pathfinders had positive productivity growth in 2023, including Next Era Energy, Merck, two of the material companies (Southern Copper and Martin Marietta), and all three high-tech companies (First Solar, Celestica, and Kimball Electronics).

**Productivity Pathfinders have been able to achieve step change, or 10%+, yearly productivity gains over the past three years. But, this performance is out of the ordinary. For the three years prior, these same companies barely grew productivity by 1% per year, while non-Pathfinder companies lost over 1% per year, on average.**

Finally, this analysis has shown that it is extremely difficult to consistently grow productivity over the very long term (ten years plus). Unanticipated demand shifts, new product launches, and changing supplier relationships can all lead even the most productive companies in the wrong direction.

This means it is just as important to identify the companies and subsequent best practices for companies that have turned the tides on productivity and gone from a no or low growth to a high growth scenario.

To this end, LNS Research has defined these Pathfinders as: **Most Improved Pathfinders** are the Top 3 companies by industry with the highest industrial productivity growth over the past three years and below-average growth the three years prior.



## 2024 Productivity Pathfinders (Cont.)

Most Improved Pathfinder companies deserve just as much study, recognition, and benchmarking as their Productivity Pathfinder brethren and, in some cases, more. They demonstrate the potential to quickly move from under performance to market leadership in a few short years. Given that most companies struggle with productivity growth, learning from

them may be more applicable to other companies, helping them identify the internal and external conditions that make such turnarounds possible.

### Clarity, Engagement, Delivery

Having a high degree of productivity is great – but it can vary greatly depending on industry, competition, intellectual property, and more.



Figure 2 - 2024 Most Improved Pathfinders, Top 3 by Industry

## 2024 Productivity Pathfinders (Cont.)

In some cases, these conditions can come from responding to adverse external events. Take, for example, Rolls-Royce and the shocks it experienced from the pandemic-related travel shutdowns and the subsequent regulatory, safety, and quality issues that halted Boeing production. In other cases, these conditions can come from internally investing in and nurturing agility and flexibility in operations as demand, demographics, or commodity prices shift; think Harley Davidson, Alcoa, or Freeport McMoran. Finally, these conditions can also come from matching and accelerating capacity with dramatic demand expansion, as in the alcohol and golf booms post-COVID with ABInBev and Topgolf Callaway.

### Financial Benefits of Being a Productivity Pathfinder

One of the most surprising results from this entire research project is that there is no correlation between productivity growth and revenue growth. Productivity Pathfinders have almost the exact same median revenue growth over the past six years as non-Pathfinder companies, 33.3% versus 33.0%.

**Key Financial Metrics**  
2017-2023 Median Performance

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

**Figure 3 - Key Financial Metrics of Pathfinders vs. Non-Pathfinder Companies**

But that is where the similarities and lack of correlations end. Perhaps the defining characteristic of Productivity Pathfinders is their ability to drive Profitable Growth.

Pathfinders grow revenue and operating margins in parallel, but non-Pathfinders typically have flat or even declining margins. What does this look like for a hypothetical \$1B industrial company?

Six years ago, each company would have \$200M in operating income with an operating margin of 20%. Six Years later, each company would have \$1.3B in revenue, but the Pathfinder would have an operating margin of 26.6% and operating income of \$355M.

## 2024 Productivity Pathfinders (Cont.)

Meanwhile, the non-Pathfinder company would have an operating margin of 19.5% and an operating income of \$260M. The delta is 7% on operating margin and \$95M in operating income. How does this translate into even further financial benefits; the benefits are two-fold.

First, Pathfinder companies can translate these increases in earnings to increases in free cash flow, almost doubling that of other companies. This is critical, because even though the Wall Street media loves to tout earnings, free cash flow is what is needed to grow investments in assets and R&D, to pay out dividends, or make stock repurchases. Finally, and most importantly, these increases in margin growth and income translate into dramatically higher market caps.

Again, in our fictitious example, if six years ago, both companies had the same earnings multiple of 10, each would have had a market cap of \$2B. Six years later, keeping valuations constant, the Pathfinder company would have a market cap of \$3.1B, and the non-Pathfinder company would have had a market cap of \$2.36B, 31% higher, with a delta of over \$700M of value creation.

Market capitalization growth alone makes for more than a compelling business case to invest in productivity for anyone's compensation that is tied to shareholder value creation.



## **Section 4**

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# **How COOs can Build an Industrial Strategy that Delivers Step Change Productivity Growth**



## How COOs can Build an Industrial Strategy that Delivers Step Change Productivity Growth

"Do more with less" is the proverbial and stereotypical COO rallying cry.

It captures the essence of productivity growth but is also misleading and not particularly motivating. In fact, our latest research on Industrial Operations Strategy shows that 74% of manufacturing leaders and COOs haven't created a compelling vision that motivates operations to action.

### Vision, Mission, and Enterprise Strategy are the Foundation

Most COOs are excellent at execution. Most are also excellent strategic thinkers. They wouldn't be where they are if it were otherwise.

They have very few gaps in:

- Understanding enterprise-level business objectives.
- Translating business objectives into operational objectives.

- Setting metrics, targets, and incentives to achieve an outcome.
- Defining roles, processes, and standard work to reduce the variance in outcomes.

Yet there is a major disconnect. Most are not viewed as strategic or motivating leaders in their organizations. Why?

Often, they haven't taken the same degree of focus and internal process execution that was applied to translating business objectives to operational objectives and applied it to building an over-arching operational strategy — then translating the company vision and mission into a vision and mission for the operations organization.

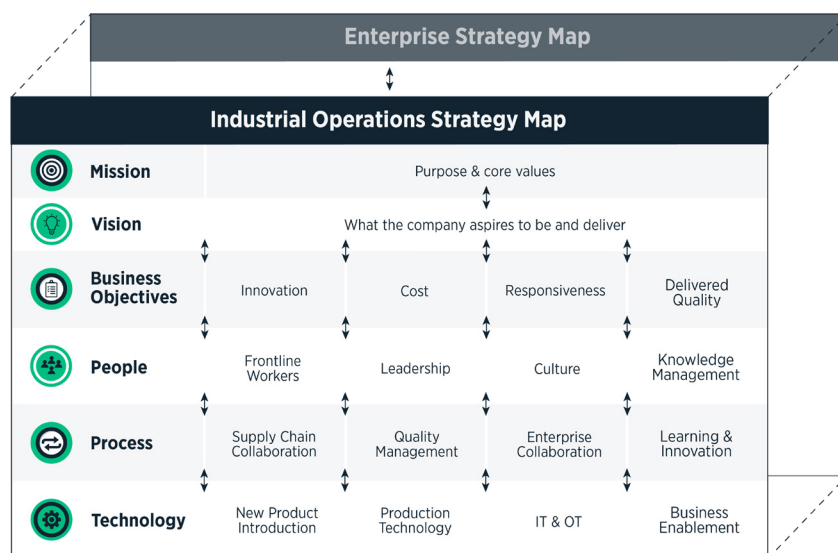


Figure 4 - Enterprise to Operations Strategy Map

## How COOs can Build an Industrial Strategy that Delivers Step Change Productivity Growth (Cont.)

Leading COOs already do it, but many others would be well served, by increasing investments in their own strategy team to help drive this thinking and process by:

- Defining and promoting a senior strategy leader as part of the team
- Running an ongoing and formal strategic planning and change management process
- Eliminating organizational debt, like redundant or struggling strategic initiatives and teams
- Clearly delineating roles between execution, improvement, and transformation

With a strategy leader, team, and process in place, COOs can quickly map the team's mission, vision, and business objectives to the enterprise's mission, vision, and business objectives.

Then comes the important part, building a truly aligned operational strategy. Aligned both in terms of creating competitive advantage and delivering unique value to customers. The starting point is going through an exercise to prioritize what operations will do and even more importantly, what operations won't do.

| Enterprise Strategy Dimension                                                                                         | Competitive Advantage       | Customer Value Proposition                        | Key Operations Contributor                               |
|-----------------------------------------------------------------------------------------------------------------------|-----------------------------|---------------------------------------------------|----------------------------------------------------------|
|  <b>Innovation</b>                   | First to market             | Desirable and innovative products                 | New product introduction and time to volume              |
|  <b>Cost</b>                       | Industry leading margins    | Lowest prices in the product-category             | Efficient, low-cost infrastructure                       |
|  <b>Responsiveness</b>             | Customer intimacy           | The product each customer wants when they want it | Capacity and flexibility, Integrated business planning   |
|  <b>Delivered Quality</b>          | Brand integrity             | Customer-experienced quality and reliability      | Process capability and risk management                   |
|  <b>Experienced Sustainability</b> | Lowest environmental impact | Alignment with customer values                    | Sourcing/Consumption, low emissions and waste, recycling |

Figure 5 - Strategy Prioritization Framework

## How COOs can Build an Industrial Strategy that Delivers Step Change Productivity Growth (Cont.)

LNS Research supports many of the tenets originally espoused in the "Discipline of Market Leaders," most importantly, a company can likely be great at anything focused on and invested in – but never great in everything.

So, it is critical that the operations strategy team chooses where it focuses its effort wisely and that it is aligned to the enterprise strategy. It is impossible to simultaneously be the most innovative, cost effective, customer responsive, highest quality, and sustainable value chain.

Of course, we must be good at everything; we must manage and sustain performance in all dimensions through discipline and our operational excellence programs. But we can only be truly great, the best in the world, at one dimension if we're focused.

A common mistake is that the COO and/or frontlines think the most important strategy dimension is being low cost, while the enterprise is focused on differentiating through being the most innovative, responsive, or some other dimension. Such a cost-centric view of operations results in a race to the bottom. Cost-cutting never delivers long-term productivity growth and will never position operations or the COO as a strategic and visionary leader.



## How COOs can Build an Industrial Strategy that Delivers Step Change Productivity Growth (Cont.)

### Operation 2030

With the strategic planning process complete, it is time to build and execute the strategy, with an eye toward effective communication and change management.

LNS Research's version of what an Industrial Operations Strategy should look like isn't a bad starting point for any organization. Some of the critical factors an industrial strategy should include for maximum impact:

- Naming, branding, and visualizing the strategy.
- Tying together enterprise-level and operational-level objectives and initiatives.

- Setting stretch goals and embracing the Power of Zero.
- Spanning people, process, and technology.
- Spanning a broad cross-section of the value chain, including suppliers, customers, and design.
- Including critical value chain support functions like quality, EHS, and operational excellence.
- Identifying foundational elements that must span the strategy and be in place for success.

### Operation 2030

Revenue | Cost of Goods Sold | Margins | Return on Assets

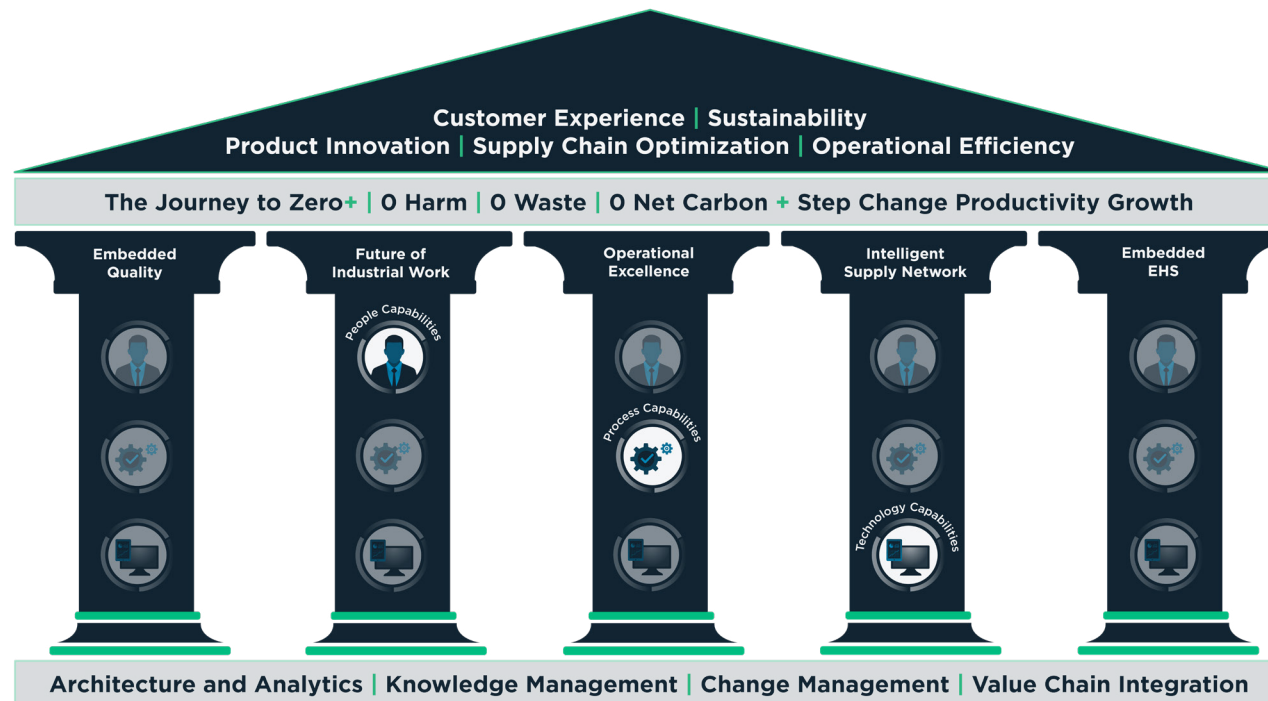
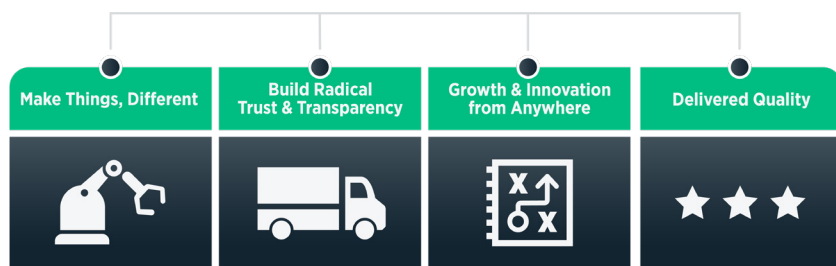


Figure 6 - Operation 2030

## How COOs can Build an Industrial Strategy that Delivers Step Change Productivity Growth (Cont.)

With the strategy team built, the strategy process running, and the operations strategy fully developed in alignment to the enterprise mission, vision, and strategy; it's time to ensure that your team has fully fleshed out the "how" of creating competitive advantage, delivering unique customer value, and driving step change productivity gains.

Our analysis of industrial operations strategy leaders has shown there are four main ways that companies can differentiate their strategy in these regards.



**Figure 7 - 4 Industrial Operations Strategy Differentiators**

The first is to make things different. This means that your operations should have either (or both!) a unique and defendable manufacturing process and a unique and defendable product.

The second is to build radical trust and transparency, which has multiple dimensions. It can mean that your organization emphasizes collaboration over competition in engaging with customers and suppliers, transparently sharing data. It can also mean your principles of leadership encom-

pass a Servant Leadership approach, which includes in-the-moment, direct, transparent, 360-degree feedback. Finally, as the importance of data and knowledge management increases, especially in the age of Artificial Intelligence (AI), your team embraces data-driven decision-making and that you invest in data quality and explainable, un-biased, AI algorithms.

The third is to grow and innovate from anywhere. This means that your organization respects the knowledge and expertise of the frontlines, takes a distributed rather than centralized approach to decision-making — where those that are best positioned to understand and solve a problem are empowered to do so — and that you take an agile approach to project management and accomplishing work.

The fourth and final is to deliver quality. This means that your team ensures compliance with regulations, standards, and ethics, but that it doesn't stop there. The team always puts the customer first and ensures that quality is delivered to and recognized in the eyes of the customer.

With your strategic differentiators well-defined and established, your organization can move to the final stage of deploying an industrial strategy that will deliver step change productivity gains, effective communication and change management.

There are multiple aspects of the Operation 2030 framework that are explicitly aimed at these ends, in particular "change management" and the "Future of Industrial Work".

## How COOs can Build an Industrial Strategy that Delivers Step Change Productivity Growth (Cont.)

### Change Management and the Future of Industrial Work

Regarding change management, there are many good existing frameworks in the market, LNS Research has ours – others exist, but there are some common principles that should be in place regardless of the tools used.

First, change management is a process that takes time. Your team has been going through this process as you developed the strategy. Things that may have seemed foreign, complex, or controversial at the start of the process three to six months ago now seem obvious, simple, and are taken for granted. Ensure you give others the same time to go through the same emotional journey.

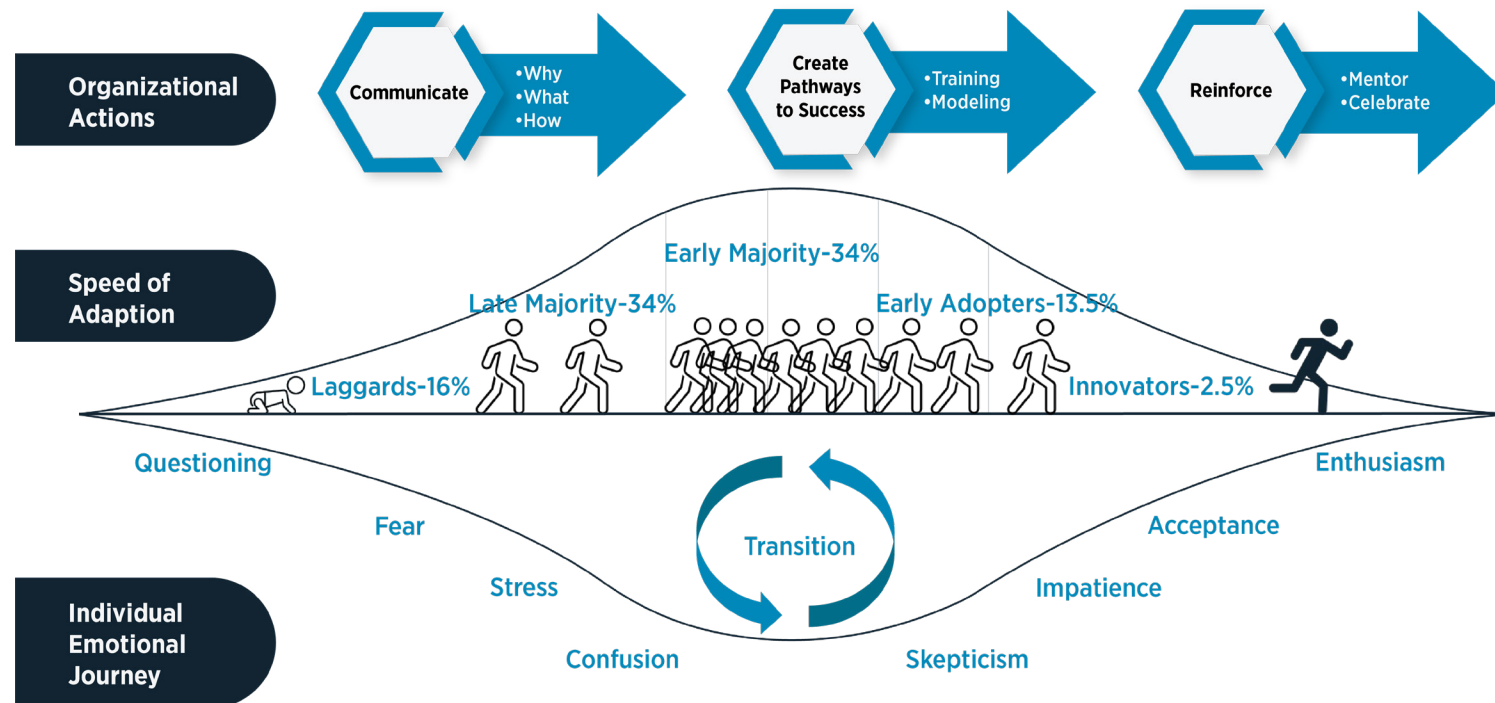


Figure 8 - Change Management Framework

## How COOs can Build an Industrial Strategy that Delivers Step Change Productivity Growth (Cont.)

Second, having a maturity model to benchmark progress toward your future vision state is an important and valuable tool. But remember, the elements of the maturity model should map to the elements of your strategy and that the usefulness of any maturity model is a balancing act of effort and results. Some organizations can spend so much time and effort understanding the current state, future progress never comes. Others can become so focused on improving maturity that they forget to ensure the progress in maturity is also delivering results and enhancing culture.

Finally, it is important to note that change and transformation is a journey where some of the necessary actions and capabilities in the early vision stages can be counter-productive in the later value delivery stages. LNS Research refers to these existing investments as organizational debt and examples include Chief Digital Officers, light house plants, and corporate innovation budgets. These are all great ideas to initiate change. But to scale and embed change, eventually digital skills must be adopted by the masses, lighthouse plants must transition to Virtual Operation Centers (VOCs) to bring along the entire manufacturing network, and P&L owners must find the funding for investments on their own merits and business case.

### The Vision to Value Pivot

To successfully transform, leaders must proactively pivot strategic intent from vision to value. Unfortunately, most leaders must pivot when they are unprepared or unwilling to do so and fail.

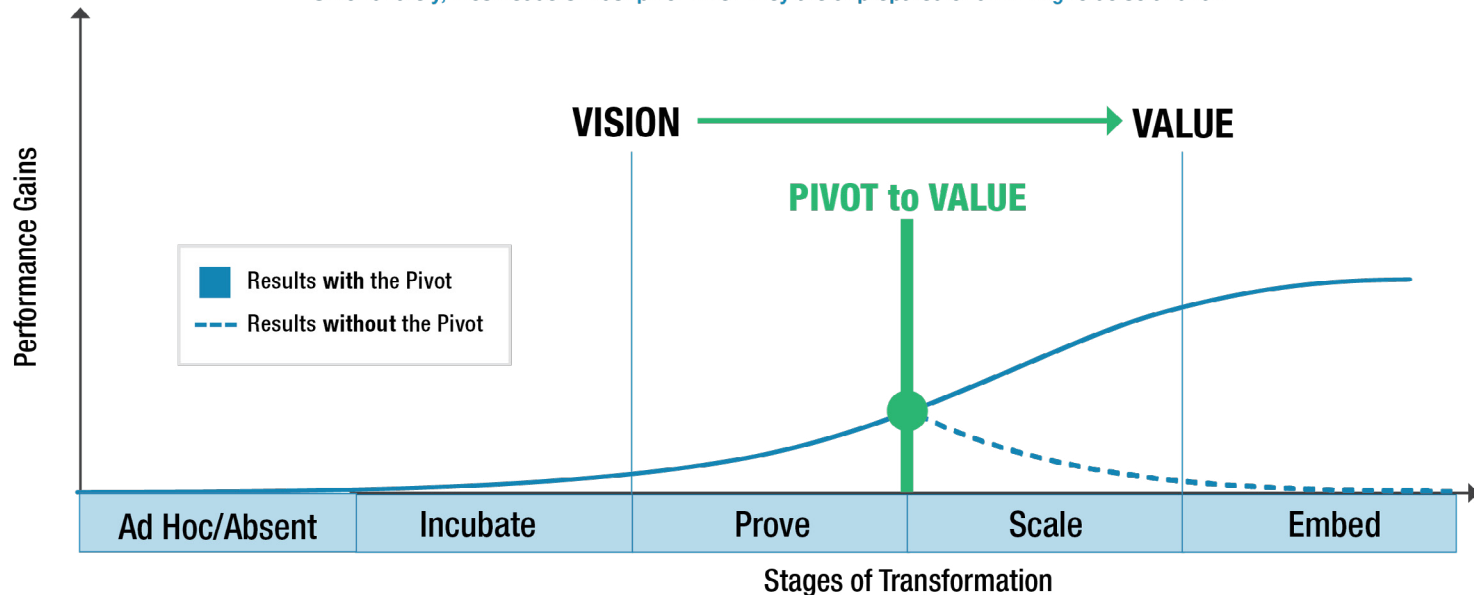


Figure 9 - 5 Stages of Maturity and Vision to Value Pivot



## How COOs can Build an Industrial Strategy that Delivers Step Change Productivity Growth (Cont.)

Regarding the Future of Industrial Work, it is important that COOs and other manufacturing leaders put the strategy into action and context for the frontlines.

This means first and foremost, COOs must have a vision for what the Total Employee Experience looks like once the strategy is fully implemented, and this vision is clearly articulated to the frontlines with buy-in gained. Second, it means a Servant Leadership approach is taken across all levels of the organization – from COOs all the way to production supervisors and unit operation team leads. This means leaders go to the shop floor early and often, with respect and support for the frontlines, not command and control. Finally, it means that the frontlines are supported with purpose built technology that simplifies and empowers them to do their best work.

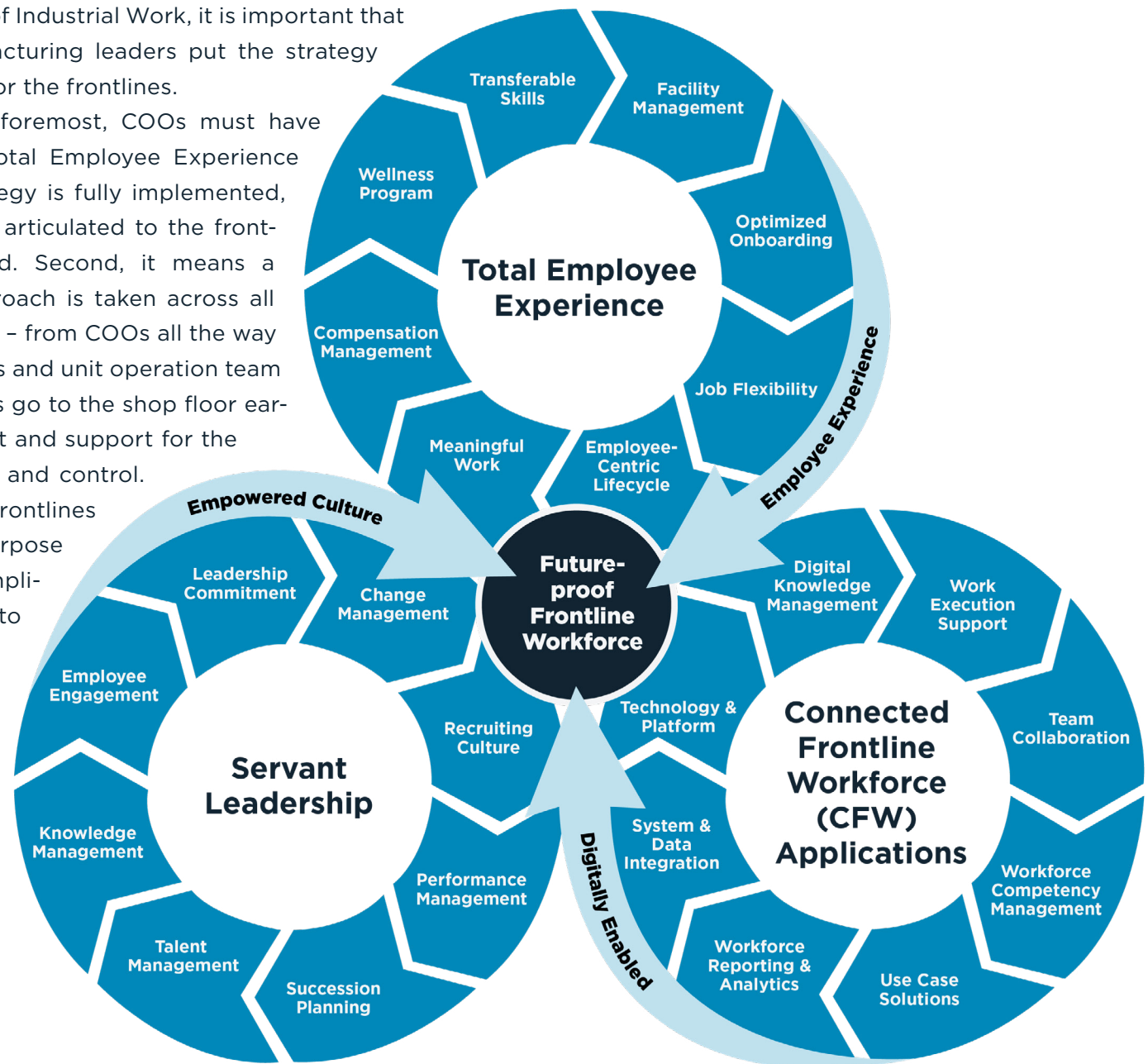


Figure 10 - Future of Industrial Work Framework



## How COOs can Build an Industrial Strategy that Delivers Step Change Productivity Growth (Cont.)

### The #1 2024 Productivity Pathfinder – First Solar

The #1 2024 Pathfinder, across all vertical industries, is First Solar with a staggering 52% growth of Industrial Productivity from 2020 to 2023.

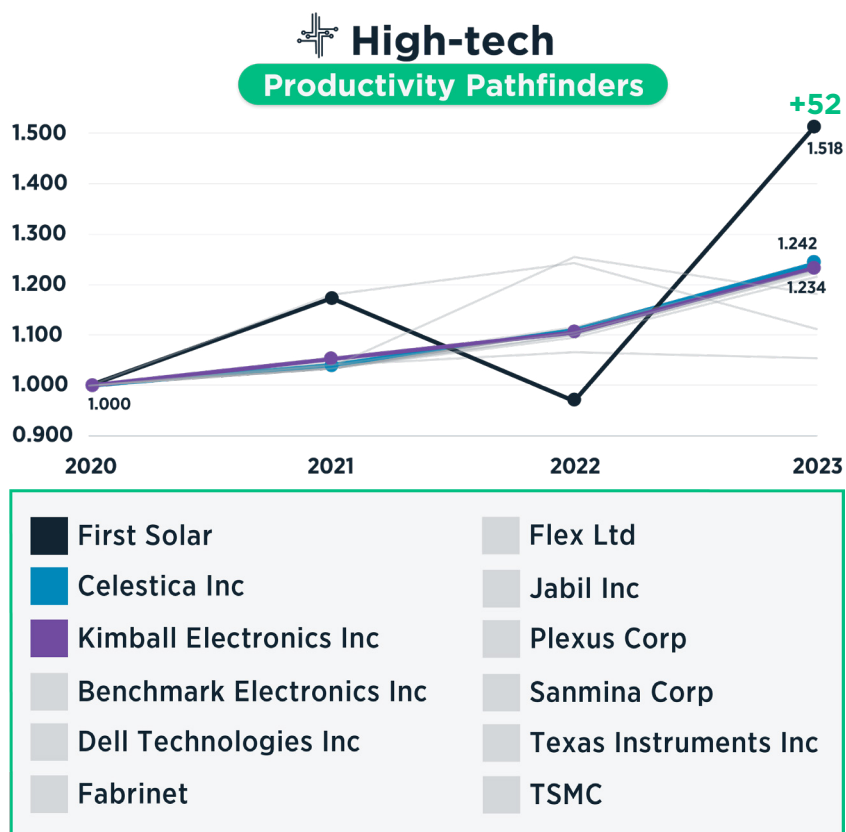


Figure 11 - High-tech Productivity Pathfinders

When we examine First Solar, we see that their enterprise and operational strategies, cultures, and leadership approaches exhibit many of the best practices described above.

They start with a mission and vision championed by the CEO that is much more than just financial success, even though he is the previous CFO. Then the company differentiates in three very specific ways.



Mark Widmar, CEO



Figure 12 - First Solar Mission, Vision, and Differentiators

#### Mission and Vision

- Leading the World's Sustainable Energy Future

#### Differentiators

- Manufacturing Leadership
- Technology Advantage
- Responsible Solar



## How COOs can Build an Industrial Strategy that Delivers Step Change Productivity Growth (Cont.)

The first two, manufacturing leadership and technology advantage, are clearly core to the company's success. They are the only solar manufacturer in the top 10 that doesn't manufacture in China. They are also one of the few companies in the index to have a "Chief Manufacturing Officer" role, which allows the company to prioritize manufacturing and ensure they have unique competitive advantages in both their manufacturing process and in their solar technology.

Finally, the company takes its mission and vision to heart. Not being satisfied with just the idea that their products help drive toward a sustainable energy future. They also ensure that they are embedding EHS and sustainability across the value chain in many ways, including eliminating waste and carbon from scope 1, 2, and eventually 3 emissions.

Did it work, the operational results are clear, and the financial results don't lie. Over the past 6 years the company has been able to increase operating margins by 310% and market capitalization by a staggering 785%, creating over \$23B in new shareholder value.

**Key Financial Metrics**  
2017-2024 (H1) Performance

|                                                                                     | Revenue Growth                  | Operating Margin Growth       | Free Cash Flow Growth              | Market Cap Growth                 |
|-------------------------------------------------------------------------------------|---------------------------------|-------------------------------|------------------------------------|-----------------------------------|
|  | <b>+14%</b><br>\$2.9B -> \$3.3B | <b>+310%</b><br>8.6% -> 26.7% | <b>+33%</b><br>\$-22.7M -> \$30.2M | <b>+785%</b><br>\$3.4B -> \$26.7B |

**Figure 13 - First Solar Key Financial Performance**

### Failure Indicators

Changing leadership, strategy, and culture at a large industrial company is a slow, sometimes an agonizingly slow, process.

So how can you self-evaluate and understand if your organization is being successful or not in driving step-change productivity growth through a differentiated approach while in process?

- **No strategy leader or strategic planning process in operations.** If operations are viewed as a cost-center. If your company's S&OP process doesn't have an "O" with a seat at the table or there are significant gaps in alignment and collaboration between design, make, and deliver functions, you may have a challenge.
- **Not bringing along shareholders and other stakeholders.** If your strategy is being dominated by short term financial goals. If your sites or procurement teams are lacking trust with local communities and suppliers respectively, you may have a challenge.
- **Technology isn't a core competency.** If operations are constantly reliant on and potentially deprioritized by internal IT and external system integrators. If your team doesn't have a solid handle on your technology architecture or solution sustainment, and you are constantly looking to copy other existing playbooks, you may have a challenge.

## How COOs can Build an Industrial Strategy that Delivers Step Change Productivity Growth (Cont.)

### Steps to Success

The degree of challenges and share of companies that struggle to grow productivity doesn't mean there aren't actions that can be taken to both increase the likelihood and pace of productivity growth success.

- **Deeply understand operation's contribution to customer value and competitive advantage.** If every role across operations has KPIs, targets, and incentives that are personalized, well-understood, and have productivity growth embedded; where operators and managers can clearly answer questions about how they make money, why customers buy, and how they beat the competition, you are probably on the right track.
- **Identify and eliminate organizational debt across operations.** If plant managers, supervisors, engineers, and the frontlines have all become comfortable with the idea that what got them here is not what will get them there and that what corporate did to build the vision for change is not the same as the ownership they will have to take to scale and embed the change, you are probably on the right track.

- **Invest in strategic communications and change management that puts productivity growth front and center.** If there is a common language from the COO all the way to frontline supervisors and team leads — where they all use step change productivity growth as the measuring stick of success, all embrace a Servant Leadership mindset, and all use the prepositions "with" instead of "to" or "for" to describe how change will happen on the frontlines — you are probably on the right track.



## **Section 5**

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# **Appendix A: The Industrial Productivity Index**

## Appendix A: The Industrial Productivity Index

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  $\text{Output} / \text{Input}$ . Profitability is calculated as  $\text{Output} - \text{Input} / \text{Output}$ ; 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 = COGS + 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:

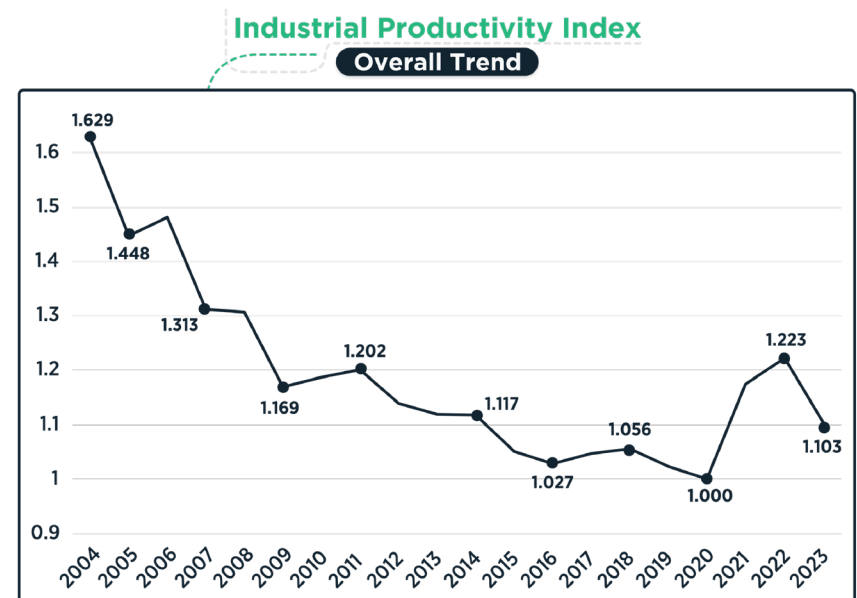


Figure 14 - Industrial Productivity Index

## 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.

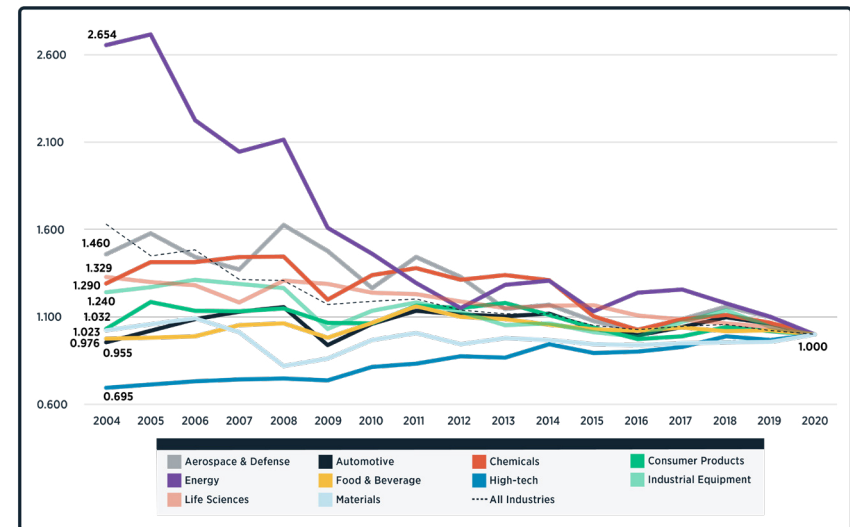


Figure 15 - Industrial Productivity Index by Vertical, 2004 - 2020

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.

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.

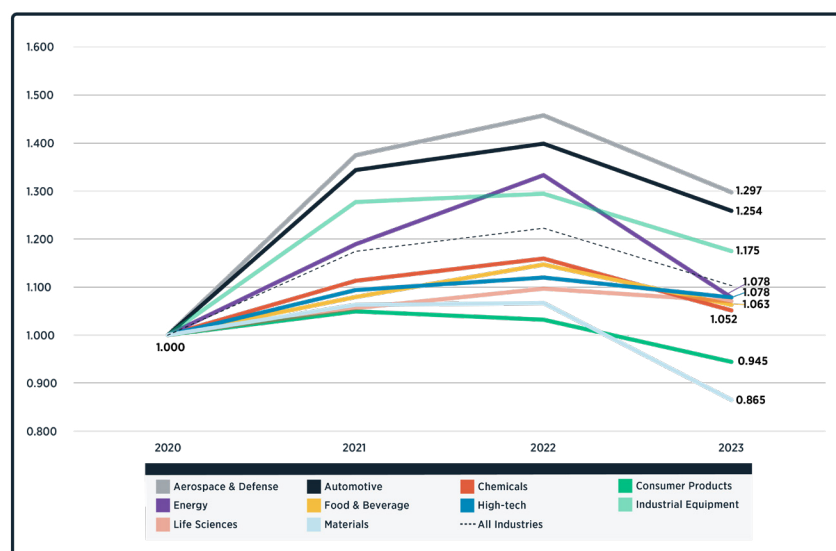


Figure 16 - Industrial Productivity Index by Vertical, 2020 - 2023

## **Section 6**

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# **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



## **Section 7**

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# **Appendix C: Detailed Industrial Productivity Index and Pathfinder Results by Vertical**

## Appendix C: Detailed Industrial Productivity Index and Pathfinder Results by Vertical

### Aerospace and Defense

#### ✈ Aerospace & Defense Productivity Pathfinders

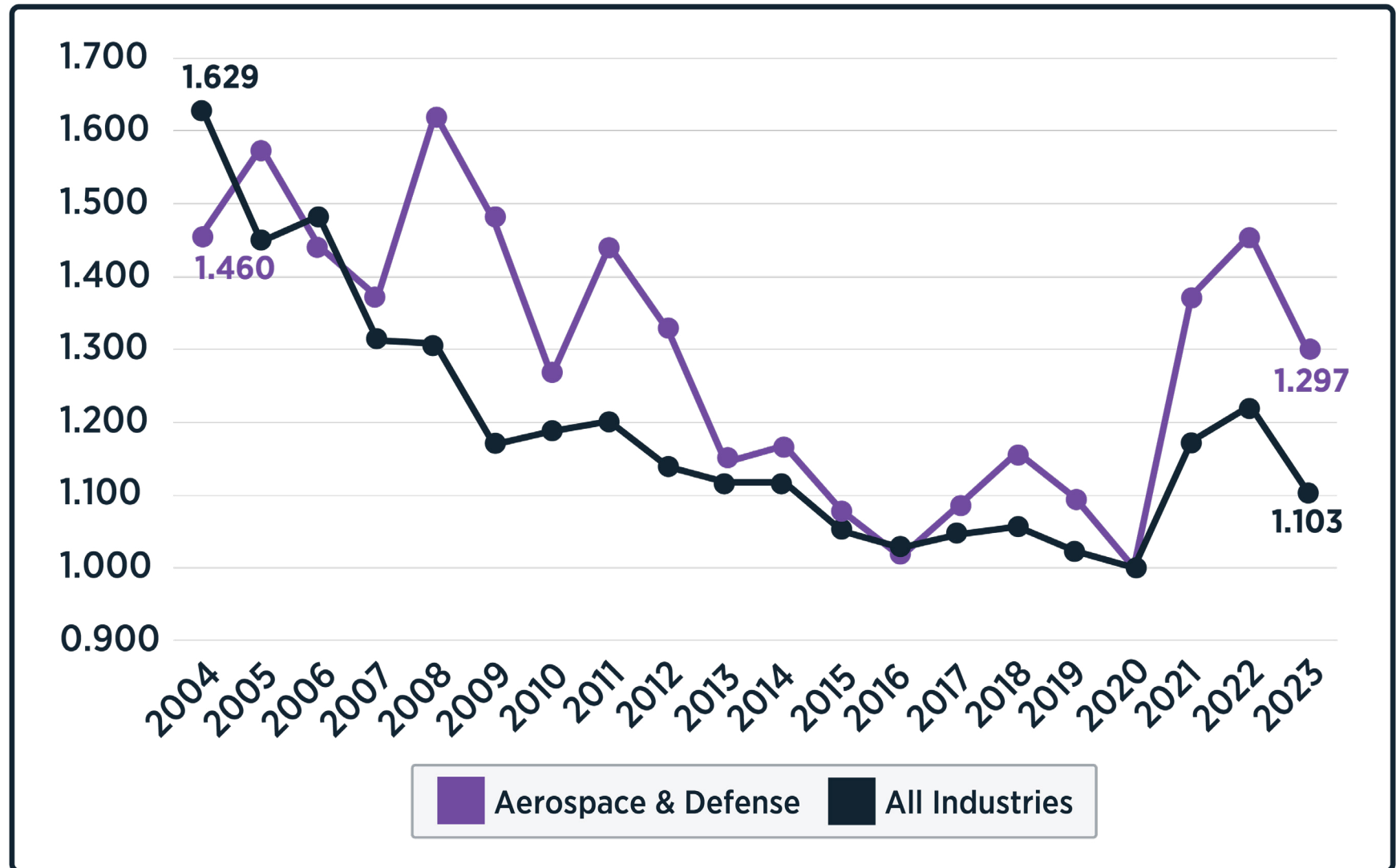
| Rank | Company                                                                                            | 2017-2020 Productivity Growth | 2020-2023 Productivity Growth | Performance Compared to Peers (2020-2023) |
|------|----------------------------------------------------------------------------------------------------|-------------------------------|-------------------------------|-------------------------------------------|
| 1    |  GE Aerospace     | -6%                           | 49%                           | 26%                                       |
| 2    |  HOWMET AEROSPACE | 1%                            | 49%                           | 26%                                       |
| 3    |  RHEINMETALL      | 5%                            | 38%                           | 15%                                       |

#### ✈ Aerospace & Defense Most Improved

| Rank | Company                                                                                                | 2017-2020 Productivity Growth | 2020-2023 Productivity Growth | Performance Compared to Peers (2017-2023) |
|------|--------------------------------------------------------------------------------------------------------|-------------------------------|-------------------------------|-------------------------------------------|
| 1    |  Rolls-Royce®       | -22%                          | 89%                           | 31%                                       |
| 2    |  WOODWARD           | -8%                           | 41%                           | 14%                                       |
| 3    |  SPIRIT AEROSYSTEMS | -26%                          | 70%                           | 10%                                       |

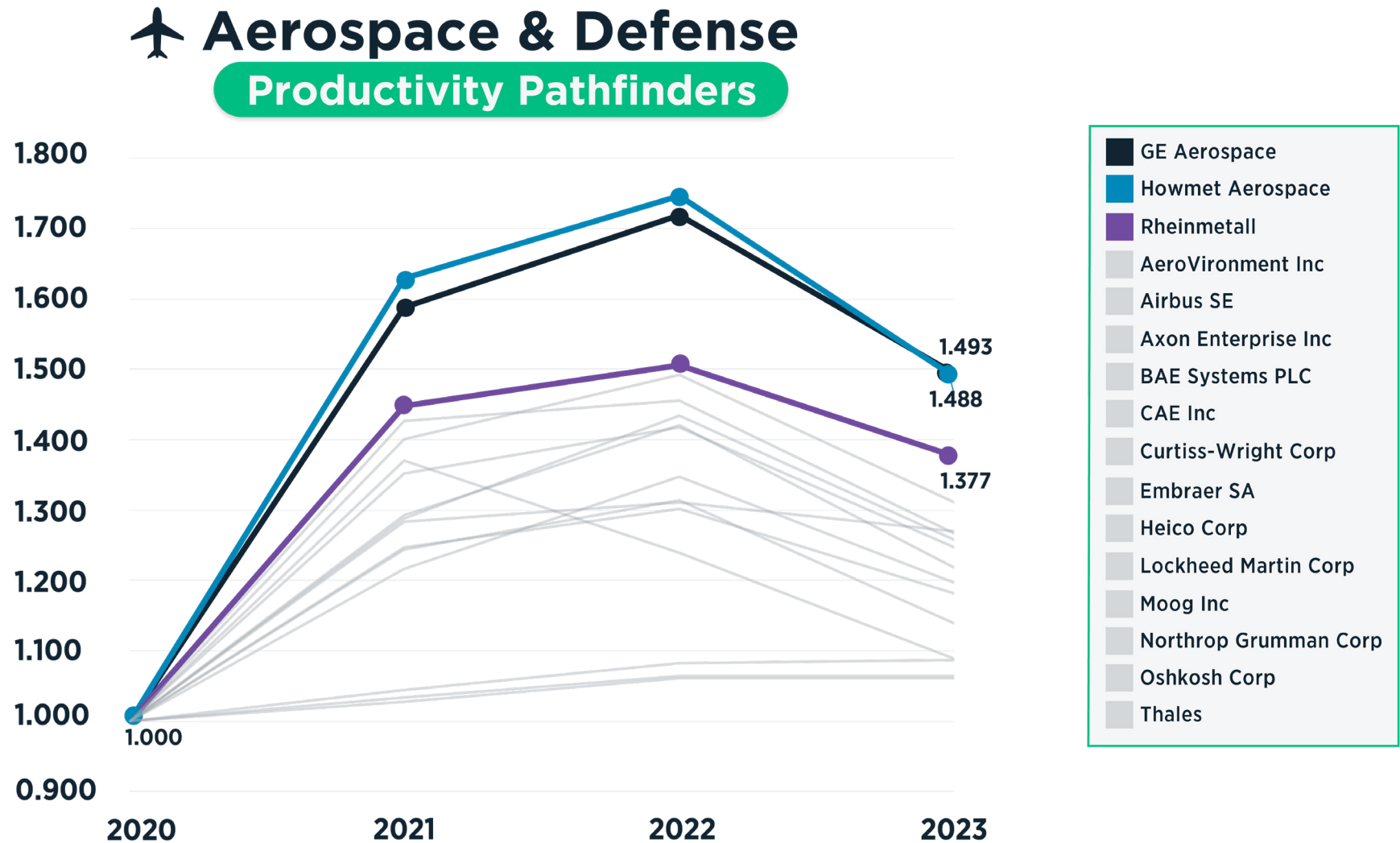
## Appendix C: Detailed Industrial Productivity Index and Pathfinder Results by Vertical

### Aerospace and Defense | Industrial Productivity Index



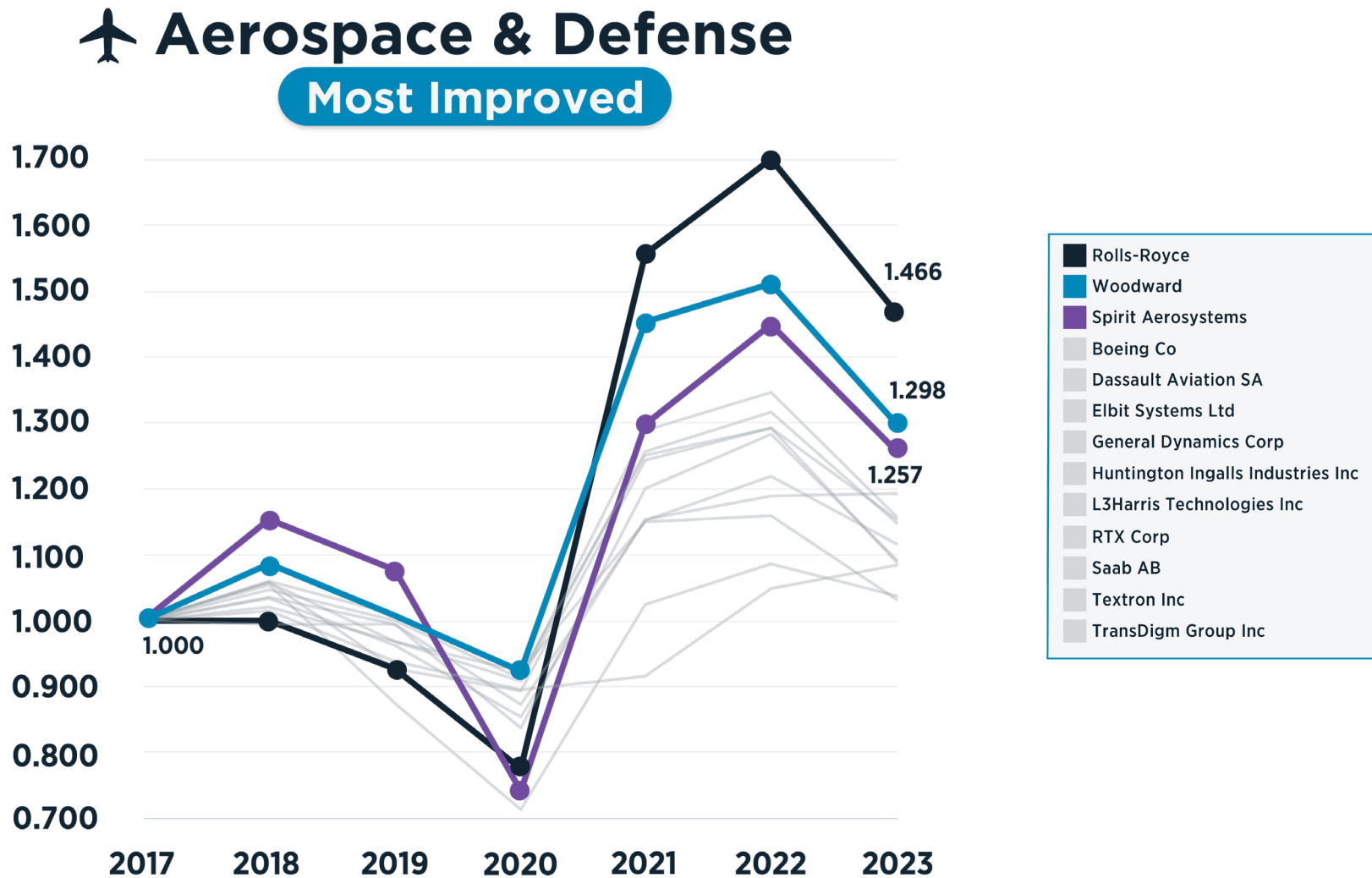
## Appendix C: Detailed Industrial Productivity Index and Pathfinder Results by Vertical (Cont.)

### Aerospace and Defense | Productivity Pathfinders



## Appendix C: Detailed Industrial Productivity Index and Pathfinder Results by Vertical (Cont.)

### Aerospace and Defense | Most Improved Pathfinders



## Appendix C: Detailed Industrial Productivity Index and Pathfinder Results by Vertical (Cont.)

### Automotive

#### Automotive Productivity Pathfinders

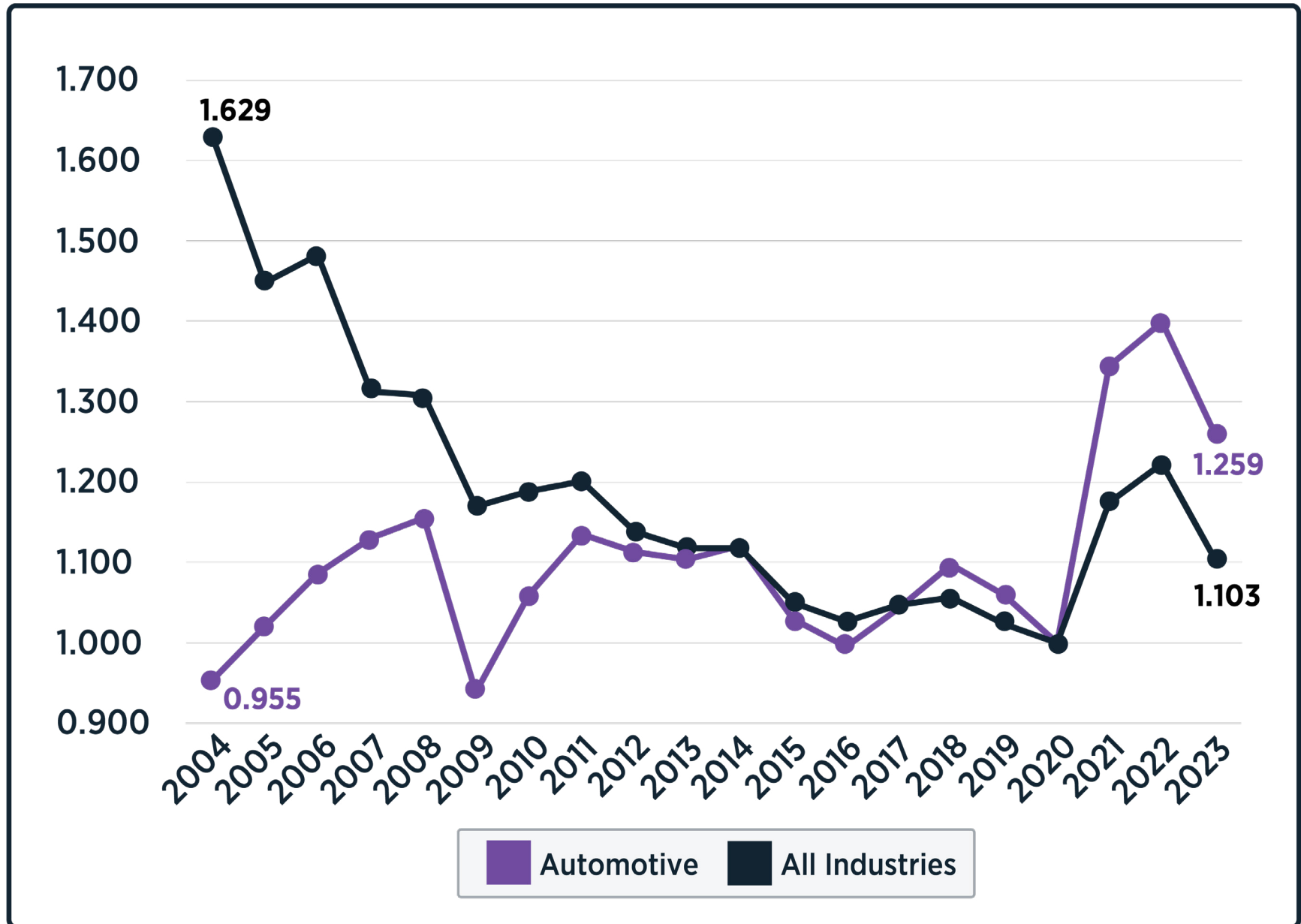
| Rank | Company                                                                                         | 2017-2020 Productivity Growth | 2020-2023 Productivity Growth | Performance Compared to Peers (2020-2023) |
|------|-------------------------------------------------------------------------------------------------|-------------------------------|-------------------------------|-------------------------------------------|
| 1    |                | -5%                           | 46%                           | 21%                                       |
| 2    |                | -5%                           | 36%                           | 11%                                       |
| 3    |  Mercedes-Benz | -6%                           | 35%                           | 10%                                       |

#### Automotive Most Improved

| Rank | Company                                                                                                 | 2017-2020 Productivity Growth | 2020-2023 Productivity Growth | Performance Compared to Peers (2017-2023) |
|------|---------------------------------------------------------------------------------------------------------|-------------------------------|-------------------------------|-------------------------------------------|
| 1    |                      | -12%                          | 49%                           | 16%                                       |
| 2    |  SUPERIOR INDUSTRIES | -12%                          | 40%                           | 15%                                       |
| 3    |                      | -7%                           | 40%                           | 14%                                       |

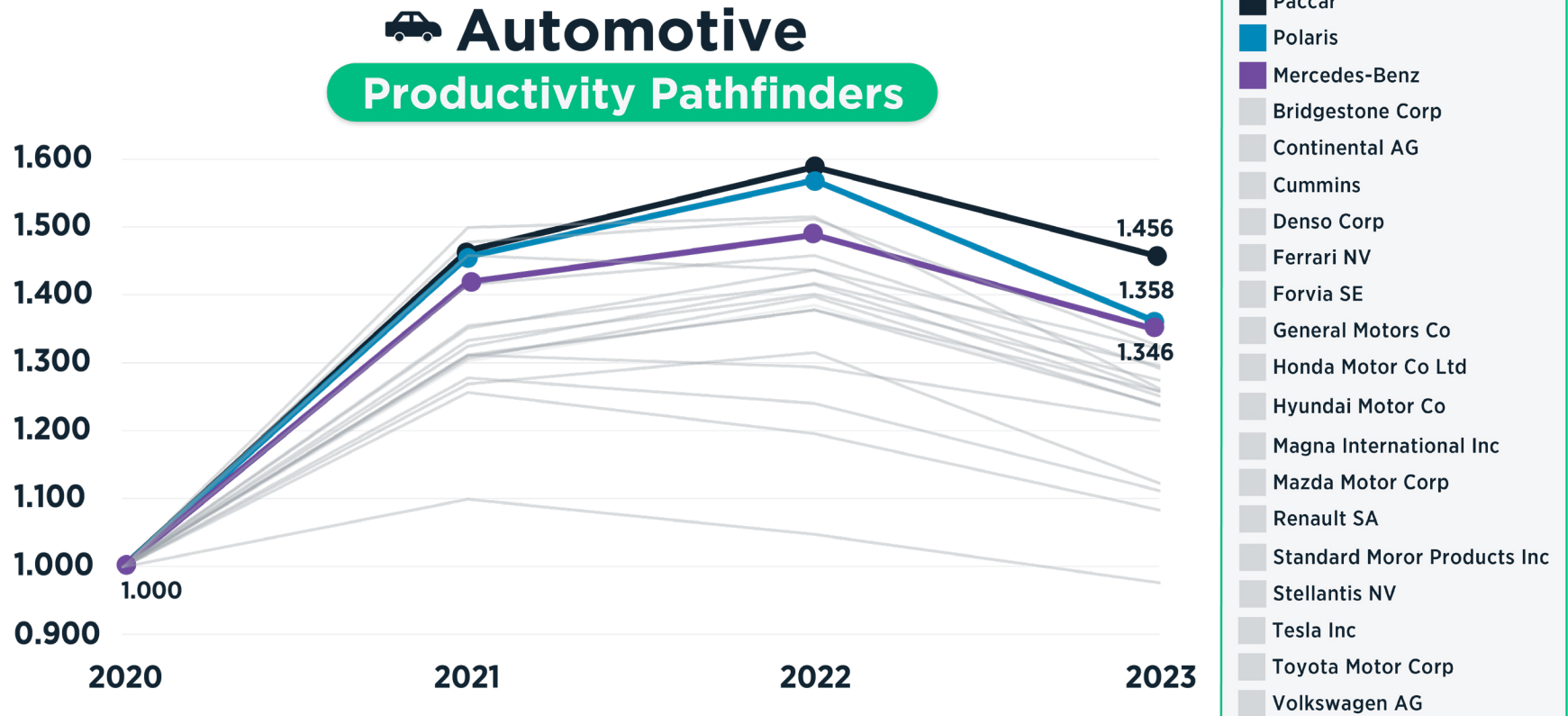
## Appendix C: Detailed Industrial Productivity Index and Pathfinder Results by Vertical (Cont.)

### Automotive | Industrial Productivity Index



## Appendix C: Detailed Industrial Productivity Index and Pathfinder Results by Vertical (Cont.)

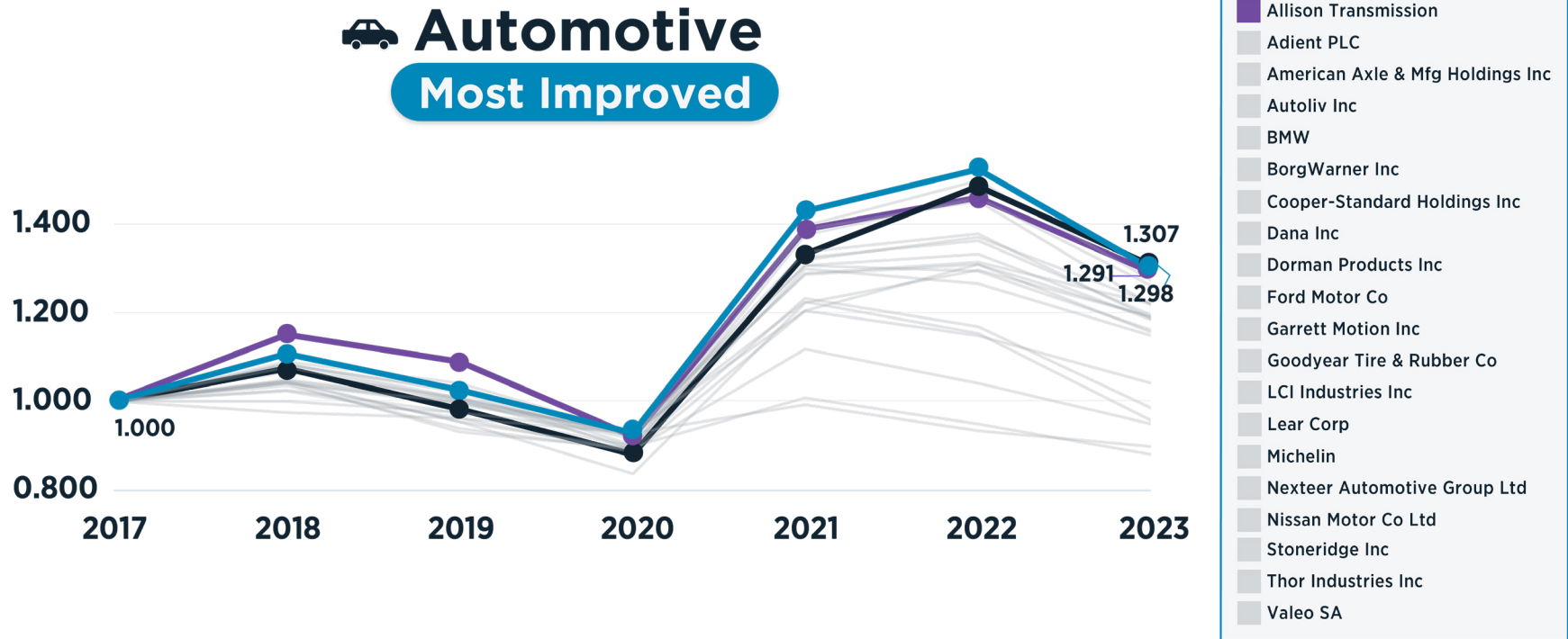
### Automotive | Productivity Pathfinders





## Appendix C: Detailed Industrial Productivity Index and Pathfinder Results by Vertical (Cont.)

### Automotive | Most Improved Pathfinders



## Appendix C: Detailed Industrial Productivity Index and Pathfinder Results by Vertical (Cont.)

### Chemicals



#### Chemicals

##### Productivity Pathfinders

| Rank | Company                                                                                                     | 2017-2020 Productivity Growth | 2020-2023 Productivity Growth | Performance Compared to Peers (2020-2023) |
|------|-------------------------------------------------------------------------------------------------------------|-------------------------------|-------------------------------|-------------------------------------------|
| 1    |  CF                        | -8%                           | 29%                           | 23%                                       |
| 2    |  Ashland<br>always solving | -9%                           | 23%                           | 17%                                       |
| 3    |  ECOLAB®                   | -3%                           | 16%                           | 10%                                       |



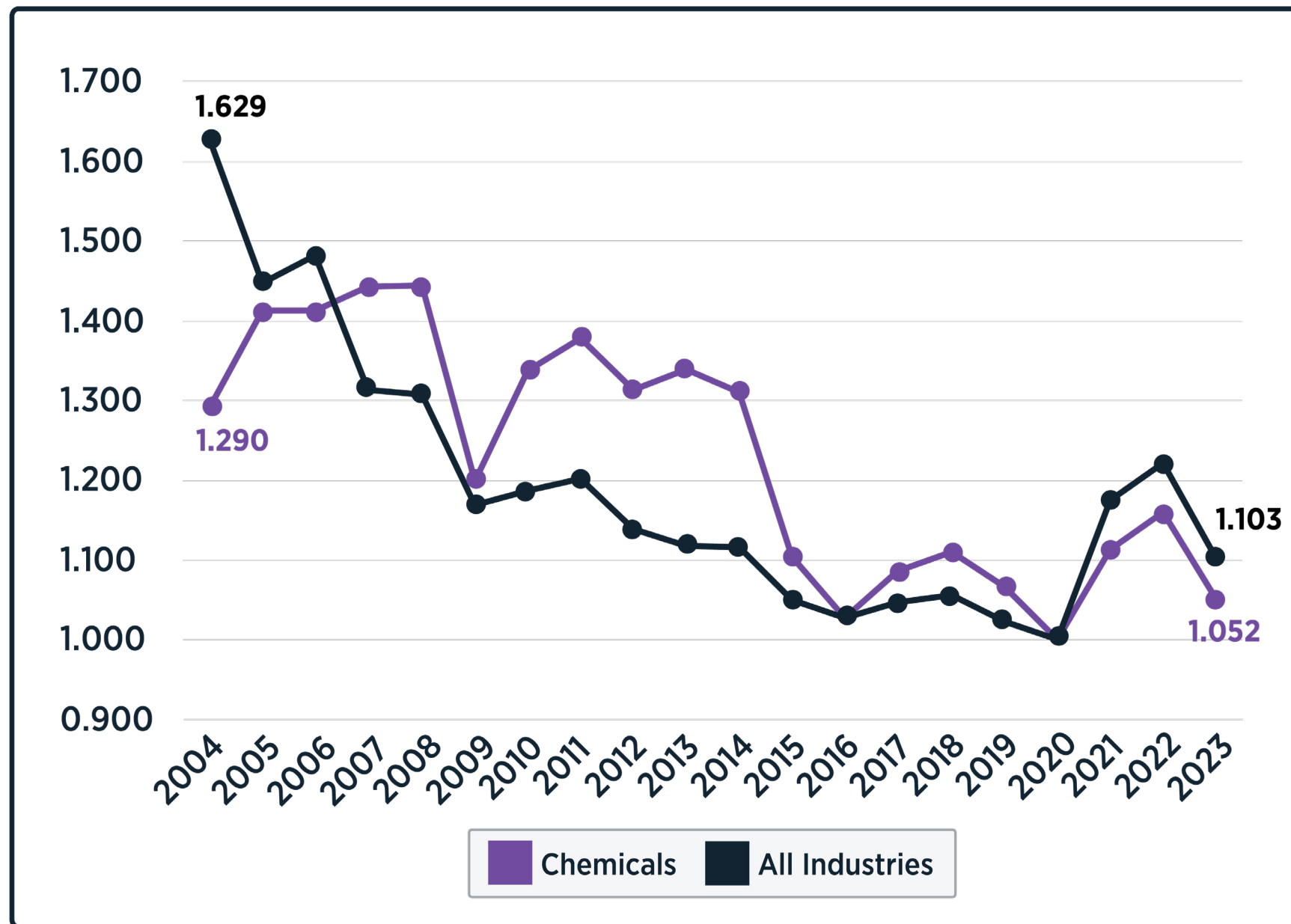
#### Chemicals

##### Most Improved

| Rank | Company                                                                                      | 2017-2020 Productivity Growth | 2020-2023 Productivity Growth | Performance Compared to Peers (2017-2023) |
|------|----------------------------------------------------------------------------------------------|-------------------------------|-------------------------------|-------------------------------------------|
| 1    |  EASTMAN  | -13%                          | 44%                           | 26%                                       |
| 2    |  Olin     | -22%                          | 47%                           | 15%                                       |
| 3    |  Celanese | -9%                           | 20%                           | 10%                                       |

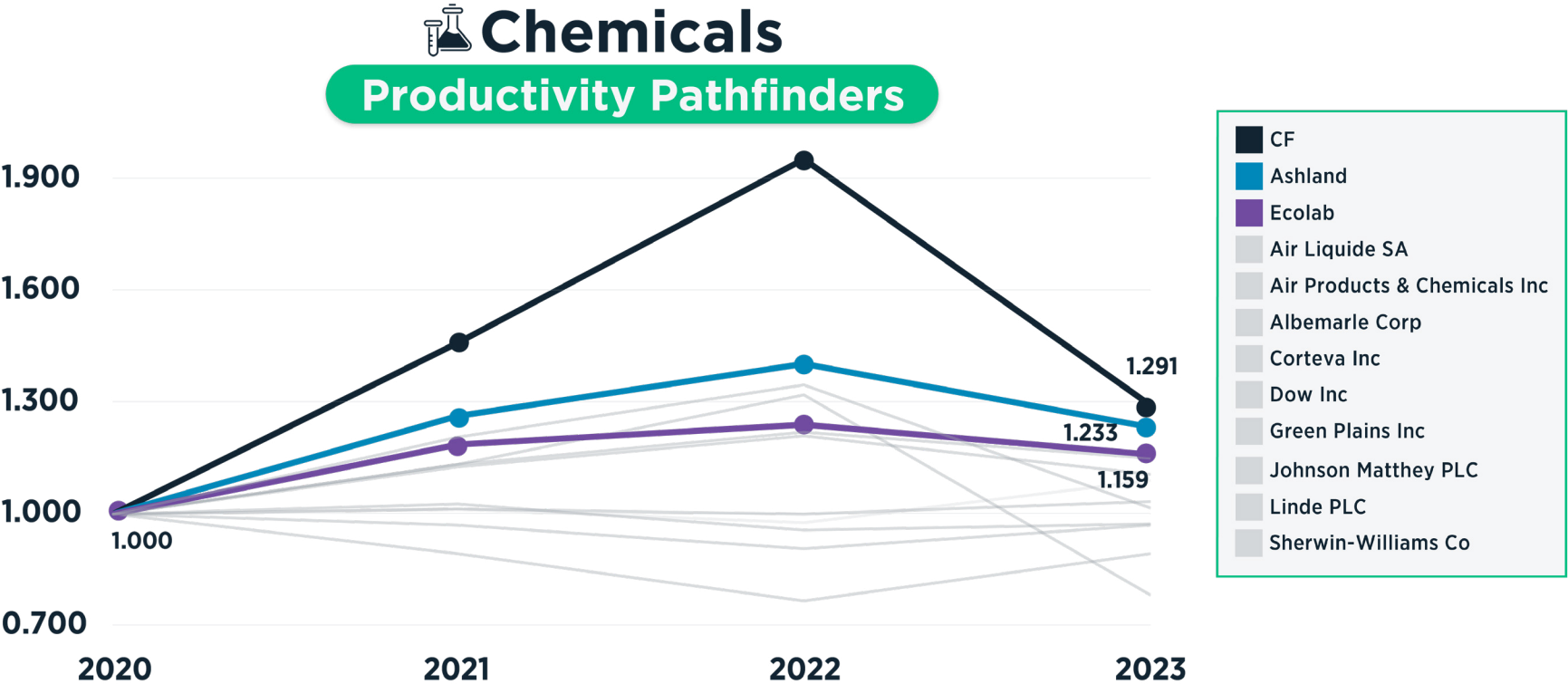
## Appendix C: Detailed Industrial Productivity Index and Pathfinder Results by Vertical (Cont.)

### Chemicals | Industrial Productivity Index



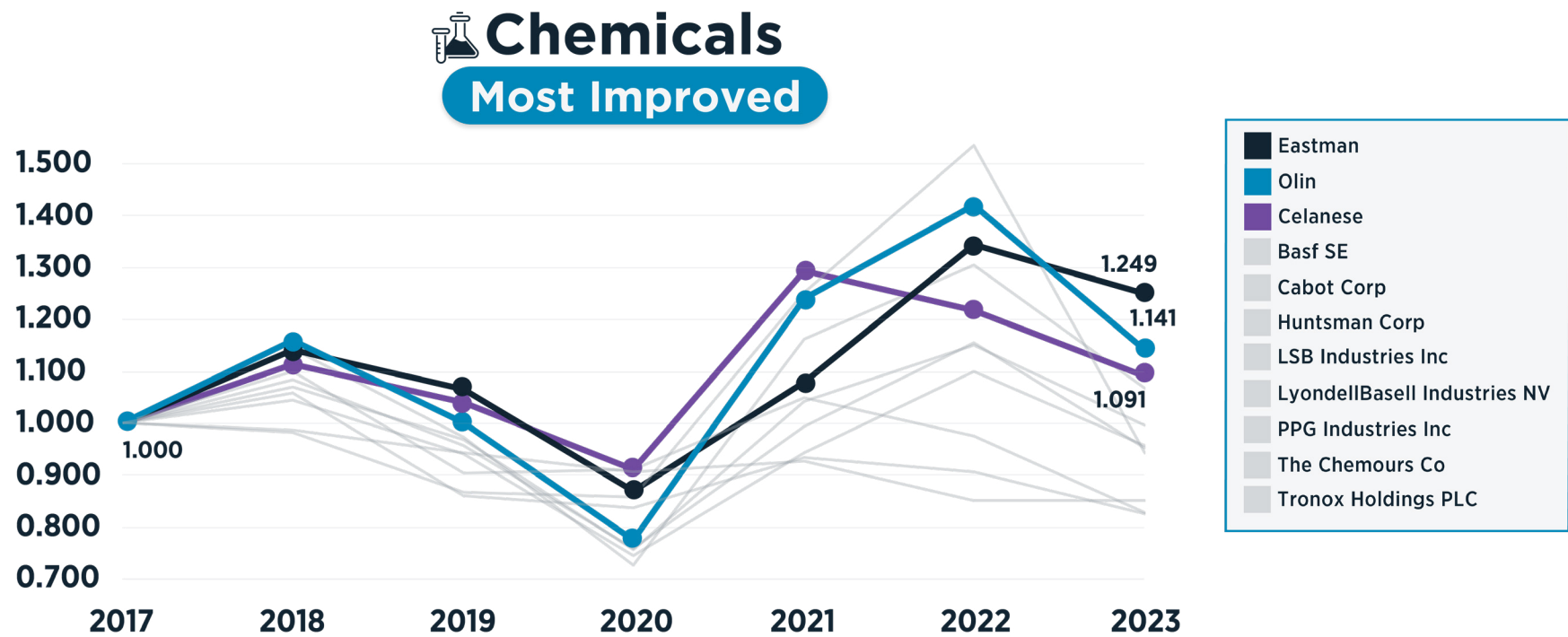
Appendix C: Detailed Industrial Productivity Index and Pathfinder Results by Vertical (Cont.)

Chemicals | Productivity Pathfinders



## Appendix C: Detailed Industrial Productivity Index and Pathfinder Results by Vertical (Cont.)

### Chemicals | Most Improved Pathfinders



## Appendix C: Detailed Industrial Productivity Index and Pathfinder Results by Vertical (Cont.)

### Consumer Products

#### Consumer Products Productivity Pathfinders

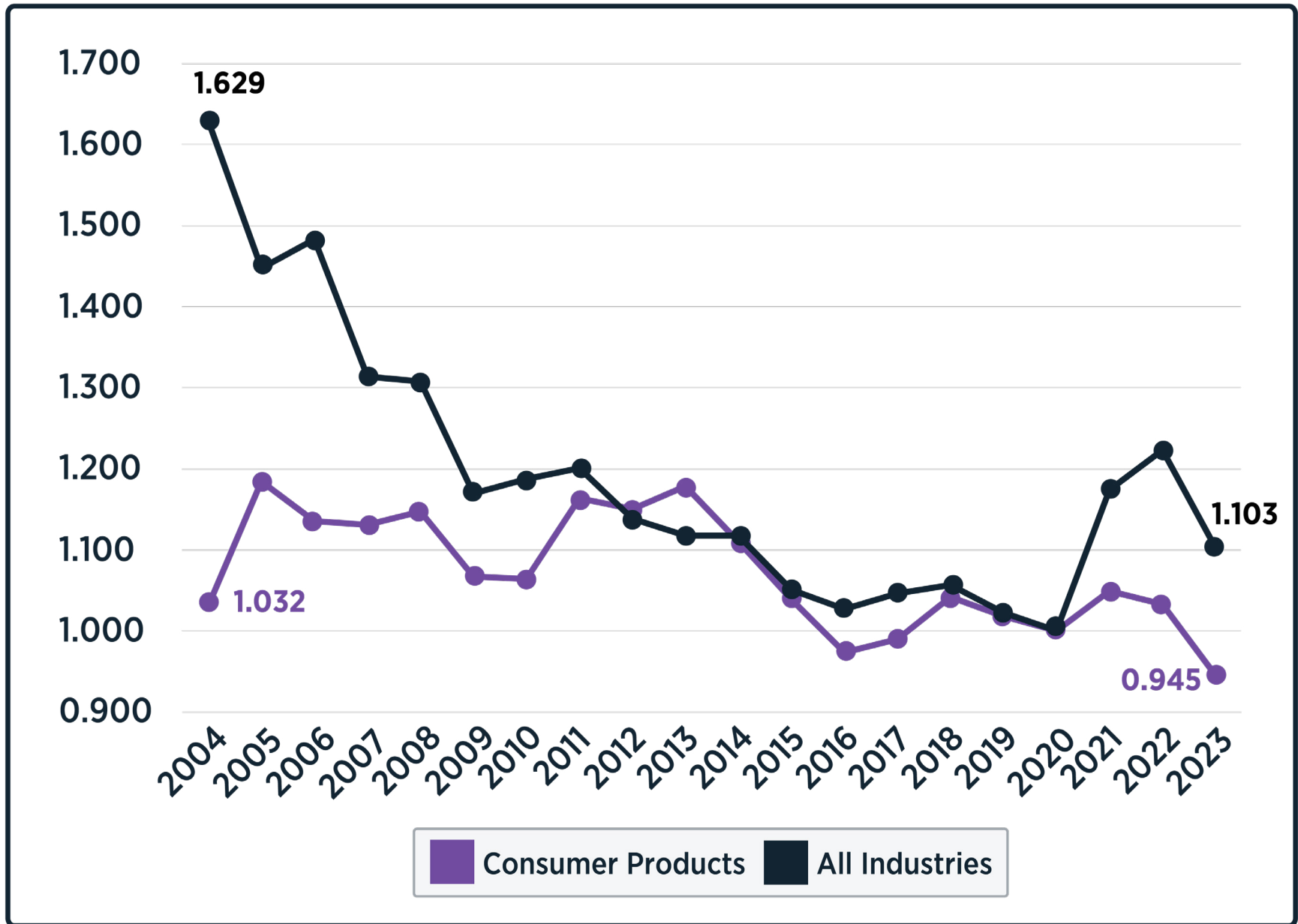
| Rank | Company                 | 2017-2020 Productivity Growth | 2020-2023 Productivity Growth | Performance Compared to Peers (2020-2023) |
|------|-------------------------|-------------------------------|-------------------------------|-------------------------------------------|
| 1    | ACUSHNET HOLDINGS CORP. | -5%                           | 31%                           | 30%                                       |
| 2    | Beiersdorf              | -5%                           | 8%                            | 7%                                        |
| 3    | reckitt                 | -1%                           | 7%                            | 6%                                        |

#### Consumer Products Most Improved

| Rank | Company                 | 2017-2020 Productivity Growth | 2020-2023 Productivity Growth | Performance Compared to Peers (2017-2023) |
|------|-------------------------|-------------------------------|-------------------------------|-------------------------------------------|
| 1    | TOPGOLF CALLAWAY BRANDS | -13%                          | 98%                           | 72%                                       |
| 2    | VISTA OUTDOOR           | -11%                          | 52%                           | 35%                                       |
| 3    | COTY<br>SINCE 1904      | -5%                           | 31%                           | 15%                                       |

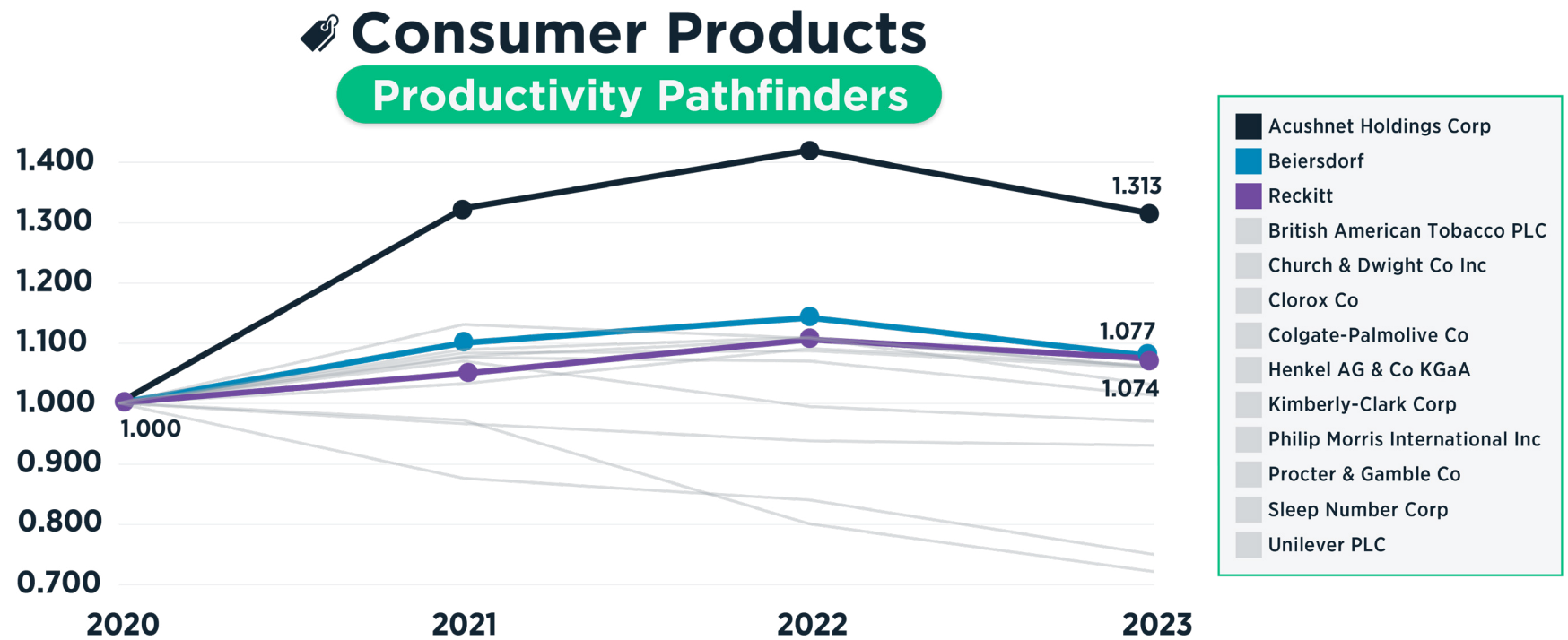
## Appendix C: Detailed Industrial Productivity Index and Pathfinder Results by Vertical (Cont.)

### Consumer Products | Industrial Productivity Index



## Appendix C: Detailed Industrial Productivity Index and Pathfinder Results by Vertical (Cont.)

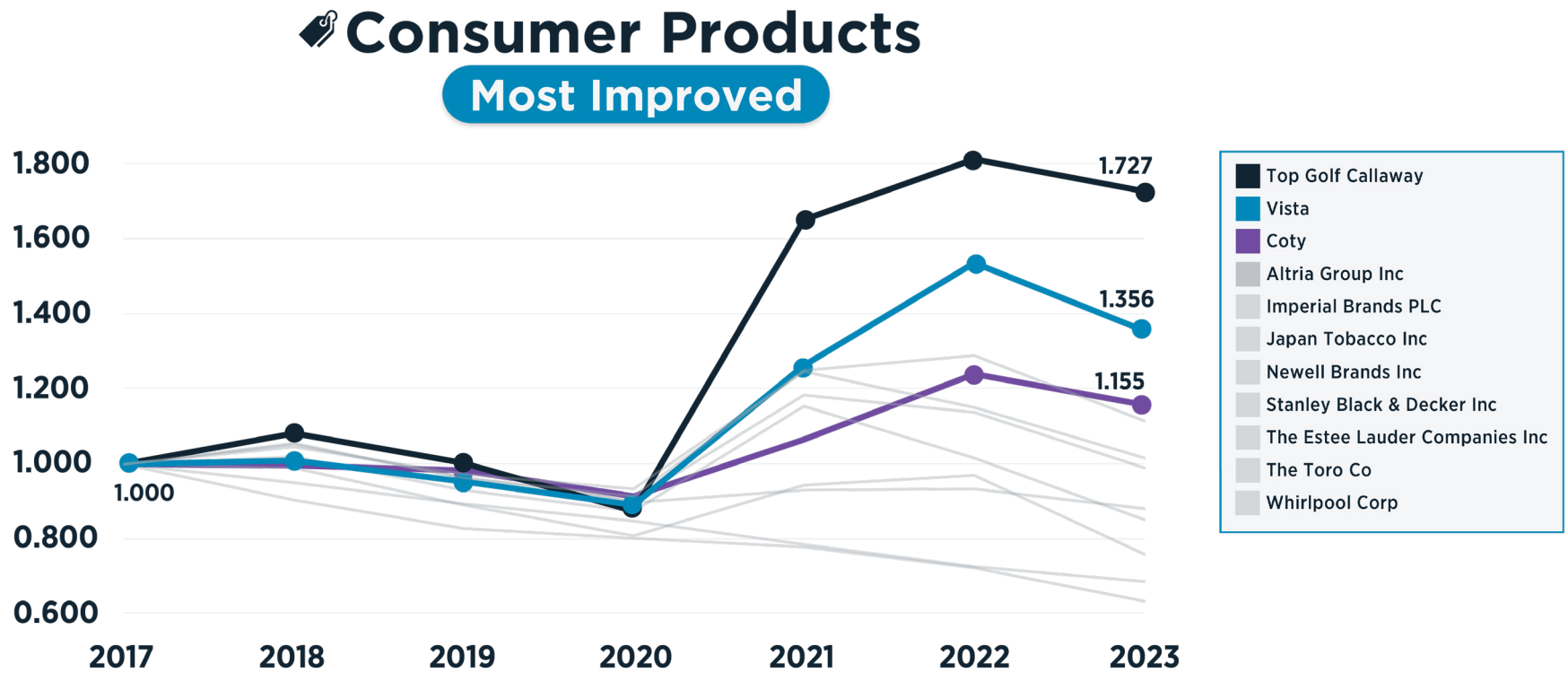
### Consumer Products | Productivity Pathfinders





## Appendix C: Detailed Industrial Productivity Index and Pathfinder Results by Vertical (Cont.)

### Consumer Products | Most Improved Pathfinders



## Appendix C: Detailed Industrial Productivity Index and Pathfinder Results by Vertical (Cont.)

### Energy

#### ⚡ Energy Productivity Pathfinders

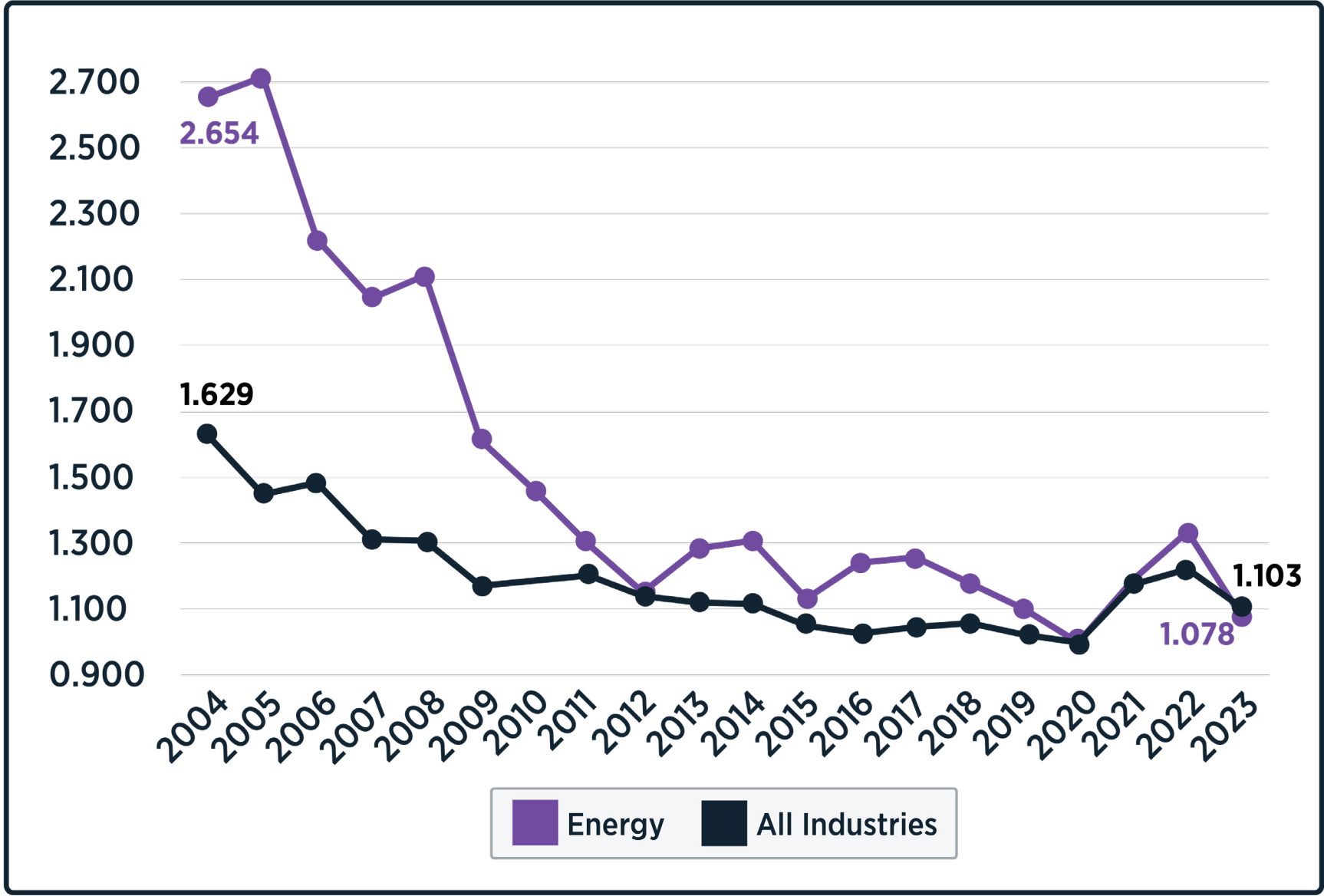
| Rank | Company                                                                           | 2017-2020 Productivity Growth | 2020-2023 Productivity Growth | Performance Compared to Peers (2020-2023) |
|------|-----------------------------------------------------------------------------------|-------------------------------|-------------------------------|-------------------------------------------|
| 1    |  | -2%                           | 34%                           | 39%                                       |
| 2    |  | -12%                          | 27%                           | 32%                                       |
| 3    |  | -12%                          | 23%                           | 28%                                       |

#### ⚡ Energy Most Improved

| Rank | Company                                                                             | 2017-2020 Productivity Growth | 2020-2023 Productivity Growth | Performance Compared to Peers (2017-2023) |
|------|-------------------------------------------------------------------------------------|-------------------------------|-------------------------------|-------------------------------------------|
| 1    |  | -42%                          | 191%                          | 83%                                       |
| 2    |  | -29%                          | 83%                           | 45%                                       |
| 3    |  | -26%                          | 50%                           | 25%                                       |

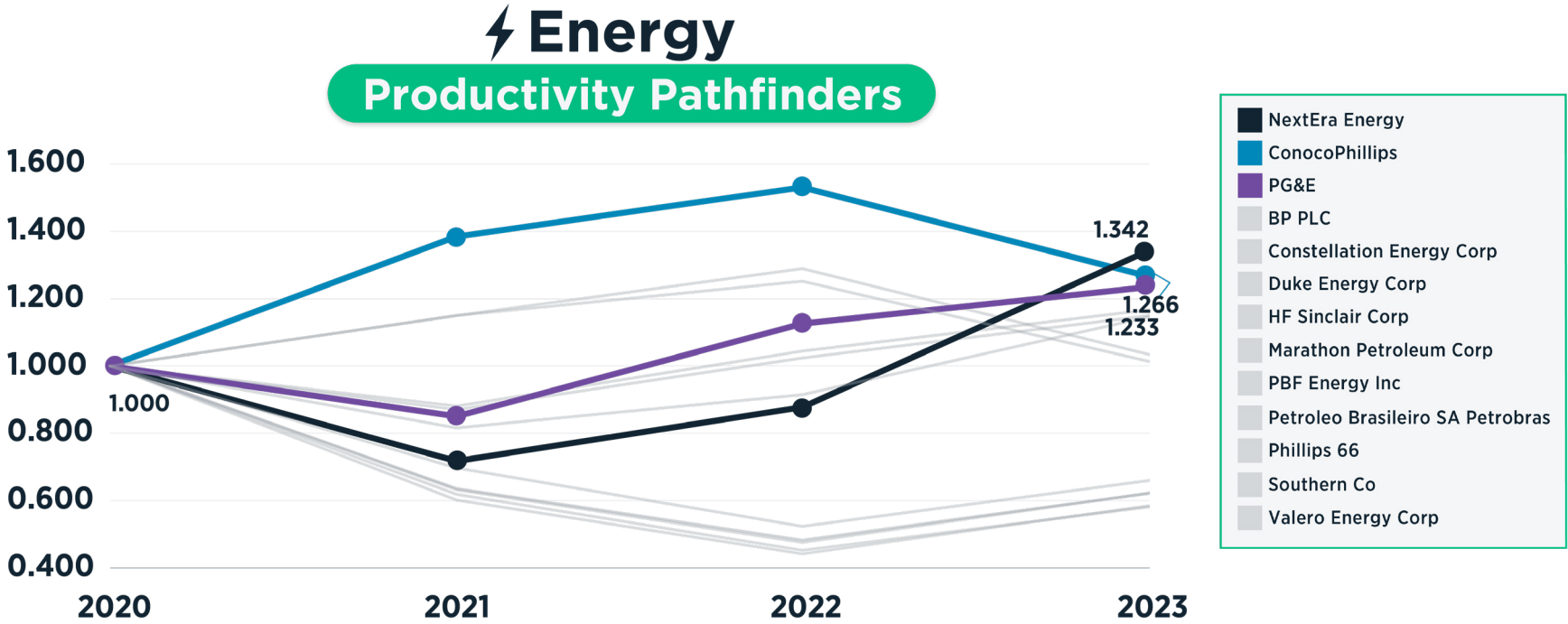
# Appendix C: Detailed Industrial Productivity Index and Pathfinder Results by Vertical (Cont.)

## Energy | Industrial Productivity Index



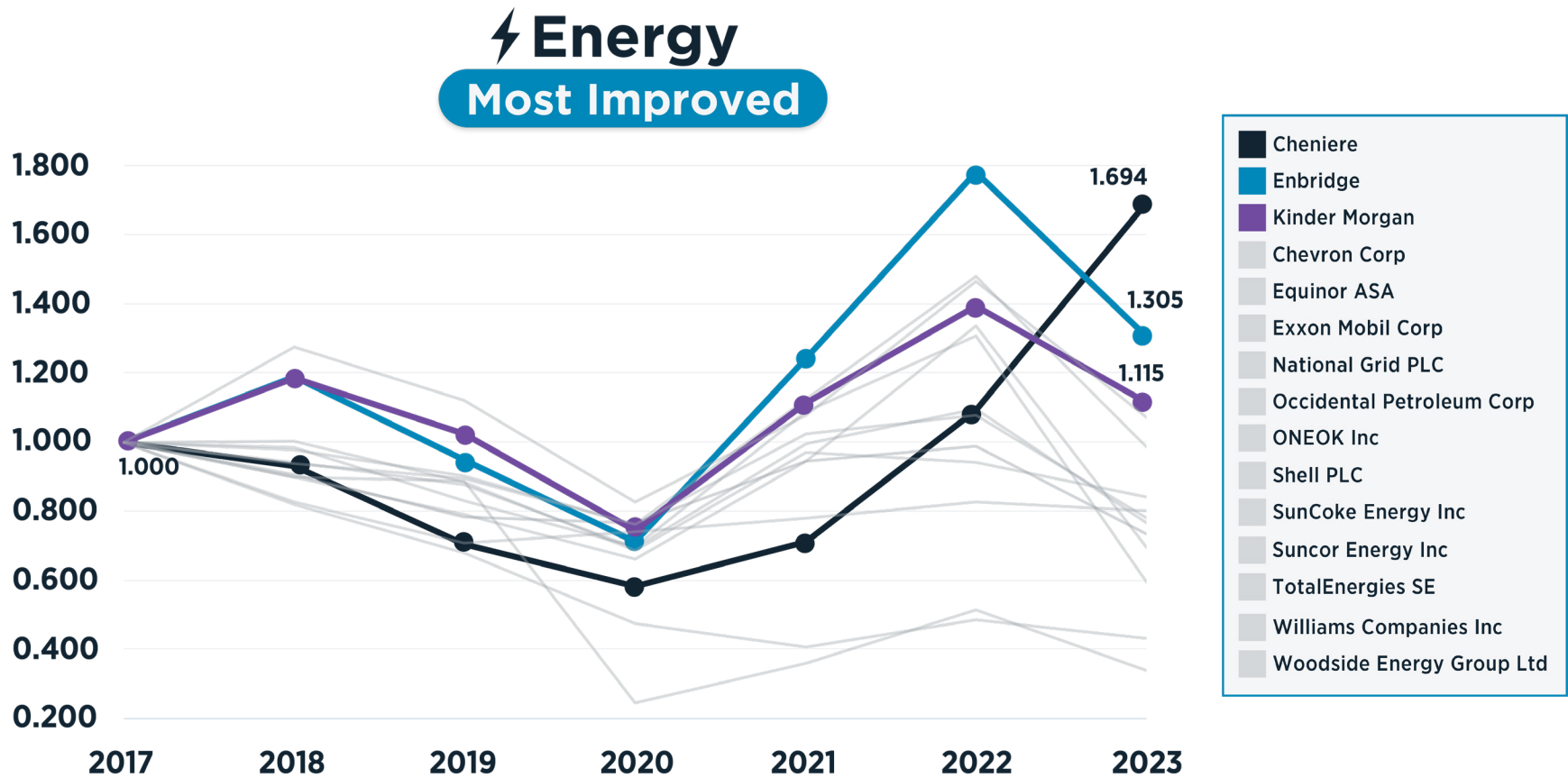
# Appendix C: Detailed Industrial Productivity Index and Pathfinder Results by Vertical (Cont.)

## Energy | Productivity Pathfinders



## Appendix C: Detailed Industrial Productivity Index and Pathfinder Results by Vertical (Cont.)

### Energy | Most Improved Pathfinders



## Appendix C: Detailed Industrial Productivity Index and Pathfinder Results by Vertical (Cont.)

### Food & Beverage

#### Food & Beverage

##### Productivity Pathfinders

| Rank | Company                                                                                                | 2017-2020 Productivity Growth | 2020-2023 Productivity Growth | Performance Compared to Peers (2020-2023) |
|------|--------------------------------------------------------------------------------------------------------|-------------------------------|-------------------------------|-------------------------------------------|
| 1    | <b>DIAGEO</b>                                                                                          | 6%                            | 37%                           | 30%                                       |
| 2    |  Constellation Brands | 8%                            | 27%                           | 20%                                       |
| 3    |                       | 1%                            | 18%                           | 11%                                       |

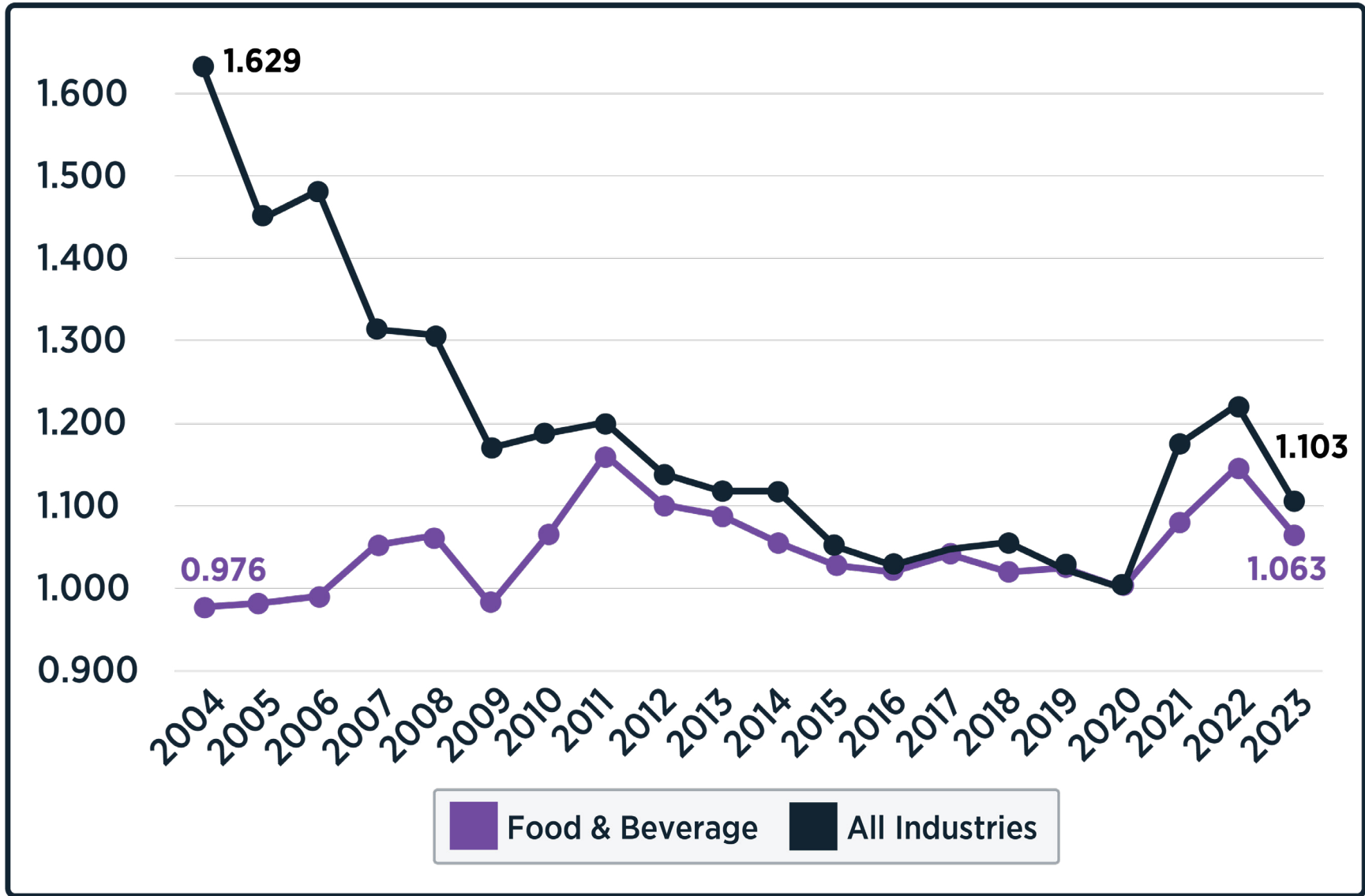
#### Food & Beverage

##### Most Improved

| Rank | Company                                                                                                  | 2017-2020 Productivity Growth | 2020-2023 Productivity Growth | Performance Compared to Peers (2017-2023) |
|------|----------------------------------------------------------------------------------------------------------|-------------------------------|-------------------------------|-------------------------------------------|
| 1    |  <b>ABInBev</b>       | -5%                           | 12%                           | 11%                                       |
| 2    |  <b>The Andersons</b> | -11%                          | 10%                           | 7%                                        |
| 3    |  <b>Ingredion</b>     | -7%                           | 6%                            | 5%                                        |

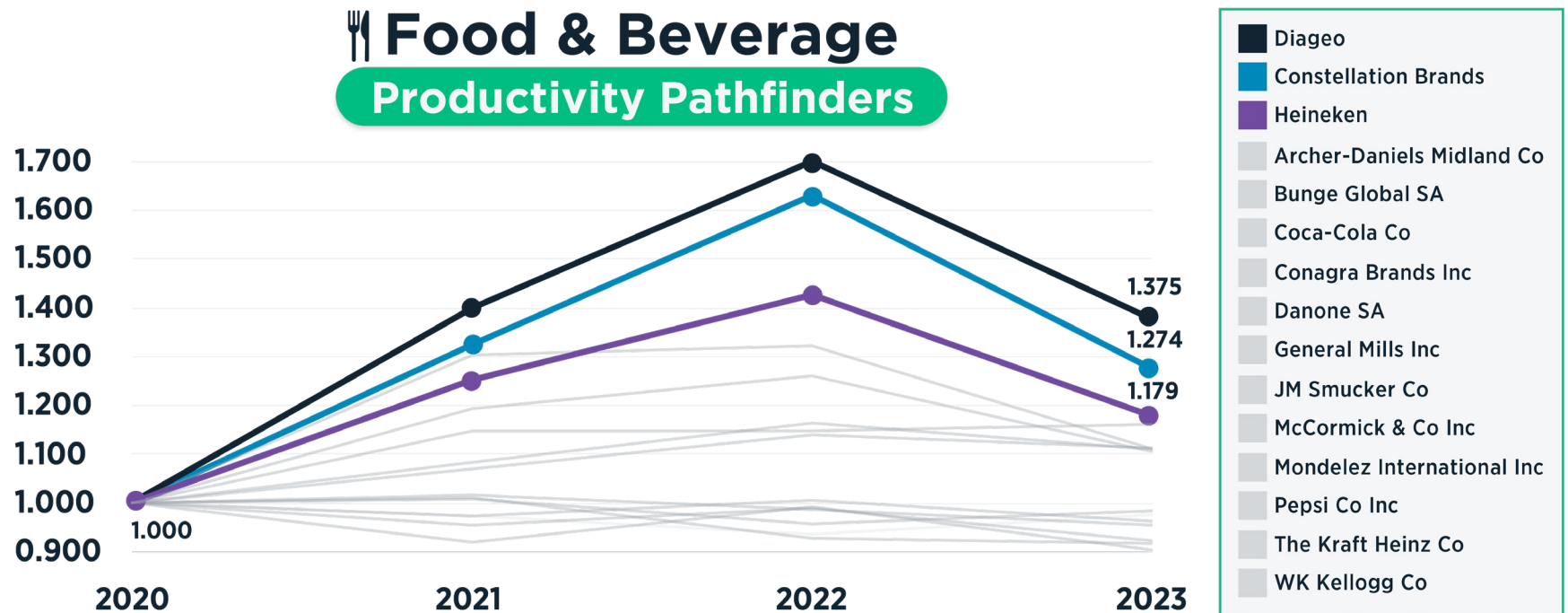
# Appendix C: Detailed Industrial Productivity Index and Pathfinder Results by Vertical (Cont.)

## Food & Beverage | Industrial Productivity Index



## Appendix C: Detailed Industrial Productivity Index and Pathfinder Results by Vertical (Cont.)

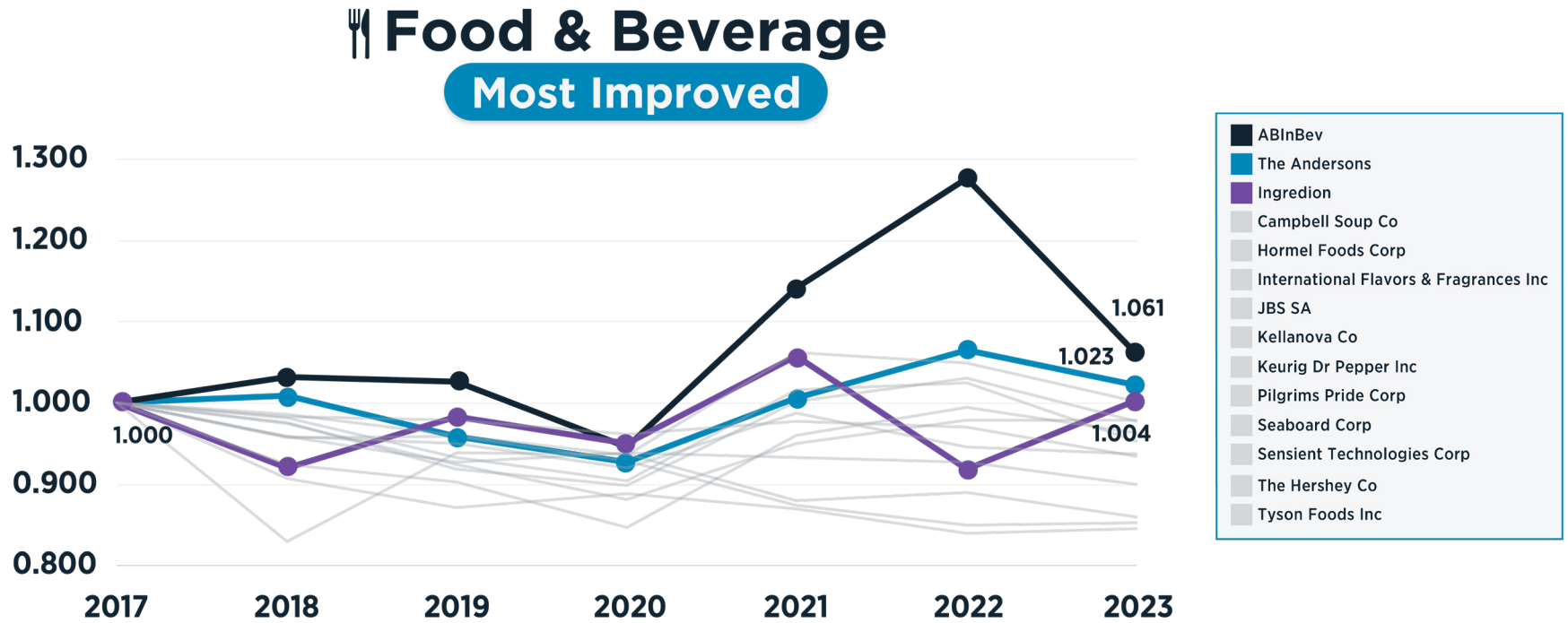
### Food & Beverage | Productivity Pathfinders





## Appendix C: Detailed Industrial Productivity Index and Pathfinder Results by Vertical (Cont.)

### Food & Beverage | Most Improved Pathfinders



## Appendix C: Detailed Industrial Productivity Index and Pathfinder Results by Vertical (Cont.)

### High-tech

#### High-tech

##### Productivity Pathfinders

| Rank | Company                                                                                               | 2017-2020 Productivity Growth | 2020-2023 Productivity Growth | Performance Compared to Peers (2020-2023) |
|------|-------------------------------------------------------------------------------------------------------|-------------------------------|-------------------------------|-------------------------------------------|
| 1    |  First Solar         | 37%                           | 52%                           | 30%                                       |
| 2    |  Celestica™          | 6%                            | 24%                           | 2%                                        |
| 3    |  Kimball Electronics | 4%                            | 23%                           | 1%                                        |

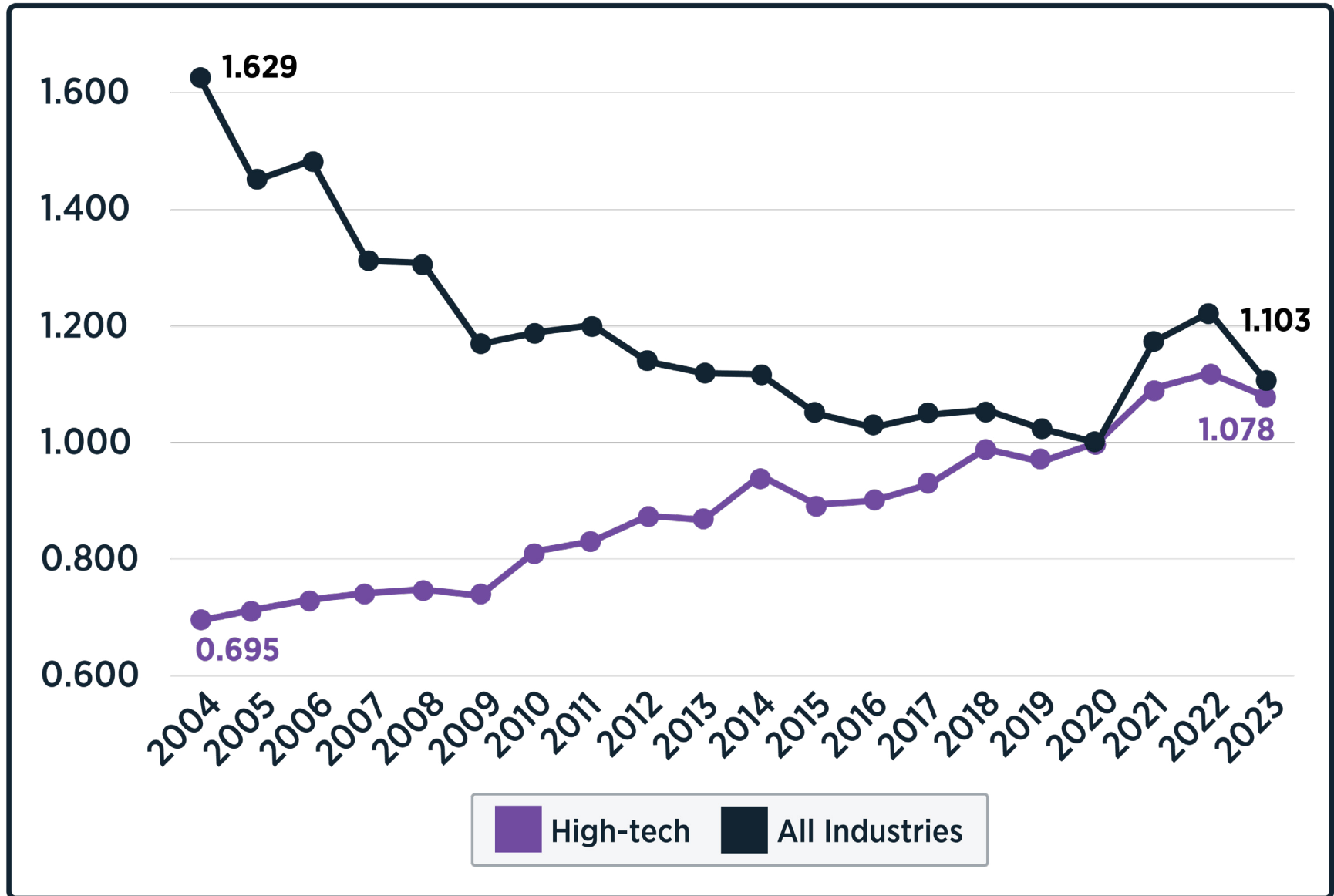
#### High-tech

##### Most Improved

| Rank | Company                                                                             | 2017-2020 Productivity Growth | 2020-2023 Productivity Growth | Performance Compared to Peers (2017-2023) |
|------|-------------------------------------------------------------------------------------|-------------------------------|-------------------------------|-------------------------------------------|
| 1    | <b>Amphenol</b>                                                                     | 2%                            | 24%                           | 20%                                       |
| 2    | <b>FOXCONN®</b>                                                                     | 1%                            | 23%                           | 19%                                       |
| 3    |  | 3%                            | 15%                           | 19%                                       |

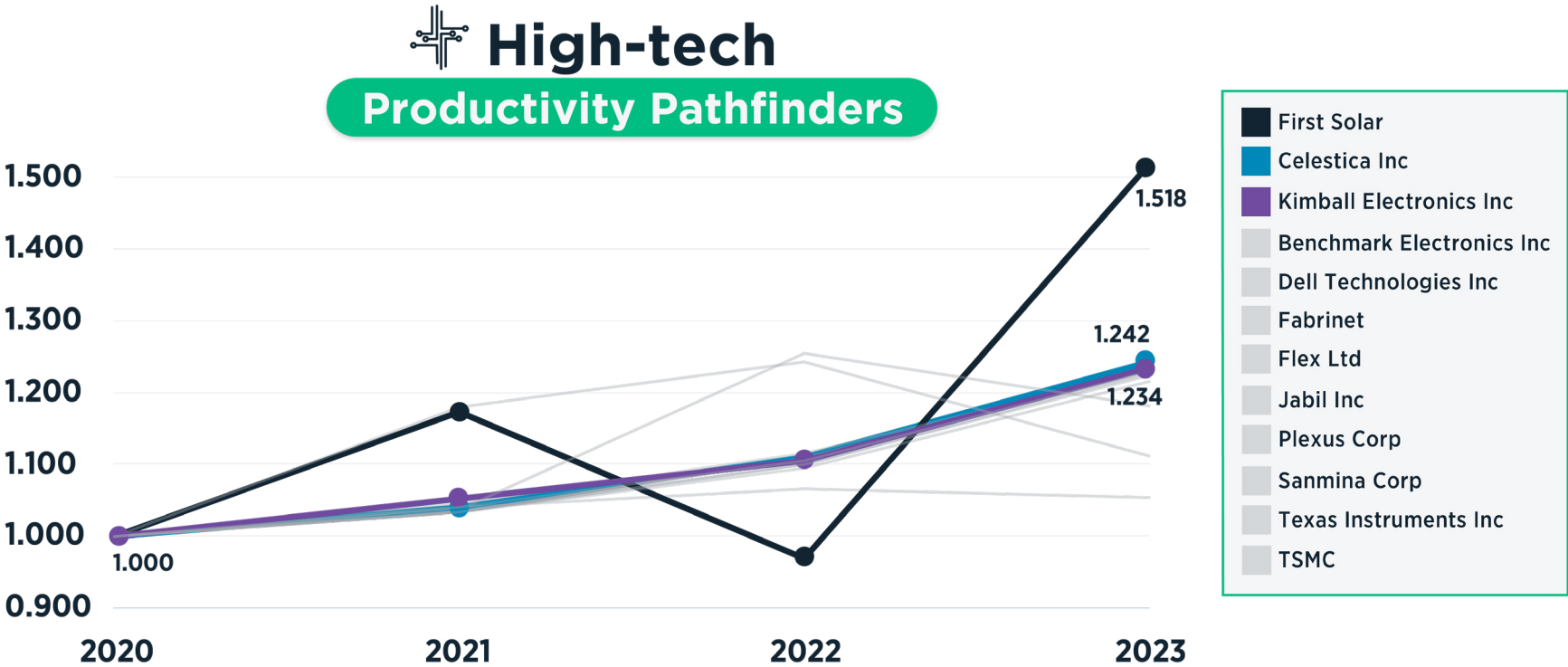
## Appendix C: Detailed Industrial Productivity Index and Pathfinder Results by Vertical (Cont.)

### High-tech | Industrial Productivity Index



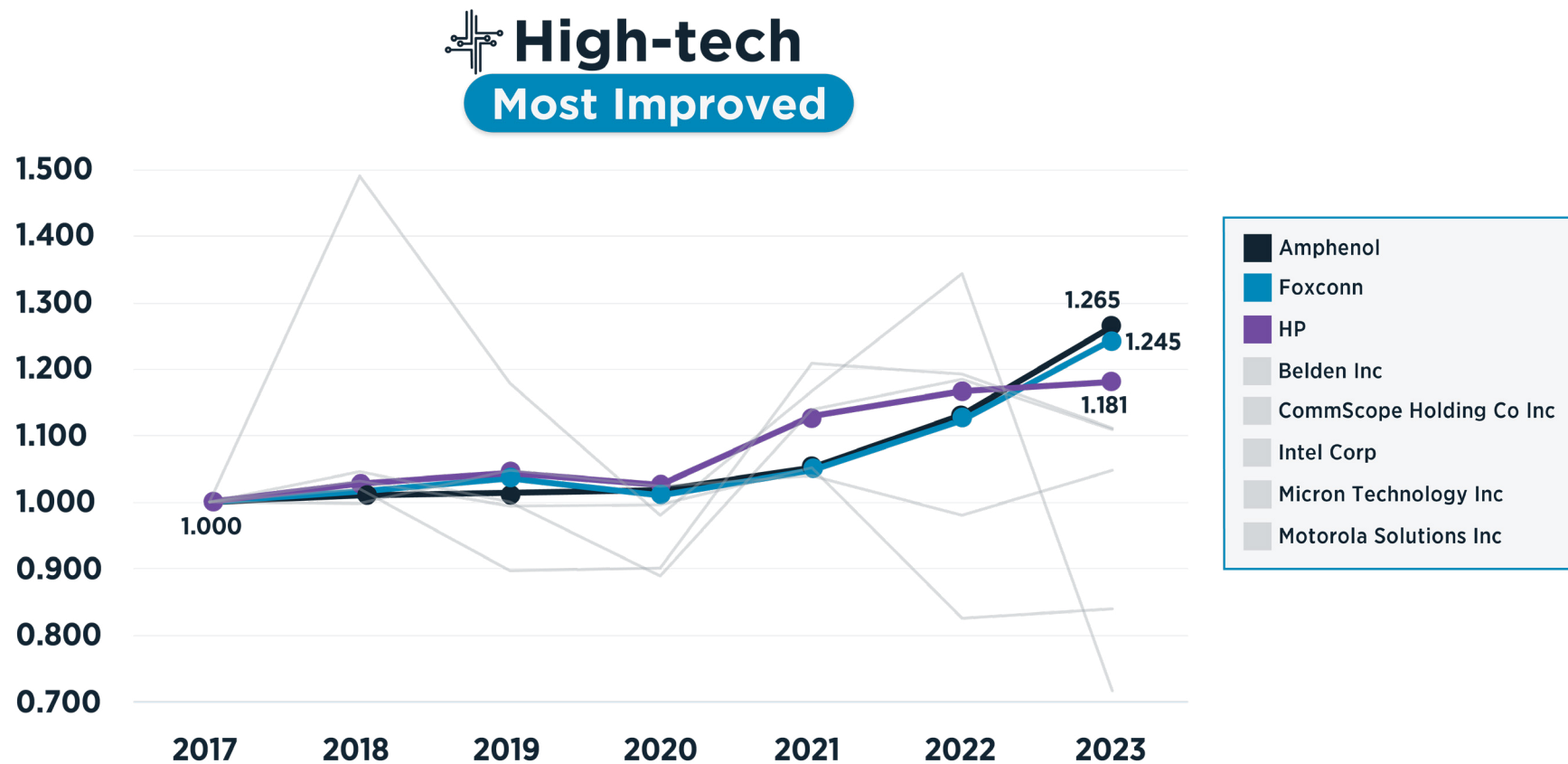
# Appendix C: Detailed Industrial Productivity Index and Pathfinder Results by Vertical (Cont.)

## High-tech | Productivity Pathfinders



## Appendix C: Detailed Industrial Productivity Index and Pathfinder Results by Vertical (Cont.)

### High-tech | Most Improved Pathfinders



## Appendix C: Detailed Industrial Productivity Index and Pathfinder Results by Vertical (Cont.)

### Industrial Equipment (Including Industrial Conglomerates)

#### Industrial Equipment Productivity Pathfinders

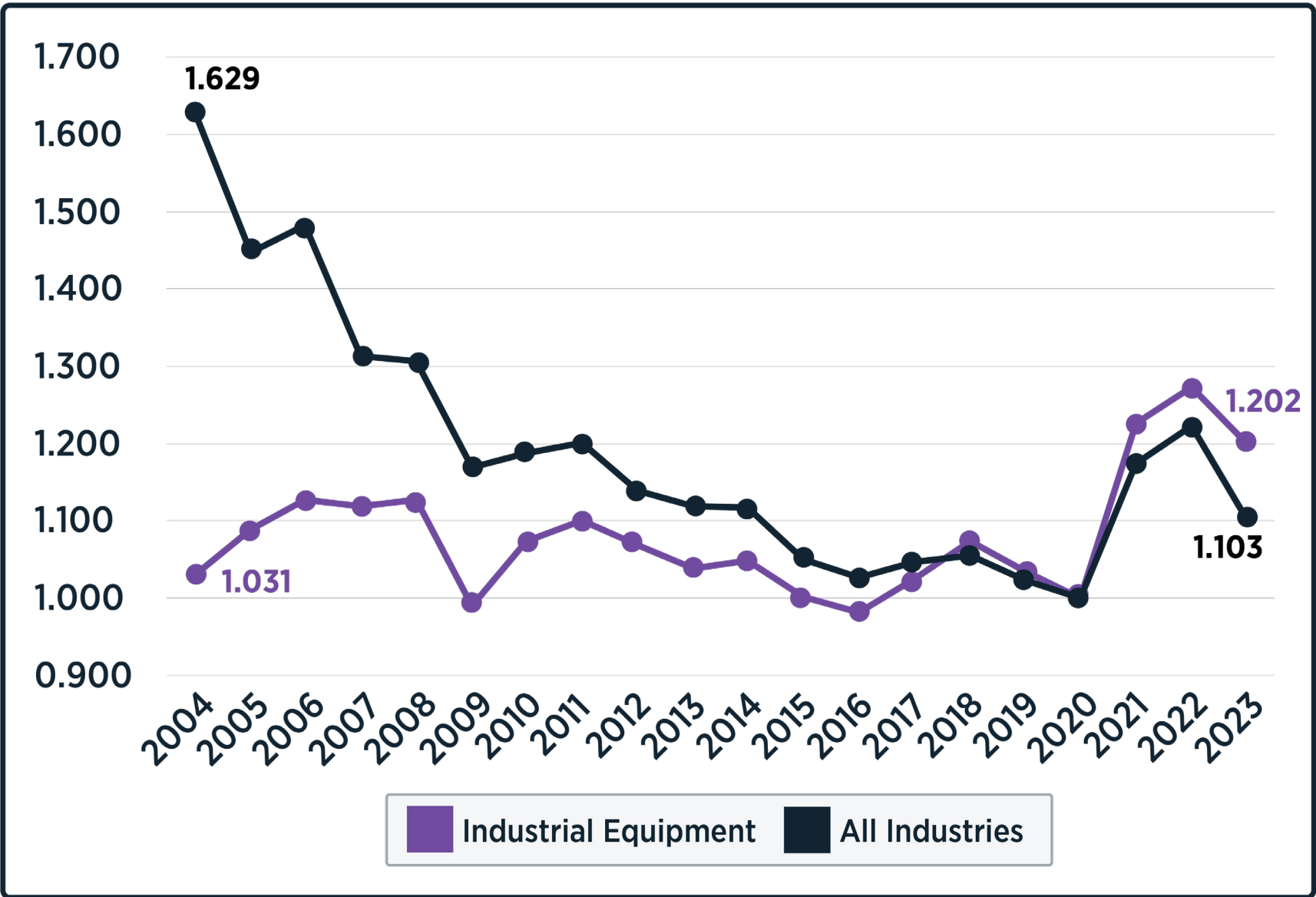
| Rank | Company                                                                           | 2017-2020 Productivity Growth | 2020-2023 Productivity Growth | Performance Compared to Peers (2020-2023) |
|------|-----------------------------------------------------------------------------------|-------------------------------|-------------------------------|-------------------------------------------|
| 1    |  | 0%                            | 41%                           | 19%                                       |
| 2    |  | 2%                            | 40%                           | 18%                                       |
| 3    |  | -2%                           | 39%                           | 17%                                       |

#### Industrial Equipment Most Improved

| Rank | Company                                                                             | 2017-2020 Productivity Growth | 2020-2023 Productivity Growth | Performance Compared to Peers (2017-2023) |
|------|-------------------------------------------------------------------------------------|-------------------------------|-------------------------------|-------------------------------------------|
| 1    |  | -9%                           | 51%                           | 27%                                       |
| 2    |  | -7%                           | 34%                           | 14%                                       |
| 3    |  | -5%                           | 29%                           | 12%                                       |

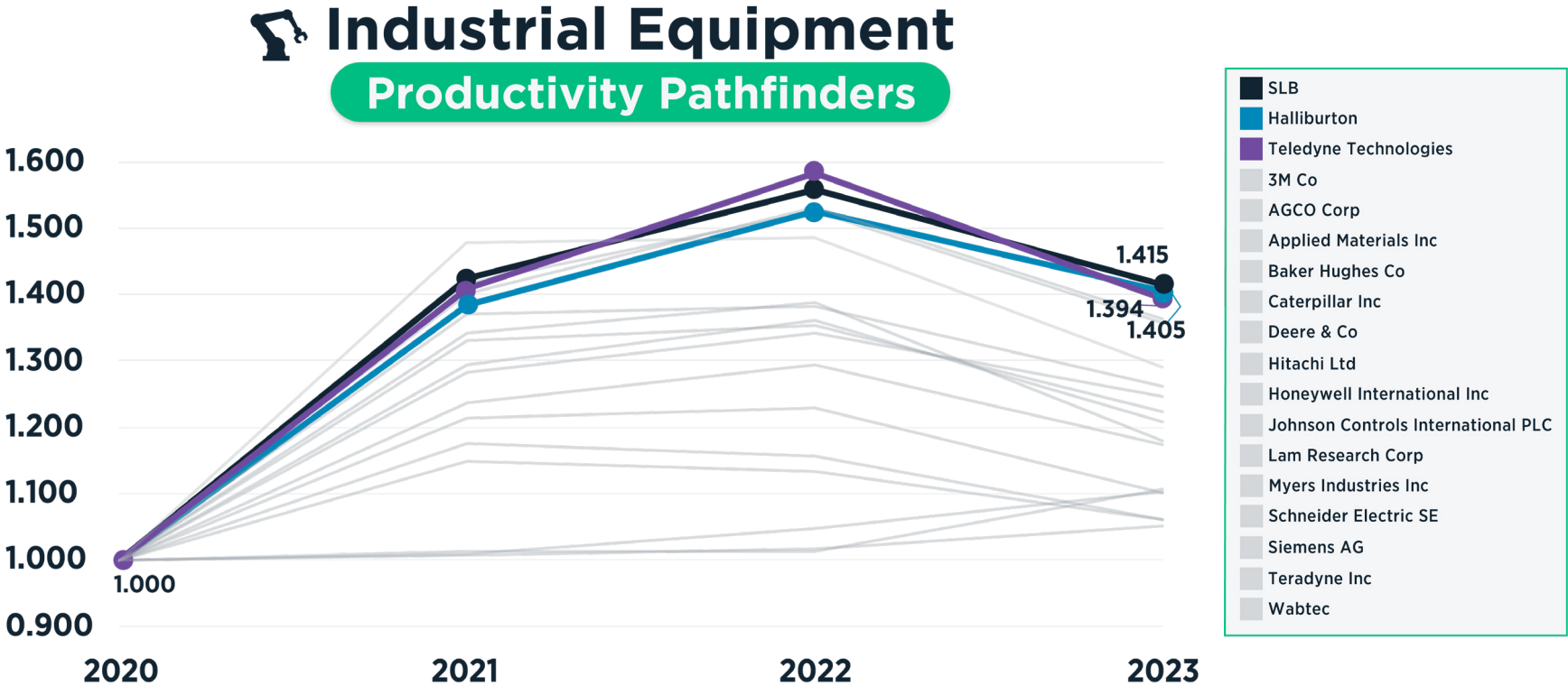
## Appendix C: Detailed Industrial Productivity Index and Pathfinder Results by Vertical (Cont.)

### Industrial Equipment (Including Industrial Conglomerates) | Industrial Productivity Index



# Appendix C: Detailed Industrial Productivity Index and Pathfinder Results by Vertical (Cont.)

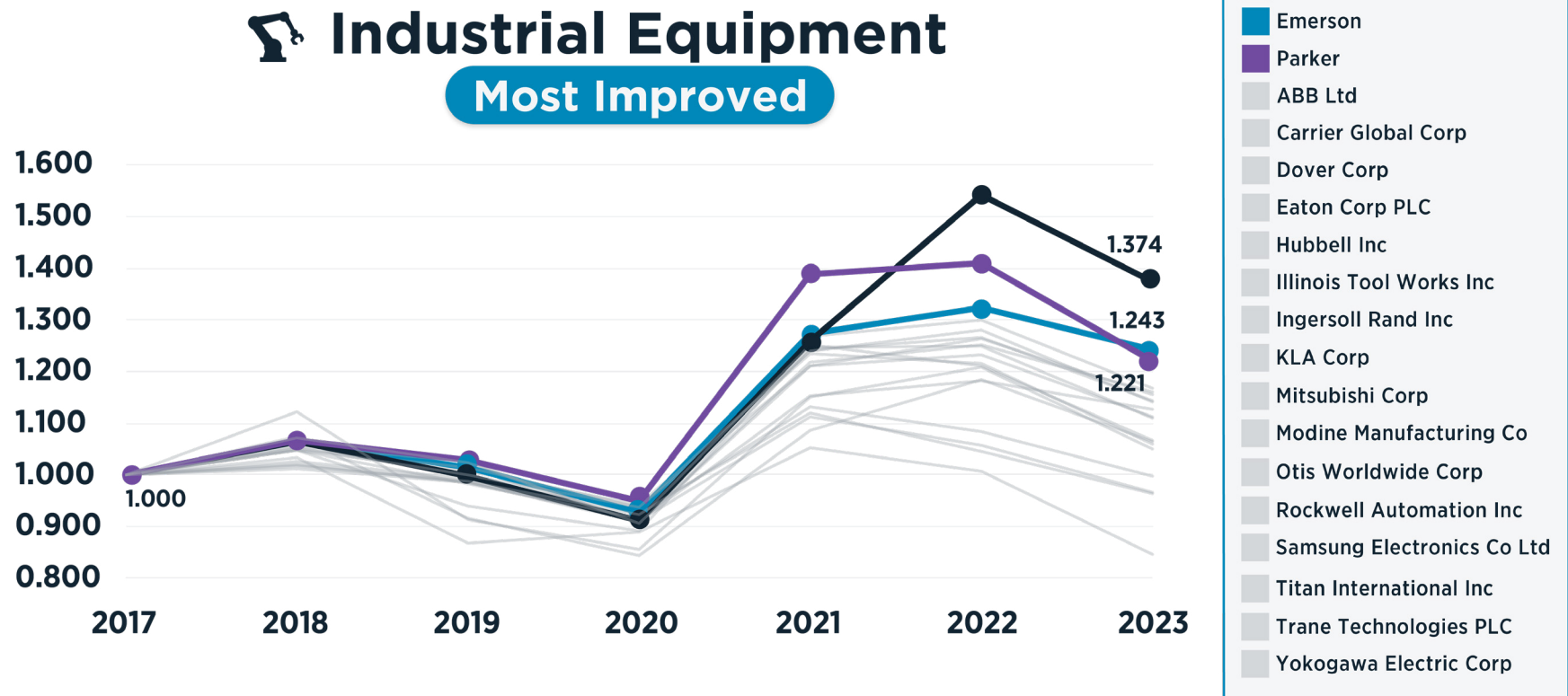
## Industrial Equipment (Including Industrial Conglomerates) | Productivity Pathfinders





## Appendix C: Detailed Industrial Productivity Index and Pathfinder Results by Vertical (Cont.)

### Industrial Equipment (Including Industrial Conglomerates) | Most Improved Pathfinders



## Appendix C: Detailed Industrial Productivity Index and Pathfinder Results by Vertical (Cont.)

### Life Sciences

#### ⊕ Life Sciences

##### Productivity Pathfinders

| Rank | Company                                                                                                | 2017-2020 Productivity Growth | 2020-2023 Productivity Growth | Performance Compared to Peers (2020-2023) |
|------|--------------------------------------------------------------------------------------------------------|-------------------------------|-------------------------------|-------------------------------------------|
| 1    |  danaher.             | 1%                            | 40%                           | 35%                                       |
| 2    |  Bristol Myers Squibb | 1%                            | 28%                           | 23%                                       |
| 3    |  MERCK                | -4%                           | 27%                           | 22%                                       |

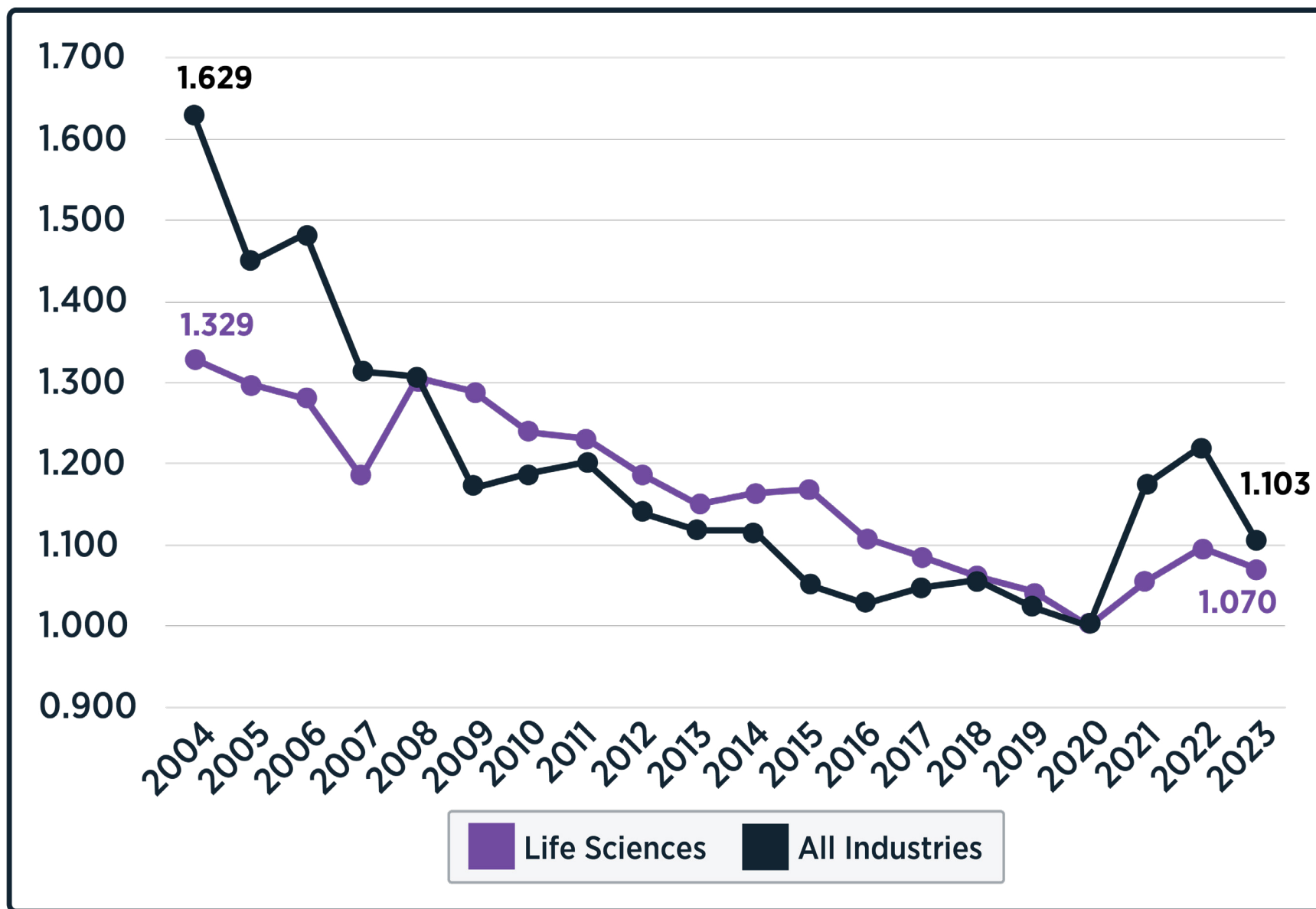
#### ⊕ Life Sciences

##### Most Improved

| Rank | Company                                                                                                                              | 2017-2020 Productivity Growth | 2020-2023 Productivity Growth | Performance Compared to Peers (2017-2023) |
|------|--------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|-------------------------------|-------------------------------------------|
| 1    |  stryker                                          | -8%                           | 33%                           | 33%                                       |
| 2    |  Boston Scientific<br>Advancing science for life™ | -18%                          | 44%                           | 29%                                       |
| 3    |  AstraZeneca                                      | -8%                           | 23%                           | 24%                                       |

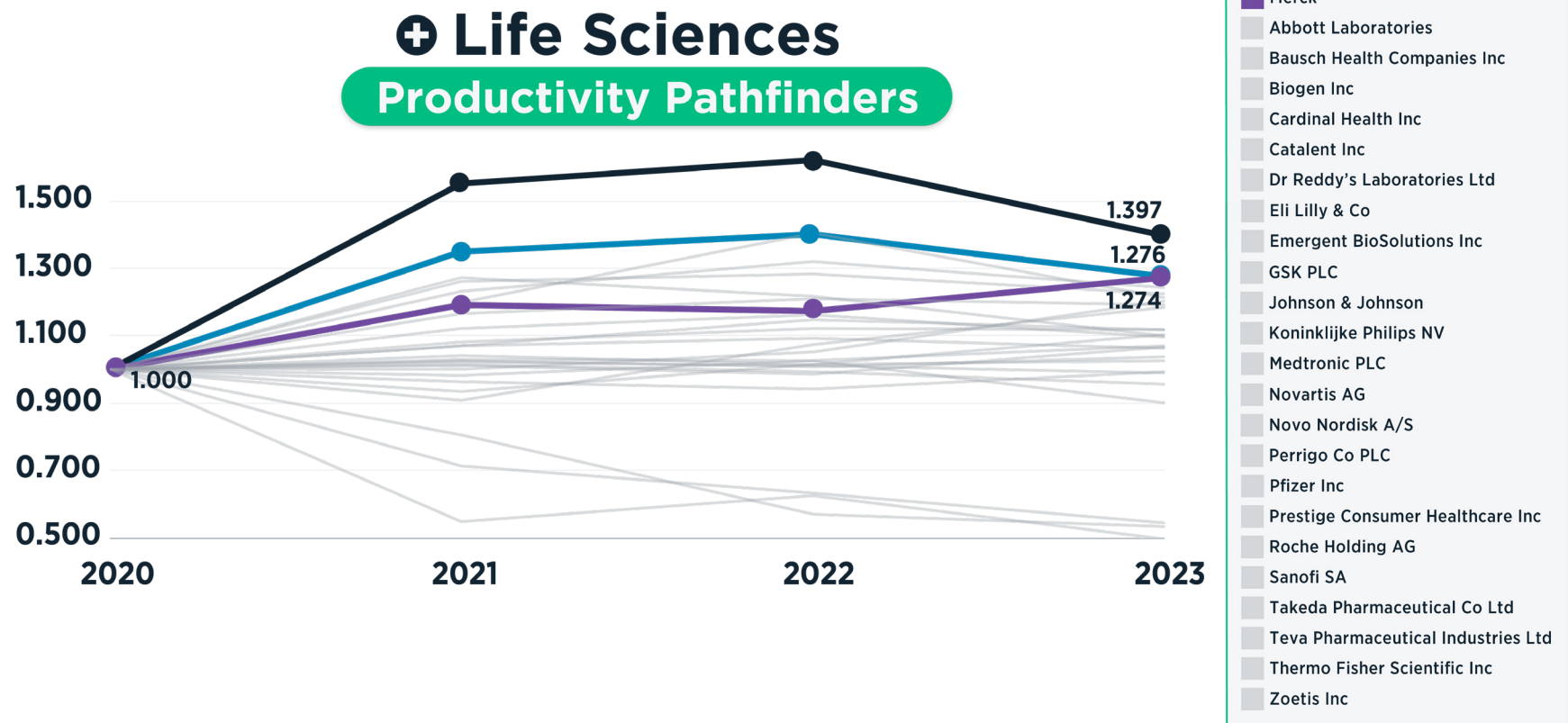
## Appendix C: Detailed Industrial Productivity Index and Pathfinder Results by Vertical (Cont.)

### Life Sciences | Industrial Productivity Index



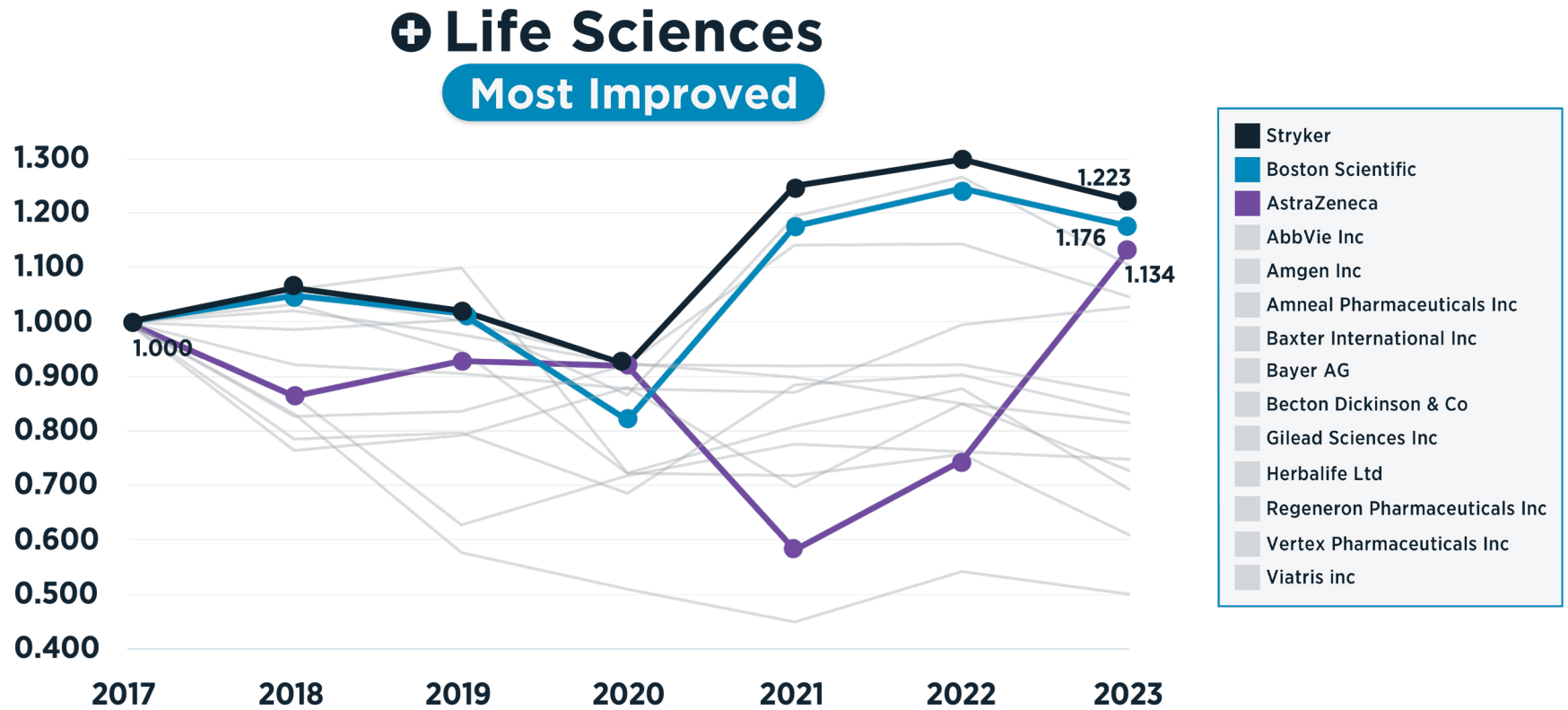
## Appendix C: Detailed Industrial Productivity Index and Pathfinder Results by Vertical (Cont.)

### Life Sciences | Productivity Pathfinders



## Appendix C: Detailed Industrial Productivity Index and Pathfinder Results by Vertical (Cont.)

### Life Sciences | Most Improved Pathfinders



## Appendix C: Detailed Industrial Productivity Index and Pathfinder Results by Vertical (Cont.)

### Materials

#### Materials

##### Productivity Pathfinders

| Rank | Company                                                                                                  | 2017-2020 Productivity Growth | 2020-2023 Productivity Growth | Performance Compared to Peers (2020-2023) |
|------|----------------------------------------------------------------------------------------------------------|-------------------------------|-------------------------------|-------------------------------------------|
| 1    |  <b>Constellium</b>     | 0%                            | 11%                           | 15%                                       |
| 2    |  <b>SOUTHERN COPPER</b> | -1%                           | 11%                           | 15%                                       |
| 3    |  <b>Martin Marietta</b> | 1%                            | 10%                           | 14%                                       |

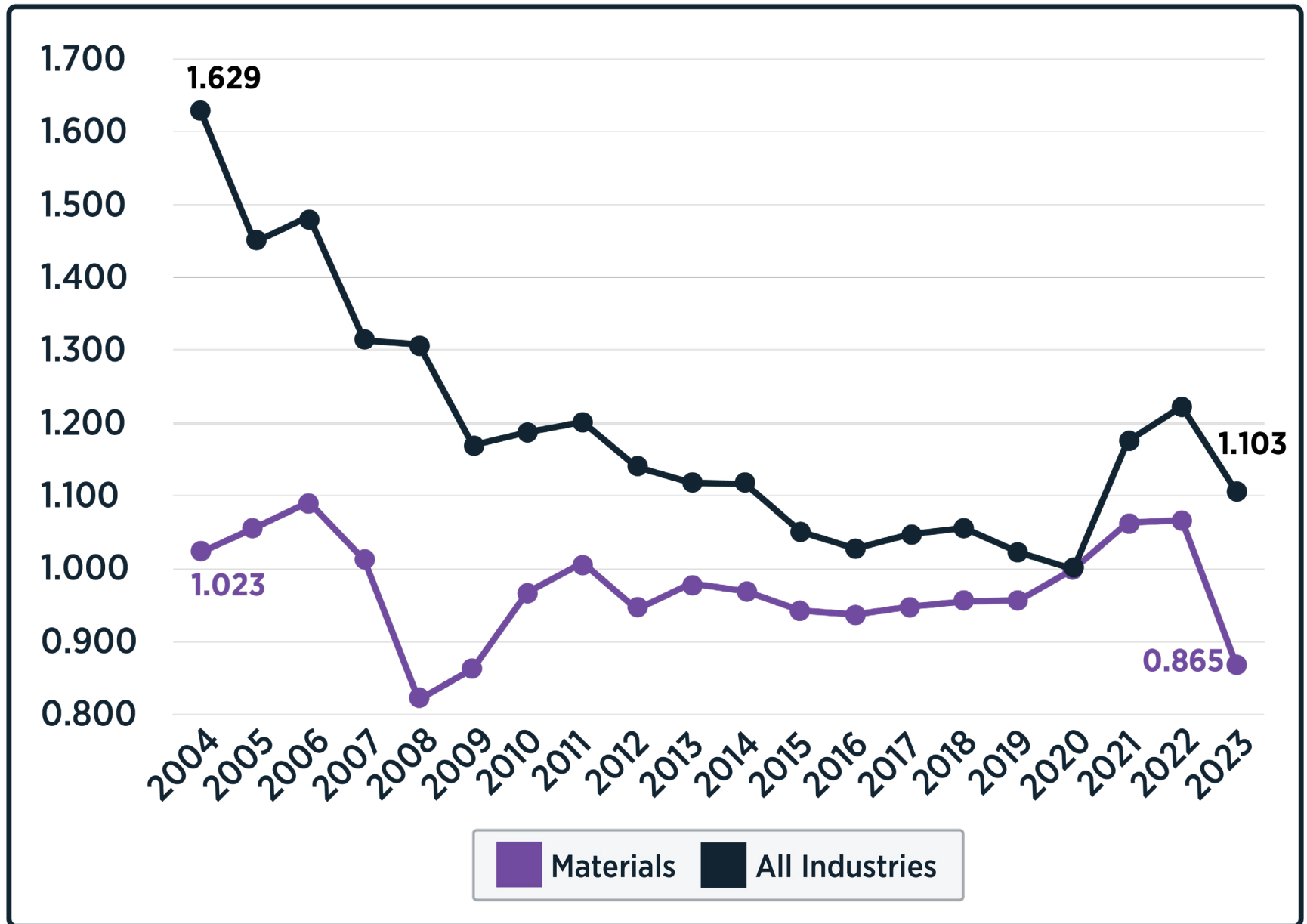
#### Materials

##### Most Improved

| Rank | Company                                                                                                     | 2017-2020 Productivity Growth | 2020-2023 Productivity Growth | Performance Compared to Peers (2017-2023) |
|------|-------------------------------------------------------------------------------------------------------------|-------------------------------|-------------------------------|-------------------------------------------|
| 1    |  <b>FREEPORT-McMoRAN</b> | -24%                          | 121%                          | 68%                                       |
| 2    |  <b>Century</b> ALUMINUM | -2%                           | 39%                           | 35%                                       |
| 3    |  <b>Alcoa</b>            | -3%                           | 20%                           | 17%                                       |

## Appendix C: Detailed Industrial Productivity Index and Pathfinder Results by Vertical (Cont.)

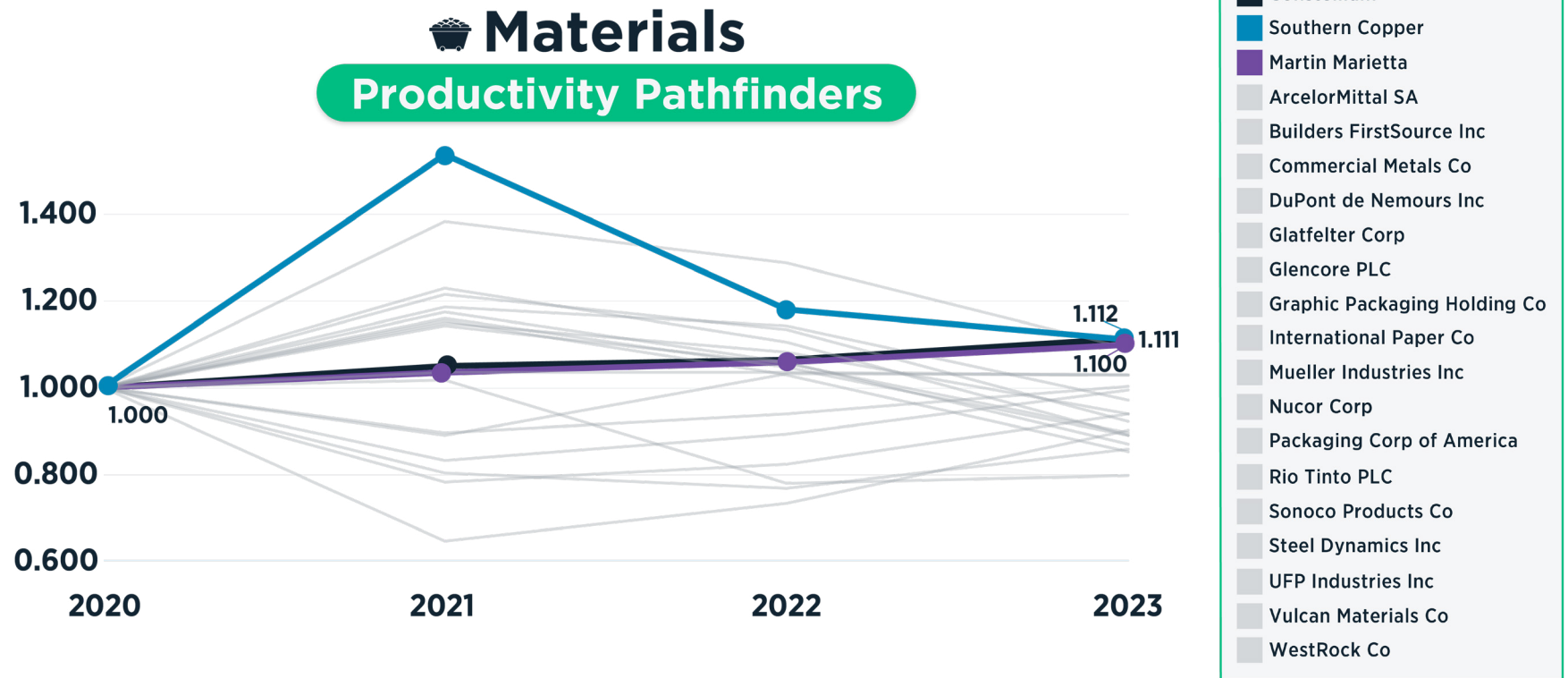
### Materials | Industrial Productivity Index





## Appendix C: Detailed Industrial Productivity Index and Pathfinder Results by Vertical (Cont.)

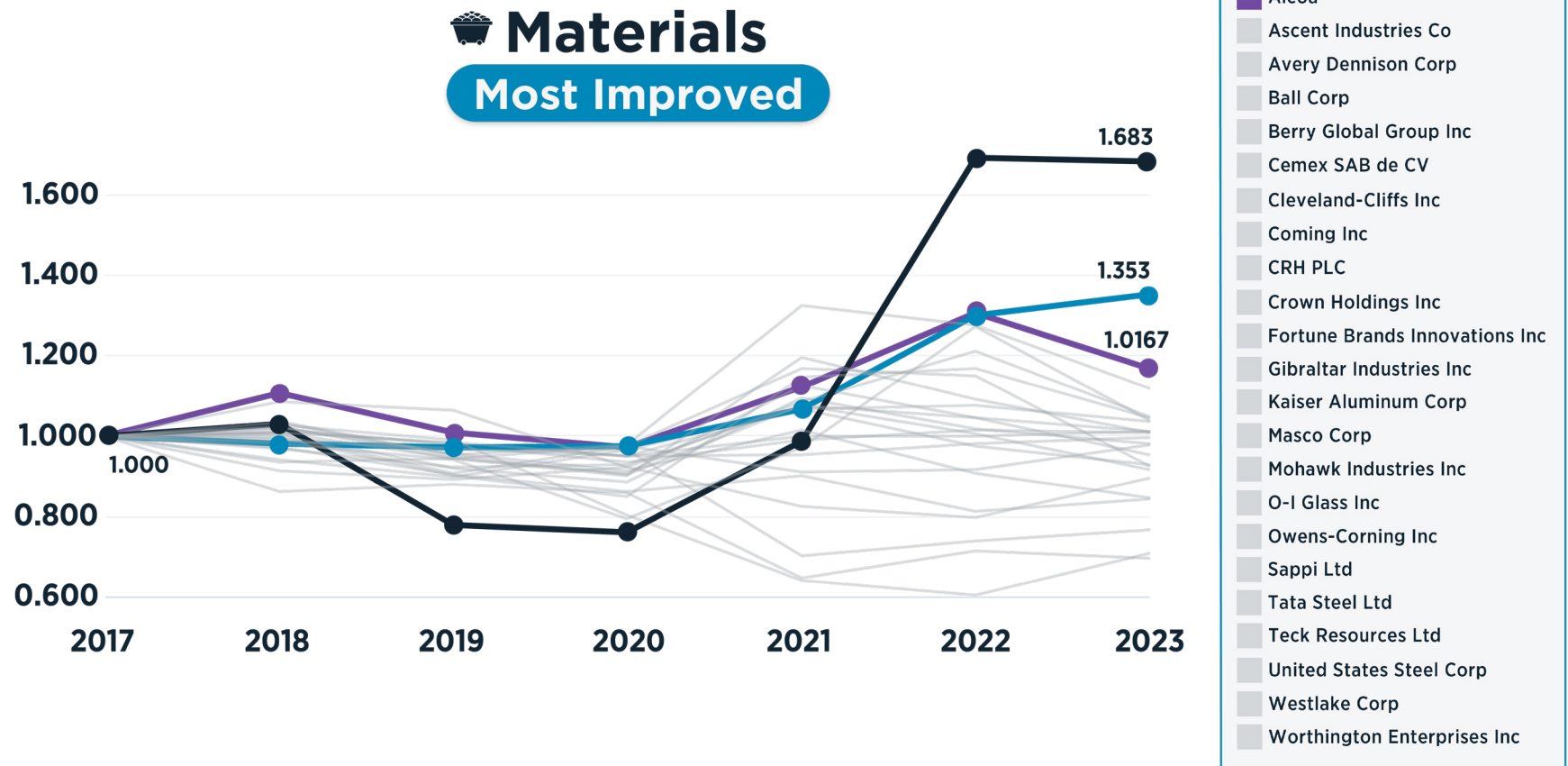
### Materials | Productivity Pathfinders





## Appendix C: Detailed Industrial Productivity Index and Pathfinder Results by Vertical (Cont.)

### Materials | Most Improved Pathfinders



## **Section 8**

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# **Further Reading**

## Further Reading

- [Industrial Operations Strategy](#)
- [The Future of Industrial Work](#)
- [Operational Excellence](#)
- [Sustainable Operations](#)
- [Bring the Whole Manufacturing Network Along](#)
- [Industrial AI](#)
- [Industrial Transformation Reference Architecture](#)
- [Industrial Transformation Readiness](#)



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

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

Inaugural Report and Industrial Productivity Index Results

**Presented by:**



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