PGIM

EXECUTIVE SUMMARY

RESHAPING SERVICES

The investment implications of technological disruption

Key Takeaways

- **The current wave of innovation impacting services will differ significantly from previous waves that vanquished manufacturing and retail incumbents for several reasons:**
  - First, services – especially healthcare and financial services – tend to be more heavily regulated globally than manufacturing or retail.
  - Second, client networks or distribution channels for services are often controlled by incumbents and can be difficult or impossible to build organically.
  - Third, after observing the turmoil in the manufacturing and retail sectors, incumbent service firms will not be caught by surprise. In fact, many are embracing new technologies rather than competing with them.
- **Technological disruption and adoption will not proceed at the same pace in all regions.** For example, emerging markets are much less encumbered by legacy technology infrastructure than the US and Europe. This allows their younger, tech-savvy populations to leapfrog technology and adopt cutting-edge innovations faster, giving disruptors an upper hand in these markets.
- **The media hype around some nascent technological innovations** – like blockchain and autonomous vehicles – is often way ahead of today's investable reality. As these evolving technologies mature, institutional investors should consider tangible investment opportunities like private blockchains and infrastructure for greener and smarter vehicles.
- **Upstart innovators will be among the winners of this next wave of disruption.** Especially ones that either expand the existing market – like neobanks – or ones that transform the way we consume services forever – like apps that monitor chronic conditions.
- **Along with these upstart innovators, a select few service incumbents will emerge from the coming wave of disruption stronger and more efficient.** Investors will need to discern which incumbents will emerge as winners and which will be left behind.

The current wave of technological disruption has finally reached the shores of the service economy. This will represent a major shift for investors and the global economy as services represent over two-thirds of global GDP, three-quarters of the workforce in developed markets, and nearly half of the workforce in advanced emerging markets.

Advances in technologies such as cloud computing, artificial intelligence (AI), advanced data analytics, and machine learning (ML) are radically reshaping winners and losers across services in both developed and emerging markets – and at an even faster pace after the COVID-19 pandemic (Table 1).

In our latest Megatrends paper, *Reshaping Services: The investment implications of technological disruption*, we propose an actionable investment agenda for institutional investors that encompasses individual asset-class strategies as well as recommendations on how to position portfolios for this new wave of disruption in the service sector. To do so, we draw on the insights of more than 70 investment professionals across PGIM's fixed income, equity, real estate, private credit and alternatives managers – as well as leading academics, technologists, industry analysts and venture investors.

We focus our investment lens on the three sectors that represent the vast majority of the service sector and 35% of the MSCI ACWI: financial services, healthcare, and transportation and logistics. We bring a pragmatic investment lens to the current wave of technological change in the service sector, recognizing that long-term investors will need to carefully separate techno-optimist hype from on-the-ground investable reality.

Table 1: **Three phases of technology evolution**

		Phase 1 Machine	Phase 2 Computer	Phase 3 Cloud+
Examples of key enabling technologies		▪ Gasoline- and electric-powered motors	▪ Personal computers and mainframes ▪ Physical network of computers ▪ Limited high-speed internet (mostly commercial)	▪ Cloud-based computing and networks ▪ Artificial intelligence and machine learning ▪ Distributed ledgers and blockchain ▪ Widely available broadband and 5G networks
Examples of key innovations		▪ Automation of agriculture, construction and industry (e.g., tractors, cranes and bulldozers)	▪ Automation of administrative and business support services (e.g., Excel spreadsheets, shared drives for digital files)	▪ Analysis of big data (e.g., algorithms to optimize global supply chains) ▪ Edge computing done on mobile devices ▪ Automation of complex tasks that requires human judgment (e.g., autonomous driving and visual recognition software)
Impact	**Agriculture**	High	Low	Medium
	Industry	High	High	Medium
	Services	Low	Medium	High

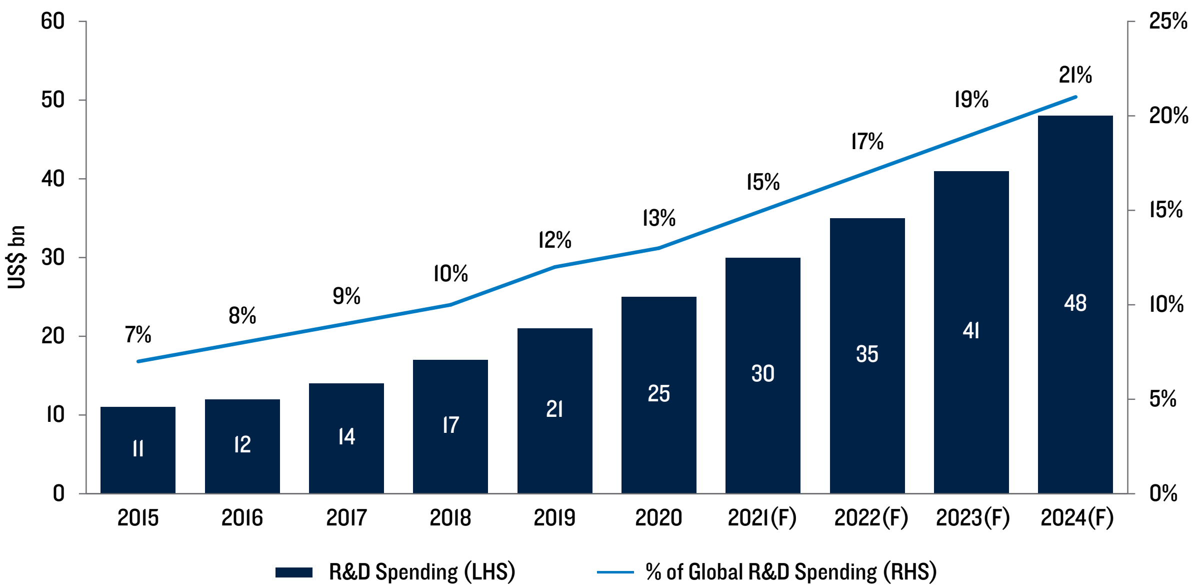
Source: PGIM analysis, Erik Brynjolfsson and Andrew McAfee, "The Second Machine Age: Work, Progress, and Prosperity in a Time of Brilliant Technologies," 2016.

Investment Implications by Asset Class

The report proposes a range of sector-specific investment themes for institutional investors to consider:

- **Financial services** is undergoing a major transformation, with neobank and fintech disruptors challenging traditional banks, insurers and wealth managers. But the incumbents are not sitting by idly either. Together, these trends are contributing to a range of investment opportunities across the sector, for example:
  - Fintech platforms that embed credit within their large online network and neobanks that target underbanked populations present attractive investment opportunities for public and private equity investors.
  - Insurance firms that leverage proprietary big data and integrate AI and ML to streamline parts of the underwriting and claims process should provide excellent opportunities for both debt and equity investors.
  - Blockchain applications that solve specific real-world problems today – like permissioned distributed ledgers for payments and transactions – are most likely to succeed and offer tangible opportunities for institutional investors.
- **Healthcare** is increasingly being defined by three major trends: virtualization, personalization and segmentation. As these trends transform the way healthcare is administered and delivered globally, several investment themes emerge. Examples include:
  - Emerging markets offer new opportunities and risks for biotech and pharmaceuticals. Despite ongoing regulatory uncertainty, China can offer some attractive growth opportunities for equity investors (Exhibit 1).
  - App-based healthcare startups that help people make better behavioral choices for their health through personalized approaches can be compelling VC investments.
  - The proliferation of precision medicine and other advances like liquid biopsy and genomics provide enduring demand growth for lab equipment and testing materials. This presents an excellent opportunity for debt investors.
- **Transportation and logistics** is another sector on the cusp of significant innovation. While some logistics firms like DHL and Amazon employ cutting-edge technology in their operations, overall the sector is at an early stage of

Exhibit 1: **China's pharmaceutical R&D spending is growing**



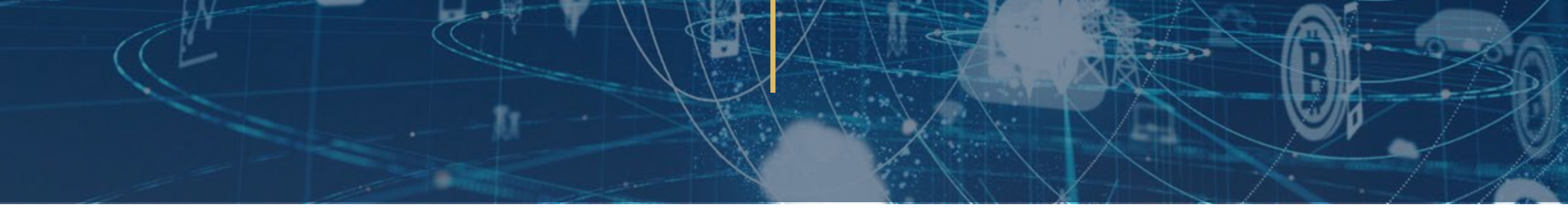
Source: Jefferies, Frost & Sullivan.

technological disruption. With transformative innovations like autonomous vehicles (AV) still in early stages of their evolution, investors have a range of opportunities to draw from, including the following:

- The landscape for AV is highly fragmented with many global partnerships vying for first-mover advantage. Importantly, testing and trials are moving forward at different speeds in different regions, providing opportunities for active equity and VC investors.
- The surge in online shopping due to COVID-19 restrictions has created tremendous new growth in demand for distribution and logistics facilities – especially in areas like Europe where e-commerce penetration had been lagging.
- The less tech-forward portions of the supply chain ecosystem provide growth opportunities for software firms that optimize logistics and improve transportation networks.

Portfolio Implications

- **Position the portfolio for service sector disruption – which will have a radically different trajectory than manufacturing and retail disruption:** In tandem with new winning startups, disruption in services will actually increase the dominance of a select group of technology-forward incumbents. Understanding the characteristics of these select winning incumbents is especially relevant for long-duration investments such as private assets and long-maturity debt.
- **Make complementary investments in the technology infrastructure that will underpin the next wave of service sector disruption:** In addition to actively evaluating leaders, laggards and new entrants in individual service sectors, CIOs will also want their asset managers to identify the companies providing the technological backbone that will support the coming disruption. This includes companies that provide cloud computing, fiber optic networks, data centers, AI and ML-powered toolkits and other related "pipes and plumbing."
- **Brace for regulatory backlash as it spills over into services:** Regulatory uncertainty is common across many cutting-edge technologies (e.g., blockchain and AV) – though specifics vary significantly by region and sectors. Investors often overlook the unsettled regulatory environment in which today's emerging firms operate. Recent examples of "techlash" in China, for example, caught many investors by surprise.
- **Proactively engage your board and senior leadership on next-generation technologies:** The implication of new technologies in services are too far-reaching to leave to tech sector analysts or back-office IT teams. CIOs can enhance their team's understanding of this disruption through a range of actions including:
  - Identify the metrics and key performance indicators that are relevant for each asset class in identifying winning incumbents (e.g., number of data scientists, investment spend of new technologies and M&A activity levels).
  - Deepen your network and relationships with startups, VC firms and even the CTOs of forward-thinking incumbents to keep pace with innovations and disruptive technologies.
  - Engage external managers in targeted discussions to learn how they monitor technology risks and opportunities across their security and asset selection process.



Investment Implications Summary

	Public Equity	Public and Private Debt	Real Estate and Infrastructure	Venture Capital	Private Equity
Financial Services					
Global opportunities in the expanding fintech ecosystem (e.g., neobanks, payment and other platforms)	●			●	●
Insurance firms that integrate advanced data analytics will succeed	●	●			
Focus on targeted blockchain applications that solve specific problems today				●	●
Incumbent banks leveraging new technology will thrive and widen their moats		●			
Next-generation payment systems allow tech-forward incumbents and select new entrants to thrive	●	●		●	●
Healthcare					
Emerging markets offer new opportunities and risks for biotech and pharmaceuticals	●			●	●
Investing in small-cap US biotech firms requires an active approach	●				
Care outside of the doctor's office, from an app				●	
Specialized healthcare platforms				●	●
Medical devices as a service offer stable cash flows for debt investors		●			
Lab testing and diagnostics offer steady cash flows for debt investors		●	●		
Senior housing remains attractive for real estate investors			●		

	Public Equity	Public and Private Debt	Real Estate and Infrastructure	Venture Capital	Private Equity
Transportation and Logistics					
Participating in fragmented AV landscape	●			●	●
Digital platforms to optimize supply chains and logistics	●	●			●
Europe offers new opportunities and challenges in logistics real estate			●		
Green technology alters the locational analysis for warehouses in the US			●		●
Opportunities in the transition to greener and smarter infrastructure		●	●		
A very long road for EV presents ICE opportunities for debt investors		●			
Logistics incumbents embracing cloud technology will thrive		●			

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