

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	<ul style="list-style-type: none"> Gasoline- and electric-powered motors 	<ul style="list-style-type: none"> Personal computers and mainframes Physical network of computers Limited high-speed internet (mostly commercial) 	<ul style="list-style-type: none"> Cloud-based computing and networks Artificial intelligence and machine learning Distributed ledgers and blockchain Widely available broadband and 5G networks 	
Examples of key innovations	<ul style="list-style-type: none"> Automation of agriculture, construction and industry (e.g., tractors, cranes and bulldozers) 	<ul style="list-style-type: none"> Automation of administrative and business support services (e.g., Excel spreadsheets, shared drives for digital files) 	<ul style="list-style-type: none"> 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

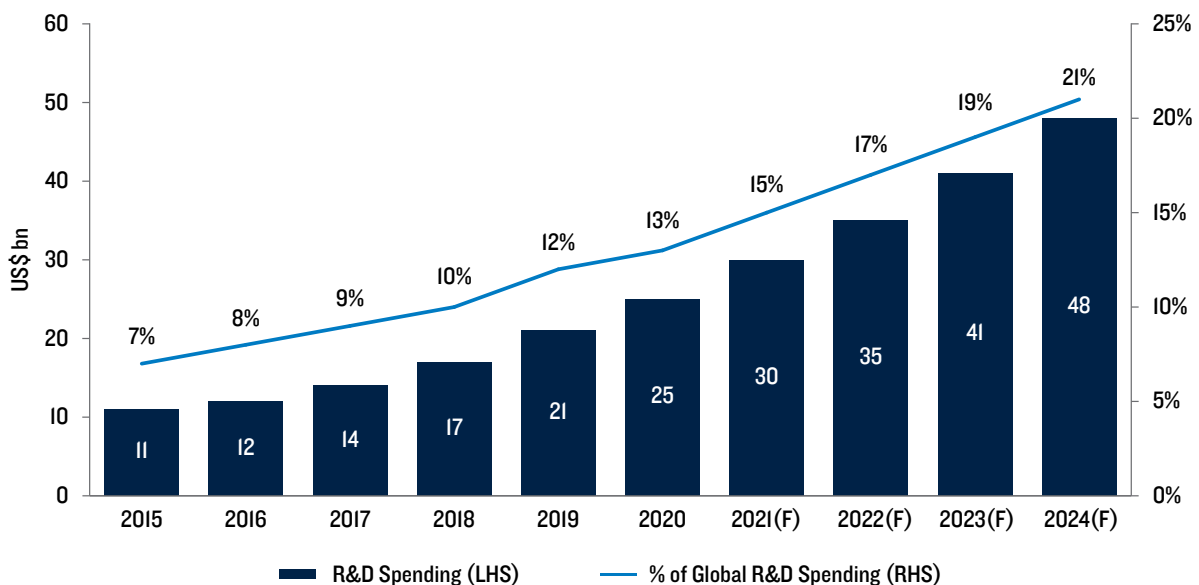
Source: PGIM analysis, Erik Brynjolfsson and Andrew McAfee, “The Second Machine Age: Work, Progress, and Prosperity in a Time of Brilliant Technologies,” 2016.

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		●			

THE PURSUIT OF OUTPERFORMANCE™

Professional Investor Use Only. All investments involve risks, including possible loss of principal. Past performance is not indicative of future results.

The information contained herein is provided by PGIM, Inc., the principal asset management business of Prudential Financial, Inc. (PFI), and an investment adviser registered with the US Securities and Exchange Commission (SEC). Registration with the SEC does not imply a certain level of skill or training.

In the United Kingdom, information is issued by PGIM Limited with registered office: Grand Buildings, 1-3 Strand, Trafalgar Square, London, WC2N 5HR. PGIM Limited is authorised and regulated by the Financial Conduct Authority (“FCA”) of the United Kingdom (Firm Reference Number 193418). In the European Economic Area (“EEA”), information is issued by PGIM Netherlands B.V. with registered office: Gustav Mahlerlaan 1212, 1081 LA Amsterdam, The Netherlands. PGIM Netherlands B.V. is authorised by the Autoriteit Financiële Markten (“AFM”) in the Netherlands (Registration number 15003620) and operating on the basis of a European passport. In certain EEA countries, information is, where permitted, presented by PGIM Limited in reliance of provisions, exemptions or licenses available to PGIM Limited under temporary permission arrangements following the exit of the United Kingdom from the European Union. These materials are issued by PGIM Limited and/or PGIM Netherlands B.V. to persons who are professional clients as defined under the rules of the FCA and/or to persons who are professional clients as defined in the relevant local implementation of Directive 2014/65/EU (MiFID II). These materials are issued to persons who are professional clients or eligible counterparties as defined in Directive 2014/65/EU (MiFID II), investing for their own account, for funds of funds or discretionary clients. In Singapore, information is issued by PGIM (Singapore) Pte. Ltd. (PGIM Singapore), a Singapore investment manager that is licensed as a capital markets service license holder by the Monetary Authority of Singapore and an exempt financial adviser (registration number: 199404146N). These materials are issued by PGIM Singapore for the general information of “institutional investors” pursuant to Section 304 of the Securities and Futures Act, Chapter 289 of Singapore (the “SFA”) and “accredited investors” and other relevant persons in accordance with the conditions specified in Section 305 of the SFA. In Hong Kong, information is provided by PGIM (Hong Kong) Limited, a regulated entity with the Securities & Futures Commission in Hong Kong to professional investors as defined in Section 1 of Part 1 of Schedule 1 (paragraph (a) to (i) of the Securities and Futures Ordinance (Cap. 571). PGIM, Inc. is exempt from the requirement to hold an Australian Financial Services License under the Corporations Act 2001 in respect of financial services. PGIM, Inc. is exempt by virtue of its regulation by the Securities and Exchange Commission under the laws of the United States of America, including applicable state laws and the application of ASIC Class Order 03/1100. The laws of the United States of America differ from Australian laws. In Japan, information is presented by PGIM Japan, Co. Ltd. (“PGIM Japan”), a registered Financial Instruments Business Operator with the Financial Services Agency of Japan. In South Korea, information is issued by PGIM, Inc., which is licensed to provide discretionary investment management services directly to South Korean qualified institutional investors on a cross-border basis.

These materials are for informational or educational purposes only. The information is not intended as investment advice and is not a recommendation about managing or investing assets. In providing these materials, PGIM is not acting as your fiduciary.

These materials represent the views, opinions and recommendations of the author(s) regarding the economic conditions, asset classes, securities, issuers or financial instruments referenced herein. Distribution of this information to any person other than the person to whom it was originally delivered and to such person's advisers is unauthorized, and any reproduction of these materials, in whole or in part, or the divulgence of any of the contents hereof, without prior consent of PGIM is prohibited. Certain information contained herein has been obtained from sources that PGIM believes to be reliable as of the date presented; however, PGIM cannot guarantee the accuracy of such information, assure its completeness, or warrant such information will not be changed. The information contained herein is current as of the date of issuance (or such earlier date as referenced herein) and is subject to change without notice. PGIM has no obligation to update any or all of such information; nor do we make any express or implied warranties or representations as to the completeness or accuracy or accept responsibility for errors. These materials are not intended as an offer or solicitation with respect to the purchase or sale of any security or other financial instrument or any investment management services and should not be used as the basis for any investment decision. No risk management technique can guarantee the mitigation or elimination of risk in any market environment. Past performance is not a guarantee or a reliable indicator of future results and an investment could lose value. No liability whatsoever is accepted for any loss (whether direct, indirect, or consequential) that may arise from any use of the information contained in or derived from this report. PGIM and its affiliates may make investment decisions that are inconsistent with the recommendations or views expressed herein, including for proprietary accounts of PGIM or its affiliates. Any projections or forecasts presented herein are as of the date of this presentation and are subject to change without notice. Actual data will vary and may not be reflected here. Projections and forecasts are subject to high levels of uncertainty. Accordingly, any projections or forecasts should be viewed as merely representative of a broad range of possible outcomes. Projections or forecasts are estimated, based on assumptions, and are subject to significant revision and may change materially as economic and market conditions change. PGIM has no obligation to provide updates or changes to any projections or forecasts.

This material may contain examples of the firm's internal ESG research program and is not intended to represent any particular product's or strategy's performance or how any particular product or strategy will be invested or allocated at any particular time. PGIM's ESG processes, rankings and factors may change over time. ESG investing is qualitative and subjective by nature; there is no guarantee that the criteria used or judgment exercised by PGIM will reflect the beliefs or values of any investor. Information regarding ESG practices is obtained through third-party reporting, which may not be accurate or complete, and PGIM depends on this information to evaluate a company's commitment to, or implementation of, ESG practices. ESG norms differ by region. There is no assurance that PGIM's ESG investing techniques will be successful.

The opinions and recommendations herein do not take into account individual client circumstances, objectives, or needs and are not intended as recommendations of particular securities, financial instruments or strategies to particular clients or prospects. No determination has been made regarding the suitability of any securities, financial instruments or strategies for particular clients or prospects. For any securities or financial instruments mentioned herein, the recipient(s) of this report must make its own independent decisions.

Conflicts of Interest: PGIM and its affiliates may have investment advisory or other business relationships with the issuers of securities referenced herein. PGIM and its affiliates, officers, directors and employees may from time to time have long or short positions in and buy or sell securities or financial instruments referenced herein. PGIM and its affiliates may develop and publish research that is independent of, and different than, the recommendations contained herein. PGIM's personnel other than the author(s), such as sales, marketing and trading personnel, may provide oral or written market commentary or ideas to PGIM's clients or prospects or proprietary investment ideas that differ from the views expressed herein.

© 2021 PFI and its related entities. PGIM, the PGIM logo, and the Rock symbol are service marks of Prudential Financial, Inc., and its related entities, registered in many jurisdictions worldwide.

21/10 - 1548

留意事項

- ※ 本資料は米国 SEC の登録投資顧問会社である PGIM インクが作成したものです。
- ※ 本資料は情報提供を目的としたものであり、特定の金融商品の勧誘又は販売を目的としたものではありません。また、本資料に記載された内容等については今後変更されることもあります。
- ※ 記載されている市場動向等は現時点での見解であり、これらは今後変更することもあります。また、その結果の確実性を表明するものではなく、将来の市場環境の変動等を保証するものでもありません。
- ※ 本資料に記載されている市場関連データ及び情報等は信頼できると判断した各種情報源から入手したものです。その情報の正確性、確実性について当社が保証するものではありません。
- ※ 過去の運用実績は必ずしも将来の運用成果等を保証するものではありません。
- ※ 本資料は法務、会計、税務上のアドバイスあるいは投資推奨等を行うために作成されたものではありません。
- ※ 当社による事前承諾なしに、本資料の一部または全部を複製することは堅くお断り致します。
- ※ 本資料内で取り上げられた資産クラス、個別セクター等はあくまで例示目的であり、推奨ならびにこれらにかかる将来性を明示・暗示的に示唆するものではありません。
- ※ “Prudential”、“PGIM”、それぞれのロゴおよびロック・シンボルは、プルデンシャル・ファイナンシャル・インクおよびその関連会社のサービスマークであり、多数の国・地域で登録されています。
- ※ PGIM ジャパン株式会社は、世界最大級の金融サービス機関プルデンシャル・ファイナンシャルの一員であり、英国プルデンシャル社とはなんら関係がありません。

PGIM ジャパン株式会社
金融商品取引業者 関東財務局長（金商）第 392 号
加入協会 一般社団法人 投資信託協会、一般社団法人 日本投資顧問業協会
PGIMJ85408