# Untapped Sources Of Economic Growth

## Reimagining Development And Future Economies

WORLD GOVERNMENTS SUMMIT 2024

in collaboration with

McKinsey & Company

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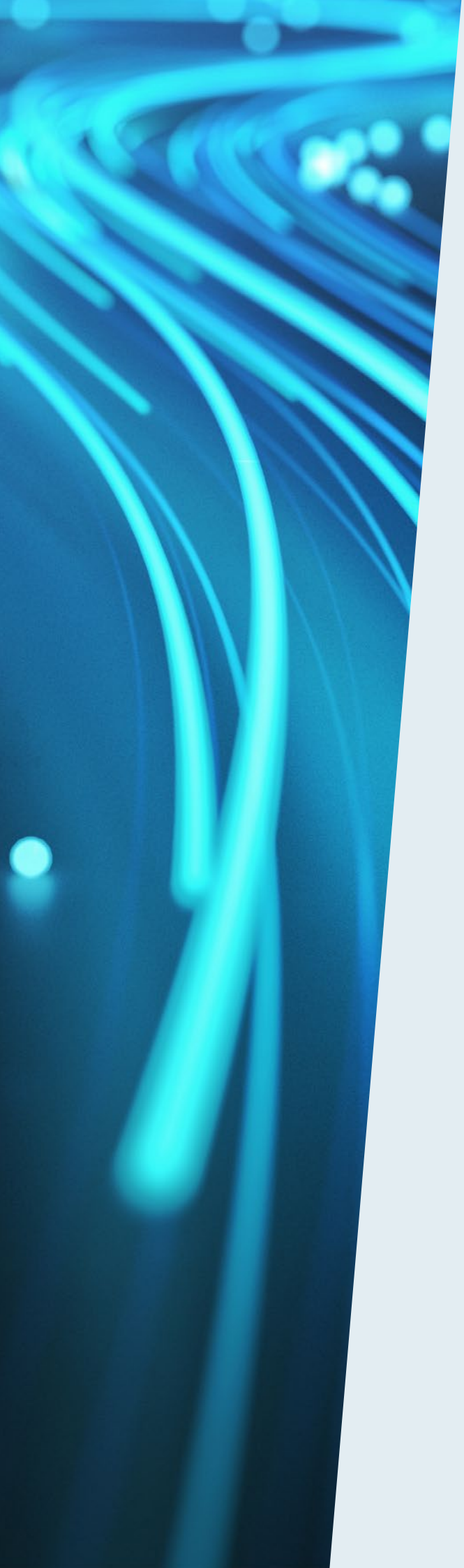
The World Governments Summit is a knowledge exchange center at the intersection of government, futurism, technology, and innovation. It functions as a thought leadership platform and networking hub for policymakers, experts and pioneers in human development.

The Summit is a gateway to the future as it functions as the stage for analysis of future trends, concerns, and opportunities facing humanity. It is also an arena to showcase innovations, best practice, and smart solutions to inspire creativity to tackle these future challenges.



# McKinsey & Company

McKinsey & Company is a global management consulting firm committed to helping organizations realize sustainable, inclusive growth. We work with clients across the private, public, and social sectors vstrategies and transformative technologies to help organizations innovate more sustainably, achieve lasting gains in performance, and build workforces that will thrive for this generation and the next.

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# Executive Summary

In pursuit of boosting economic competitiveness, leaders across business, finance, and government are relying heavily on the familiar journeys of economic development — investing in competitive advantage, fueling economic growth by producing better or cheaper goods and services, and boosting exports.

Since World War II, successive waves of countries have adopted this industrial export-led model of economic development, starting with Germany and Japan, followed by the Asian Tigers[1], ASEAN, China, to name a few examples.[2,3]

Although successful in the past, this industrial export-led model is getting harder to emulate as global trade becomes more concentrated. As the McKinsey Global Institute has shown, for 40% of global trade of goods, the importing economy relies on three or fewer nations to supply a given good.[4] This concentration of global trade with trade partners who benefit from significant advantages of scale and technological advancements represents a barrier to entry for newcomers. Some countries and regions have had success with an alternative model to economic growth; rather than breaking into existing markets to compete with existing players, they identify, capture, and secure a position in an emerging economic sector, where barriers to entry are still low.

1 Asian Tigers include Hong Kong, Singapore, South Korea, Taiwan
2 Helge and Schindler 2010
3 Hosono 2017
4 White et al. 2023

This paper examines the case for tapping into emerging sectors as an important source of economic growth and development. We study examples of different countries and regions and their approach to identifying new opportunities and capturing inherent economic value. Some of these examples include Bangalore and its rise to becoming a hub for tech companies and the business process outsourcing (BPO) industry; Austin, Texas and its emergence as a tech capital in North America; and Taiwan and the scaling of the semiconductor industry.

In the regions studied, we observed the journeys to move into emerging sectors. We saw how technologies can be applied to different sectors to create emerging economic sectors and studied the influence of global trends on the creation of new products and services. We also looked at how countries might understand their competitive positioning in emerging sectors and how governments have typically supported the growth of emerging sectors in the past as well as the lessons from innovative ecosystems that can support growth. This paper discusses observations on the role of government in the recent past but does not take a position on the degree of their involvement.

# Introduction

Policy-makers around the world deal with a complex variety of objectives, such as inclusion, prosperity, employment, health, sustainability, purchasing power, and wealth. Economic growth is rarely the only objective for policy-makers, but its absence is associated with undesirable social outcomes, such as unemployment and lower purchasing power.

In today's interconnected world, economic growth comes with international competitiveness, and hence, most countries deploy certain policies that are designed to enhance their competitiveness.

While there is no prescription for how countries can boost their competitiveness across sectors, more and more countries are actively supporting growth in strategic and future sectors. The UK recently launched a government plan to become a science and technology superpower by 2030, committing around $446 million[5] in government support to future industries ranging from quantum computing and supercomputing to Artificial Intelligence [AI].[6] The UAE, for example, has developed a list of promising sectors prioritized for investment and economic acceleration, including advanced technology and digital economy.[7]

This article is not recommending a specific approach for how to enable and support emerging sectors; we are rather highlighting the specific considerations and choices to be considered by decision-makers aiming to unleash the power of emerging economic sectors through untapped sources of growth.

5 Currency converted in November 2023
6 UK Government 2023
7 UAE Ministry of Economy 2023

# Section 1

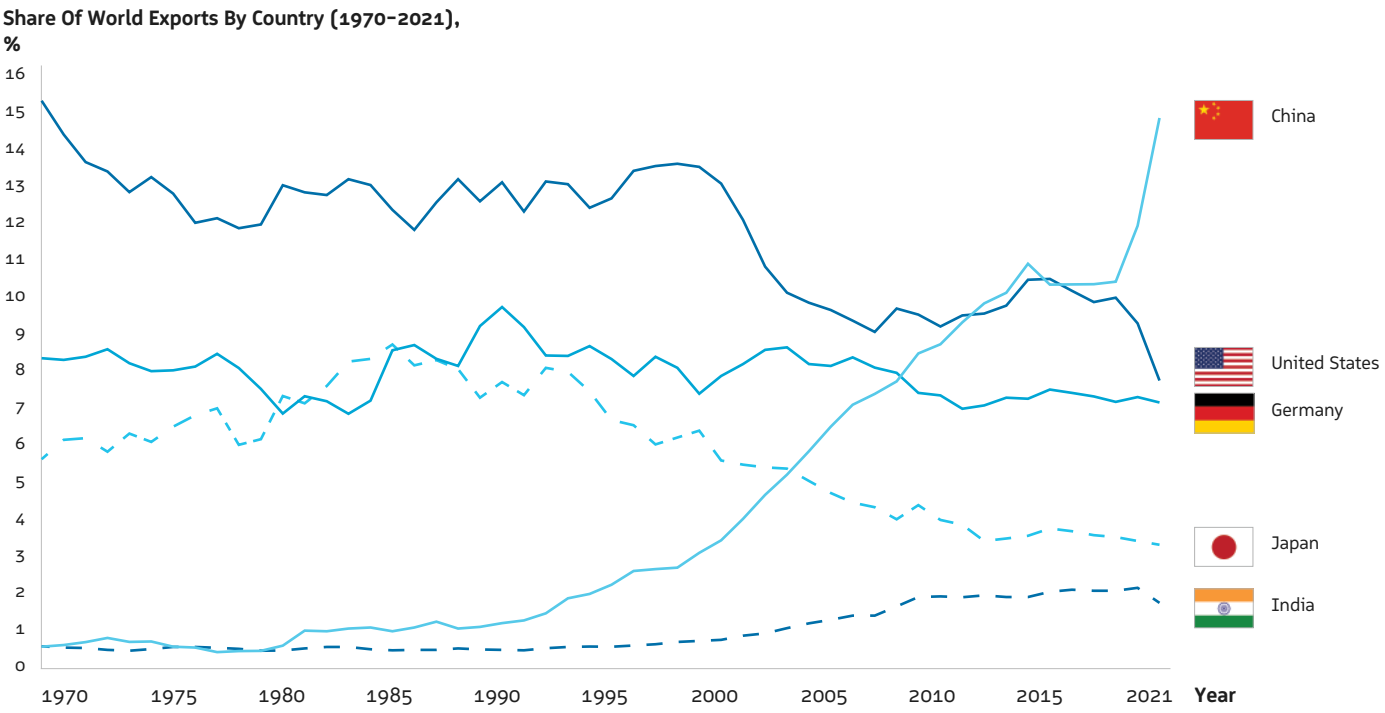
# The Case For New Sources Of Economic Growth

# For most countries, economic development is closely linked with natural endowment, industrial development, and export growth.

The growth of domestic sectors (telecommunications, retail, etc) is inherently constrained by the purchasing power of a country. The growth of resource-driven sectors (oil and gas, mining, etc) is limited by the wealth of a country's natural resources. The growth of manufactured goods (machinery, textiles, food, etc) or exportable services (financial services, healthcare, tourism, etc), however, is not constrained by either. Since World War II, successive waves of countries have adopted an industrial-led and export-led model of economic development, starting with Germany and Japan, followed by the Asian Tigers, ASEAN, China, to name a few examples. Yet, as global trade becomes more concentrated, this model of economic development may need to evolve.

Exhibit 1

**China Was A Big Winner From Globalization, Becoming The Largest Goods Exporter In The World**




Source: World Bank, 2023; World Trade Organization, 2022

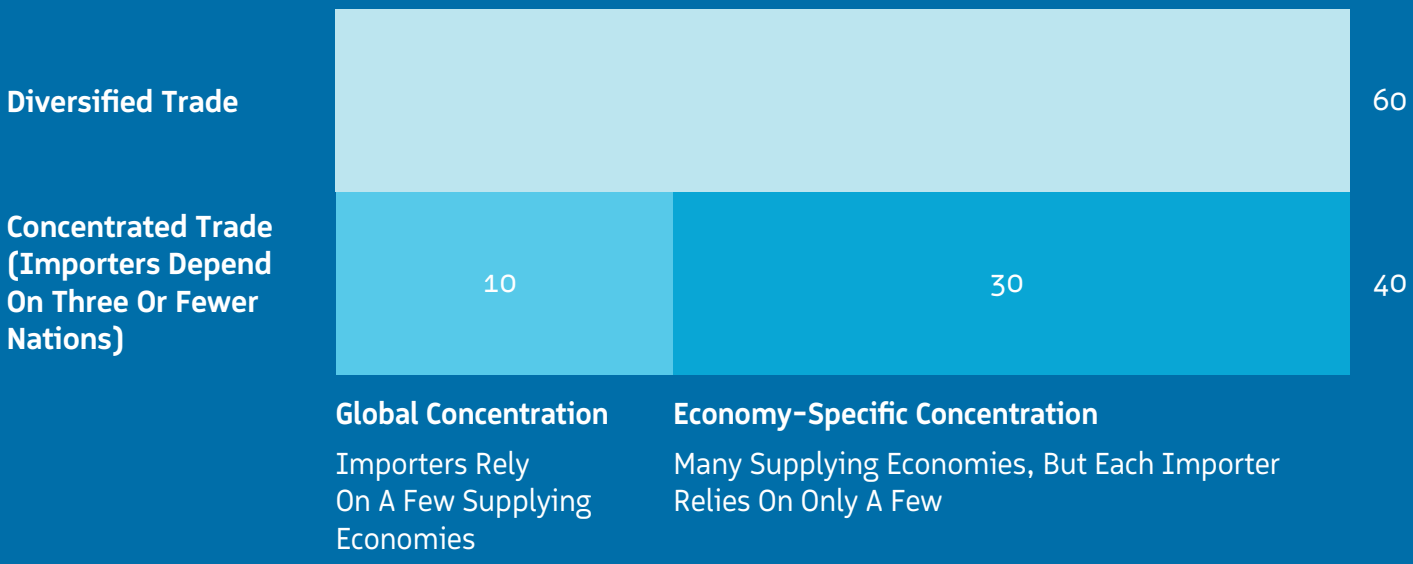
China's growth, for example, was driven by a steady increase in its share in global exports – driven by manufactured goods - overtaking the US as the world's export leader around 2010 (see Exhibit 1). Such growth has created tremendous opportunities and wealth in China, with GDP per capita growing from $2,917 PPP in 2000 to $19,484 PPP in 2021.[8]

Yet the industrial export-led economic development model has been so successful, leading to trade concentrations, making it harder to emulate for countries seeking to grow their economies. The main reason behind this difficulty is the concentration of global trade. As the McKinsey Global Institute has shown recently, for 40% of global trade in products by value, the importing economy relies on three or fewer nations for the supply of a given product.[9] This trade concentration is most pronounced in sectors such as agriculture, mining, food and beverage, electronics, and chemicals and comes in two dimensions: global concentration and economy-specific concentration (see Exhibit 2).

Global concentration exists when the supply of a specific good is highly concentrated in two or three countries around the world. This type of concentration occurs either in resources, where natural endowments play a big role (iron ore in Australia and Brazil), or in manufactured goods, where global scale advantages (for example, China in laptop production) or proprietary technologies (South Korea in certain types of advanced machinery) lead to a strong competitive advantage.[10]

8 World Bank 2023
9 White et al. 2023
10 White et al. 2023

Exhibit 2
**A Significant Share Of Global Trade Is Concentrated, Largely Due To Economy-Specific Factors**
Global Trade Value By Type of Concentration (2021), Percentage



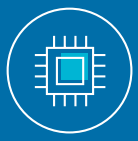

**Examples**


Iron Ore


Natural Gas (Pipeline)


Airplanes


Laptops


Semi-conductors


Diamonds


Soybeans


Vaccines


Maize (Corn)

**Economy-Specific Factors Drive Concentration In Trade**

Concentration in the importing economy refers to 'concentrated trade' covering imports with HHI[1] over 3,000 which means products from only three or fewer economies

The 10% of trade classified as 'fewer supplying economies' comprises products with a global export market HHI above 3,000

1. Herfindahl-Hirschman Index
Source: UN Comtrade, 2021; "The complication of concentration in global trade", McKinsey Global Institute, January 2023

Economy-specific concentration exists when individual economies procure their supply of a specific good from a small group of countries (typically three or fewer). Four factors particularly contribute to economy-specific concentration: geography, consumer and business preferences, market structure, and preferential trading agreements and other trade barriers. Geography and transportation costs may lead some countries to source most of their goods from a neighboring economy (for example, Mexico sources almost 90% of its wheat imports from the US). Consumers and businesses may have a strong preference for goods sourced from a certain country (for example, certain steel mills in Japan and South Korea import a specific low-alumina iron ore that is produced in a single region of Australia in order to reduce impurity). In some cases, the market structure may lead to concentrated relationships at the economy level. This is the case with airplanes: many airlines source their planes almost exclusively from either France and Germany or the US. Finally, preferential trading arrangements and barriers such as tariffs or free trade agreements can lead to concentration at the economic level.[11]

**This concentration of global trade creates barriers for the industrial exports-led model of economic growth.**

Countries trying to develop their export industries need to first break into existing partnerships or trade blocks and overcome the long-standing competitive edge gained through scale effects or technological advantages. Successful new players are often helped by changes such as technological disruptions, changing labor costs, shifting markets, and regulatory disruptions. These can help them successfully develop a successful export industry that can compete in the global market.

However, some players have bypassed this type of competition altogether. Rather than building an export industry in an existing sector, they have leveraged untapped sources of economic growth by focusing on emerging sectors.

Emerging sectors are economic sectors comprising products and services created by the disruption of existing sectors through trending technologies.

Some examples of sectors that emerged over the last couple of decades include semiconductors and BPO. Prior to the 1970s most semiconductors have been limited to specialized applications communications and science. A series of political and economic setbacks prompted the public sector leaders in Taiwan to think about their economic transformation and create the Industrial Technology Research Institute (ITRI) in 1973. A few years later, the Radio Corporation of America transferred its know-how in semiconductor technology to ITRI, and soon, ITRI built Taiwan's first 3-inch wafer fabrication plant. In 1981, ITRI spun off Taiwan's first semiconductor company, and in 1987, Taiwan Semiconductor Manufacturing Company (TSMC) was founded.[12] With

11 White et al. 2023
12 Chang 2010

the help of the public sector, Taiwan built a complete semiconductor supply chain from design and fabrication to packaging and testing. Today, TSMC constitutes more than 40% of the global pure play foundry production market and together with UMC and other players Taiwan's global market share is more than 60%.[13] Together with the rest of the semiconductor industry, it contributes about 15% of Taiwan's GDP and makes up about one-third of the Taiwanese stock market. The dominance of Taiwan in semiconductor manufacturing is such that access to semiconductors is no longer just an economic consideration but also a geopolitical one.[14]

When BPO began to take shape in the late 1980s, it was already an established sector, and many companies were outsourcing their business processes to service providers. However, it was previously untradeable, and the rise of the internet suddenly enabled BPO services to become tradeable around the world. The sector evolved from a domestic service sector to a globally traded, competitive market – and India was ready to reap its benefits. The 1980s saw several policy changes in India that supported this emerging market, including the Computer Policy announced in November 1984, and the Computer Software, Development and Training Policy announced in 1986, which made investments and other incentives available for domestic industries, lowered import tariffs on software and computers, and liberalized access to the latest technologies and software tools to promote the local software and BPO industries. Later, the first deals with Amex and General Electric (GE) followed to consolidate back-office operations in Gurgaon, and the Department of Electronics introduced the scheme of Software Technology Parks (STPs) in the early 1990s – technology parks similar to export-processing zones.[15,16] Today, the IT and business process management sector in India contributes 7.5% to the country's GDP and 53.0% to Indian services export, and it recently saw a 17.2% growth in export revenue in 2022.[17]

As these examples illustrate, emerging sectors can be a significant untapped source of economic growth. In the remainder of this paper, we will explore what emerging sectors are, what can be considered in strategizing for emerging sectors, and how to tap into them to ignite the engine of economic development.

13 Omdia 2022
14 Kelter 2022
15 Srinivasan and Krueger 2005
16 Business Today India 2011
17 Invest India 2023

# Section 2

# The Magic At The Intersection Between Technologies And Sectors

# New economic sectors emerge when innovation intersects with sectors.

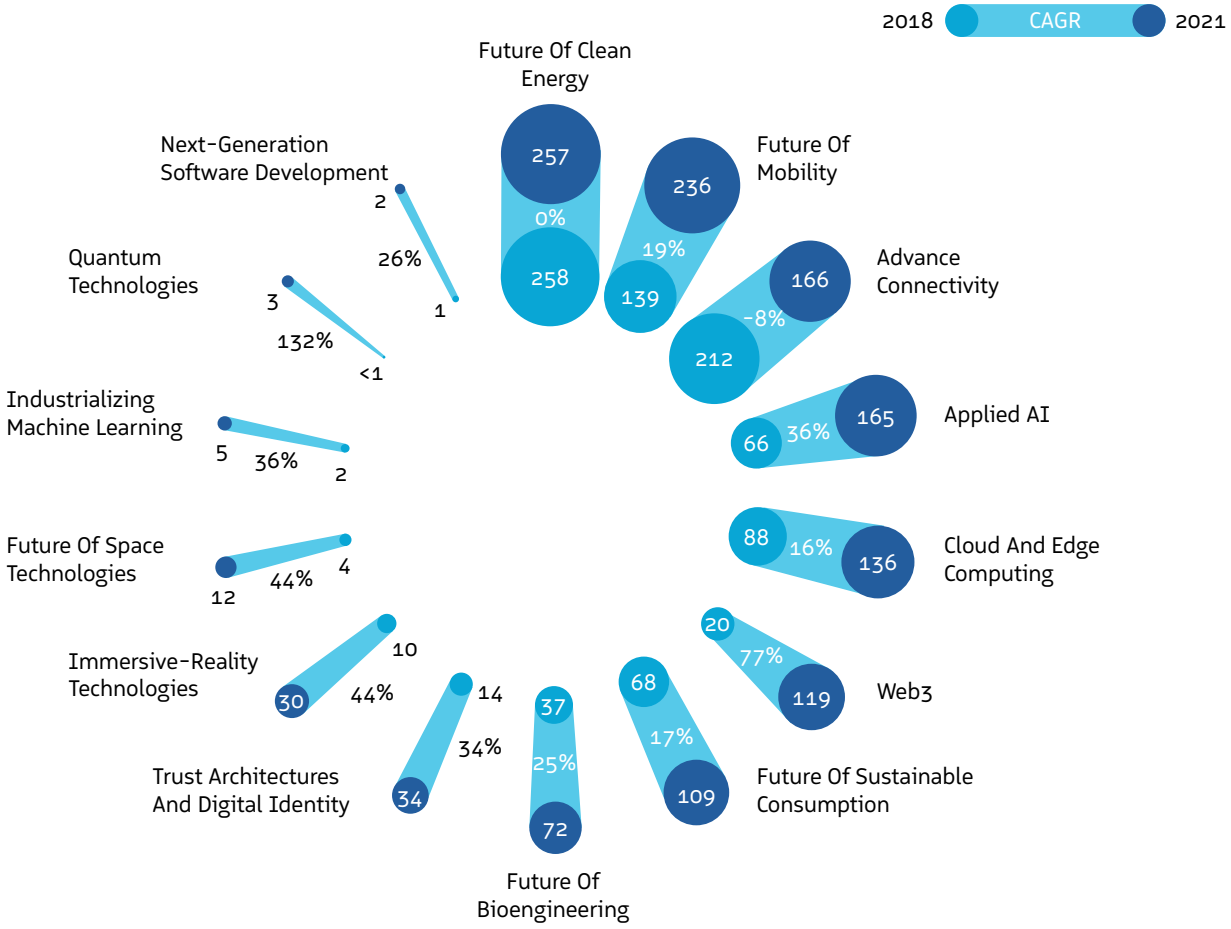
One of the key tools for innovation is technology and when technologies are applied to sectors, they can create new products and services for the market. Hence, to identify emerging sectors, we can first look at some of the latest technologies.

Many different classifications of technologies and several forecasts highlight which technologies will impact our lives the most. We analyzed the investments in transversal technologies and how these investments evolved.

Exhibit 3

**Investment Is Flooding Into 14 Transversal Technologies**

Total Investment In Transversal Technologies (2021), USD billion




Source: PitchBook; "McKinsey Technology Trends Outlook", McKinsey, 2022

Exhibit 3 shows an overview of investment growth for different technologies between 2018 and 2021. The size of the bubble indicates the total capital invested. Technologies such as quantum technologies and Web3 have seen remarkable growth over the past few years; other leading technologies have seen limited investment growth yet high overall investment (for example, clean energy hasn't grown in the past few years but is invested in the most given the importance of sustainable solutions across sectors and the commitment to various global standardization protocols). These three technologies and the remaining 11 highlighted in Exhibit 3 bring to light some of the latest technologies that have several use cases.

- **Future Of Clean Energy:** This technology is driving the ongoing shift toward environmentally sustainable energy sources, such as renewables (for example, solar, wind, hydro, geothermal) and emerging technologies (for example, advanced nuclear, green hydrogen). It is driven by factors such as government policies, international commitments, and increased public awareness, aiming to reduce carbon emissions and foster a more environmentally friendly energy sector.

- **Future Of Mobility:** Advancements in technology enhance the efficiency and sustainability of transportation in air, land, and sea for both people and goods.


MARGARET JOHNSON


H2
HYDROGEN H2

Mobility is shaped by four key disruptive dimensions, collectively known as ACES: autonomous technologies, electrification technologies, connected-vehicle technologies, and smart mobility solutions. These are complemented by supporting technologies such as lightweight technologies and value chain decarbonization, which further promote sustainable and efficient transportation.

- **Advanced Connectivity:** 5G/6G cellular, wireless low-power networks, low-earth-orbit satellites, and other technologies support a host of digital solutions that can help networks increase geographic coverage, reduce latency, lower energy consumption, raise data throughput, and improve spectrum efficiency. This has led to higher-quality network access for consumers and unlocked new use cases for industrial players.

- **Applied AI:** The intelligent application of AI is used to solve classification, prediction, and control problems to automate, add, or augment real-world business use cases. As AI technologies rapidly push new frontiers of innovation, business adoption continues to grow across use cases.[18]

- **Cloud And Edge Computing:** Both edge and cloud computing provide centralized data processing and remote storage over the internet outside the traditional data center. Cloud computing provides access to storage, servers, and other resources through the internet, eliminating the need for extensive on-site IT infrastructure. On the other hand, edge computing leverages 5G and IoT technologies to enable data analysis at the source, without relying on traditional IT data centers. This approach has applications in various domains, including security, medical monitoring, autonomous vehicles, and customer experience enhancements.[19]

- **Web3:** This shift to the next version of the internet is built on blockchain technology; this is a decentralized system with open standards and protocols and protection of digital ownership rights, providing users with greater data ownership and control over how data is monetized.

- **Future Of Sustainable Consumption:** Sustainable consumption refers to the use of services and products while minimizing the use of natural resources and toxic materials, lowering emissions of waste and pollutants over the life cycle of the service or product, and reducing or recycling waste.[20] It is built around three objectives: decoupling environmental degradation from economic growth, applying life cycle thinking, and sizing opportunities for developing countries. It provides society with an opportunity to leverage environmental and competitive technologies to avoid the pitfalls of unsustainable development.[21]

- **Future Of Bioengineering:** Bioengineering applies engineering design and principles to biological systems, encompassing applications such as the design of artificial organs, genetic synthesis, gene editing, surgical simulation, medical imaging, and tissue/organ regeneration. The decreasing cost of technologies like genomic synthesis has fueled a surge in bioengineering

18 Chui, Roberts, and Yee 2022
19 Hewlett Packard Enterprise 2023
20 Chui, Roberts, and Yee 2022
21 UN Environment Programme 2023

research and its applications.[22]

- **Trust Architectures And Digital Identity:** Increasing cyberattacks and data breaches continually pose new challenges due to trending technology (for example, quantum computing for encryption breaking). Digital-trust technologies empower organizations to gain a competitive advantage by building, scaling, and maintaining the trust of stakeholders (for example, customers and regulators) in the use of their data and digital-enabled products and services.[23]

- **Immersive-Reality Technologies:** Four key technologies are enabling immersive experiences, including spatial computing, mixed reality (MR), augmented reality (AR), and virtual reality (VR).[24]

- **Future Of Space Technologies:** The space sector is seeing rapid change through innovation. Several countries are already active in space and rely on space for navigation, weather forecasting, and communications. With the entry of the private sector into this field, there have been large technological advances and shifts in ambitions for space exploration extending to space travel and tourism.[25,26]

- **Industrializing Machine Learning:** Solutions industrializing machine learning provide the software and hardware technologies to scale machine learning workflows and ease the development and deployment of machine learning for organizations.

- **Quantum Technologies:** These future technologies aspire to change our computational, networking, and sensory infrastructure in the coming decades to exponentially increase computational performance for certain problems and transform networks by making them more secure.

- **Next-Generation Software Development:** The next generation of software development involves tooling that aids in the development of software applications, improving processes and software quality across each stage of the software development life cycle, including AI-enabled development and testing as well as low-code/no-code tools.[27]

Technologies absent of any application are neither goods nor services and they are rarely traded alone. It is the technologies' applications to economic sectors that need to be considered.

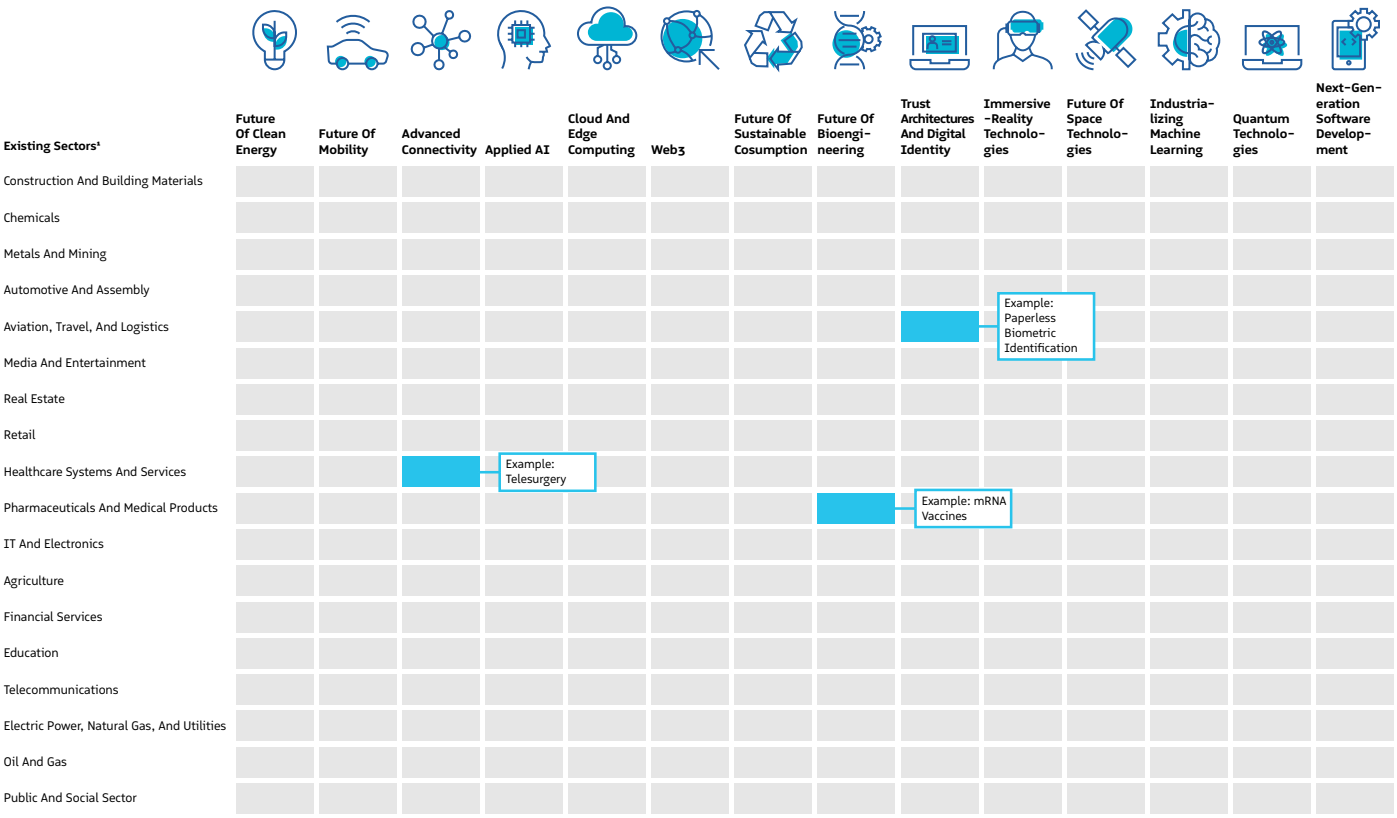
Economic activities are organized into economic sectors, and these sectors are outlined by the International Standard Industrial Classification of All Economic Activities (ISIC), which is used by the UN.[28]

22 Rios Rojas and Kemp 2020
23 Chui, Roberts, and Yee 2022
24 Chui, Roberts, and Yee 2022
25 NASA 2023
26 Marr 2022
27 Chui, Roberts, and Yee 2022
28 United Nations Department of Economic and Social Affairs, Statistics Division 2008

## Exhibit 4

**New Products And Services Arise At The Intersection Of Sectors And Technologies**

Not exhaustive




1. Manufacturing is embedded within other sectors

Many technologies can disrupt a variety of sectors. AI is already used regularly in a variety of industries, including advanced industries, consumer goods, energy and materials, and financial services.[29] Similarly, Bioengineering is disrupting sectors like healthcare, pharmaceuticals, agriculture, and industrial manufacturing.[30]

Where trending technologies find applications and business models in economic sectors, new goods and services are created. Therefore, for a country to construct a map of untapped sources of economic growth, it is crucial to identify the intersections between technologies and sectors. For example, the application of new Bioengineering in pharmaceuticals and medical products gave rise to mRNA vaccines, which eventually saw a breakthrough during the COVID-19 pandemic (see Exhibit 4).[31]

When new products and services emerge at the intersection of technologies and sectors, companies have an opportunity to provide these goods and services, build a competitive advantage, and ignite an engine for economic growth. To leverage untapped sources of economic growth, it is therefore important to understand where new products and services might arise. To develop this understanding, we need to introduce a third element: trends.

29 Chui et al. 2023
30 European Commission 2023a
31 Dolgin 2021

# Section 3

# Trends As Amplifiers

# Trends shape economic development in important ways and trend analysis helps leaders, government agencies and organizations alike.

They distinguish how sectors might shift and evolve and helps identify which opportunities will create sustainable, lasting economic value versus a spike in temporary excitement and economic impact. To understand the impact of trends on economic growth, we distinguish ‘trends’ from the ‘fundamental forces’ driving these trends. Fundamental forces are the limitless, unstoppable ‘forces of nature’ that will affect the world for decades to come. They are certain and have an infinite time horizon, yet the magnitude and direction of their impact are unclear.

For the purposes of this paper, we will look at three of the most consequential fundamental forces: technological innovation, societal change, and environmental change.

- **Technological Innovation:** The pace of technological innovation has accelerated, dramatically powered by increasing specialization, higher levels of efficiency, and the rapid spread of education and infrastructure that allow many more citizens to participate in innovation at the technological frontier.[32]

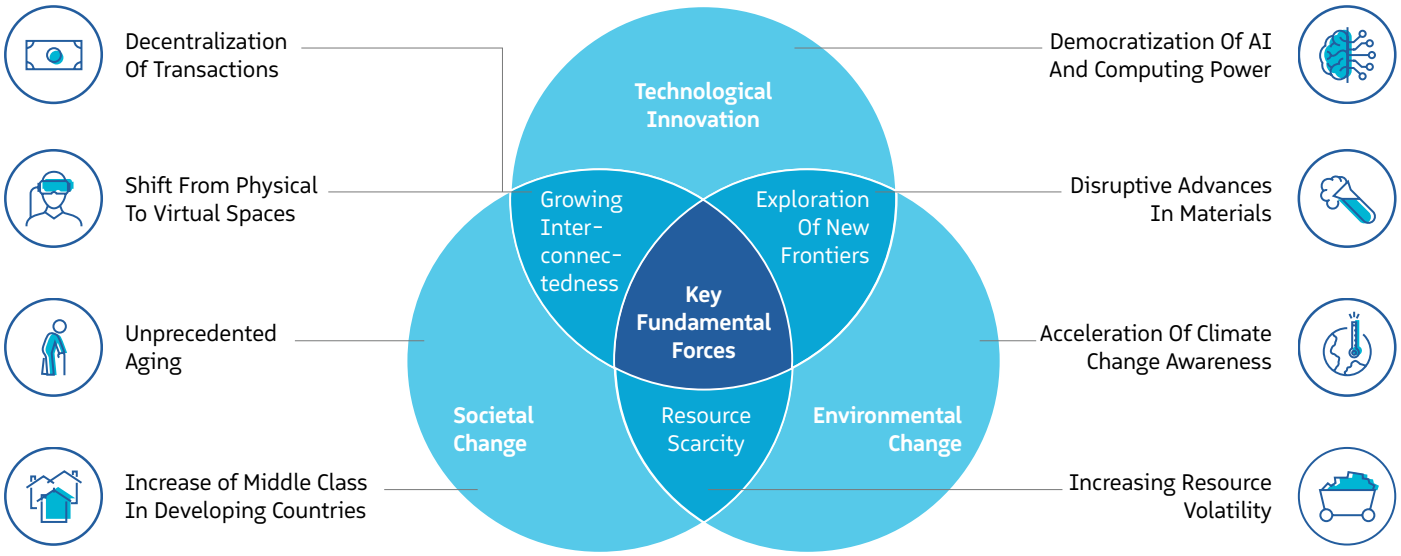
- **Societal Change:** Advanced economies are aging rapidly while emerging markets' labor forces are still growing. However, fertility rates are decreasing globally, and the world's population is expected to reach its peak somewhere in the 2080s.[33]

- **Environmental Change:** Anthropogenic impact on the environment is changing the world as we know it, in particular with respect to climate change, the depletion of biodiversity, change in land and freshwater use, nitrogen and phosphorus cycles, stratospheric ozone depletion, ocean acidification, chemical pollution, and atmospheric aerosol loading.[34]

The number of trends that can be considered to connect technologies and sectors is almost unlimited and trend forecasting is often much more of an art than a science. To illustrate how fundamental forces can give rise to trends, we have identified eight examples of trends that emanate from these forces and impact the emergence of new economic sectors and activities (Exhibit 5).

- **Decentralization Of Transactions:** Decentralized transactions can improve trust, redundancy, and access to resources and information. Cryptocurrencies, for example, reached an all-time high of

Exhibit 5
**Fundamental Forces Give Rise To Medium-Term Trends: Illustrative Examples**




Source: PitchBook; "McKinsey Technology Trends Outlook", McKinsey, 2022

32 Eskelinen et al. 2015
33 United Nations Department of Economic and Social Affairs, Population Division 2022
34 Rockström et al. 2009

$3 trillion in market capitalization in November 2021.[35] Since then, the market value has decreased substantially, but decentralized transactions could be here to stay and possibly expand to other sectors such as logistics, healthcare, and personal datasecurity.[36]

- **Shift From Physical To Virtual Spaces:** More and more activities are rapidly moving from the physical to the virtual world. For example, 60% of consumers familiar with the metaverse are excited about engaging in metaverse activities, and 95% of business leaders expect it to have a positive impact on their industry within five to ten years.[37]

- **Unprecedented Aging:** According to WHO, global life expectancy increased by more than six years between 2000 and 2019, the fastest increase since 1960s.[38] At the same time, two-thirds of the global population live in a country or area where lifetime fertility is below 2.1 births per woman – in other words, below replacement level.[39] The result is an unprecedented aging of the global population over the next decades.

- **Increase Of Middle Class In Emerging Economies:** While the world's total population is both growing and growing older, it is also growing in prosperity. Globally, extreme poverty dropped from 38% in 1990 to 8.4% in 2019.[40] The result is a growing global middle class and increased consumption across sectors.

- **Democratization Of AI And Computing Power:** The barriers for access to AI, algorithms, and computing power are being lowered dramatically. As recently as 2015, only large tech companies had access to the algorithms and computing power required to run large AI models.[41] Today, anyone with a phone can access ChatGPT.

- **Disruptive Advances In Materials:** AI, sustainability technologies, and nanotechnology are creating disruptive advances and possibilities in materials. Scientists have been pioneering new ways to produce materials with innovative attributes – from smart materials that are self-healing or self-cleaning to memory metals that can shift their shape to return to their original shapes.[42]

- **Acceleration Of Climate Change Awareness:** Every year, Gallup conducts a survey with questions about environmental problems. In March 2010, the share of people who worry a "great deal" or a "fair amount" about global warming or climate change was 52%. By March 2016, this percentage had crossed 60% and has stayed above 60% ever since. Most recently, in March 2023, 61% of respondents were worried about climate change or global warming.[43]

- **Increasing Resource Volatility:** Increased volatility in global resources will stem both from an expanding gap between supply and demand as well as more volatility in global supply chains. The UN expects that by 2030, global freshwater

35 Tambe and Jain 2023
36 IBM 2023
37 Elmasry et al. 2022
38 WHO 2023
39 United Nations Department of Economic and Social Affairs, Population Division 2022
40 World Bank 2022
41 Hosnagar 2017
42 Manyika et al. 2013
43 Gallup 2023

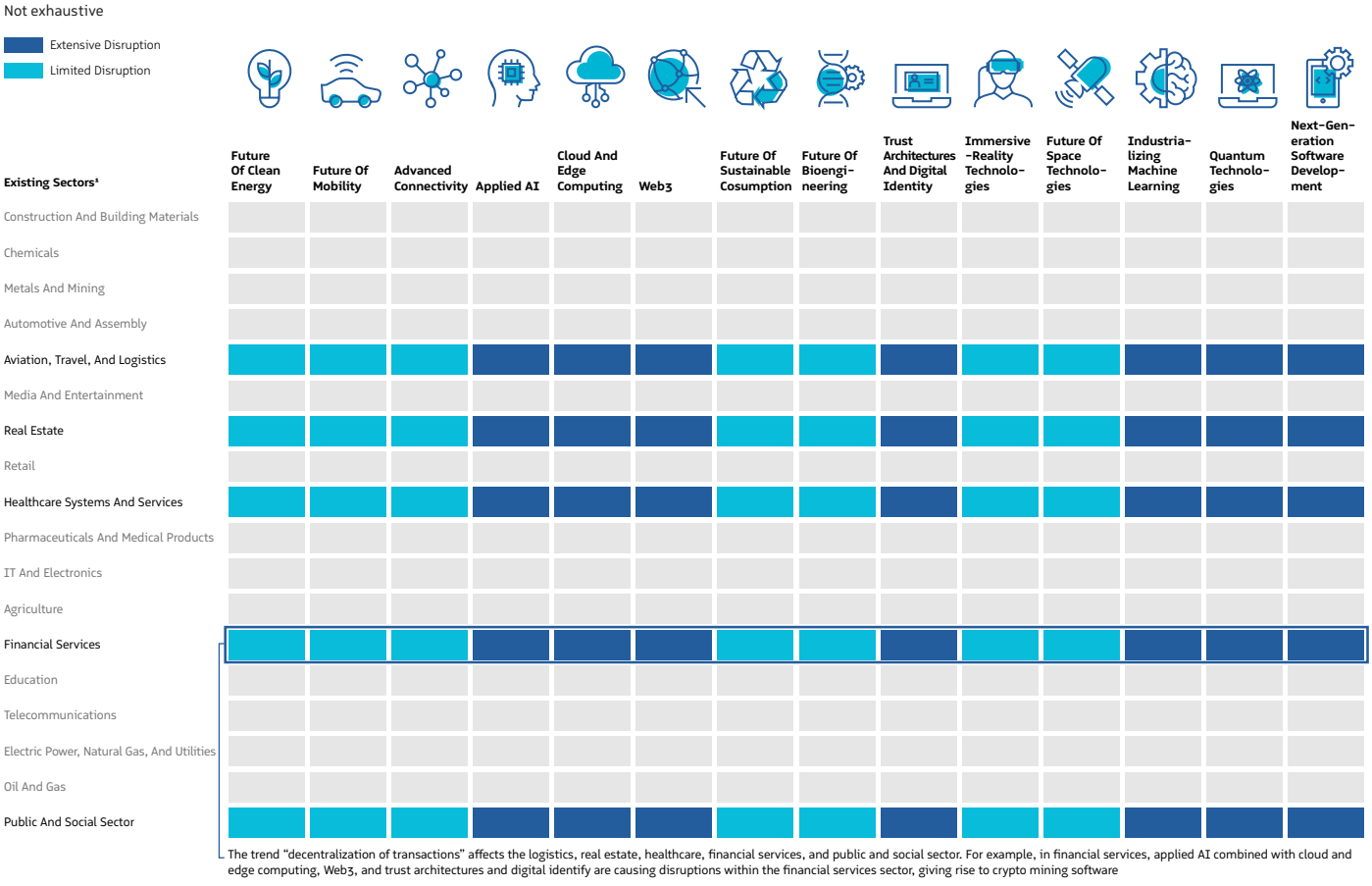
demand will be 40% higher than supply.[44] Supply chain volatility is also applying increasing pressure on the distribution of natural resources. On average, disruptions lasting at least one month now occur every 3.7 years, and the financial toll has been rising. Over the course of a decade, losses from these disruptions average 42% of one year's earnings before interest taxes, depreciation, and amortization.[45]

This list of trends is not exhaustive, nor will any ever be. However, it is a starting point to identify where technologies and sectors might intersect to create new products and services. For example, the trend on 'decentralization of transactions' will disrupt the logistics, real estate, health care, financial services, and public sector industries through technologies such as applied AI, cloud and edge computing, Web3, trust architectures and digital identity, industrialized machine learning, quantum technologies, and next-generation software development. At each of the intersections, new products and services are emerging such as cryptocurrency exchanges or distributed identification and authentication services (see Exhibit 6).

To further explore the evolution of trends and how they create economic opportunities, we spoke to Rohit Talwar, CEO of Fast Future and dubbed as one of the top ten futurists in the world by the UK's Independent Newspaper.

## Exhibit 6

**Example: Decentralization Of Transactions – How Trends Connect Sectors And Technologies To Create New Products And Services**




The trend "decentralization of transactions" affects the logistics, real estate, healthcare, financial services, and public and social sector. For example, in financial services, applied AI combined with cloud and edge computing, Web3, and trust architectures and digital identify are causing disruptions within the financial services sector, giving rise to crypto mining software

1. Manufacturing is embedded within other sectors

44 Harvey 2023
45 Lund et al. 2020

# Interview with Rohit Talwar

Rohit Talwar, CEO of Fast Future dubbed as one of the top ten futurists in the world by the UK's Independent Newspaper

## How do you spot trends, and what do you look for when identifying a trend?

There are several factors that futurists look for that take a concept from a new development or 'weak signal' of possible change to becoming a trend. These include the concept's potential rate of traction (ease of adoption, ease of use, level of effectiveness, etc), cost (initial and ongoing financial investment, organizational disruption, security implications, psychological challenges such as fear or skepticism, etc), the mindset shift required to take full advantage of the development, the distribution mechanisms required to get it to a viable market proposition, and scalability challenges to go from initial concept to mature proposition.

## At what point in the life cycle of a trend does it start creating new economic opportunities?

While some trends take time to achieve momentum and start creating economic opportunities (such as cloud computing and BPO), others could take off rapidly (similar to the mass market launch of generative AI, which grew rapidly from its relatively limited investment leading up to launch in 2023). The deciding factors that influence the pace at which trends start to create value include the size of the potential addressable market and accessible user base, the ease of scalability, the level and speed of adoption by users, and the investment required to get to financial viability.

## What are one or two emerging trends that are top of mind for you?

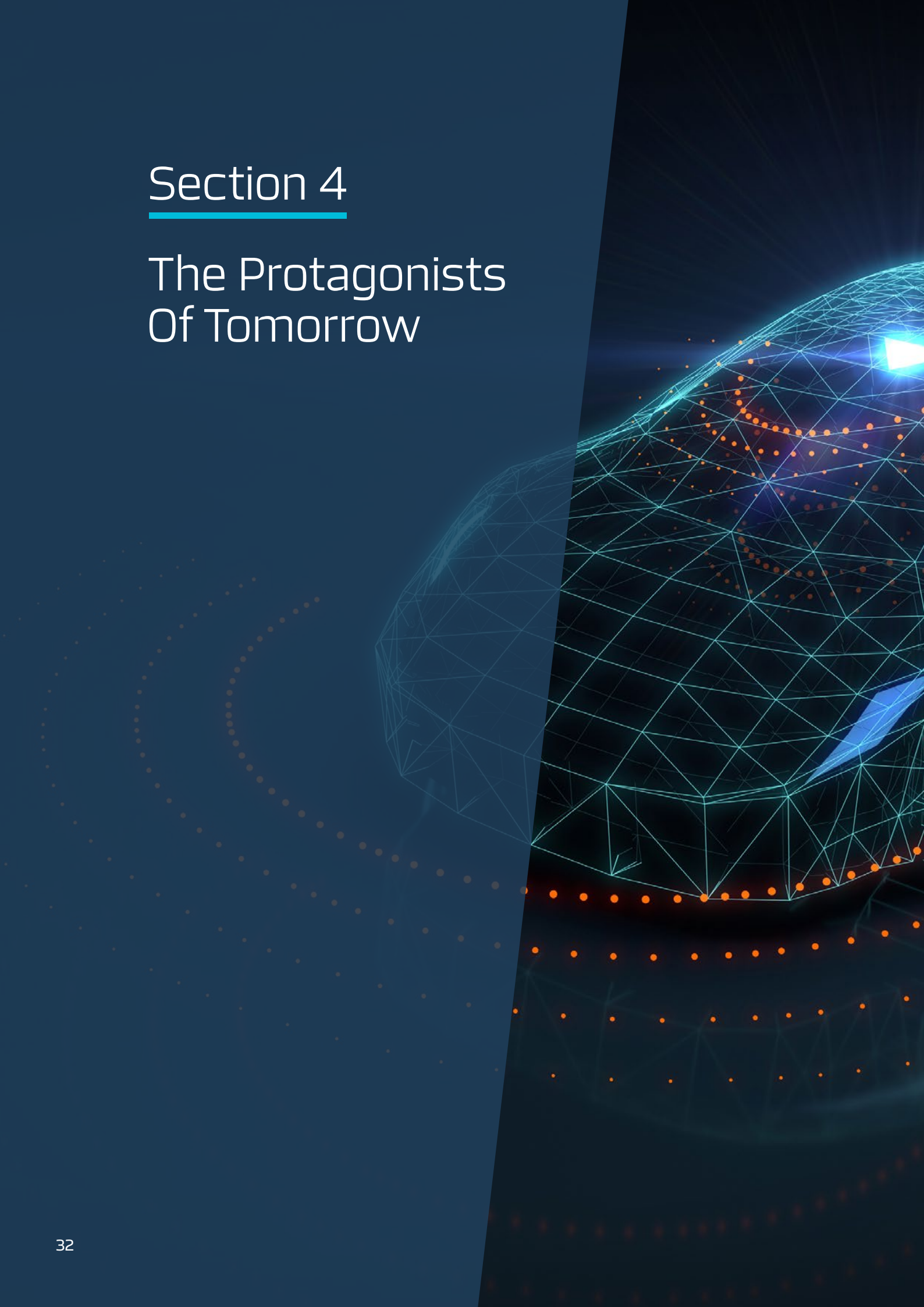
Two very interesting trends that are top of mind for me are asset tokenization, where ownership rights of an asset are bought and sold as digital tokens and stored on the blockchain, and the blurring lines between the health and wellness sector and the emerging field of science and technology-driven human augmentation techniques, where companies are investing in enhancing human bodies to increase life expectancy and the quality of life.

## What are some of the biggest trends that are in the early stages right now and could become transformative in the longer term?

Some trends that are in the early stages right now that hold considerable promise to be transformative include the rapid pace of development of genetic medicine, which uses DNA and RNA in new ways to target disease treatment; genetic computing and DNA storage to address a 30-40X increase in annual data generation over the next decade; the transition to a rental-based economy, marking the accelerating shift away from traditional forms of ownership to buying everything on demand on an 'as required' basis; the development of the next generation of hybrid 'social engagement media' that focuses on blending electronic social exchange with the revival of more human connections; a move to total reusability, where everything is subject to recycling or conversion of waste to power; self-powered and self-sustaining facilities (those capable of harnessing kinetic energy and heat from bodies and movement to power facilities); innovative methods for widespread distribution of high-quality education to all - enabling lifelong learning; and the rise of the arts and personalized human experiences in a world that is becoming ever more automated and digital.

# Section 4

# The Protagonists Of Tomorrow



# By investigating the trends and how they impact sectors and technologies, we can complete the map of untapped sources of economic growth.

Families of new products and services can be grouped to form emerging sectors. It is critical that we understand emerging sectors as those where completely new products and services emerge and a consumer makes a differentiated decision. They do not include existing products that are simply manufactured through new technologies but are nearly indistinguishable from existing products. As an example, a smart agriculture node that measures soil moisture, conductivity, and temperature to calculate optimal fertilizer use is a new product that can be considered part of the emerging agriculture technology (AgTech) sector. The tomato that is produced with the assistance of this technology, however, is not considered a new product that is part of an emerging sector as it competes in the same category as existing tomatoes.

Below, we offer three examples of emerging sectors across the landscape of sectors and technologies, recognizing there are many different possible classifications of emerging sectors (Exhibit 7).

# Advanced Mobility

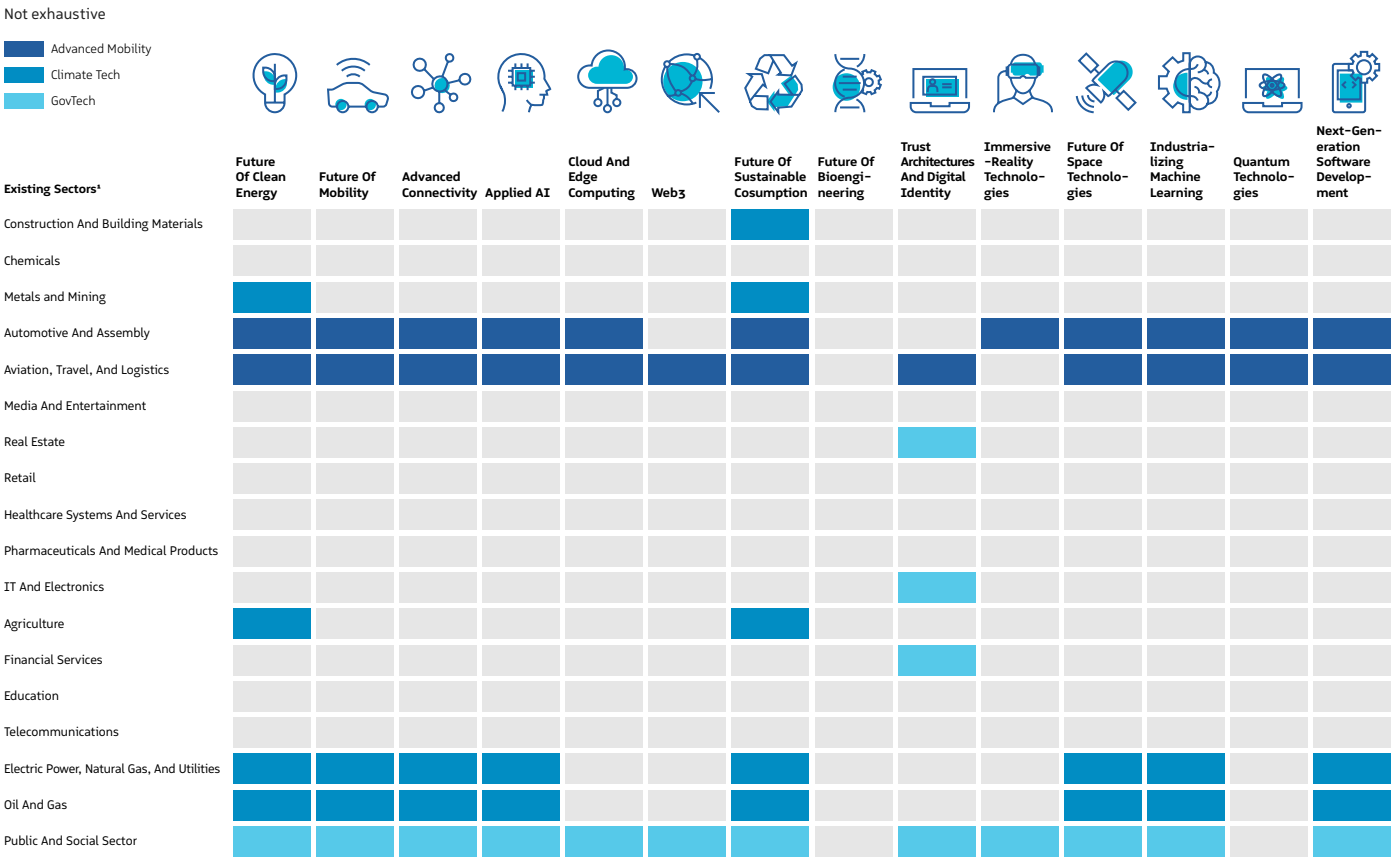
When looking at the automotive and assembly, and aviation, travel, and logistics sectors, there are several technologies that, when applied, create the emerging sector of advanced mobility. These technologies include the future of mobility, advanced connectivity, and applied AI.

Advanced mobility refers to more efficient and convenient transportation solutions that aim to reduce congestion, lower environmental impact, and enhance safety by leveraging cutting-edge technology, data, and infrastructure. In the McKinsey Center for Future Mobility's annual consumer survey that looks at shifts in advanced mobility, many respondents stated that they are open to changing their transportation habits.[46]

There are several trends that amplify the impact of these technologies on advanced mobility as an emerging sector – these trends include the democratization of AI and

Exhibit 7

**New Products And Services Arise At The Intersection Of Sectors And Technologies**




1. Manufacturing is embedded within other sectors

46 Heineke et al. 2023

computing, and the acceleration of climate change awareness. These trends create new products and services that fall within some of the most prominent categories of products and services in the advanced mobility sector: autonomous driving and micromobility. We will deep dive into these two categories of products and services.

- **Autonomous Driving:** Around 80% of the technological infrastructure required to put self-driving cars into use is in place. Robust hardware such as radars, lidars, ultrasonic sensors, GPS modules, and cameras are largely available.[47] Some autonomous vehicle manufacturers shifted to manufacturing their own hardware, such as Waymo, which began manufacturing their lidar sensor in early 2017 as a way to dramatically reduce the costs of its autonomous vehicle business.[48]

  The greater challenge for autonomous driving is on the software side, especially in AI systems, which involve the development of software capable of consistently and accurately predicting the actions of other drivers, pedestrians, and cyclists.[49] Many tech giants are working on developing their own software. Nevertheless, there is still room for start-ups to join the race and start developing their own self-driving solutions such as Pony.ai, which is offering AI-based solutions for improving the self-driving automobile experience.[50] The autonomous driving industry is growing rapidly and has seen great interest from cities, especially in the US. Phoenix, San Francisco, and Austin are currently the only cities in the US where driverless cars are allowed for testing purposes on public roads, and it is hoped the cars will fuel economic growth, bring new jobs, provide research opportunities for the state's academic institutions, and help the cities become hubs for these new technologies. [51]

- **Micromobility:** The global micromobility market, including products such as docked and dockless bikeshare, e-bikes, and standing or sitting e-scooter systems,[52] is worth about $180 billion today. McKinsey analysis shows that the value could more than double by 2030 to reach about $440 billion.[53] In the 2022 survey mentioned above, almost one-third of respondents planned to increase their use of micromobility or shared mobility over the next decade. At the same time, the world has witnessed the rise of micromobility start-ups such as Lime Micromobility, which was founded in 2017 and is now in more than 200 cities across nearly 30 countries.[54]

## Climate Tech

Technologies like clean energy and sustainable consumption are intersecting with the following industries: construction and building materials; metals and mining; agriculture; electric power, natural gas, and utilities; and oil and gas. This intersection has resulted in the emergence of climate tech.

47 Shell Eco-marathon Team 2023
48 Hawkins 2019
49 Shell Eco-marathon Team 2023
50 Gray 2022
51 Zappala 2017
52 Price et al. 2021.
53 Heineke et al. 2023
54 Lime 2023

Climate tech is the set of innovative products and services that address climate change and its environmental effects by mitigating the drivers of greenhouse gas (GHG) emissions or adapting systems to environmental changes. This space includes new technologies that aim to reduce reliance on GHG, including in power, transportation, water, agriculture, and carbon.[55]

Products and services in the climate tech space are influenced by various trends, especially by the acceleration of climate change awareness. This has helped create new products and services to mitigate climate change. Some of the key mitigation products and services used across these sectors include carbon capture, utilization, and storage (CCUS); renewable energy sources; batteries and energy storage; and remote sensing of GHGs.[56]

One key area worth highlighting is CCUS. Governments globally are pushing to achieve net zero by 2050 with a focus on adopting carbon capture solutions. CCUS consists of four stages, each stage with specialized vendors or one vendor across all stages.[57] These stages include carbon capture; compression and dehydration; transportation; and sequestration.[58]

For the carbon capture stage, there have been several solutions that differ by the implementation cost as well as by the purpose of use for the stored carbon. These carbon capture solutions include direct air capture (DA); enhanced rock weathering (ERW); cryogenic carbon capture (CCC); carbon capture using nanotechnology; and aqueous amine-based CO2 capture.

Aqueous amine-based CO2 capture is a new product that captures carbon emissions via a solvent that can be heated later for further utilization of the CO2.[59] One example of this solution is BASF OASE, supplied by Air Liquide, and it is available for sweet gas applications, offering low hydrocarbon co-absorption and selective H2S removal with limited CO2 co-absorption.[60]

## Government Technology

Moving to the public and private sectors, there are a handful of technologies that, when applied, cause disruption and create the emerging sector of government technology (GovTech). These technologies include advanced connectivity, applied AI, cloud and edge computing, trust architectures, and digital identity.

GovTech is a holistic, technology-based government approach to public-sector modernization. It focuses on three core areas: citizen-centric public services that are universally accessible; a whole-of-government approach to digital government transformation; and simple, efficient, and transparent government systems and processes. The aim is to improve government efficiency, reduce bureaucracy, increase transparency, and enhance the overall quality of public services. It is an evolving field that continues to adapt to changing citizen expectations.[61] Recent estimates of the GovTech market place it close to $500 billion in 2021, an increase from the previous year of more than 5%.[62]

55 Dillon 2021
56 McLellan 2023
57 Mirza and Kearns 2022
58 Equinox Engineering 2023
59 Veloso 2023
60 Air Liquide Engineering & Construction 2023
61 Nam 2019
62 Goasduff 2021

These technologies disrupting the public and private sectors were impacted by multiple trends, including the decentralization of transactions, the shift from physical to virtual, and the democratization of AI and computing power. These trends play a role in creating new products and services, two of which we would like to highlight: national cryptocurrencies and digital identity and biometric solutions.

- **Digital Identity And Biometric Solutions:** Gartner estimates that by 2024, over one third of governments will offer citizens mobile-based identity wallets.[63] Some of the other most sought-after products in GovTech are identity and biometric solutions for government applications, national ID systems, secure document sharing, and election solutions. Vision-Box is one company that provides self-processing biometric solutions across airports, including check-in kiosks, baggage-drop biometric modules, and eGates.[64] The eGate market itself is estimated to grow at a cumulative annual growth rate [CAGR] of around 20% between 2022 and 2027, reaching $2.4 billion.[65]

- **National Cryptocurrencies:** Some countries are creating their own central bank digital currencies (CBDCs). The use of a national cryptocurrency along with digital identity can enhance financial inclusion, improve access to financial services, and ensure secure transactions.[66] There are multiple types of CBDCs being piloted across countries.

  One type of CBDC is an account-based model, such as DCash, which is being launched in the Eastern Caribbean. DCash allows consumers to hold deposit accounts directly with the central bank.[67] This is a pilot project within the Eastern Caribbean Currency Union (ECCU) between the Eastern Caribbean Central Bank (ECCB) and the Barbados-based FinTech company, Bitt Inc.[68] Another model of this national cryptocurrency solution, e-CNY, was piloted in China – relies on private-sector banks to distribute and maintain digital-currency accounts for customers. China showcased e-CNY during the 2022 Olympic Games in Beijing. Visitors and athletes could use the currency to make purchases within the Olympic Village.[69]

The three emerging sectors above are examples of how technologies and trends disrupt existing sectors and lead to the emergence of new products and services that will form emerging sectors. These emerging sectors represent untapped sources of economic growth ready to be tapped into by governments and businesses around the world. The next section will discuss how governments can help businesses and people capture these opportunities.

63 Keen 2023
64 Airport Suppliers 2023
65 Technavio 2023
66 Abi Karam 2023
67 McKinsey & Company 2023
68 Bitt 2023
69 McKinsey & Company 2023

# Section 5

# Find Your Match

# Not all countries are equally positioned to tap into a specific untapped source of economic growth.

India's success in IT outsourcing is fueled by a large young population (more than 40% of India's population is below the age of 25[70]) with IT and English language skills. Also, the time zone difference that allows India's programmers to work on code 'overnight' for US clients contributes substantially to the industry's success. For countries to capture untapped sources of economic growth, it is important to build on their competitive advantages, which are driven by either access to markets, access to resources, a cost differential, an advantage in design and R&D, or their relative advancement in the given sectors.

70 United Nations Population Fund 2023

Countries looking to supercharge their economic development trajectory by building a strong market position in an emerging sector could investigate five different categories of competitiveness to identify products and services that match their competitive advantages: resource-driven predispositions, market-driven predispositions, productivity-driven competitiveness, cost-driven competitiveness, and level of relative progress.[71]

**Resource-Driven Predispositions** capture a country's natural endowment. These factors are particularly important for resource-intensive sectors such as mining, metals, or agriculture. Rare earth elements, for example, are used in magnets, catalysts, and special alloys and can be important for certain advanced materials or industrial tech products. China, Vietnam, and Brazil together make up over 70% of the world's rare earth mineral reserves, hence they have a competitive advantage in these sectors.[72]

Resource-driven predispositions can be measured in a variety of ways, and they are highly specific to sectors and products. Common metrics for resource-driven competitive advantage include the availability of arable land, fresh water, fossil fuels, and minerals.

**Market-Driven Predispositions** describe a country's access to key end markets. They include the size and growth of relevant markets and the existence or absence of barriers of trade or preferential treatment. For example, trade unions like the EU or trade agreements such as the EU-Canada Comprehensive Economic and Trade Agreement offer preferential market access to large markets, which can add to a country's competitive advantage.[73] In addition, for end markets, market-driven predispositions can arise from an existing ecosystem of complementary players, such as suppliers or research institutes. For example, the research triangle region between Raleigh, Durham, and Chapel Hill in the US has long benefited from an ecosystem of higher education institutions, hospitals, and life sciences companies that form a vibrant life sciences hub.[74]

Typical measures of a country's market-driven predisposition for a sector are the market size and growth of the sector (for example, the industrial sector for industrial tech) and the size of important ecosystem sectors, such as scientific research.

**In many cases, resource-driven and market-driven predispositions are factors that are impossible or very difficult to change.**

These factors place a limit on which sectors a country can be competitive in. However, there are other factors of competitiveness that can be addressed and improved through government action. These are productivity-driven competitiveness and cost-driven competitiveness.

71 McKinsey analysis based on Manyika et al. 2010
72 U.S. Geological Survey 2021
73 European Commission 2023b
74 Research Triangle Regional Partnership 2023

**Productivity-Driven Competitiveness** encompasses different factors that contribute to the value of a particular good or service, including R&D, innovation, design, and the availability of specialized or high-skilled talent, in particular for service sectors, which are highly dependent on the right talent. For example, for the 12th year in a row, Switzerland has topped the Global Innovation Index – which is a measure of innovation output, such as patents or publications, as well as innovation input, such as R&D spend, information and communications technology access, and education levels.[75]

Typical measures to identify productivity-driven competitiveness include the number of graduates from specific higher education programs (for example, computer science for the software industries), patent applications, and the number of university-industry collaborations in R&D.

**Cost-Driven Competitiveness** looks at the potential of a country to have a cost advantage. This can include the cost of raw material, logistics, labor, and utilities or the general cost of doing business, such as licensing fees and taxes. For example, many Eastern European countries have lower hourly wages in manufacturing than the Western European demand centers.[76] Hence, they can produce labor-intensive manufactured goods and export them to the West – which is often also supported through preferential market access to the EU.

Cost-driven competitiveness can be quantified by looking at average annual or monthly salaries, interest rates, cost of doing business, tax rates, cost to import and export, and the price for industrial utilities.

Drivers of productivity- and cost-driven competitiveness can often be influenced by government decision-makers. Hence, an analysis of competitive drivers can not only inform which sectors a country may be competitive in but also give indications of where government policy can remove binding constraints to further improve competitiveness.

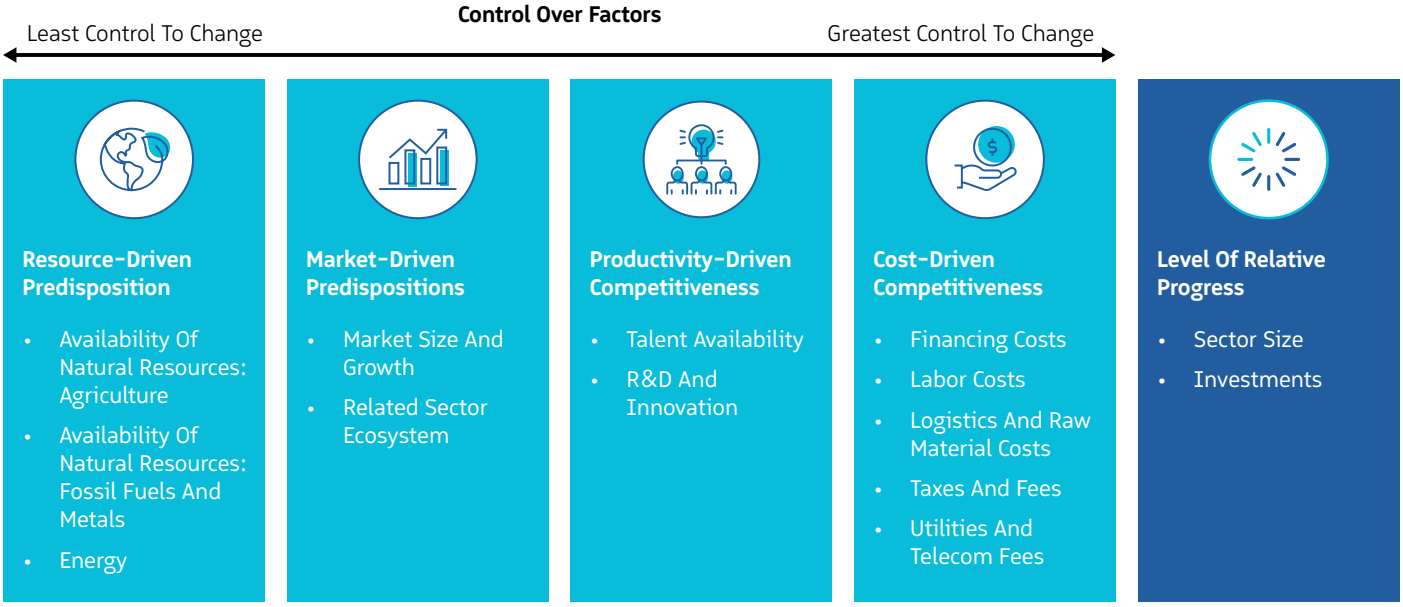
**Level Of Relative Progress** is the final metric to evaluate a country's competitiveness in each emerging sector. This is a measure of head start and how far ahead a country is already. Early innovators are often able to capture an emerging sector by leveraging economies of learning, economies of scale, and network effects. For example, the Institute of Financial Services Zug (IFZ) publishes a ranking of FinTech hubs. It shows that countries like Singapore, Switzerland, Sweden, the US, and the Netherlands already have a head start in this important emerging sector, given the size and vibrancy of their existing FinTech sectors.[77]

The level of relative progress of an emerging sector in a country can be measured by the size of the sector, the amount of capital invested in the sector, or industry-specific rankings, as illustrated above.

These five factors of competitiveness – resource-driven predispositions, market-driven predispositions, productivity-driven competitiveness, cost-driven competitiveness, and level of relative progress – can give countries an indication of which emerging sectors they could have a competitive advantage in (see Exhibit 8) or which binding constraints should be resolved to build a competitive advantage. These considerations can give decision-makers and business leaders an indication of where to focus and which efforts to prioritize.

75 World Intellectual Property Organization 2022
76 ILOSTAT 2023
77 Ankenbrand et al. 2023

Exhibit 8
**The Five Categories Of Competitiveness**




Source: "How to compete and grow: A sector guide to policy", McKinsey Global Institute, March 2010; McKinsey analysis

For each category of competitiveness, the relative importance of that category is dependent on the emerging sector a particular decision-maker or business leaders is looking to enter. For example, having a resource-driven predisposition and cost-driven competitiveness is highly important to an emerging sector like AgTech. For a country looking to enter into a specific emerging sector, they first look at the relative importance of each category of competitiveness. Then they look at their own performance with respect to that category.

Within each of the categories of competitiveness in emerging sectors, there are factors to measure a country's performance. For example, a country's resource-driven predisposition could be measured through analyzing the availability of natural resources (agriculture, fossil fuels, and metals) as well as the availability of energy. Each of these factors could have different indicators to measure country performance, depending on the emerging sector the country is measuring their competitiveness in.

In Exhibit 9, we take an unnamed country as an example and look at their hypothetical performance in three emerging sectors, across the categories of competitiveness, in relation to the relative importance of each of these categories. For example, Country X is performing competitively in the categories that are important to industrial tech and thus, it could likely enter and grow that emerging sector. When it comes to FinTech, Country X is not well-positioned for this emerging sector, as its performance falls behind in market-driven predisposition and cost-driven competitiveness, and these factors are highly important in this sector. For AgTech, Country X could attempt to enter the sector if it focuses on building a better market-driven predisposition through building the related sector ecosystem, for example.

## Exhibit 9

**Example: Country Performance Vs. The Relative Importance Of Categories Of Competitiveness For Three Emerging Sectors**

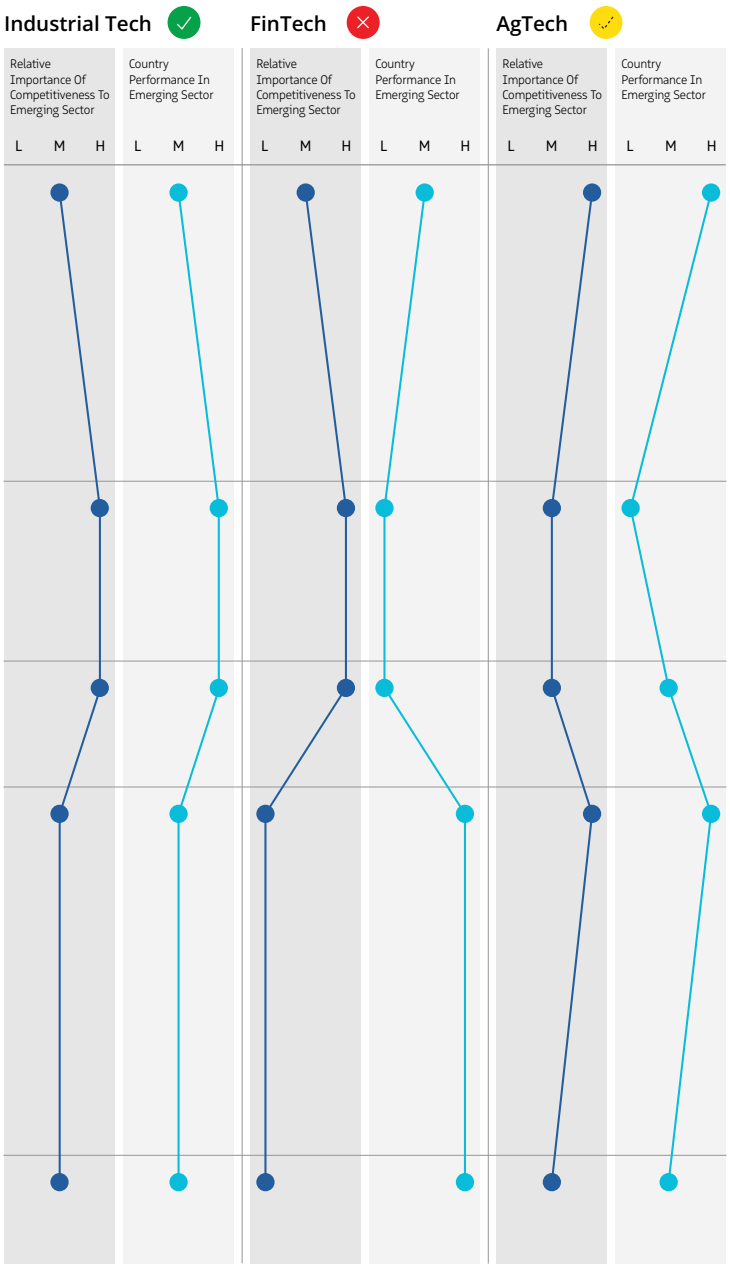
Competitive In Emerging Sector

Somewhat Competitive In Emerging Sector With Room For Growth

Not Competitive In Emerging Sector

**L:** Low **M:** Medium **H:** High

| Categories Of Competitiveness | Factor | Example Indicators |
|---|---|---|
| **Resource-Driven Predisposition** | • Availability Of Natural Resources: Agriculture | • Land Area<br>• Nominal Value Added: Agriculture |
| | • Availability Of Natural Resources: Fossil Fuels And Metals | • Crude Oil Production<br>• Iron Production |
| | • Energy | • System Average Interruption Frequency Index (SAIFI) |
| **Market-Driven Predisposition** | • Market Size And Growth | • Sector Size And Growth |
| | • Related Sector Ecosystem | • Nominal Sector Value Added: Scientific Research |
| **Productivity-Driven Competitiveness** | • Talent Availability | • STEM[1] Graduates |
| | • R&D And Innovation | • Patents |
| **Cost-Driven Competitiveness** | • Financing Costs | • Policy Rate |
| | • Labor Costs | • Sector Average Monthly Earnings |
| | • Logistics And Raw Material Associated Costs | • Cost To Export, Border Compliance<br>• Diesel Price |
| | • Cost Of Taxes And Fees | • Corporate Tax Rate |
| | • Cost Of Utilities And Telecom | • Industrial Electricity Price |
| **Level Of Relative Progress** | • Sector Size | • Gross Sector Output |
| | • Investments | • CAPEX[2] As % Gross Output |




1. Science, Technology, Engineering, and Mathematics 2. Capital expenditure

# Section 6

# The Role Of Government

# The role of government in promoting economic sectors – either existing sectors or emerging sectors – is a long-standing topic of debate among economists and decision-makers.

Sector policies or industrial policies, which are government efforts to influence the economy through promoting specific industries, firms, or economic activities, are considered an interventionist approach to policy-making (as opposed to laissez-faire economics[78]) and typically manifest in providing infrastructure, R&D funding, favorable government regulations (trade protection, etc), or subsidies to a specific sector. There is a longstanding debate on the effectiveness of government intervention and industrial policies.[79]

78 Laissez-faire is an economic system whereby people are free from economic interventionism by governments

79 Juhász, Lane, and Rodrik 2023

Proponents of industrial or sector support argue that there are circumstances under which the market fails to produce desired output in the absence of government intervention. A classic example is positive externalities in the case of R&D or learning-by-doing spillovers across multiple firms. As these activities have societal benefits beyond the individual or firm, proponents argue for government intervention. The argument of coordination failure is similar.

**As the production of complex goods and services often depends on a network of suppliers, producers, and customers, the government can play a role in coordinating different actors.**

Finally, certain economic activities depend on public goods such as infrastructure, which may be government provided and thus can be influenced by government intervention.[80]

On the other hand, opponents of sector support by governments argue that government failure is worse than market failure. The most widely cited arguments revolve around elite capture and inefficiency. Elite capture encompasses the notion that government policies can be subject to rent seeking and lobbying to allocate subsidies and advantages to well-connected firms and industrialists close to government. The inefficiency argument says that governments do not have the capacity or information required to pick specific winners. Proponents of this school of thought argue that sectoral support will prop up industries which will remain uncompetitive and drain government finances for years to come.[81]

While the debate on the effectiveness of sector support continues, there has been a rise in industrial policy interventions since the 2000s. Exhibit 10 shows the results of a text-based approach to identify the number and share of industrial policies covered by the Global Trade Alert (GTA) database where this is evident.[82]

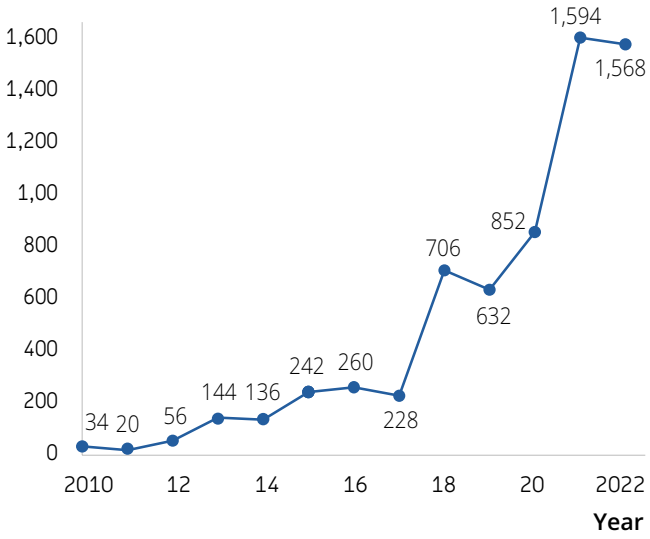
The increase in sector support can also be observed in flagship legislation around the world. For example, the US Inflation Reduction Act, signed into law in August 2022, includes $500 billion of spending and tax breaks to encourage investments in domestic manufacturing, procurement of critical supplies from within the US or from free-trade partners, and increase R&D and commercialization of technologies.[83]

80 Ibid
81 Irwin 2023; Juhász, Lane, and Rodrik 2023
82 Juhász et al. 2022; Juhász, Squicciarini, and Voigtländer 2020
83 Badlam et al. 2022a

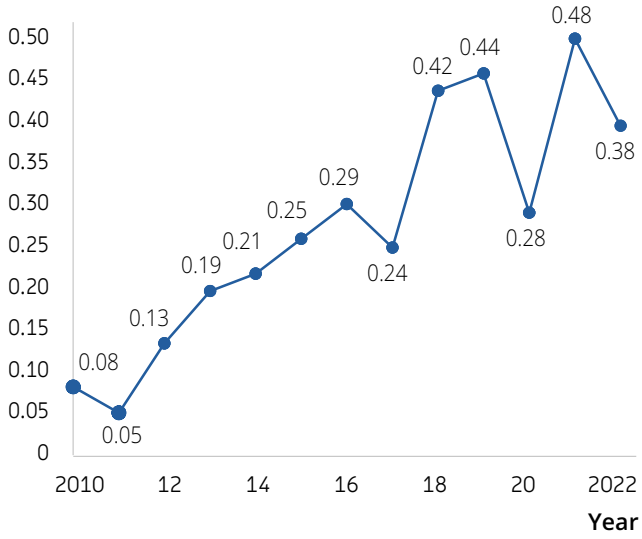
## Exhibit 10

**The Return Of Industrial Policy In Numbers**

**Panel A:**
**Total No. Of Industrial Policy Interventions[1]**
(2010–2022)




**Panel B:**
**Share Of All Interventions[2] That Are Industrial Policies**
(2010–2022)




1. Involves government interventions such as subsidies, tax incentives, infrastructure development, and regulations to influence specific industries and sectors
2. Includes all government policies including industrial policy interventions as well as additional policies such as environmental, education, and trade policies
3. Global Trade Alert

Note: Panel A plots the total number of industrial policy interventions by year globally; panel B plots the share of industrial policy interventions among all interventions in the GTA. Following guidance from GTA, only policies entered in the same calendar year are included to ensure comparability across time. See the July, 2023 data update from Juhász et al. for details

Source: Réka Juhász, Nathan J. Lane, Emily Oehlsen, and Verónica C. Pérez, "The who, what, when, and how of industrial policy: A text-based approach," Structural Transformation and Economic Growth (STEG) working paper, WP050, December 2022. Réka Juhász, Mara P. Squicciarini, and Nico Voigtländer, "Technology adoption and productivity growth: Evidence from industrialization in France," NBER, July 2020.

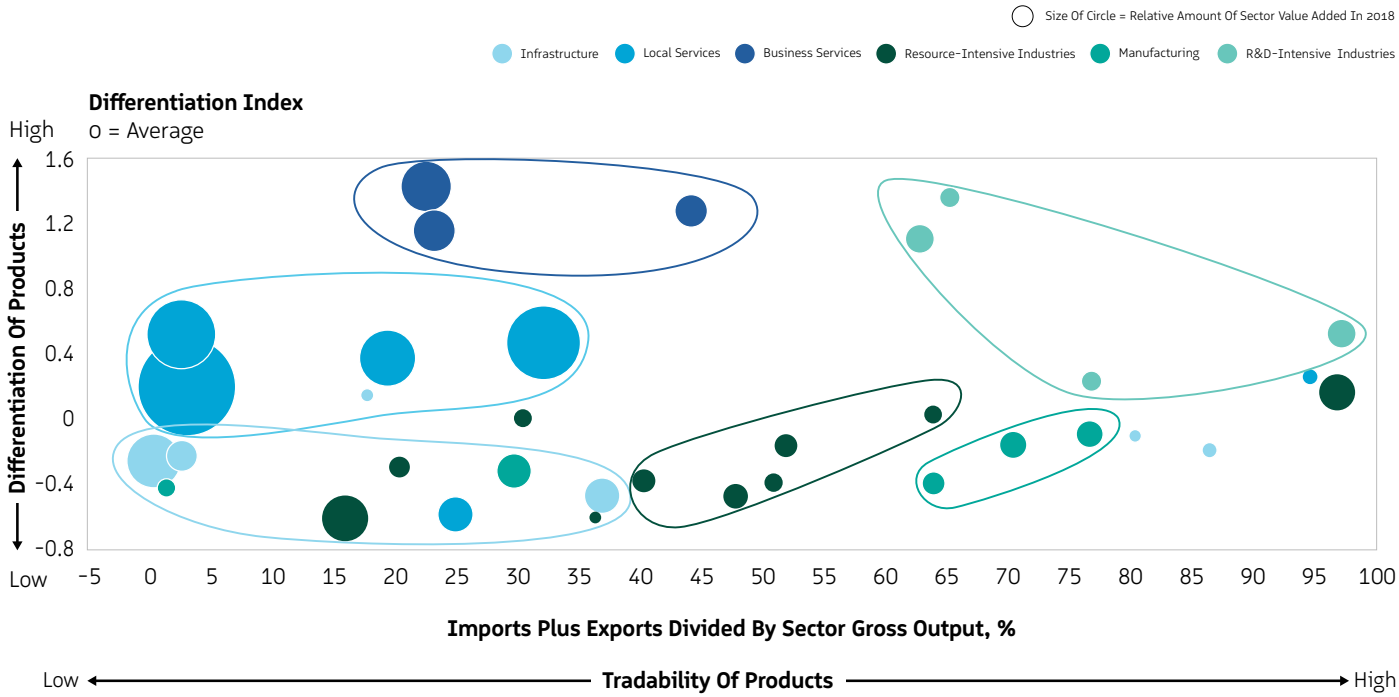
Similarly, the US CHIPS and Science Act (also signed into law in August 2022) was designed to encourage investment in domestic semiconductor manufacturing. It also aims to increase R&D in technologies such as quantum computing, AI, and nanotechnology while expanding the STEM[84] workforce[85]. These policies are not limited to the US. The EU Chips Act was adopted on July 25, 2023, and seeks to double global market share in semiconductors from 10% to a minimum of 20% by 2030. This will be achieved through large-scale capacity building and innovation within the EU, ensuring the EU is self-supplying to a much greater extent, and ensuring the EU can react quickly in the event of supply crises.[86]

While this paper does not advocate for or against government intervention, we explore the different degrees of government involvement typically observed in different emerging sectors as well as the support levers that are applied.

84 Science, Technology, Engineering, and Mathematics
85 Badlam et al. 2022b.
86 Council of the European Union 2023

Exhibit 11

**McKinsey Global Institute Categorizes Sectors Into Six Groups According To Degrees Of Differentiation And Tradability**




Source: EU KLEMS growth and productivity accounts; OECD input-output tables; McKinsey Global Institute analysis, 2005 (updated November 2023 with 2018 data)

The McKinsey Global Institute categorizes sectors into six groups according to degrees of differentiation and tradability (Exhibit 11). Each of the six groups comprise sectors with similar underlying economics and industry dynamics. Depending on these dynamics, government intervention typically follows different paths.[87]

1. **Infrastructure services** include sectors such as utilities, telecommunications, and railroads – industries with large, fixed costs for the construction of network infrastructure. They are characterized by large economies of scale where governments typically get involved to regulate the industry and enable competition. Emerging products such as large-scale CCUS infrastructure and industrial parks, solar power, and certain advanced mobility products (for example, hyperloop) fall into this category.[88]

2. **Local services** encompass services to local households and businesses, including wholesale and retail trade, hotels and restaurants, and finance and insurance. This group typically encompasses a large share of a country's labor force, and, over time, more productive companies will replace less productive ones due to the intensity of competition.[89] Today, there are several emerging sectors that play in this field, such as EdTech and FinTech.

3. **Business services** include R&D, professional services, and Information and Communications Technology. These sectors are typically supported through a regulatory environment that

87 Manyika et al. 2010
88 Ibid.
89 Ibid.

enables effective competition among private companies, including sufficient intellectual property rights and a highly skilled workforce. In terms of untapped sources of economic growth, we find that typical sectors such as next-generation software would be part of this category.[90]

4. **Resource-intensive industries**, such as natural resources and agriculture, are typically tradeable commodity businesses that require substantial up-front capital investment and thereafter mainly compete on cost. Cost-competitive regions usually have access to natural resources, scale, operational efficiency, and logistics networks in major markets.[91] While few new or emerging sectors are in this category specifically, some new sectors, such as AgTech, rely on end users in resource-intensive industries.

5. **Manufacturing sectors**, such as motor vehicles, apparel, and food, compete both on cost and the ability to differentiate on quality and brand. Specific product competitiveness depends on technical expertise, logistics, and labor costs. There are few new emerging products or services in this category, however, manufacturing serves as an important end market for industrial tech and advanced materials.[92]

6. Finally, **R&D-intensive manufacturing** includes globally traded sectors such as pharmaceuticals and communication equipment. Success requires a competitive mix of a highly skilled workforce and low-cost production capacity, as these sectors are subject to intense global competition and rapid productivity growth. Most new products in the advanced materials, industrial technology, and Bioengineering space fall into this category.[93]

Based on these six categories of sectors, governments typically tailor their degree of intervention to influence the underlying competitive dynamics. The McKinsey Global Institute has categorized four degrees of government interventions:[94]

1. **Setting Ground Rules And Direction:** Governments lay out broad national priorities and can set regulations in order to set the foundations and direction for the sector.

2. **Building Enablers:** Without distorting market mechanisms, governments can support the private sector by expanding infrastructure and ensuring availability of resources and capabilities.

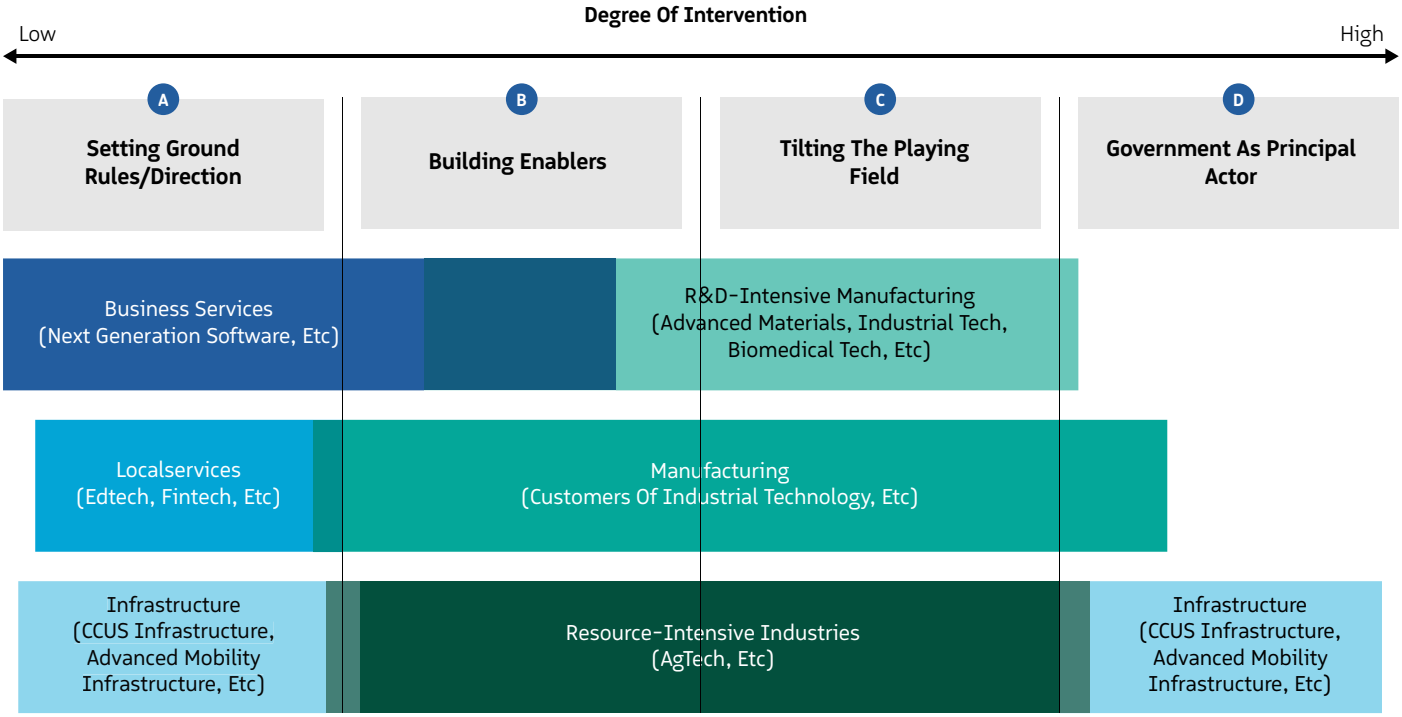
3. **Tilting The Playing Field:** Governments can choose to create favorable conditions for local production by influencing local markets.

4. **Playing The Role Of Principal Actor:** Governments can take the role of a direct actor in the sector.

As discussed above, the underlying competitive dynamics in a sector are critical to understanding the degree of government intervention that could be effective in promoting competitiveness.

90 Ibid.
91 Ibid.
92 Ibid.
93 Ibid.
94 Ibid.

Exhibit 12
**Degree Of Government Intervention Varies From Sector To Sector**




Source: "How to compete and grow: A sector guide to policy", McKinsey Global Institute, March 2010

Based on over two decades of McKinsey Global Institute research, Exhibit 12 demonstrates the degrees of intervention that are typically used for each of the six sector groupings with specific examples of emerging sectors that fall into each category.

Emerging sectors fall into different categories of sectors and, governments typically tailor their degree of intervention depending on the underlying competitive dynamics. As per Exhibit 12, many emerging sectors fall into the R&D-intensive manufacturing and business services categories, which can both be supported by government through building enablers. This can be done, for example, by supporting R&D.

Although there is a debate about the effectiveness of R&D programs, a large literature in economics and management has mostly found a positive effect of these programs on innovation such as R&D spending and patents.[95] For example, public R&D spending through NASA during the Cold War was demonstrated to have large and meaningful effects on long-term manufacturing growth in the space sector.[96] Similarly, it was shown that US R&D investment during World War II catalyzed

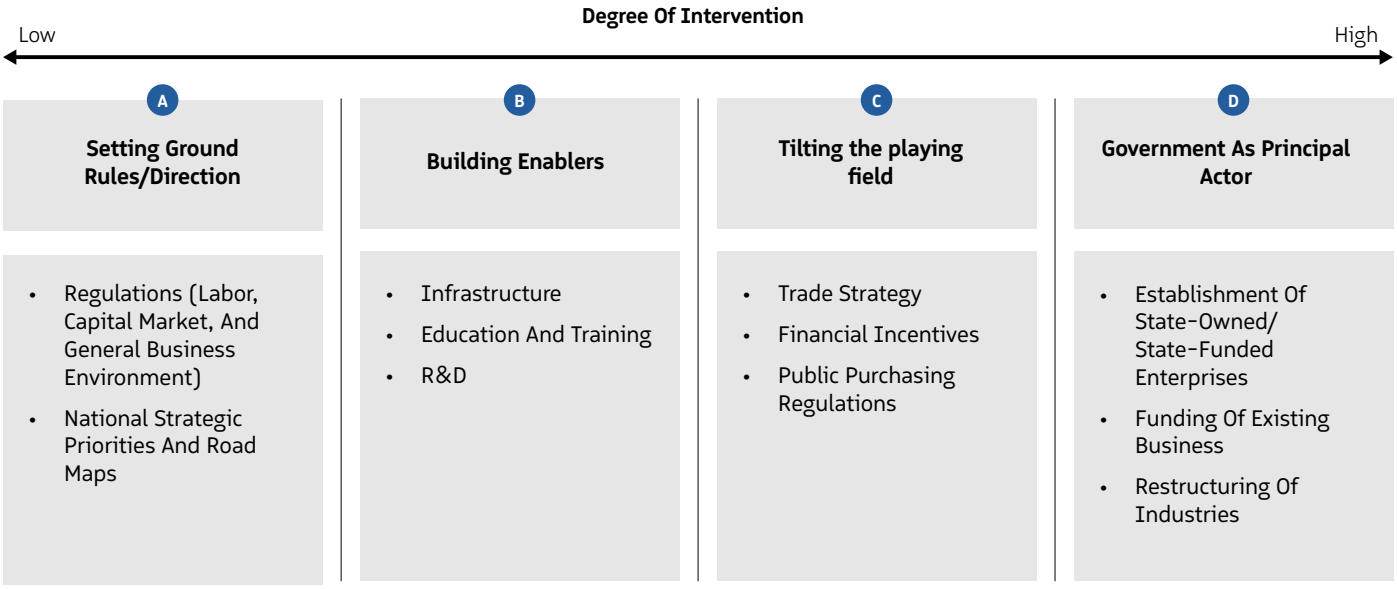
95 Cherif et al. 2022
96 Kantor and Whalley 2023

Exhibit 13

**Governments Use Various Tools To Support Emerging Sectors Depending On The Degree Of Their Involvement**

Degree Of Government Involvement And Typical Levers Of Government Support

Not Exhaustive




Source: "How to compete and grow: A sector guide to policy", McKinsey Global Institute, March 2010

sustained growth, employment, and business creation in US high-tech industries. For example, industrial clusters that received substantial public R&D funding were producing 40% to 50% more patents annually by 1970 than clusters that did not receive such funding.[97]

Yet governments have a whole range of different tools at their disposal to support sectors based on the degree of intervention. This is illustrated in Exhibit 13.

Governments use different tools for each of the different degrees of intervention. For example, if a government chooses to support an emerging sector, such as advanced mobility, through setting the ground rules or direction, it might choose to make regulatory changes. For example, the UAE General Civil Aviation Authority published the world's first national regulation related to vertiports to support development and investment in the UAE's advanced air mobility sector. This would regulate the design and operational requirements of vertiports while ensuring an enabling regulatory environment for electrical vertical take-off and landing aircraft and advanced air mobility.[98] Countries and regions may also build national strategic priorities around an emerging sector, as seen in Singapore, which released a master plan for 2030 for their EdTech sector called, "*Transforming Education through Technology.*"[99]

97 Gross and Sampat 2020
98 Dubai Airshow 2023
99 Singapore Ministry of Education 2023

# Section 7

# The First-Mover Advantage

# When launching new products, companies face the critical decision of timing. Is it better to be a first mover or a fast follower?

In the context of building a whole industry around a newly emerging economic sector to drive economic development, this question is of paramount importance, as it will inform the risk and investment appetite of leaders in the public and private sector.

However, the question of moving first versus moving second does not have one simple answer. Instead – as in the case of the role of government – timing needs to be addressed, considering the underlying sector dynamics. Underlying the timing decision is the fundamental question of competitiveness and even more so: How easily can my competitive advantage in an emerging sector be replicated?

In Section 5, we outlined five categories of competitiveness:

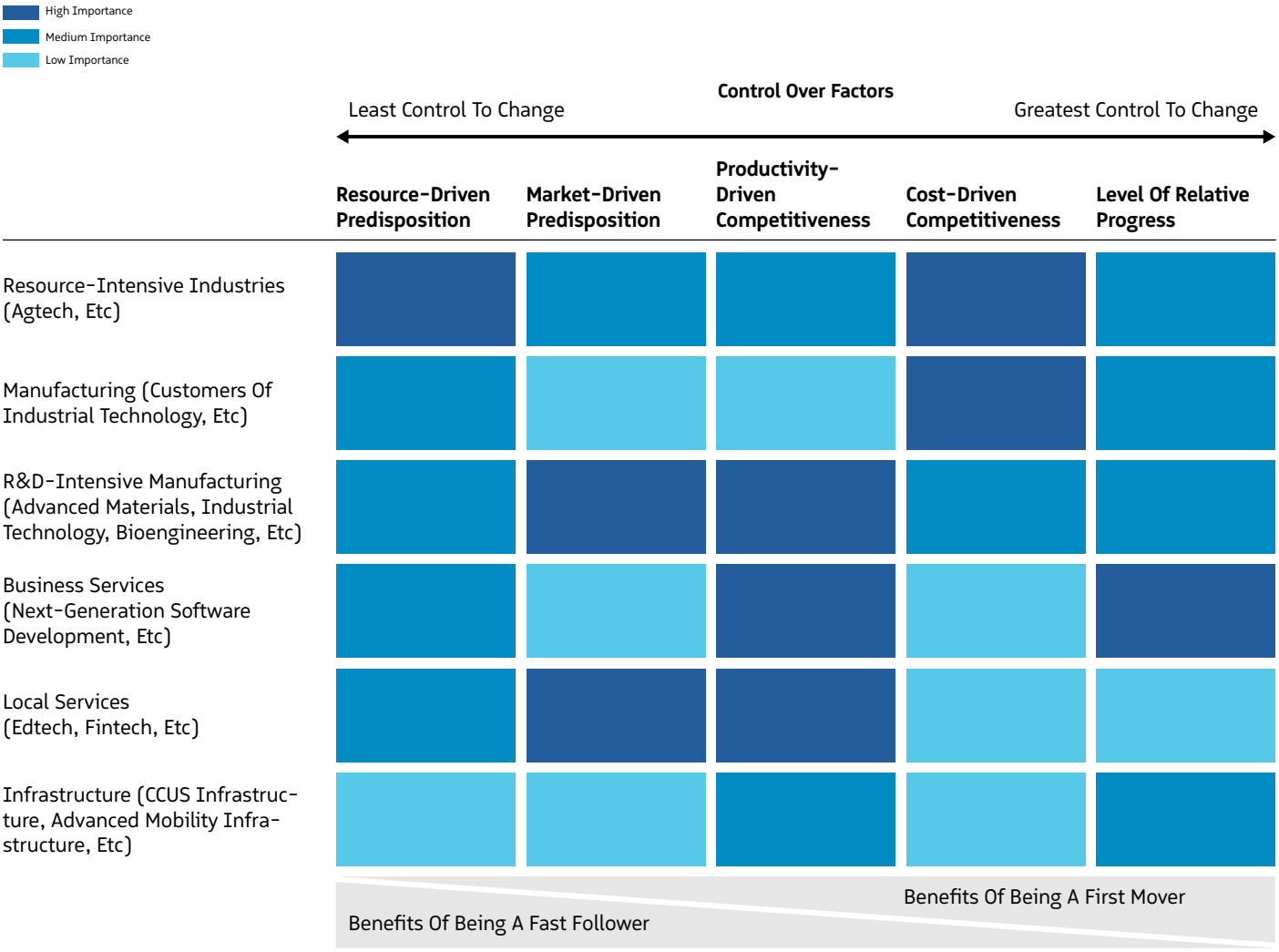
- **Resource-driven predisposition,** or a country's natural endowment (natural resources and arable land, Etc)
- **Market-driven predisposition**, or a country or company's access to markets (access to a large market of potential buyers, Etc)
- **Productivity-driven competitiveness**, which includes factors such as R&D or high-skill talent
- **Cost-driven competitiveness** as measured by cost of input factors, cost of labor, or cost of doing business
- **Level of relative progress**, which measures current market size and investment levels, thereby measuring the current degree of first-mover advantage

We have also seen that certain drivers of competitiveness are harder to replicate (resource-driven predisposition, etc), whereas other drivers can be achieved through economies of scale or government intervention (cost-driven competitiveness, Etc). Therefore, when business leaders and decision-makers consider a play in an emerging economic sector, they must investigate the key sources of competitiveness and identify why they believe themselves to be better positioned to capture this market than others. If their source of competitiveness is hard to replicate, (natural endowments, Etc), they can wait and learn from the experiences of other companies. However, if their source of competitiveness is easily replicated, they should aim for a first-mover advantage to build network effects, economies of scale, intellectual property, and proprietary knowledge, which will help them sustain a competitive advantage over time.

Using the sector categories from Section 6, we can provide a generalized assessment of the importance of different categories of competitiveness for different types of sectors. However, this assessment is only an initial indication and competitive dynamics can vary between products, regions, or even countries. Our aim is to illustrate the approach and give an initial starting point rather than provide a definite answer on the benefits of being a first mover versus a fast follower (see Exhibit 14).

- **Resource-Intensive Industries:** Unsurprisingly, resource-intensive industries score high on resource-driven predisposition. Countries and companies require access to significant natural resources to be competitive (oil, arable land, and rare earth minerals, Etc). In addition, many of these products are easily commoditized, which requires firms to be cost competitive. Overall, the benefits of being a fast follower in these industries may be quite high, as countries with large or cost-competitive natural endowments will easily be competitive with first movers who have less competitive endowments.
- **Manufacturing:** Manufacturing (as opposed to R&D-intensive manufacturing) is often characterized by cost and the ability to differentiate products to target different customer groups. Hence, manufacturers compete on cost-driven competitiveness, productivity-driven competitiveness, and market-driven predisposition. Being a first mover can be an advantage to the extent it allows companies and countries to build economies of scale to drive down production costs and create

Exhibit 14
**The Role Of Timing**




Source: "How to compete and grow: A sector guide to policy", McKinsey Global Institute, March 2010; McKinsey analysis

customer loyalty through branding and differentiation. Yet for firms mostly competing on product differentiation rather than cost, being a first mover may be less advantageous. Economies of scale have played a significant role in automotive manufacturing, both at the level of individual firms and at the level of ecosystems co-locating suppliers and manufacturers.[100] Consequently, building a new automotive industry from scratch has been a costly undertaking for many countries.

- **R&D-Intensive Manufacturing:** R&D-intensive manufacturing relies heavily on productivity-driven competitiveness factors, such as R&D and high-skill talent, as well as market access, in particular as it is related to the protection of intellectual property in certain markets. Being a first mover in these types of markets is associated with high benefits, but also high costs for R&D, while benefits are highly dependent on the protection of intellectual property. A prime example of this type of market is

100 Hilker 2021

the biopharmaceuticals industry, where both first movers and fast followers have viable business models.

- **Business Services:** This sector often requires a highly specialized and productive workforce and is prone to network effects, while cost considerations and natural endowments are less important for the margin. Due to the presence of network effects and high customer loyalty (due to lock-in effects), first movers can often be highly successful. An example is cloud infrastructure, as shown by Amazon Web Services and Microsoft Azure, which together command more than 50% of total market share.[101]

- **Local Services:** Local services are often highly region specific, due to language, regulation (including, for example, education curriculum), and access. Consequently, competitiveness in these services stems from market access and product differentiation, whereas cost competitiveness and uptake play a more local (rather than global) role. Hence, being a fast follower can be advantageous by emulating the business model of companies in foreign markets at home. EdTech is an example, where business models are often tailored significantly to local markets.

- **Infrastructure:** Similar to local services, infrastructure is highly region specific and tradability is limited. Also similar to resource-intensive industries, there is a high degree of commoditization in infrastructure sectors and significant economies of scale are possible. The regional specificity makes fast following possible by emulating foreign business models at home. However, cost-driven competitiveness and often large up-front investments also provide a significant advantage to first movers in specific regional markets.

As we have outlined above, the decision on whether to be a first mover or a fast follower is highly specific to the sector and depends on underlying competitiveness dynamics. Using the McKinsey Global Institute categorization of six sectors, we have illustrated how to think about timing in the context of different drivers of competitiveness. In our final section, we explore how a leadership position in a sector can be expanded over time and become a lasting source of economic growth.

101 Law 2023

# Section 8

# A Sustainable Engine For Growth

# In previous sections, we have seen how regions can identify and tap into untapped sources of economic growth

However, making an initial play in an emerging sector does not guarantee a sustainable engine for growth. In this section, we will identify how supportive ecosystems for emerging economic sectors can help cement a competitive advantage.

## An ecosystem can be defined as a complex connected community of interacting digital and physical institutions. These institutions collaborate and compete to create and capture economic value.

While businesses are important players in such an ecosystem, they can include a wide variety of entities, including government agencies, universities, and non-profit institutions.

Some regions have emerged as hubs for emerging sectors, including Bangalore, Austin, and Munich. Bangalore, which is home to the largest number of high-growth tech companies in India, is often referred to as the Silicon Valley of India. Its history of innovation began to soar after the success of companies such as Infosys and Wipro.[102] Austin is considered one of the tech capitals of North America. In the 1960s, the presence of a prominent research institution, the University of Texas at Austin, and the relatively low cost of living attracted major tech players to the ecosystem, including IBM and Texas Instruments. Their establishment, the birth of Austin's Silicon Hills in the 1970s and 1980s, the founding of the Sematech Consortium (a collaboration between semiconductor manufacturers), and other strategic moves to attract tech players helped this city grow as a hub for technology innovation.[103] Munich is the leading Bioengineering player in Germany and is considered a leader in this space in Europe. With a strong academic research network working closely with more than 450 life sciences companies, the ecosystem is ripe for innovation – in fact, most medium-sized Bioengineering companies there are spin-offs of scientific institutions.[104]

We spoke to Jay Latta to hear about his experience operating in an emerging sector as well as his perspective on the role that an ecosystem plays in supporting emerging sectors. Jay Latta is an emerging technology strategist and a technology manager, and he was an innovation supervisor at BMW Group until 2020. He also founded a think tank on emerging technologies for topics such as mobility as a service and future mobility concepts.

102 Cornish 2022
103 Singer 2023
104 Bavarian Biotech Cluster Development 2023.

# Interview with Jay Latta

Jay Latta is an emerging technology strategist and a technology manager, who served as an innovation supervisor at BMW Group until 2020. He also founded a think tank on emerging technologies for topics such as mobility as a service and future mobility concepts.

## What are some of the highlights of the role you held at BMW, focusing on emerging technologies?

As an emerging technology strategist and innovation supervisor at BMW Group until 2020, I was involved in spearheading initiatives related to the smartification and electrification of the overall vehicle architecture. I was also involved with other BMW innovative endeavors, including BMW Startup Garage, which serves as an incubator, facilitating the collaboration between promising start-ups and the departments within BMW, and BMW iVentures, which is a venture capital firm that invests in entrepreneurs building resources in hardware, software, and services across manufacturing, transportation, and sustainability.

## In your journey, who were the main players involved in the innovation ecosystem at BMW?

There were four primary groups of actors: 1) internal departments at BMW, including procurement, business relationship management, innovation, strategy, legal, and compliance; 2) external ecosystem players, including local start-ups to support innovation; innovation partners (such as Trendone); technology partners (such as Intel); consulting firms; and universities and research centers; 3) funding partners, such as venture capitalists and investors; and 4) the government, which typically deals directly with legal and compliance.

## What are the corporate priorities and shifts required for a company that is looking to enter and/or succeed in an emerging sector?

Corporations need to establish a few key priorities, including: flattening the organizational hierarchy and having a more agile approach, fostering a mindset shift to become an experimental and curious company with innovation being unconditional to ignite the necessary spark of curiosity, trusting more people fresh from the market, having diverse teams, building a culture of knowledge sharing, and altering the business model to emphasize sustainability and quality over volume-driven sales.

## What support can the government provide for companies looking to succeed in an emerging sector?

Governments could establish initiatives that break away from the dominance of established players and instead, collaborate with independent individuals or organizations. These initiatives should actively encourage cross-industry dialogue, promoting the exchange of ideas and expertise that can drive innovation forward. In addition, governments could encourage the incorporation of environmental, social, and governance criteria in targets. These government initiatives could pave the way for a more diverse, sustainable, and innovative business landscape.

In "*Building innovation ecosystems: Accelerating tech hub growth*," McKinsey identifies six priorities for creating innovation ecosystems:[105]

1. **Aspiration And A Bold Vision:** This includes a clear aspiration and forward-looking goals that build stakeholder excitement and buy-in.

2. **Cluster And Partner Strategy:** Innovation ecosystems are more likely to thrive when leaders focus on specific sectors and subsectors, especially as it comes to emerging economic sectors. This will attract specific players in a common value chain and create synergies across the ecosystem. Companies looking to emphasize their competitive advantages also grow through strategic Mergers & Acquisitions [M&A] and other partnerships to cement their position. For example, the number of biopharma M&A deals and the number of other types of partnership deals have risen as large entrants try to consolidate their market leadership in this sector. By capitalizing on their competitive advantage (market access and productivity-driven competitiveness) and using partnerships to cement their dominance, these players are aiming to secure a sustainable source of economic value.[106] Players can also consider moving into adjacent products.

   For example, for the business processing outsourcing industry in India. What started as pure business outsourcing in the 1990s has since evolved into a sector cluster comprised of several global giants in related industries. Examples are Tata Consulting Services, Wipro, and Infosys, which offer a wide variety of services that go far beyond BPO, including IT consulting and cloud computing services.

3. **Capital And Funding:** Having a strong backbone of R&D funding, venture capital, and commercialization support allows new ideas to flourish and grow into businesses. Large pharmaceutical companies like Eli Lilly are increasingly capitalizing on the growth in biological drugs, supported by well-functioning innovation ecosystems, such as the Research Triangle Park in North Carolina.

4. **Talent And Community Building:** As we have seen above for individual companies, talent is essential for innovative ecosystems aiming to enter emerging economic sectors. This includes K-12 and higher education as well as vocational education pathways and upskilling and reskilling opportunities for talent to stay current with today's fast-paced technology landscape.

5. **Real Estate, Infrastructure, And Placemaking:** Real estate and quality of life is not only critical to attracting talent and businesses. Well-designed physical spaces also allow for the exchange of ideas, informal meetups, and serendipity that are crucial for innovation in emerging economic sectors.

6. **Diversity, Equity, And Inclusion:** Tapping into emerging economic sectors earlier and better than competitors requires tapping into the best minds an economy has to offer. Hence, fostering diversity, equity, and inclusion is a critical component of building successful innovation ecosystems.[107]

105 Davis, Safran, Schaff, and Yayboke 2023
106 Ibid.
107 Ibid

# Conclusion

In this article, we have presented an approach to identify, enter, and secure untapped sources of economic growth.

We have demonstrated how regions, supported by future-oriented governments and innovative ecosystems, can enter emerging economic sectors and build a strong position that leverages a competitive advantage in a multitude of sectors for several decades. As technological progress accelerates and disruption becomes more frequent, it is critical that leaders in the public and private sectors engage in the process of discovering and tapping into emerging economic sectors to capture growth that is both sustainable and inclusive.

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