

Counterpoint Global Insights

New Business Boom and Bust

How Capitalism Experiments

CONSILIENT OBSERVER | June 15, 2022

Introduction

A baby's learning after birth is dazzling. Take the acquisition of language as an example. Normal children effortlessly acquire the language spoken around them without special instruction. Before they can learn to read, kids add a new word to their vocabulary every couple of hours that they are awake. By the time they graduate from high school, Americans know about 60,000 words or phrases, or roughly 3 times the number of words in the oeuvre of William Shakespeare.¹

Learning about the environment is crucial to survival. A child must develop an effective neural network to do so. Nature's solution to the problem needs to be robust, inexpensive, and efficient. But the approach is not intuitive, especially to those who perceive that most solutions are the product of design.²

Neurons and synapses are elemental components in your body's neural network. Neurons are cells in the nervous system that connect and communicate with other cells. Synapses provide the structure that allows the neurons to communicate with one another. Your neurons are the nodes and your synapses are the connections in the neural network that is you. The challenge is figuring out how to build a network that allows you to speak your native language fluently and to understand it effortlessly, along with a range of other essential skills.

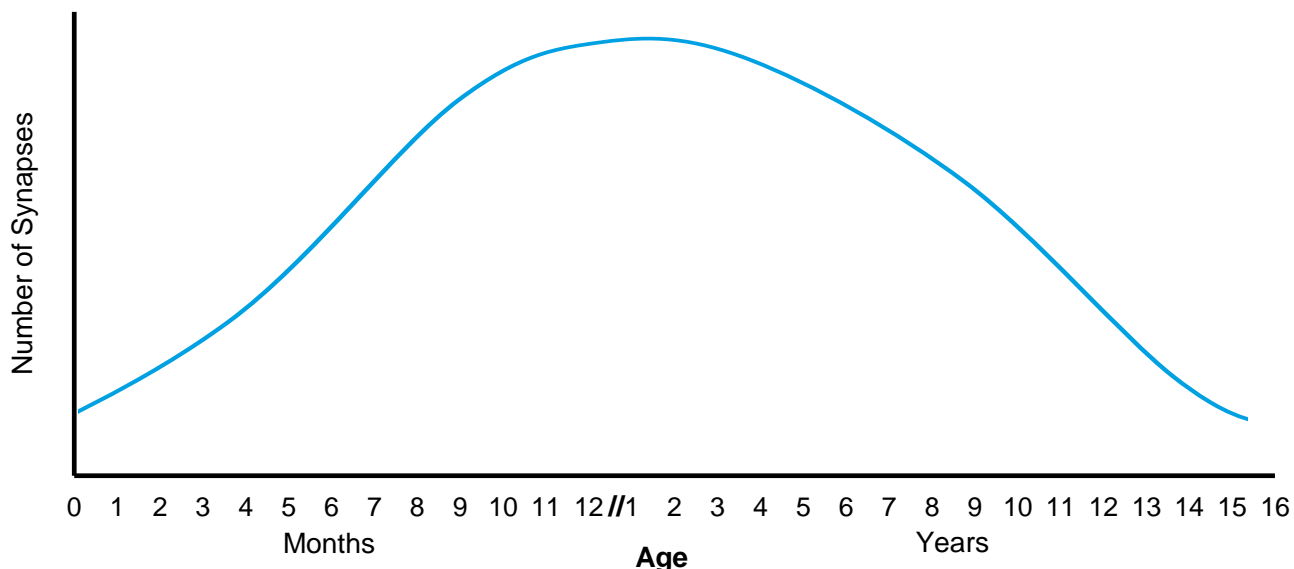
Exhibit 1 shows the solution that evolution found. The number of neurons does not change dramatically throughout life.³ What does change is the number of synaptic connections between the neurons. While the timing is different for various brain functions, the pattern is the same: the brain creates a huge number of synaptic connections and then reinforces the ones that are used and prunes the ones that are not used. To put some figures to it, at the peak a toddler has about 1 quadrillion synaptic connections (one thousand trillion), or about 15,000 per neuron.⁴ In the pruning phase, a child loses about 200 billion connections a day on the way to having about one-half as many by the age of 10. It's "use it or lose it."

AUTHORS

Michael J. Mauboussin
michael.mauboussin@morganstanley.com

Dan Callahan, CFA
dan.callahan1@morganstanley.com

Exhibit 1: Neural Connections in Early Childhood



Source: Based on Ross A. Thompson and Charles A. Nelson, "Developmental Science and the Media: Early Brain Development," *American Psychologist*, Vol. 56, No. 1, January 2001, 5-15.

This process of overproduction and pruning appears wasteful, especially considering that the brain uses about 20 percent of the body's energy. But scientists have shown that this approach creates a network of neurons that functions well in a wide range of potential environments.⁵ In effect, the swell in synaptic connections prepares the child for lots of possible paths, and the pruning matches the mind with the circumstances that prevail in the child's world.

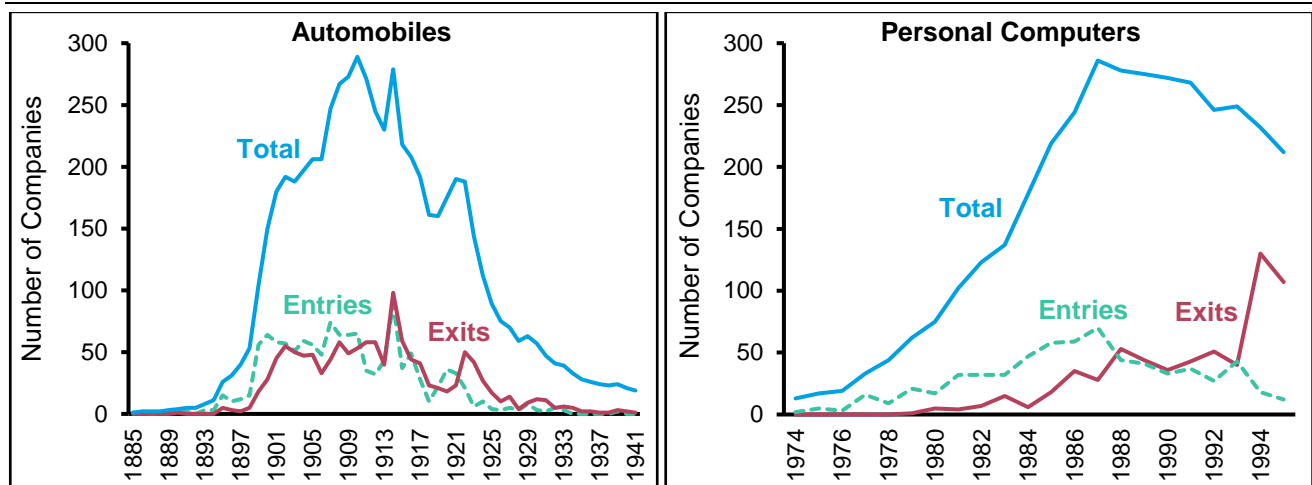
Burgeoning industries commonly follow the same pattern as they develop. The increase in synaptic connections is analogous to new companies, each entering the industry with a novel approach or technology to address the business challenge. The marketplace is the environment, which "selects" the products or services that best fit the industry's needs. The decrease in connections is analogous to the exit of companies.

We discuss this pattern for companies, describe why investors should care, and offer some current examples of where this pattern of entry and exit is playing out.

Pruning for Performance and the Product Life Cycle

Let's start with some classic examples of this pattern. Exhibit 2 shows the development of the U.S. automobile and personal computer (PC) industries. The auto industry started around 1895, saw a massive rate of net entry until about 1910, and then saw a substantial rate of net exit through 1941.⁶ The PC industry started in the mid-1970s, climbed to a peak number of companies in 1987, and saw a decline in total companies through the mid-1990s.⁷ Researchers have documented a similar outline of industry evolution for dozens of industries.⁸

Exhibit 2: Entry, Exit, and Total Companies in the U.S. Automobile and PC Industries



Source: Autos: Wikipedia contributors, "List of defunct automobile manufacturers of the United States," Wikipedia, The Free Encyclopedia, https://en.wikipedia.org/w/index.php?title=List_of_defunct_automobile_manufacturers_of_the_United_States&oldid=1087965710 and Wikipedia contributors, "List of automobile manufacturers of the United States," Wikipedia, The Free Encyclopedia, https://en.wikipedia.org/w/index.php?title=List_of_automobile_manufacturers_of_the_United_States&oldid=1088463190; PCs: Mariana Mazzucato, "The PC Industry: New Economy or Early Life-Cycle?" Review of Economic Dynamics, Vol. 5, No. 2, April 2002, 318-345; Counterpoint Global.

Steven Klepper was an economist at Carnegie Mellon and a leader in this field. This pattern of boom and bust is known as the product life cycle. Klepper identified and described six regularities in this evolutionary process:⁹

1. As an industry is born it is common for the number of entrants to rise and then fall over time. The total number of competitors is ultimately small.¹⁰
2. The output of the industry continues to grow even as the number of producers falls from the peak.
3. The market shares of the competitors are unstable at first, but eventually stabilize.¹¹
4. The diversity of versions of competing products coincides with the growth of entrants. The number of innovations peaks in the growth phase and falls thereafter.
5. Product innovation is the focus early in the cycle. Process innovation is the focus late in the cycle.
6. When the number of entrants is on the upswing, most product innovations come from new entrants.

Klepper, along with Michael Gort, an economist, examined 46 industries and measured the average time it took to pass through the various stages, including the growth in net entry, low to zero net entry near the peak of competition, and negative net entry.¹² The early phases last longer on average than the late ones. Further, we can observe that the diffusion of new innovations is happening faster today than it did in the past.

In his book, *Mastering the Dynamics of Innovation*, James Utterback, an emeritus professor of management at MIT, describes three phases in this recurring pattern.¹³

The first is the fluid phase where there is a lot of experimentation with product design and the nature of the business model. The outcome is unclear, and the emphasis is on the performance of the various competing products. Companies tend to be led by entrepreneurs. This phase is akin to the rise in synaptic connections where a wide range of outcomes is possible.

The second is the transitional phase where the market has settled on a product design and the focus shifts to process innovation. Investors use the term “product-market fit” to describe when the product coalesces with the needs of the market. In effect, the customers prune subpar alternatives and reinforce the product that best serves their needs. Consideration of complementary assets is also important because new companies are also embedded in a business ecosystem. Autos with internal combustion engines need roads, gas stations, and mechanics that can fix them. The emphasis is on how best to bring the product to market given the environment.

Finally, there is the specific phase where the pace of product and process innovation is slow because most competitors have adopted the industry’s best practices. Companies here may be susceptible to disruptive innovation, where new business models, a form of process innovation, allow for entrants to compete for specific segments of the market.¹⁴

Neural development and the product life cycle follow a similar pattern because they are effectively addressing the same task of discovering what is useful in a new environment. The solution in both cases is to try out a lot of alternatives and winnow down what does not work.

Investor Takeaways from the Pruning Process

Understanding this pattern of innovation can help investors in a number of ways. To begin, it is very useful to understand which phase an industry is in. One straightforward way to do this is by measuring the number of entries, exits, and total number of firms in the industry. This fits with the first of Klepper’s stylized facts. Failure rates are high in the early phase and drop substantially once the process is largely complete. Exits are the result of going out of business, which is bad for shareholders, or of being acquired by another company, which is often not as bad.

Investors should also be aware of the interplay between financial and technology markets.¹⁵ Here’s the basic story. Financial capital tends to flow in as it becomes clear that a potential new industry is emerging. In many cases, the companies associated with the innovation receive inflows that lift asset prices to levels that are unsupported by the fundamentals. Financial capital then flees, leaving asset prices that are fair to undervalued. Finally, the financial and technological markets come into alignment.

In the fluid phase, investments in companies have payoffs similar to options. A financial option is the right but not the obligation to invest in a stock at a set price within a predetermined time. About one third of options expire worthless. In the aggregate, these investments in the early phase appear to generate a return similar to, or below, that of the broader market.¹⁶

But similar to the venture capital industry, the distribution of the returns to shareholders is heavily skewed, with a small number of companies generating outsized gains and the majority losing money for shareholders.¹⁷

Importantly, the influx of financial capital is essential to developing the industry because it funds experimentation. It appears inefficient in retrospect once the market has sorted the winners and losers. But this evolutionary process is similar to what happens with the synaptic connections: the generation of options is followed by selection for what is most appropriate for the environment.

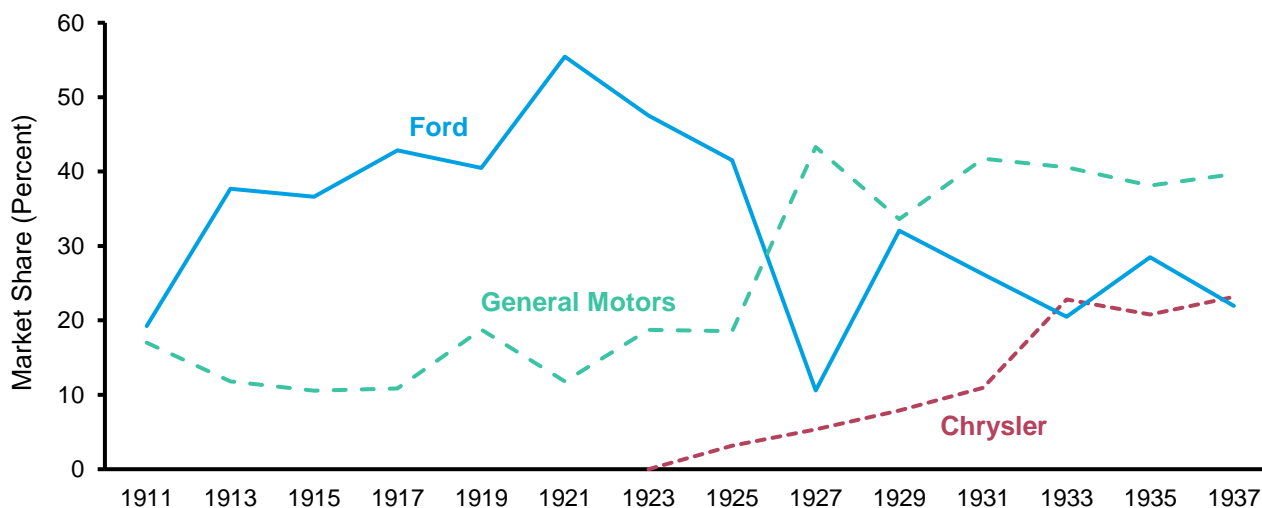
Another investor takeaway relates to the assessment of competitive advantage. Market share stability is one of the ways to test for competitive advantage.¹⁸ The premise is that if an industry’s market shares are highly unstable then it is unlikely that one or more companies within the industry have a sustainable competitive

advantage. Further, an expanding list of companies that have any share of the market suggests limited barriers to entry. A thoughtful assessment of barriers to entry is central to a proper analysis of competitive advantage.¹⁹

The degree of market stability tends to mirror the stages of industry development, consistent with the regularities that Klepper identified. Market shares are very unstable in the fluid phase. For example, General Motors, Ford, and Chrysler swapped rankings in market share in the U.S. automobile industry multiple times between 1925-1935 (see exhibit 3). Market shares settle down in the transitional phase, after the market has separated the early winners from the losers.²⁰

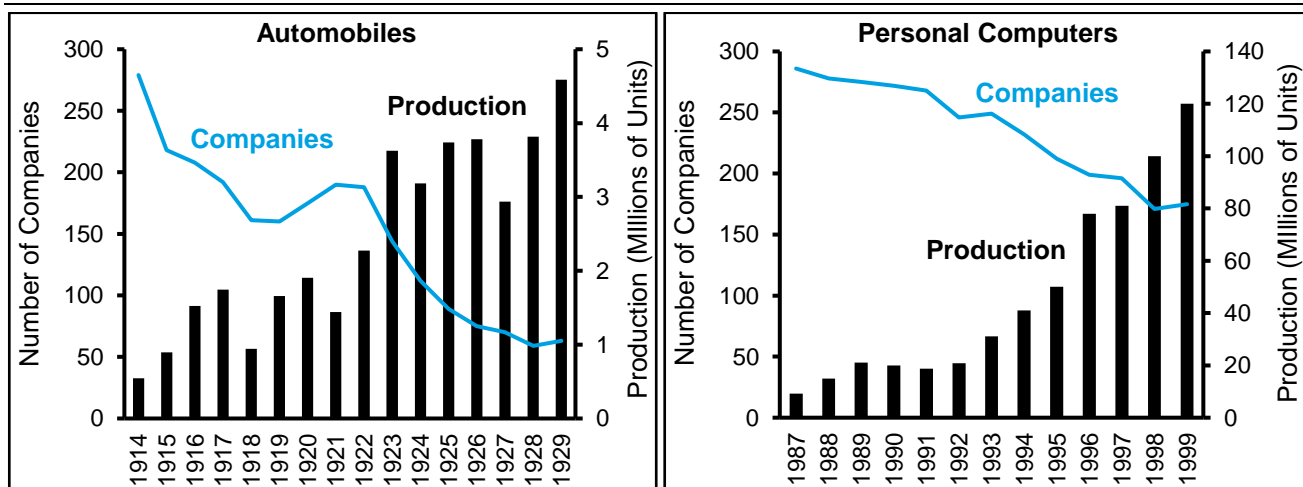
A fourth takeaway for investors is that the industry’s output continues to increase even as the total number of companies decreases. This means that a smaller number of companies are taking a greater share of a larger market. Exhibit 4 shows this pattern for the U.S. automobile and PC industries.

Exhibit 3: Market Share for the U.S. Automobile Industry, 1911-1937



Source: "Report on Motor Vehicle Industry," Federal Trade Commission, June 5, 1939 and Counterpoint Global.

Exhibit 4: Fall in Companies and Rise in Production in the U.S. Automobile and PC Industries



Source: Auto companies: Wikipedia contributors (see exhibit 2); Auto production: NBER Macrohistory: I. Production of Commodities, Series 01107a, see: www.nber.org/research/data/nber-macrohistory-i-production-commodities; PC companies: Mariana Mazzucato, "The PC Industry: New Economy or Early Life-Cycle?" Review of Economic Dynamics, Vol. 5, No. 2, April 2002, 318-345; PC production: Jeremy Reimer, see <https://jeremyreimer.com/rockets-item.jsp?p=137>; Counterpoint Global.

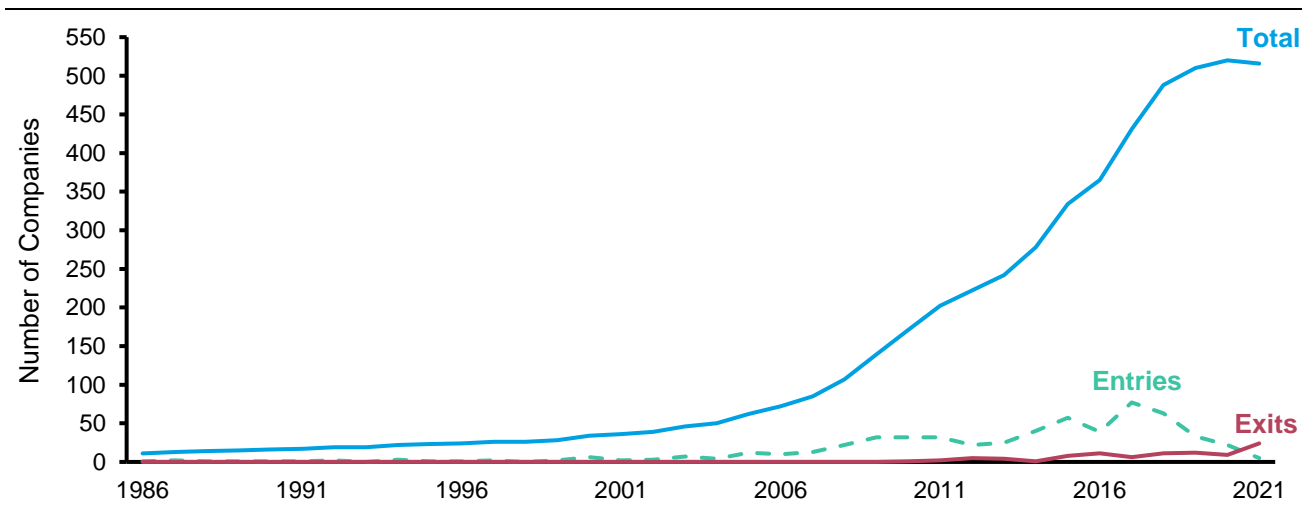
Process innovation tends to be most significant during the transition phase. As a result, the unit price of the good often declines during this period.²¹ A lower price promotes additional adoption. This can be the sweet spot for investors, as the market has selected the survivors and growth is in its early phases.

Pattern recognition is important for investors but often tricky to implement because humans tend to see patterns even where none exist.²² This process of overproduction and pruning has played out in billions of brains and dozens of industries. And it is happening today.

The Beginning of Boom and Bust

We currently see this pattern in a few areas. One example is the electric vehicle market (see exhibit 5). We count a little more than 500 companies in the industry when we include automobile and truck manufacturers (both new entrants and traditional manufacturers of vehicles with internal combustion engines diversifying into the electric vehicle industry), makers of batteries and other key components such as powertrains, and companies that provide technology for charging. While the COVID-19 pandemic had an impact on the entry and exit data, we appear to be in a phase where new entrants exceed exits.

Exhibit 5: Selected Electric Vehicle Companies, 1986-2021

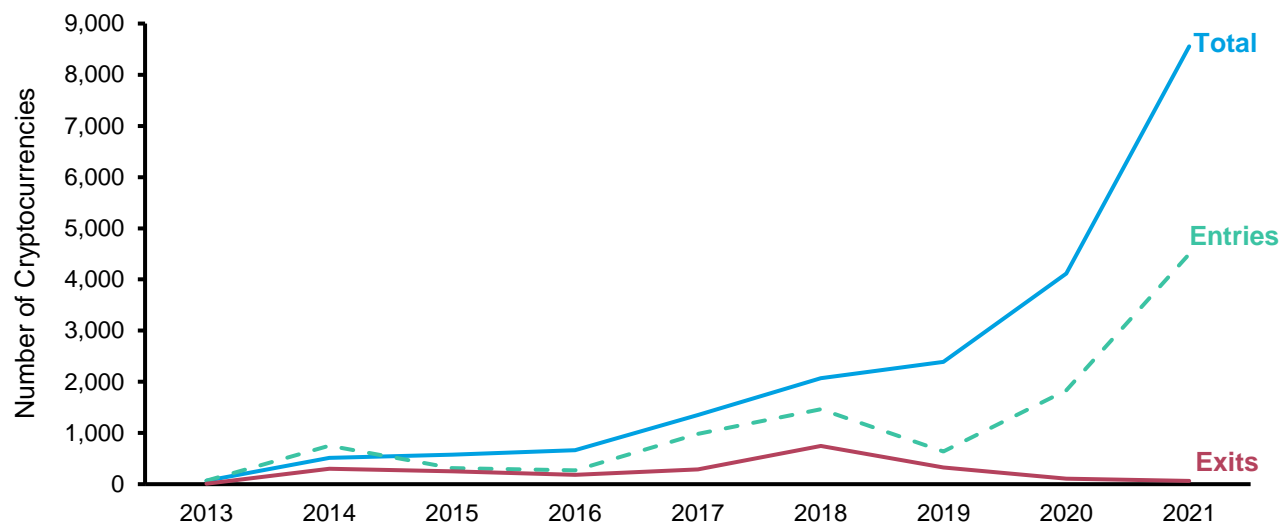


Source: PitchBook and Counterpoint Global.

Cryptocurrencies also share this form, albeit at an earlier phase than electric vehicles. A cryptocurrency is a digital token that is created and maintained through a computer network via blockchain technology and therefore does not operate through a centralized authority. Cryptocurrencies are one component of the infrastructure necessary to support decentralized finance, which combines open-source building blocks to reduce friction and centralized control in the traditional financial system.

Exhibit 6 shows that there were just under 9,000 cryptocurrencies at year-end 2021 and that the rate of entry remains robust. To date, more than 2,400 cryptocurrencies have exited, either as the result of failure or fraud. The vast majority of the existing cryptocurrencies are likely to fail as well.

It is also worth noting that two cryptocurrencies, Bitcoin and Ethereum, represent almost two-thirds of the total market value of all cryptocurrencies and that the market capitalizations of cryptocurrencies follow a power law.²³ Bitcoin largely operates now as a store of value and, to a lesser degree, as a payment network. Ethereum extends the Bitcoin applications as it allows for smart contracts, which reside on the Ethereum blockchain and define interactions.²⁴

Exhibit 6: Number of Cryptocurrencies, 2013-2021

Source: Total: CoinMarketCap, see <https://coinmarketcap.com/historical>; Exits: Coinopsy, see www.coinopsy.com/dead-coins; Counterpoint Global.

Both of these areas are in the early phase, which means that investors have to recognize that many, if not most, of the entrants will fail. Much of the capital that will flow into these sectors will earn substandard returns but will facilitate experimentation and product innovation.

As the market sorts the winners from the losers, there should be substantial opportunity for the companies that achieve product-market fit. While difficult to handicap, some companies will rise to the top and flourish amid the shakeout.

Conclusion

An engineer confronted with a problem in a novel environment would be tempted to fashion a specific solution. But studies of the pattern of synaptic connections of children, as well as the emergence of industries, show that the overproduction of options and pruning of those that are not useful is a tried-and-true way to solve the problem.

This pattern is particularly noteworthy in capitalistic economies because of the interaction between financial and technology markets. Capital flows are often very strong as a new industry develops. This money fuels vital experimentation, but since most ideas fail the investments behind them fare poorly. Capital markets are generally less enamored with the industry when exits exceed entrants, but at that juncture fewer companies capture more market share of a growing industry.

Investors are well served to understand this general pattern and to consider where it is in the process of playing out. Examples today include the markets for electric vehicles and cryptocurrencies.

Please see Important Disclosures on pages 10-12

Endnotes

¹ Steven Pinker, *The Language Instinct: How the Mind Creates Language* (New York: HarperCollins, 1994), 150-151.

² For example, see Daniel C. Dennett, *Darwin's Dangerous Idea: Evolution and The Meanings of Life* (New York: Simon & Schuster, 1995).

³ Thai Nguyen, "Total Number of Synapses in the Adult Human Neocortex," *Undergraduate Journal of Mathematical Modeling: One + Two*, Vol. 3, No. 1, Article 14, 2010.

⁴ Alison Gopnik, Andrew Meltzoff, and Patricia Kuhl, *The Scientist in the Crib: What Early Learning Tells Us About the Mind* (New York: First Perennial, 2001), 186-187.

⁵ Saket Navlakha, Alison L. Barth, and Ziv Bar-Joseph, "Decreasing-Rate Pruning Optimizes the Construction of Efficient and Robust Distributed Networks," *PLOS Computational Biology*, July 28, 2015 and Willem E. Frankenhuis and Dorsa Amir, "What Is the Expected Human Childhood? Insights from Evolutionary Anthropology," *Development and Psychopathology*, Vol. 34, No. 2, May 2022, 473-497.

⁶ Philip Hillyer Smith, *Wheels Within Wheels: A Short History of American Motor Car Manufacturing—Second Edition, Revised* (New York: Funk & Wagnalls, 1970).

⁷ Mariana Mazzucato, "The PC Industry: New Economy or Early Life-Cycle?" *Review of Economic Dynamics*, Vol. 5, No. 2, April 2002, 318-345.

⁸ Michael Gort and Steven Klepper, "Time Paths in the Diffusion of Product Innovations," *The Economic Journal*, Vol. 92, No. 367, September 1982, 630-653.

⁹ Steven Klepper, "Entry, Exit, Growth, and Innovation over the Product Life Cycle," *American Economic Review*, Vol. 86, No. 3, June 1996, 562-583. For related work, see Steven Klepper and Elizabeth Graddy, "The Evolution of New Industries and the Determinants of Market Structure," *RAND Journal of Economics*, Vol. 21, No. 1, Spring, 1990, 27-44; Steven Klepper, "The Capabilities of New Firms and the Evolution of the U.S. Automobile Industry," *Industrial and Corporate Change*, Vol. 11, No. 4, August 2002, 645-666; Rajshree Agarwal and Michael Gort, "The Evolution of Markets and Entry, Exit and Survival of Firms," *Review of Economics and Statistics*, Vol. 78, No. 3, August 1996, 489-498; Steven Klepper, *Experimental Capitalism: The Nanoeconomics of American High-Tech Industries* (Princeton, NJ: Princeton University Press, 2016); Timothy Dunne, Mark J. Roberts and Larry Samuelson, "Patterns of Firm Entry and Exit in U.S. Manufacturing Industries," *RAND Journal of Economics*, Vol. 19, No. 4, Winter 1988, 495-515; Harry Bloch, "Innovation and the Evolution of Industry Structure," *International Journal of the Economics of Business*, Vol. 25, No. 1, February 2018, 73-83; and Paolo Calvosa, "Entry, Exit and Innovation Over the Industry Life Cycle in Converging Sectors: An Analysis of the Smartphone Industry," *International Journal of Business and Management*, Vol. 15, No. 12, 2020, 151-168.

¹⁰ Sometimes the industry starts with lots of companies.

¹¹ For a good illustration of this regularity for the U.S. automobile industry, see Mariana Mazzucato, *Firm Size, Innovation and Market Structure: The Evolution of Industry Concentration and Instability* (Cheltenham, UK: Edward Elgar Publishing, 2000), 28-29.

¹² Gort and Klepper, "Time Paths in the Diffusion of Product Innovations."

¹³ James M. Utterback, *Mastering the Dynamics of Innovation: How Companies Can Seize Opportunities in the Face of Technological Change* (Boston, MA: Harvard Business School Press, 1994), 92-97 and William J. Abernathy and James M. Utterback, "Patterns of Industrial Innovation," *Technology Review*, Vol. 80, No. 7, June/July 1978, 40-47.

¹⁴ Clayton M. Christensen, *The Innovator's Dilemma: When New Technologies Cause Great Companies to Fail* (Boston, MA: Harvard Business School Press, 1997).

¹⁵ Perhaps the best book on the topic is Carlota Perez, *Technological Revolutions and Financial Capital: The Dynamics of Bubbles and Golden Ages* (Cheltenham, UK: Edward Elgar Publishing, 2002). That said, Perez focuses on technological revolutions that are larger in scale than the development of industries and products.

¹⁶ See William D. Bygrave, Julian E. Lange, J. R. Roedel, and Gary Wu, "Capital Market Excesses and Competitive Strength: The Case of the Hard Drive Industry, 1984-2000," *Journal of Applied Corporate Finance*, Vol. 13, No. 3, Fall 2000, 8-19; Robin Greenwood, Andrei Shleifer, and Yang You, "Bubbles for Fama," *Journal of Financial Economics*, Vol. 131, No. 1, January 2019, 20-43; and Valentin Haddad, Paul Ho, and Erik Loualiche, "Bubbles and the Value of Innovation," *Journal of Financial Economics*, Vol. 145, No. 1, July 2022,

69-84. These risky bets appear to be the result of investor preferences rather than investor beliefs. For a neat approach to separating those possibilities through study of markets for sports betting, see Tobias J. Moskowitz and Kaushik Vasudevan, "Betting Without Beta," *SSRN Working Paper*, May 2, 2022.

¹⁷ Gregory Brown, Robert S. Harris, Wendy Hu, Tim Jenkinson, Steven N. Kaplan, and David Robinson, "Private Equity Portfolio Companies: A First Look at Burgiss Holdings Data," *SSRN Working Paper*, March 3, 2020.

¹⁸ Bruce Greenwald and Judd Kahn, *Competition Demystified: A Radically Simplified Approach to Business Strategy* (New York: Portfolio, 2005), 52-76.

¹⁹ See P. A. Geroski, *Market Dynamics and Entry* (Oxford: Basil Blackwell, 1991) and Paul Geroski, *The Evolution of New Markets* (Oxford: Oxford University Press, 2003).

²⁰ Mazzucato, *Firm Size, Innovation and Market Structure*, 28.

²¹ Boyan Jovanovic, "Michael Gort's Contribution to Economics," *Review of Economic Dynamics*, Vol. 1, No. 2, April 1998, 327-337.

²² Jason Zweig, *Your Money and Your Brain: How the New Science of Neuroeconomics Can Help Make You Rich* (New York: Simon & Schuster, 2007), 57-61.

²³ In this case, when you plot the rank by size on the horizontal axis and the market capitalization on the vertical axis (both using a logarithmic scale), the result is a trendline that is straight and can be expressed with an equation that has a discernible exponent (or "power," hence the term "power law"). The practical implication is that a small number of cryptocurrencies have very large market capitalizations, and a large number of cryptocurrencies have very small market capitalizations. See Ke Wu, Spencer Wheatley, and Didier Sornette, "Classification of Cryptocurrency Coins and Tokens by the Dynamics of their Market Capitalizations," *Royal Society Open Science*, Vol. 5, No. 9, September 2018.

²⁴ Campbell R. Harvey, Ashwin Ramachandran, and Joey Santoro, *DeFi and the Future of Finance* (Hoboken, NJ: John Wiley & Sons, 2021), 1-21.

IMPORTANT INFORMATION

The views and opinions and/or analysis expressed are those of the author as of the date of preparation of this material and are subject to change at any time due to market or economic conditions and may not necessarily come to pass. Furthermore, the views will not be updated or otherwise revised to reflect information that subsequently becomes available or circumstances existing, or changes occurring, after the date of publication. The views expressed do not reflect the opinions of all investment personnel at Morgan Stanley Investment Management (MSIM) and its subsidiaries and affiliates (collectively "the Firm"), and may not be reflected in all the strategies and products that the Firm offers.

Forecasts and/or estimates provided herein are subject to change and may not actually come to pass. Information regarding expected market returns and market outlooks is based on the research, analysis and opinions of the authors or the investment team. These conclusions are speculative in nature, may not come to pass and are not intended to predict the future performance of any specific strategy or product the Firm offers. Future results may differ significantly depending on factors such as changes in securities or financial markets or general economic conditions.

Past performance is no guarantee of future results. This material has been prepared on the basis of publicly available information, internally developed data and other third-party sources believed to be reliable. However, no assurances are provided regarding the reliability of such information and the Firm has not sought to independently verify information taken from public and third-party sources. The views expressed in the books and articles referenced in this whitepaper are not necessarily endorsed by the Firm.

This material is a general communications which is not impartial and has been prepared solely for information and educational purposes and does not constitute an offer or a recommendation to buy or sell any particular security or to adopt any specific investment strategy. The material contained herein has not been based on a consideration of any individual client circumstances and is not investment advice, nor should it be construed in any way as tax, accounting, legal or regulatory advice. To that end, investors should seek independent legal and financial advice, including advice as to tax consequences, before making any investment decision.

Charts and graphs provided herein are for illustrative purposes only. Any securities referenced herein are solely for illustrative purposes only and should not be construed as a recommendation for investment.

This material is not a product of Morgan Stanley's Research Department and should not be regarded as a research material or a recommendation.

The Firm has not authorised financial intermediaries to use and to distribute this material, unless such use and distribution is made in accordance with applicable law and regulation. Additionally, financial intermediaries are required to satisfy themselves that the information in this material is appropriate for any person to whom they provide this material in view of that person's circumstances and purpose. The Firm shall not be liable for, and accepts no liability for, the use or misuse of this material by any such financial intermediary.

The whole or any part of this work may not be directly or indirectly reproduced, copied, modified, used to create a derivative work, performed, displayed, published, posted, licensed, framed, distributed or transmitted or any of its contents disclosed to third parties without MSIM's express written consent. This work may not be linked to unless such hyperlink is for personal and non-commercial use. All information contained herein is proprietary and is protected under copyright and other applicable law.

Eaton Vance is part of Morgan Stanley Investment Management. Morgan Stanley Investment Management is the asset management division of Morgan Stanley.

This material may be translated into other languages. Where such a translation is made this English version remains definitive. If there are any discrepancies between the English version and any version of this material in another language, the English version shall prevail.

DISTRIBUTION

This communication is only intended for and will only be distributed to persons resident in jurisdictions where such distribution or availability would not be contrary to local laws or regulations.

MSIM, the asset management division of Morgan Stanley (NYSE: MS), and its affiliates have arrangements in place to market each other's products and services. Each MSIM affiliate is regulated as appropriate in the jurisdiction it operates. MSIM's affiliates are: Eaton Vance Management (International) Limited, Eaton Vance Advisers International Ltd, Calvert Research and Management, Eaton Vance Management, Parametric Portfolio Associates LLC, and Atlanta Capital Management LLC.

This material has been issued by any one or more of the following entities:

EMEA

This material is for Professional Clients/Accredited Investors only.

In the EU, MSIM and Eaton Vance materials are issued by MSIM Fund Management (Ireland) Limited ("FMIL"). FMIL is regulated by the Central Bank of Ireland and is incorporated in Ireland as a private company limited by shares with company registration number 616661 and has its registered address at 24-26 City Quay, Dublin 2, DO2 NY19, Ireland.

Outside the EU, MSIM materials are issued by Morgan Stanley Investment Management Limited (MSIM Ltd) is authorised and regulated by the Financial Conduct Authority. Registered in England. Registered No. 1981121. Registered Office: 25 Cabot Square, Canary Wharf, London E14 4QA.

In Switzerland, MSIM materials are issued by Morgan Stanley & Co. International plc, London (Zurich Branch) Authorised and regulated by the Eidgenössische Finanzmarktaufsicht ("FINMA"). Registered Office: Beethovenstrasse 33, 8002 Zurich, Switzerland.

Outside the US and EU, Eaton Vance materials are issued by Eaton Vance Management (International) Limited ("EVM") 125 Old Broad Street, London, EC2N 1AR, UK, which is authorised and regulated in the United Kingdom by the Financial Conduct Authority.

Italy: MSIM FMIL (Milan Branch), (Sede Secondaria di Milano) Palazzo Serbelloni Corso Venezia, 16 20121 Milano, Italy. **The Netherlands:** MSIM FMIL (Amsterdam Branch), Rembrandt Tower, 11th Floor Amstelplein 1 1096HA, Netherlands. **France:** MSIM FMIL (Paris Branch), 61 rue de Monceau 75008 Paris, France. **Spain:** MSIM FMIL (Madrid Branch), Calle Serrano 55, 28006, Madrid, Spain. **Germany:** MSIM FMIL Frankfurt Branch, Große Gallusstraße 18, 60312 Frankfurt am Main, Germany (Gattung: Zweigniederlassung (FDI) gem. § 53b KWG). **Denmark:** MSIM FMIL (Copenhagen Branch), Gorrissen Federspiel, Axel Towers, Axelortov2, 1609 Copenhagen V, Denmark.

MIDDLE EAST

Dubai: MSIM Ltd (Representative Office, Unit Precinct 3-7th Floor-Unit 701 and 702, Level 7, Gate Precinct Building 3, Dubai International Financial Centre, Dubai, 506501, United Arab Emirates. Telephone: +97 (0)14 709 7158).

This document is distributed in the Dubai International Financial Centre by Morgan Stanley Investment Management Limited (Representative Office), an entity regulated by the Dubai Financial Services Authority ("DFSA"). It is intended for use by professional clients and market counterparties only. This document is not intended for distribution to retail clients, and retail clients should not act upon the information contained in this document.

U.S.

NOT FDIC INSURED | OFFER NO BANK GUARANTEE | MAY LOSE VALUE | NOT INSURED BY ANY FEDERAL GOVERNMENT AGENCY | NOT A DEPOSIT

ASIA PACIFIC

Hong Kong: This material is disseminated by Morgan Stanley Asia Limited for use in Hong Kong and shall only be made available to “professional investors” as defined under the Securities and Futures Ordinance of Hong Kong (Cap 571). The contents of this material have not been reviewed nor approved by any regulatory authority including the Securities and Futures Commission in Hong Kong. Accordingly, save where an exemption is available under the relevant law, this material shall not be issued, circulated, distributed, directed at, or made available to, the public in Hong Kong. **Singapore:** This material is disseminated by Morgan Stanley Investment Management Company and should not be considered to be the subject of an invitation for subscription or purchase, whether directly or indirectly, to the public or any member of the public in Singapore other than (i) to an institutional investor under section 304 of the Securities and Futures Act, Chapter 289 of Singapore (“SFA”); (ii) to a “relevant person” (which includes an accredited investor) pursuant to section 305 of the SFA, and such distribution is in accordance with the conditions specified in section 305 of the SFA; or (iii) otherwise pursuant to, and in accordance with the conditions of, any other applicable provision of the SFA. This publication has not been reviewed by the Monetary Authority of Singapore. **Australia:** This material is provided by Morgan Stanley Investment Management (Australia) Pty Ltd ABN 22122040037, AFSL No. 314182 and its affiliates and does not constitute an offer of interests. Morgan Stanley Investment Management (Australia) Pty Limited arranges for MSIM affiliates to provide financial services to Australian wholesale clients. Interests will only be offered in circumstances under which no disclosure is required under the Corporations Act 2001 (Cth) (the “Corporations Act”). Any offer of interests will not purport to be an offer of interests in circumstances under which disclosure is required under the Corporations Act and will only be made to persons who qualify as a “wholesale client” (as defined in the Corporations Act). This material will not be lodged with the Australian Securities and Investments Commission.

Japan

This material may not be circulated or distributed, whether directly or indirectly, to persons in Japan other than to (i) a professional investor as defined in Article 2 of the Financial Instruments and Exchange Act (“FIEA”) or (ii) otherwise pursuant to, and in accordance with the conditions of, any other allocable provision of the FIEA. This material is disseminated in Japan by Morgan Stanley Investment Management (Japan) Co., Ltd., Registered No. 410 (Director of Kanto Local Finance Bureau (Financial Instruments Firms)), Membership: the Japan Securities Dealers Association, The Investment Trusts Association, Japan, the Japan Investment Advisers Association and the Type II Financial Instruments Firms Association.