
# Value is Dead, Long Live Value

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Value investing is a bedrock principle for quantitative and fundamental equity managers, as there is long-term efficacy to buying cheap stocks over expensive growth stocks. While Value investing remains attractive over the entire history of available data, it has been under extraordinary pressure since the beginning of 2007. As of June 30, 2019, the Russell 1000 Value has underperformed the Russell 1000 Growth by a cumulative -136%, for an annualized return gap of -4.3% over twelve and a half years. Since the middle of 2017 alone, Value has trailed an additional -21%. This recent underperformance has left the investment community on its heels, as Value managers struggle to explain why their style has been out of favor for so long, and allocators question overweight positions in Value.

The severity and length of Value's underperformance will entice some to capitulation. This may take the form of terminating a manager with a sound investment process, and proven track record, or adjustments to strategic allocations because "Value is dead."

We believe that the key principle to investment success is maintaining one's discipline in periods when performance works against you. Discipline is fostered from a conviction in the investment process. And conviction is born out of extensive research. This research piece attempts to answer the questions about Value's underperformance by setting this most recent period within a larger historical context, providing some explanations for why we are in a Growth Regime, and try to set expectations for, if, and when, Value investing will return to favor.

## Growth Regime(s)

The main question investors face is whether this underperformance is structural or episodic; is Value investing broken forever or simply in an extended bad run. Part of the challenge in answering this question is that most investment research does not include any periods of Value underperformance lasting over twelve years, leading investors to believe that it's different this time.

In our search for perspective, we extended the research to include new time frames. Most research starts in 1963 because that's when Compustat, the main data provider for historical financial statements, has quarterly availability for income statements. There is also a data set collected by Ken French providing the Book Value of Equity back to 1926, which does allow for some extended research. We like to utilize multiple valuation metrics in our research. To try and gain new insights into whether this Regime of Growth is structural or episodic, we created a new set of fundamentals, which we call Deep History, that extends revenue and earnings data for individual companies back to June-1926.[1] The combination of these datasets with the CRSP pricing database allows us to conduct ninety-two years of historical research on Value Investing for three ratios: Book-to-Price, Earnings-to-Price and Sales-to-Price. In order to ensure that we are working with investible and replicable universes, we also utilize the S&P 500 constituents available through CRSP to create Value and Growth portfolios. For specifics on Data and Methodology, see appendices A & B.

The broad conclusion is that across the entire 92-year time frame, Value investing has been an effective investment strategy generating higher returns than Growth stocks. But by including the earliest time frame back to 1926, we discovered another period where Value investing struggled as badly as it has today: a second Growth Regime from July of 1926 through 1941, shown in Exhibit 1.

| | B/P | E/P | S/P |
|---|---|---|---|
| Jul-1926 to Dec-2018 | 1.06% | 3.15% | 3.63% |
| Jun-1926 to Dec-1941 | -6.13% | -4.82% | 2.14% |
| Dec-1941 to Dec-2006 | 4.29% | 6.07% | 5.12% |
| Jan-2007 to Dec-2018 | -5.97% | -0.87% | -2.03% |

**Exhibit 1: Difference of Annualized Returns of S&P 500 Value over S&P 500 Growth**
(Top (30% minus bottom 30% for each Factor))

Attribution[2] on these time frames shows there were specific sectors[3] in Value and Growth that had significant contributions to the return of the portfolio. For the Growth portfolios, Manufacturing stocks from 1926-1941 were primarily in the Growth portfolio, as were Technology stocks from 2007-2018. For the Value portfolios, Utilities[4] were primarily in the Value portfolio for the earliest Growth regime, while Financials were clustered in Value in the most recent portfolio. This is shown in Exhibit 2.

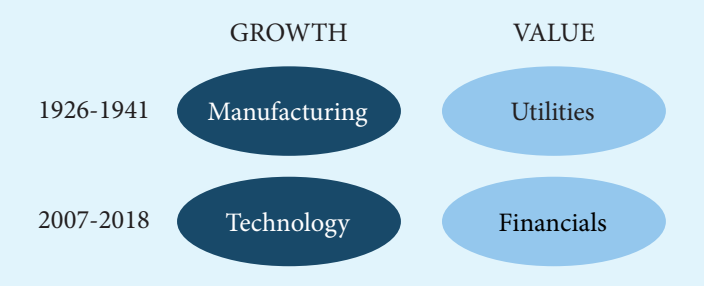



**Exhibit 2**

## Technological Revolutions

The history of these two periods is complex and difficult to summarize, but economic models are useful for simplifying large scale trends into something digestible and applying one may provide insights. With both Growth regimes lasting twelve to fifteen years, but sixty-seven years apart, they are best studied through the lens of the long-term economic cycle of Technological Revolutions.[5]

Technological Revolutions are clusters of new technologies that cause economic upheaval over periods lasting 45 to 60 years. The cycles start with the discovery of ideas, an installation of infrastructure to make it scalable, followed by a deployment with strong growth that eventually results in maturity, where growth slows down. In her work "Technological Revolutions and Financial Capital" (2002), Carlota Perez identifies the phases of a revolution as two halves: the Installation phase and Deployment phase.

In the Installation phase of a new technological revolution, the previous revolution is nearing exhaustion of profitable opportunities. Then, through experimentation new social and economic norms are established for the utilization of ideas. As these concepts take shape and the form factor for utilization is established, people see the potential growth and infrastructure is laid for their widespread adoption. This Installation phase is one of creative destruction, as the new standards replace those from preceding revolutions. It is a period where wealth becomes skewed as innovators are rewarded.

As the new technology shifts to becoming the new norm, the Deployment phase begins. It takes advantage of the infrastructure laid in the Installation phase and expands to broad societal acceptance. This begins with a high growth phase, where real growth occurs, and the technological revolution diffuses across the whole economy. Entrepreneurial activity moves from building infrastructure to the application layer on top. This is a time of creative construction. Winners emerge to form oligopolies, and this growth eventually slows to the Maturity phase, where market growth stagnates.

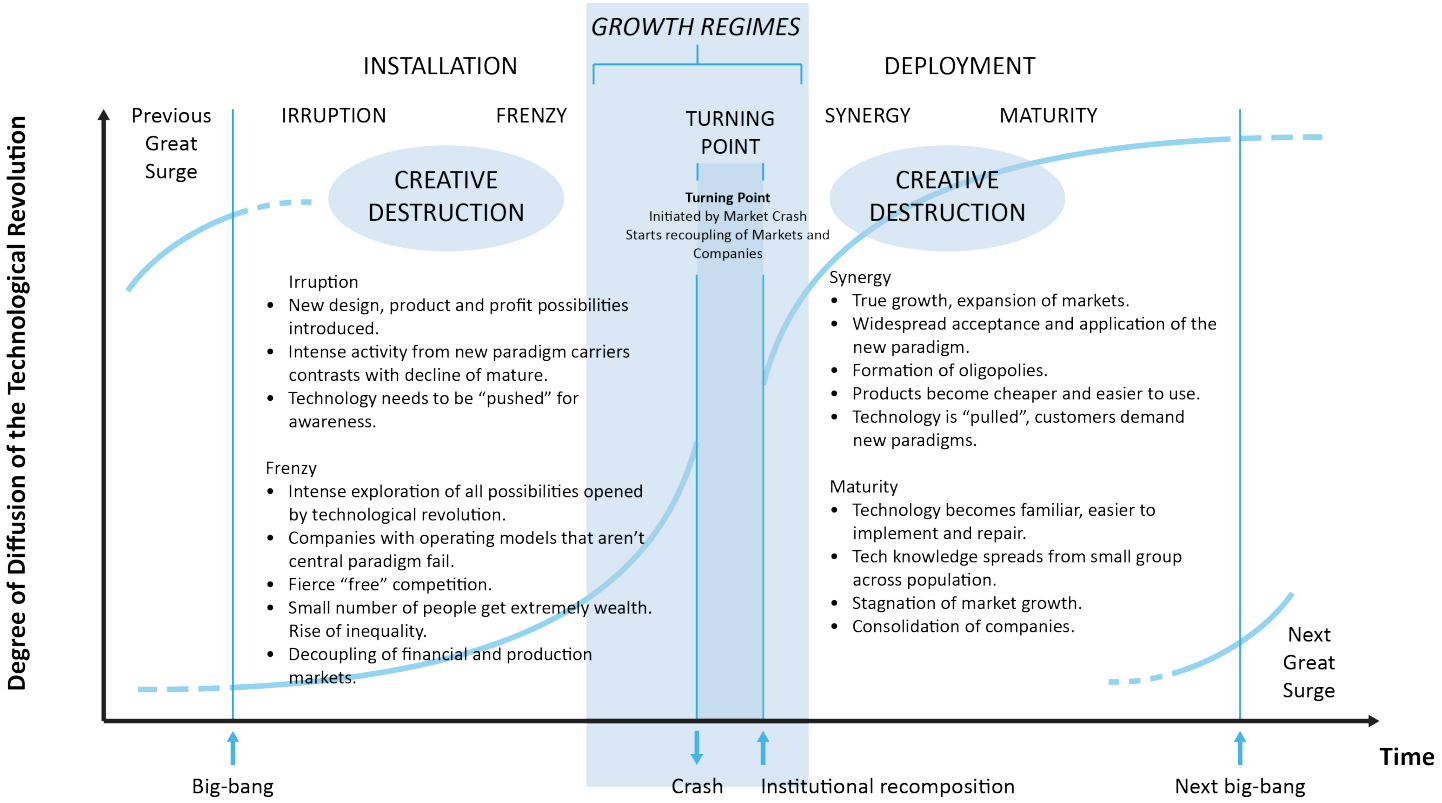


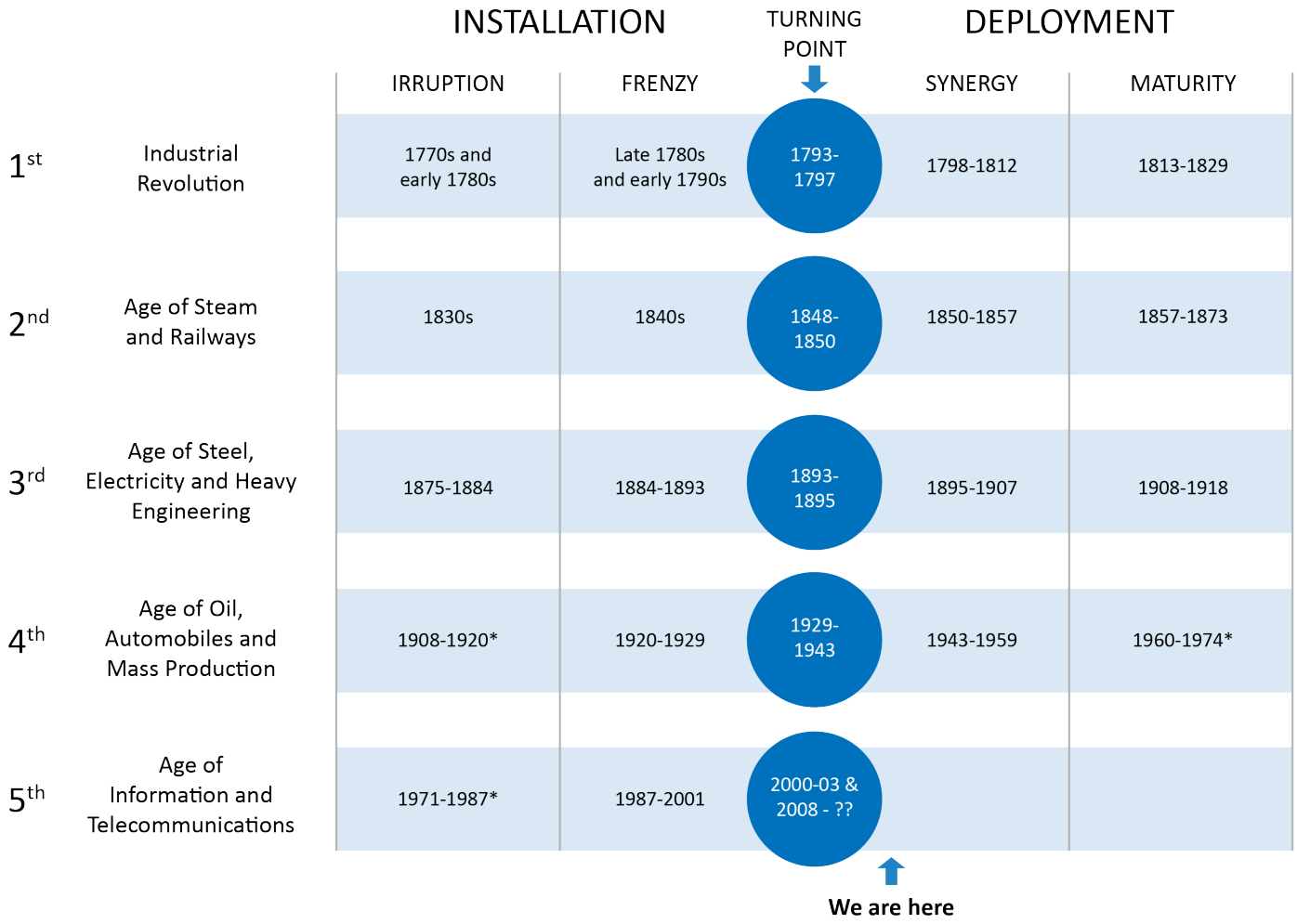

**Exhibit 3: Phases of a Technological Revolution**
*Source: "Technological Revolutions," Perez*

This framework has played out several times in history, with technologies like the light bulb. Experimentation occurred over decades with electric arc lamps and vacuum tubes, until Thomas Edison perfected the carbonized filament bulb in 1880, setting the form factor for electric lighting. The coincident innovations of power generation and electrical infrastructure were also required, but after the Installation of the paradigm, there was a rush of applications for it: longer business shifts, the first night-time baseball game. Once the applications were discovered, it was simply a matter of Deployment to electrify the country and change how we lived. Eventually the ideas reach maturity and commoditization, and dozens of light bulbs are now in every house. These phases are illustrated in Exhibit 3.

Timing when these revolutions start and end is subject to interpretation, but Perez's model incorporates some specific timing for phases through a couple of key observations. The first is a "big-bang" event of technological innovation, highly observable events of technological progress. The second timing signals market bubbles that naturally occur from a technological revolution. Perez makes a distinction between production capital and financial capital: "Financial Capital represents the criteria and behavior of those agents who possess wealth in the form of money or other paper assets. Production Capital embodies the motives and behaviors of those agents who generate new wealth by producing goods or performing services."[6] As the norms begin to scale, a "Frenzy" begins where financial capital outstrips production capital, producing valuation bubbles. These bubbles indicate the beginning of the Turning Point. Financial capital eventually relinks, reestablishing normal valuations of the real production of companies, but this can take several years. There are significant failures during this period, as the winners are established.

Between the big bang initiations and the market bubbles, Perez can assign approximate time frames for phases of technological revolutions. She has identified five main technological revolutions, starting with the Industrial Revolution. The two most recent are the Age of Oil, Automobiles and Mass Production (1908-1974) and the Age of Information and Telecommunications (1971-present).

In her model, the two Growth Regimes we have identified are right in the middle of the turning points for the 4th and 5th Technological Revolutions, as shown in Exhibit 4.




Techno-economic paradigm "Common-sense" innovation principles

- Factory production
- Mechanization
- Productive/timekeeping and time saving
- Fluidity of movement (as ideal for machines with water-power and for transportation through canals)
- Local networks

- Economies of Agglomeration/Industrial cities/National markets
- Power centers with national networks
- Scale as progress
- Standard parts/machine-made machines
- Energy where needed (steam)
- Interdependent movement (of machines and transport)

- Giant structures (steel)
- Economies of Scale of plant/vertical integration
- Distributed power for industry (electricity)
- Science as a productive force
- World wide networks and empires (including cartels)
- Universal Standardization
- Cost accounting for control and efficiency

- Mass production/mass markets
- Economies of scale/horizontal integration
- Standardization of products
- Energy intensity (oil based)
- Synthetic materials
- Finctional specialization/heirarchal pyramids
- Centralization/metropolitan centers/suburbanization

- Information-intensity (microelectronics-based ICT)
- Decnetralized integration/network structures
- Knowledge as capital/intangible value added
- Heterogeneity, diversity, adaptability
- Segmentation of markets/proliferation of niches
- Economies of scope and specialization combined with scale
- Globalization/interaction between the global and local
- Inward and outward cooperation/clusters
- Instant contact and action/instant global communication

**Exhibit 4: Timing of the Five Technological Revolutions**
*Source: Combination of Table 2.3 and Figure 5.2 in "Technological Revolutions," with an adaptation of the 5th turning point from Perez's blog post at http://beyondthetechrevolution.com/blog/second-machine-age-or-fifth-technological-revolution-part-2/*

## The Age of Oil, Automobiles, and Mass Production

Understanding how the innovation from a Technology Revolution changes societal behavior is central to comprehending how a Technological Revolution might affect Value investing. Any survey of a technological revolution in this piece will be superficial, but to gain perspective on what these phases look like, it's informative to review what we know from the two previous revolutions.

The key innovation from the 4th Technological Revolution was the convergence of internal combustion engines and cheap energy through gasoline to create the automobile. The production of automobiles started through craftsmen in the 1880s, where one commissioned a car to be custom made. At the time, the industry was trying several configurations to determine the best model for widespread adoption. At the turn of the century, in fact, steam and electric vehicles accounted for about three-quarters of the estimated four-thousand automobiles produced by 57 American firms.[7]

The big-bang in the automobile industry was Henry Ford's new Highland Park Plant in Detroit. This plant set the manufacturing standards for automobiles by introducing the moving assembly line, where the body of cars were constructed while being transported along a moving platform. As the process evolved, Ford was eventually producing a car every two minutes. This innovation produced a host of organizational, managerial, social and technological changes resulting in the advent of mass manufacturing.

The automobile's rise, however, was only possible because of the ubiquitous, cheap power from gasoline. Established in 1913 after Standard Oil developed the thermal cracking process through experimenting with the refinement of crude oil at various temperatures and pressures, oil became a core input to the rise of automobiles. The creation of an assembly line for mass production, and the commoditization of energy through gasoline are hallmarks of the Irruption phase.

The ensuing frenzy phase began with mass adoption of the automobile, which was fueled by Henry Ford's focus on selling automobiles at low prices. Ford's Model T was introduced in 1908 at $850 and was $360 by 1916, undercutting more expensive options like the electric car which cost $2,800 in 1913.[8] Additionally, General Motors invented GMAC in 1919 to provide financing to auto purchasers, which solidified GM as the industry leader. Lower prices and access to capital resulted in mass adoption of the automobile and established the form factor still in existence today: gas powered internal combustion engine, a gear box, four wheels, control through pedals, and a steering wheel. By 1929, the number of automobiles per U.S. household in the had risen to 0.80 per household.[9] With Chrysler, these rounded out the "Big Three" that would dominate automobile manufacturing for years to come, and it should come as no surprise that General Motors is the Growth portfolio's top contributor from 1926 to 1941.[10] Both of these relationships are illustrated in Exhibits 5 and 6.

Growth wasn't limited to just one product. Change was widespread as several other industries grew in tandem. These came directly from the inputs for manufacturing cars, but also indirect socioeconomic changes stemming from the automobile's

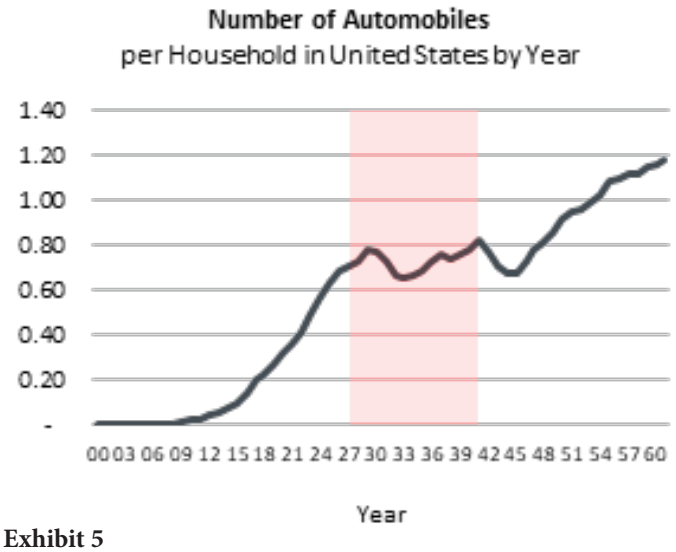



**Exhibit 5**

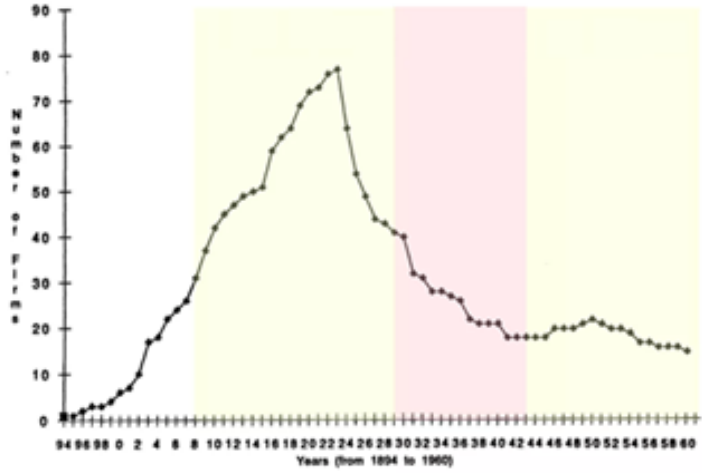



**Exhibit 6**

introduction. Focusing on the direct raw inputs for cars, by 1929, automobile production consumed 73% of the plate glass, 60% of strip steel, and 84% of the rubber, 52% of the malleable iron, and 37% of the aluminum produced in the United States, as well as significant amounts of copper, tin, lead, and nickel.[11] Consequently, companies producing those basic materials all experienced significant growth.

As the Technological revolution moved to Deployment, the scope of the social after-effects from the automobile and mass manufacturing is so wide that it is difficult to capture. For example, the application of organizational and managerial strategies from the moving assembly line created other industries like home appliances. This was possible because of transportation infrastructure from trucking and the ability for shipment of goods to the household. These appliances changed everyday life; with the average number of hours each household spends on housework plummeting from 58 hours a week in 1900 to 18 hours by 1975.

| | Electric Light | Mechanical Refrigerator | Washing Machine | Vacuum Cleaner |
|---|---|---|---|---|
| 1900 | 3 | 0 | n/a | 0 |
| 1920 | 35 | 1 | 8 | 9 |
| 1940 | 79 | 44 | n/a | n/a |
| 1960 | 96 | 90 | 73 | 73 |
| 1970 | 99 | 99 | 70 | 92 |

**Exhibit 7: US Families Owning Various Appliances (% all families)[12]**

In the same vein, the automobile altered how people shopped. Previously, the consumer experience had been limited to goods provided by local craftsmen and mail order catalogs. Everything changed in 1924 when Robert E. Wood joined Sears, Roebuck and Co. While Sears had only operated as a mail-order catalog business, Wood recognized that people in outlying areas would have greater access to urban retail areas because of the automobile. Sears created the first retail store in Chicago in 1925, and by 1929 the company had 300 locations. In 1931 retail sales topped mail-order catalogs for the first time and continued to grow. By the "middle of the twentieth century Sears' domestic annual revenue was about 1% of U.S. GDP, equivalent of $180bn. (In 2016, Amazon's… North American revenue was 'only' $80bn)."[13] Sears' primary and most successful innovation was its consolidated stores of mass-produced goods. The company knew that customers across a wide geographic radius could reach its locations, establishing the standard for American consumerism.

## The Turning Point of 1926-1941

Think of the Installation phase as the long process of establishing the technologies that make a car work, as well as the process of building and financing them at a price point for mass consumption, and the Deployment phase as the refinement and mass adoption and maturation of the industry. The "Turning Point" is between these two phases, where the growth is the highest because the trend is just beginning, and the eventual winners from the industry are established. This is when Value underperformed Growth for a prolonged period.

Attribution for the Value and Growth portfolios helps quantify this shift. First, we can see a stark difference in sector allocations. 65% of the Growth portfolio is in Manufacturing stocks, contrasted to only 19% of the Value portfolio. Additionally, 74% of the Value portfolio was in Utilities, while the Growth portfolio only had a 12% allocation to this sector. This is illustrated in Exhibit 8. Taken together, these add up to a little over half of the reason why Growth outperformed Value from 1926-1941.[14]

Looking at individual stocks, we mentioned that General Motors is Growth portfolio's top contributor, but other Manufacturers (e.g. General Electric, Eastman Kodak) and retailers (e.g. Sears, Woolworth) are large contributors as well. For the Value portfolio, Utilities and Railroads were the main detractors, as the railroads faced multiple headwinds: declining infrastructure from nationalization back in 1917-1920, and a structural competitive disadvantage from the comparative cost to run steam locomotives versus trucking. Oil also helped the Growth portfolio, as Standard Oil of NJ and Standard Oil of California (i.e. Exxon and Chevron) were top contributors. The rise of mass food production through National Biscuit, Standard Brands and General Foods also helped the Growth portfolio. 'Old' productions of the capital world like coal, iron, steel, shipbuilding and cotton had flat to decreased demand from 1905 to 1936, while 'new' industries like gasoline, aluminum, nitrogen and artificial silk tripled in size or more, generating strong growth for companies like Union Carbide & Carbon (now a part of Dow Chemical) and Allied Chemical & Dye (AlliedSignal became Honeywell).

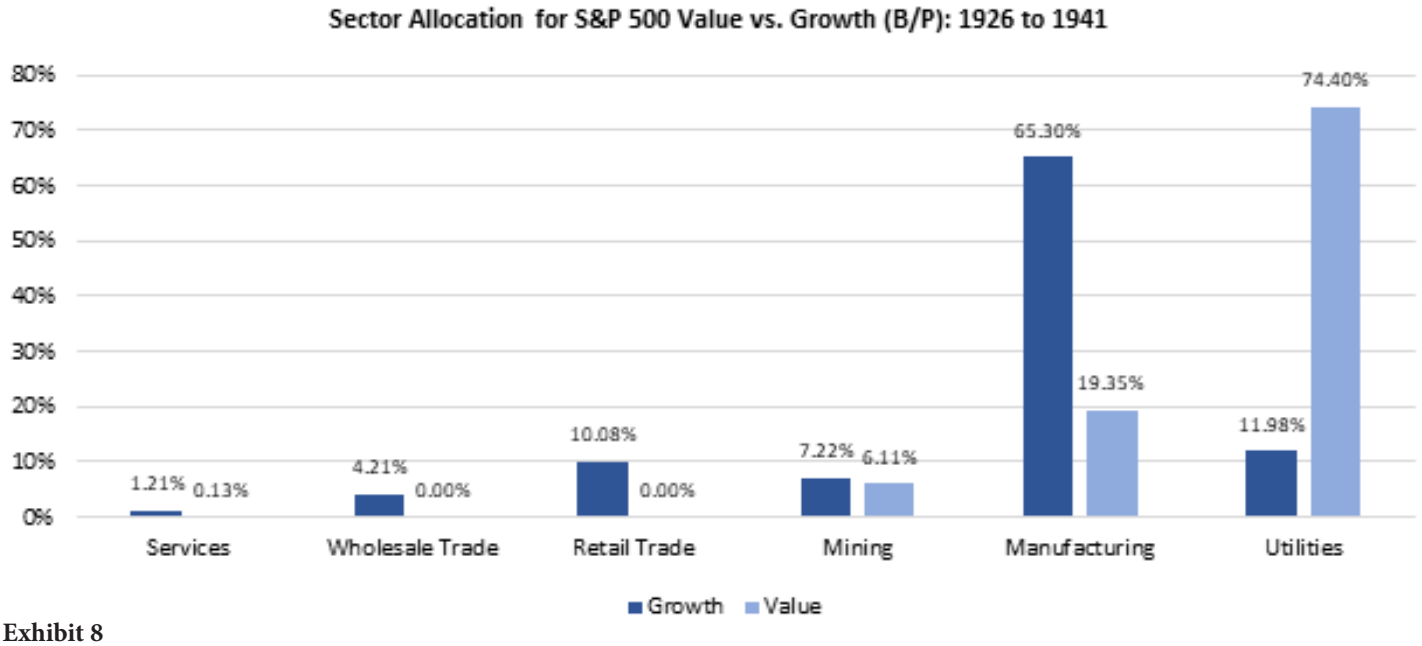



**Exhibit 8**

## The Age of Information and Telecommunications

The similarity between these two ages, and of Manufacturing and Technology, is the broad societal changes introduced through innovation. The technology revolution started with the microprocessor back in 1971, but a steady pace of development has led to convergence for mass utilization over roughly the last fifty years. A popular statistic people quote to scale the advances in processing power is that the iPhone 6 can perform instructions 120 million times faster than the computers that landed Apollo on the moon. It's akin to comparing the Wright brothers' first plane in 1903 to a World War II "flying fortress" bomber. The areal density of disk space doubled every 13 months driving down the price of storage for digital content. Microsoft was founded in 1975, creating an operating system to develop software for productivity and entertainment. In 1977, Apple, Tandy and Commodore bundled these together to offer desktop computing at affordable price points for individual households. Like the Model T, having a price point that was affordable for individual households led to mass adoption. Routers and networking protocols started in the 1980s, followed by HTTP and HTML protocols for standardized development on top of them, which led to the explosion of internet services in the late 1990s.

Amazon was the early winner from the internet boom, as the leader in eCommerce. They created the business template, establishing trust so people would enter their credit card into a site. Comparing the fourth revolution to the fifth, Sears and retailers of the 1930s disrupted the craftsman market because the automobile allowed people to travel to department stores where they could shop for anything. Amazon partially unwound the retail model of the fourth age by offering a retail experience where you order online, and the goods are shipped to you. Some retail models (i.e. groceries) are still being established in the eCommerce age, indicated by Amazon purchasing Whole Foods.

Broadband changed the internet experience, as people migrated from dial-up connections over telephone lines to cable modems, allowing for richer media and higher interaction with sites. 3G wireless networks were introduced in 1998, followed by 4G in 2008, extending cellular service beyond voice and messaging to wireless data.

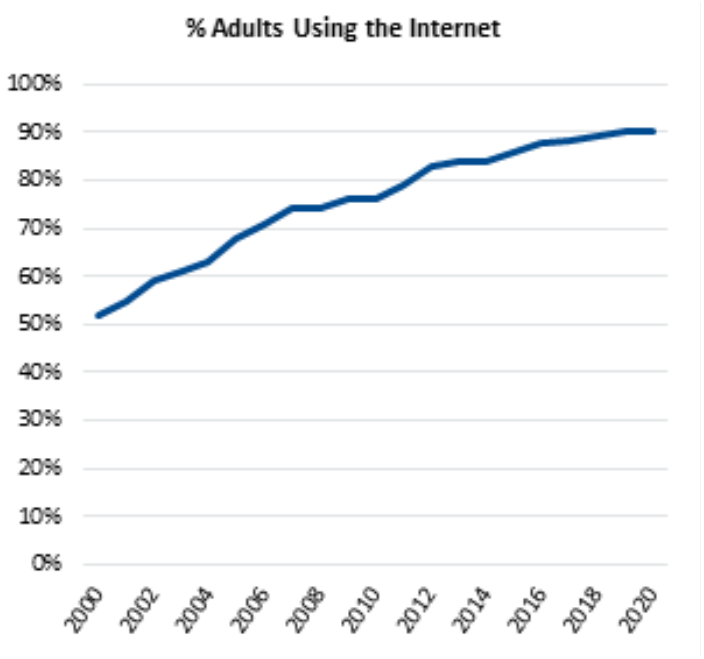



**Exhibit 9**

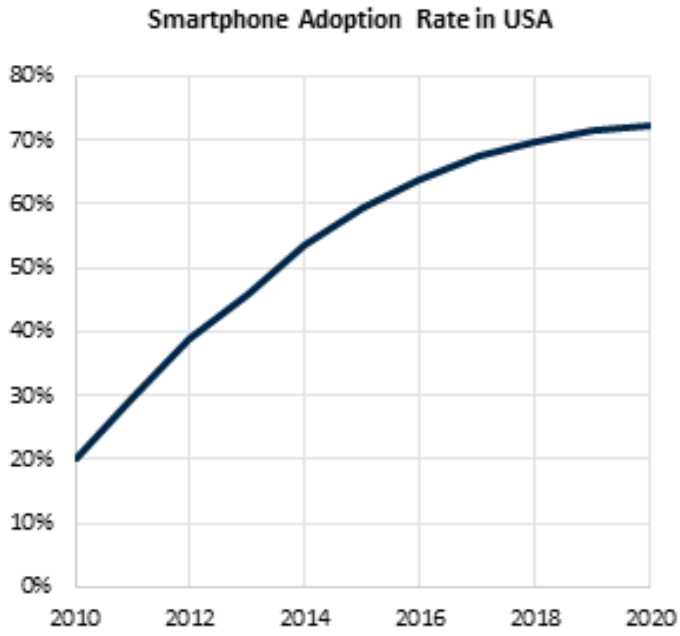



**Exhibit 10**
*Source: Statista, % of Entire Population*

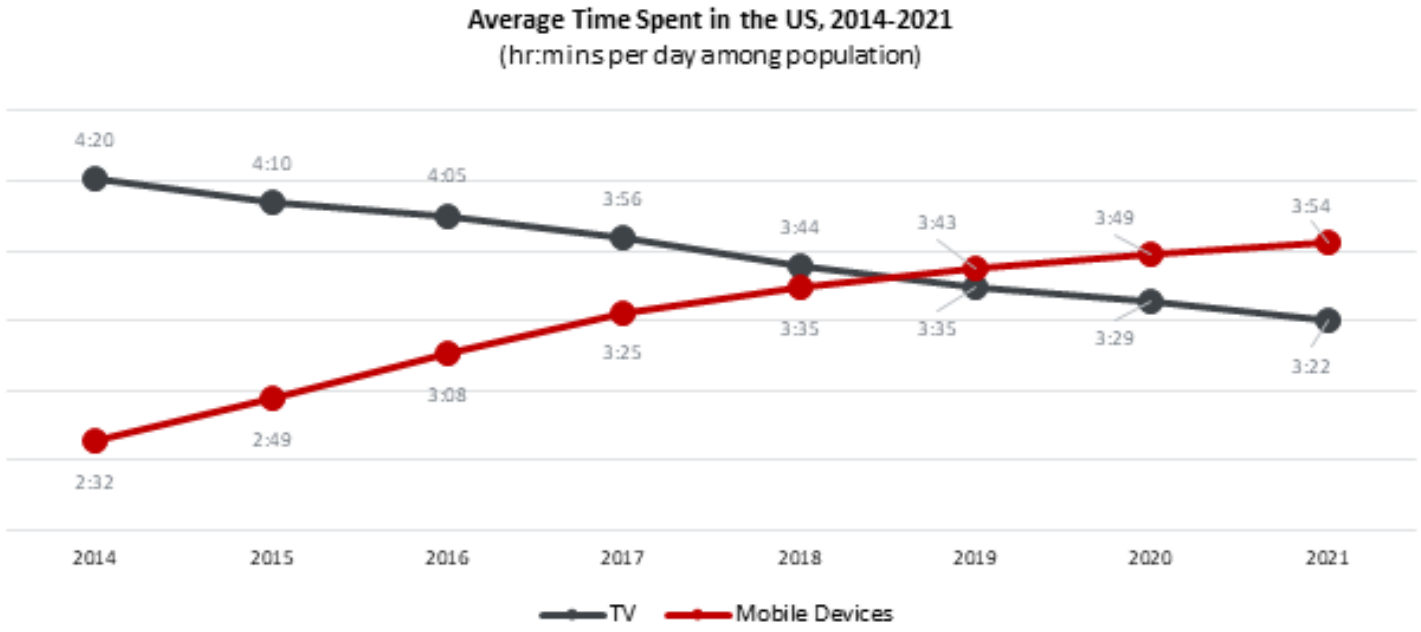



**Exhibit 11**

*Source: eMarketer April 2019, ages 18+; time spent with each medium includes all time spent on that medium, regardless of multitasking.*

Far from slowing down, Innovation continued with the introduction of smartphones. There were some initial attempts at such devices in the 1990s, but by the early 2000s, RIM had established itself as a market leader in the business community with the Blackberry, which focused on email as its primary use. Then, in January of 2007, Steve Jobs introduced the iPhone. "We are going to… get rid of all these buttons and use this giant screen."[15] The iPhone wasn't a technological innovation in itself, rather a new form factor of several established pieces of technology: computer processing, flash memory, battery storage, touch screen, and operating system. It established a new paradigm for how people interacted with their phones, and connected people to the internet, for information, communication, and entertainment, regardless of geographical location.

The iPhone first shipped in June of 2007, and with its intuitive interface, the smartphone adoption rate grew significantly, from 20% to 72% of the US population from 2010 to 2018. Normal market competition ensued, with Samsung releasing a competitive product at a lower price point, and the overall market continued to expand. Blackberry failed to adopt the touchscreen format and started posting quarterly losses in 2012. Smartphone sales finally peaked in 2018, the first year that sales ever declined. To put it in perspective of the market penetration, 18% of the population is aged 14 or under, [16] meaning almost every adult now has a smart phone. In addition, usage of the devices has increased steadily, where daily iPhone usage surpassed TV for the first time in 2019. At almost four hours a day, the average person spends more than a full day on their phone each week. Over this time, Apple went on to become at one point the most valuable company in the world, and the number one contributor to Growth outperforming Value from 2007-2018.[17]

Value investing generates excess return by an over-discounting of future earnings relative to trailing earnings. But it requires a stabilization and recovery, alongside a rerating of valuations to the new expectations. A good example is Seagate Technology, which a number of short-sellers openly bet against in 2013. The investment thesis was that the PC market was declining with the advent of mobile computing and cloud computing, hard disk drives would be in structural decline. What wasn't accounted for was that hard disk drives were still the best solution for large scale data centers, so demand would not decline as far as predicted. The stock began 2013 with a P/E around 4x,[18] and price went on to more than double over the next two years through a rerating back to a P/E of 14x. Seagate's story is not yet complete, but those two years squeezed the short-seller while the Value investor was rewarded.

Blackberry looked increasingly like a Value investment in the middle of its creative destruction. The P/E ratio of Blackberry company after the iPhone launch reached as low as a P/E in the 3x range until earnings went negative in 2012. Technology revolutions work through creative destruction, which in the case of Blackberry, offers no stabilization for the rerating to occur. OSAM mitigates the risk of Value traps by using quality factors to confirm the health of the company, themes like Earnings Growth, Earnings Quality, Financial Strength, Momentum. But even with quality controls, the clustering of innovation from Technological Revolutions creates more potential traps for Value portfolios.

## The Turning Point of 2007-2019

A similar sector weighting imbalance also occurs between the Value and Growth portfolios, with Technology stocks belonging primarily to Growth. The technology stocks that contributed in Value are those taking advantage of the infrastructure laid starting in the 1970s. We discussed Apple's ability to revolutionize mobile computing, and Amazon setting the standard of eCommerce, and they are the two top contributors from Technology. Facebook built a social media empire on top of the internet and mobile computing and contributed strongly. The technology companies that laid the infrastructure like Intel didn't figure into Value or Growth as they tended to be more core valuations with relative maturity in their business cycle. Microsoft is the only stock from the Irruption phase that remains a top contributor, as it has positioned itself well within the shift to cloud computing through Azure.

While the rise of technology stocks is a significant component of the reason that Growth outperformed Value over this turning point, about three quarters of the underperformance comes from Financials.[19] In the Turning Point of the 4th age, a similar negative impact came from Utilities, so it becomes useful to understand the impact of these sectors on the Value portfolios.

## Two Crashes of Financial Capital

Although not well known, Samuel Insull might have had more effect on the utilities industry than anyone else in the country. Insull was originally hired as Thomas Edison's personal secretary and had risen to become the number three person at General Electric by 1892. At the age of 32, he left to take over Chicago Edison which was about 2% of the size of GE. At Chicago Edison, he established several business paradigms for utilities that exist in today's utility markets, including the use of AC/DC in distributing power.

As he built out the utility business, Insull aggressively purchased several other utilities, creating a gas and electric empire extending over thirty-two states. The basis for his ability to purchase so many companies was a pyramid holding company structure that heavily favored bonds and preferred stock with a guaranteed dividend. His aggressive acquisition spurred others to similar action, resulting in "eight holding companies controlling 73 percent of the investor-owned electric business."[20] As cash dried up, Insull also switched from cash dividends to stock dividends, using the inflated stock valuations in lieu of cash to keep the machine going. After a takeover attempt, Insull created two additional layers of holding companies to try and retain control. Stacking these structures created massive amounts of leverage, to the point where he controlled an empire of $500m in assets with only $27m in equity.[21] This leverage was fine in the upmarket, but a market decline would cause significant problems. When asked in a Forbes interview about the leverage in his holding company, Insull responded that "a slump or calamity that would be disastrous [for electric utilities] is practically inconceivable." [22]

During the decline of the Great Depression, utility revenues did hold up better than manufacturing, but even a slight decline caused significant pressure on the company. Insull's company had pledged its stock as collateral to New York banks, and eventually the company went under when England announced that it was leaving the gold standard. As the banks started uncovering the issues with leverage, the state initiated criminal proceedings, and Insull immediately fled the country, believing there was no way he could get a fair trial. He was eventually extradited and faced trial but was exonerated on all charges. One juror that had served as a sheriff commented he had "never heard of a band of crooks who thought up a scheme, wrote it all down, and kept an honest and careful record of everything they did." [23]

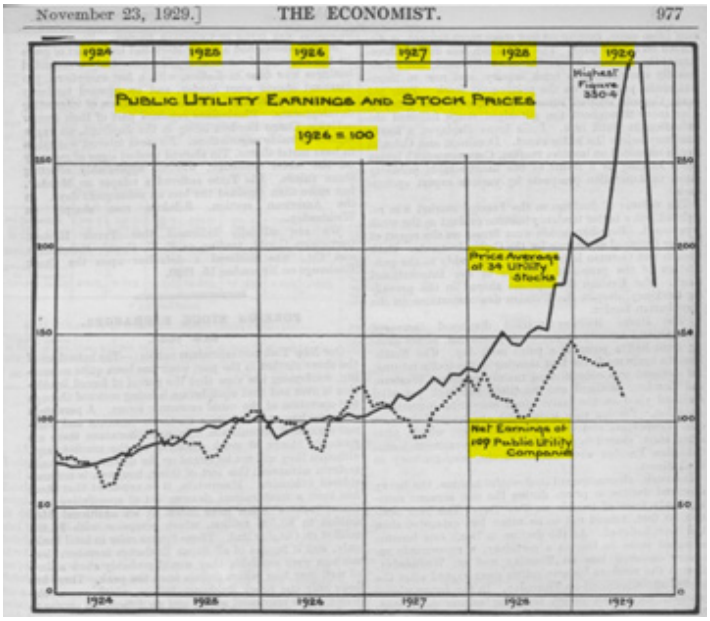



**Exhibit 12**
*Source: The Economist, 1929*

The criminal system might have determined Insull wasn't culpable, but the political process did not, resulting in the federal Securities Act of 1933, Securities Exchange Act of 1934, and the Public Utility Holding Company Act of 1935. The last act broke up the holding companies, and forced them to register with the SEC. In addition, the companies were ordered to specialize in one service (such as gas or electricity), and divest all unrelated holdings. This era of tighter regulation created a barrier for utility companies in achieving economies of scale and generating supernormal earnings for the foreseeable future.

We don't need to revisit the financial crisis, so long as the reader understands the similarities to what happened with utilities from 1926-1941: the belief that a market would never go down, combined with leverage, led to a bubble and subsequent collapse, which was followed by public outrage and tighter regulation.

Carlota Perez's model accounts for both of these collapses in Part II of her book, where she introduces the relationship between financial capital and production capital. As the Frenzy and Turning Point part of the cycle occurs, the success from investing causes financial capital to "believe itself capable of generating wealth by its own actions, almost like having invented magic rules for a new sort of economy."[24] In this case, the leverage used from Insull's scheme, and the easy money from subprime credit, both fueled by the belief that the demand for electricity and housing prices would never collapse.

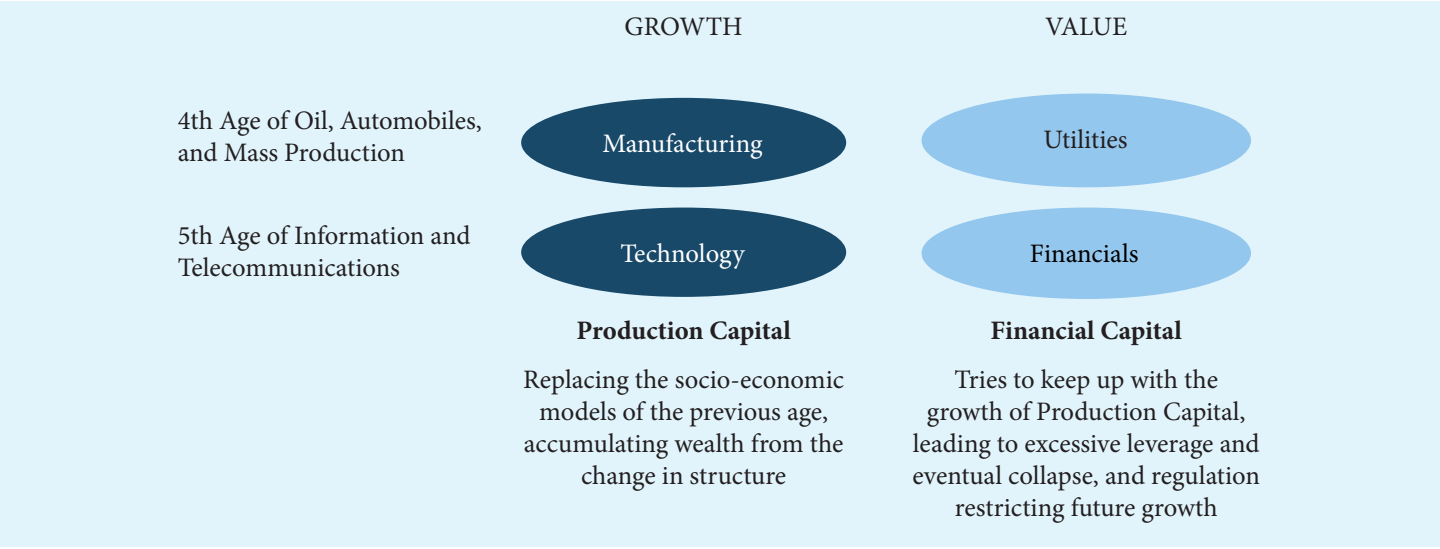



**Exhibit 13**

## Moving Along the Curve

Hopefully by this point we have established that while this may be a long-term market dynamic, the last twelve years are something we have gone through before. There are periods of innovation clusters that change the standards of our society, the consumption patterns of the economy and how the value from those economic actions are distributed across public companies. These clusters of innovation have periods of transition from widespread Installment to Deployment are aligned with regimes when Growth outperforms Value. The insight provided by this analysis is that as the economy transitioned out of the turning point to the Deployment phase, the economy enjoyed broad growth from the expanded utilization of the framework, during which Value returned to outperforming Growth. There is no guarantee this pattern will continue, but the rationale is compelling.

Looking at the 4th Technological Revolution, we can see that Value Investing returned to form fairly quickly as we moved along to Deployment and the high growth of Synergy. All three Value factors generated higher spreads within that period than across the entire 92-year period. The chart showing the decline for Price-to-Book across the two periods looks remarkably similar, and one can see the sharp rebound starting in 1942.

Attribution of the Synergy phase of 1942-1959 shows that some of the outperformance came through Manufacturing as companies like Goodyear Tire, Texas Co and International Paper moved to from Growth to Value, similar Apple moving towards Value (based on earnings) over the last few years. But the main contributor to Value outperforming was from railroads and utilities, the companies of the third Technology Revolution that dragged so badly during the turning point of 1929-1941. The railroad industry began a transformation from Steam to Diesel in the 1930s, moving away from the third revolution and fully into the Fourth. This change dramatically changed their cost structure, where dieselized railroads created a competitive cost advantage over trucking for mass transport of goods. Southern Railway, the railroad with the strongest returns over this time period, started adopting diesel in 1939, and became the first major carrier to have a complete diesel fleet by 1953.[25]

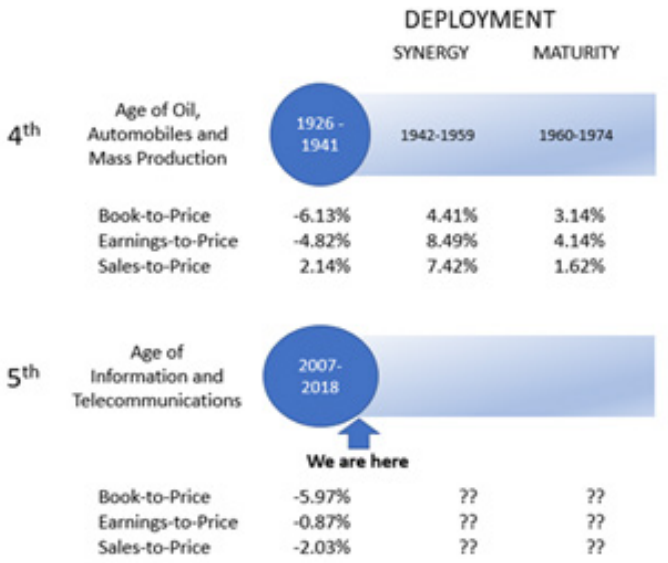



**Exhibit 14: Annualized Spread of Value over Growth by Phase of Technological Revolution**

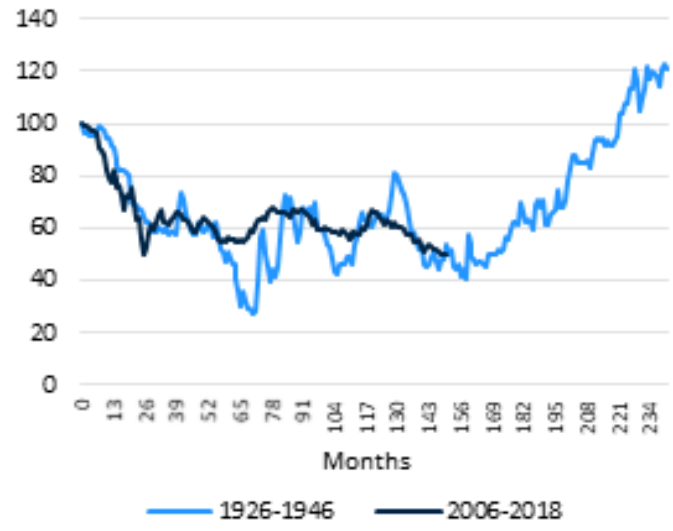



**Exhibit 15**

| NAME | Jun-1926 to Dec-1941 | Jan-1942 to Dec-1958 |
|---|---|---|
| SOUTHERN RAILWAY CO | -78.3% | 8876.3% |
| NORTHERN PACIFIC RAILWAY CO | -91.0% | 6878.9% |
| SOUTHERN PACIFIC CO | -85.7% | 4338.9% |
| NEW YORK CHICAGO & ST LOUIS RR | -78.3% | 3957.0% |
| ATCHISON TOPEKA & SANTA FE RY C | -61.4% | 3434.3% |
| S&P 500 | 34.11% | 1484.0% |

**Exhibit 16**

If we believe that this long-term historical narrative will play out, the important question is when are we moving into the Deployment phase? For allocators of capital, we want to know how much longer this Growth Regime can last.

We do have the timing mechanisms of the market crashes. The problem is that there is no prescribed passage of time after the bubble correction when you move into Deployment. That said, given that it's been twelve years, it certainly seems like this period is getting a bit long in the tooth.

One key pivoting point in any technology is when the standards are set for how the technology will be deployed across society. In the case of technology, one could argue that the introduction of the smartphone disrupted the consumption patterns of information, and we are still figuring out the matching of platform to consumption. The societal habits for whether people will use their desktop, laptop, gaming console, smart speaker, tablet, or phone for communicating, shopping, gaming, and business productivity. But with the smartphone adoption curve shown before, the platform is established for delivery of information to anyone anywhere, and with embedded cookies, canvas fingerprinting, and geolocational tracking, the delivery of information on everyone to anyone.

Another key sign in standards being set are the formation of oligopolies and monopolies. For every one of the previous

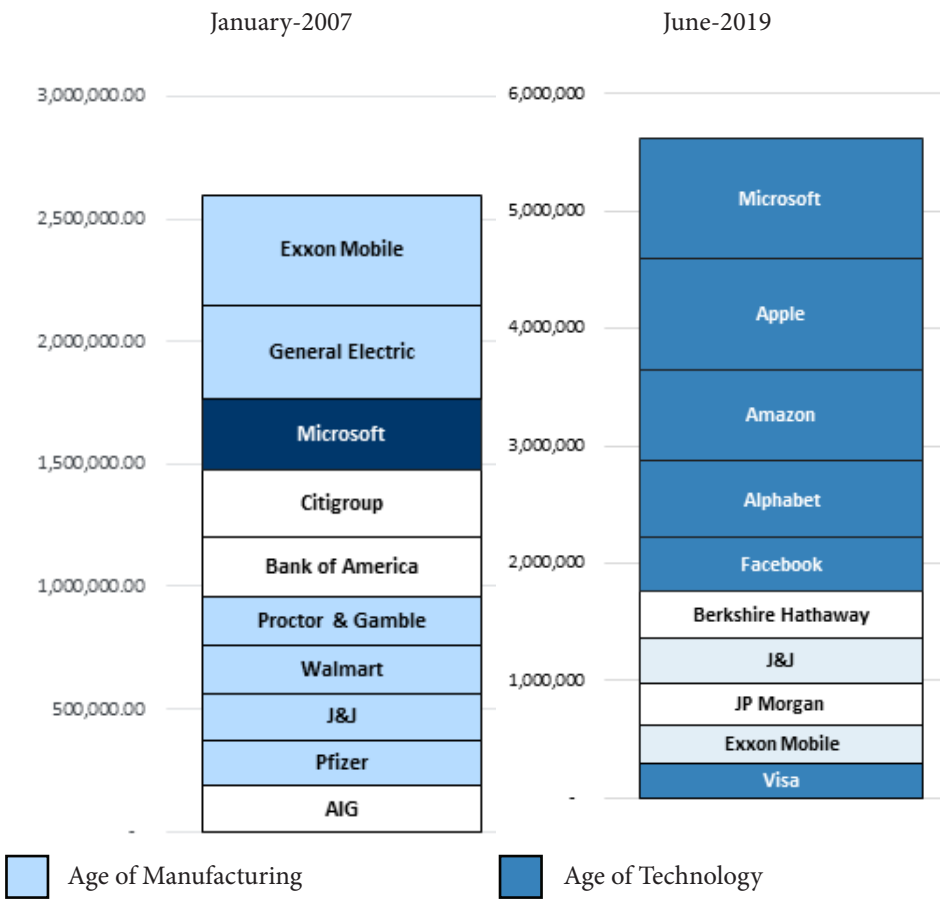



**Exhibit 17: Largest Ten Names in S&P 500**

technological revolutions, there have been winners that have established the standards accumulated market share and became synonymous with the technology itself. Exhibit 17 shows the shift in the market leadership over the last twelve years, with the Age of Technology forming oligopolies through the FAANG stocks.

It should be mentioned that because these oligopolies are so large, one would suspect that they can't get bigger. Amazon's market share is 49% of online retail and 5% of total retail. While it's one of the largest companies in the world, there's still potential to grow. Sears didn't grow to become 1% of GDP until the 1950s, well into the Deployment of the cycle. General Motors and Sears were the top two contributors to the Growth Portfolio[26] during the synergy phase of 1942-1959, but the Value portfolio outperformed during the creative construction of deployment, where the overall economy grew and the value cycle of stocks being overly discounted and rerated was the norm.

One should not underestimate the role of regulation in how the Age of Technology plays out. The Senate hearings regarding Facebook highlight the idea that privacy rights are far from established and could create structural issues for technology companies. Additionally, anti-trust legislation always rears its head as near monopolies exert power.

If Value investors take nothing else from this piece, hopefully it gives perspective. Technological revolutions are one framework for looking at history, but they offer a lot of insight into what our world and our markets are going through right now. The introduction of the internet and mobile computing has been broad and swift, introducing change at a far greater pace than the automobile. And it makes sense that these changes will cause distress on businesses from the previous paradigm. These are long cycles that have played out before, starting with the Industrial Revolution in the 1770s. What we have offered here, as our ability to gather historical data continues to improve, is the possibility that long regimes where Growth outperforms Value are part of these arcs. We have also seen that eventually as the innovations move to maturity, Value investing has also returned towards a longer-term trend of outperforming.

***Disclosure***

*The material contained herein is intended as a general market commentary. Opinions expressed herein are solely those of O'Shaughnessy Asset Management, LLC and may differ from those of your broker or investment firm.*

## Appendix

### Appendix A: OSAM Deep History

The OSAM Deep History dataset was created through several steps. OSAM procured digital copies of the entire history of Moody's Manuals for Transportation, Industrials and Railroads. A list of companies available through CRSP with a market cap over $200m (inflation-adjusted) and a stock price over $1 were supplied as the companies to generate data for. These files were sent to an offshore third party, where the entirety of the income statement and balance sheet were typed into spreadsheets.

In order to determine which items were Sales, Net Income and Book Value of Equity, a supervised machine learning algorithm (Support Vector Machine) was used. We classified about 5% of the data manually and used those as the training data set. Any items with sufficient confidence level of classification was incorporated into the dataset. Another round data entry was performed to get almost 100% coverage of S&P index constituents. A data outlier algorithm (Isolation Forest) was used to look for additional outliers within the data, which were subsequently cleansed.

### Appendix B: Value Portfolios

For the investment universe we limited ourselves to the S&P 500 constituents available through CRSP. The idea was for 1) an investible universe of stocks so the research would reflect real world conditions and 2) have our methodology be replicable to other researchers could verify findings. The S&P 500 constituents became 500 stocks in 1957, so from 1926 to 1957 there are only 90 stocks in the universe for investment.

Pricing and market capitalization are provided by CRSP. Sales and Net Income were sourced from OSAM Deep History and Compustat, with Deep History being the primary source for fiscal years of 1956 and before, and Compustat thereafter. Book Value was sourced primarily through Compustat, followed by the dataset provided on Ken French's website, and lastly through the OSAM Deep History. The reason for using Ken French's data for Book Value first was to allow for replication of the time series on Book-to-Price by others.

Portfolios are formed using a similar methodology as Fama-French (1993), fundamentals are formed at the end of June every year to ensure full reporting of annual reports. This also coincides with the release of the Moody's manuals the new dataset is based on, to ensure there is no lookahead bias.

Because of the limited number of stocks in the universe, we build Value and Growth portfolios based on the Fama-French 1993 methodology of Top 30% and Bottom 30% for each valuation metric. This ensures an appropriate number of stocks in each portfolio to achieve diversification of stock-specific risk. We use value-weighted (i.e. market-cap weighted) returns for each test. Equally-weighted returns of S&P 500 constituents were also run, and showed similar underperformance during the time frames discussed.

| | Growth | Core | Value | Spread |
|---|---|---|---|---|
| **S&P 500 MArket Cap Weighted** | 3.00% | 2.42% | -3.13% | -6.13% |
| **Market Cap > $200m Market Cap Weighted** | 3.46% | 0.64% | 0.07% | -3.39% |
| **Market Cap > $200m Equally Weighted** | 2.19% | 0.97% | 0.65% | -1.54% |
| **Market Cap > $50m, Eq wt** | 2.24% | 2.05% | 1.01% | -1.23% |
| **Market Cap > $20m, Eq wt** | 2.01% | 3.19% | 1.19% | -0.82% |
| **Market Cap > $10m, Eq wt** | 2.20% | 3.81% | 2.29% | 0.09% |
| **Market Cap > $5m, Eq wt** | 2.38% | 4.81% | 4.08% | 1.70% |
| **No Limits, Eq wt** | 2.70% | 5.32% | 8.63% | 5.93% |

**Appendix B: Book-to-Price Portfolios (July-1926 to Dec-1941)**

One note: while our S&P 500 portfolios aligned generally with the Value-Weighted portfolios on Ken French's website, we saw significant differences in the equally-weighted universes. We believe this is due to the inclusion of microcap stocks in the French portfolios. The following table shows the returns on the 30/40/30 portfolios formed on Book-to-Price using various market cap limits (inflation adjusted) for the 1926 to 1941 time period. The inclusion of a small number of very small companies dramatically shifted the equally-weighted Value portfolio. This is particularly true in 1932, where small companies like the Manati Sugar Co, with a total market capitalization of thirty-one thousand dollars, was up 800% over the next twelve months. We believe including these companies provides an inaccurate representation of how Value investors would have done from 1926-1941.

**Appendix C : Attribution Calculation**

In this paper, a multi-period Brinson Attribution methodology was applied to account for relative performance contributions. For every period, group weights, returns and contributions were calculated for each portfolio. The relative performance for every group was then decomposed into Allocation, Selection, and Interaction effects following the Brinson approach:

Portfolio contributions and relative performance decompositions were linked across periods using a geometric linking method. Group allocation, selection, and interaction effects were then summed to arrive at total effects. The residual of actual excess performance and linked excess performance was distributed equally across all final composed effects.

$$Allocation = (w_i^p - w_i^b) \times (R_i^b - R^{-b})$$
$$Selection = w_i^b \times (R_i^p - R_i^b)$$
$$Interaction = (w_i^p - w_i^b) \times (R_i^p - R_i^b)$$

, where

$w_i^p$ = Portfolio weight for group i

$w_i^b$ = Benchmark weight for group i

$R_i^p$ = Portfolio return for group i

$R_i^b$ = Benchmark return for group i

$R^{-b}$ = Total Benchmark return

## Endnotes

1. See Appendix A on the data collection methodology.
2. See Appendix C for attribution methodology.
3. Broad SIC classifications were used to define sectors. Using two-digit codes, Manufacturing is 20-39, Utilities are 40-49, Financials are 60-69, Technology stocks are predominantly in code 73.
4. Note: the Utilities sector includes power Utilities such as Gas and Electric, as well as Railroads.
5. Also known as Kondratiev waves, first observed by Nikolai Kondratiev in *Major Economic Cycles* 1925.
6. Perez 72.
7. Freeman and Louca *As Time Goes By*, 274.
8. Freeman and Louca *As Time Goes By*, 275.
9. OSAM Research. Source: Number of Firms Participating in the Auto Industry in the U.S.: Utterback, JM, and FF Suarez. "Innovation, Competition, and Industry Structure." Research policy. December (1993).
10. Note: Ford was a private company until 1958. Value based on Book-to-Price.
11. Freeman and Louca *As Time Goes By*, 265.
12. Freeman and Louca *As Time Goes By*, 289.
13. https://www.theatlantic.com/business/archive/2017/10/amazon-sears-mistakes/541926/
14. OSAM Research.
15. McNish and Silcoff. 2015 *Losing the Signal*, 129.
16. https://en.wikipedia.org/wiki/Demography_of_the_United_States
17. Note: Apple was in the Growth portfolio for Book-to-Price for almost the entirety of 2007-2018, but was not consistently in the Growth portfolio on Earnings. By the middle of 2013 it actually moved into the Value portfolio, and is a contributor for the difference in performance between B/P and E/P over that time period.
18. OSAM Research.
19. The impact of financials is slightly higher in S&P 500 portfolios because it is using just the top 30% and bottom 30% on Book-to-Price, but it's not far off from contribution for the Russell 1000 Growth and Value, where Financials accounted for about 56% of the total underperformance from Jan-2007 to Dec-2018.
20. Hyman, Leonard S. (1988), America's Electric Utilities: Past, Present and Future, Public Utility Reports, p. 74. As cash dried up, Insull also switched from cash dividends to stock dividends, using the inflated stock valuations in lieu of cash to keep the machine going.
21. https://www.nytimes.com/2006/03/19/business/yourmoney/before-there-was-enron-there-was-insull.html.
22. Henderson and Cudahy. 2005. "From Insull to Enron," *Energy Law Journal*: 59.
23. Henderson and Cudahy. 2007. "From Insull to Enron," *Energy Law Journal*: 71.
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26. Valuation based on Book-to-Price.

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Chris Meredith is the Director of Research, Co-Chief Investment Officer and a Portfolio Manager at O'Shaughnessy Asset Management (OSAM). He is responsible for managing investment related activities at the firm: investment strategy research, portfolio management, and the firm's trading efforts. He directs the Director of Portfolio Management and the Director of Trading on managing daily investment decisions. On the research side, Chris leads a team of analysts conducting research on new factors, improving existing stock selections and portfolio construction techniques. Chris has also authored several whitepapers including *Value is Dead, Long Live Value, Price-to-Book's Growing Blind Spot* and *Microcap as an Alternative to Private Equity*. He is also the author of "Investing Research" blog. Chris is an equity owner in OSAM and a member of the firm's Executive Committee and Operating Committee. Chris is also a Visiting Lecturer of Finance at the Johnson School of Business at Cornell University, where he co-teaches Applied Portfolio Management and co-manages the student-run Cayuga Fund. Prior to joining OSAM, Chris was a Senior Research Analyst on the Systematic Equity team at BSAM. He was a Director at Oracle Corporation and spent eight years as a technology professional before attending the Johnson School at Cornell University. Christ Holds a B.A. in English from Colgate University, an M.B.A. fromm Cornell University, and an M.A. of Financial Mathematics from Columbia University. He is a CFA charterholder.