

EIGHT INVESTMENT THEMES FOR GLOBAL GROWTH: 2016 & BEYOND

Authored by: The Boston Company's US Small Cap Growth Team

In this paper, our US Small Cap Growth team takes a close look at eight themes that could influence the investment climate over the next year or longer. This year, we examine Millennials' spending habits, shifts into a digital landscape, how the Internet of Things impacts our lives, the explosion in data, biotech drugs, the next stages in health care, U.S. government spending, and the continuing U.S. energy renaissance.

Executive Summary

Each year, The Boston Company's US Small Cap Growth team holds an intensive off-site review of the global investment landscape. Through this process, they identify distinctive profit themes that they believe will influence the investing climate over the next year or longer, acting as tailwinds across sectors of the economy. While the team focuses on the small- and mid-cap growth equity asset classes, these themes apply broadly across the investment landscape, regardless of investment style or market-capitalization preference.

The overwhelming takeaway from this year's offsite is the far-reaching realities of the digitalization of the global economy. While we are intrigued by the opportunities resulting from this transformation, we are also cognizant of the negative implications for many industries. Barriers to entry are rising for a few dominant companies such as Amazon and Google, but are crumbling for many companies. The sharing economy should improve asset efficiency, but capital spending as a percentage of GDP may have forever peaked. Robotics and automation are transforming the manufacturing industry, but what does that mean for employment? Software and connectivity are ubiquitous, but traditional measures of productivity are stagnating. We hope that standards of living are rising, but digitalization (being "always on") has both benefits and burdens for society.

Price transparency may be the most disruptive aspect of digitalization. This deflationary pressure is happening at a time when governments around the world are desperate for inflation. Government debt has exploded in size, and inflation makes it easier to repay the debt. What does this say about future monetary policy? Policy makers will continue to do whatever they think it takes to avoid deflation.

Our attraction to profit themes is straightforward: Profit themes focus our research effort on areas of the market that have demand tailwinds. We believe these companies

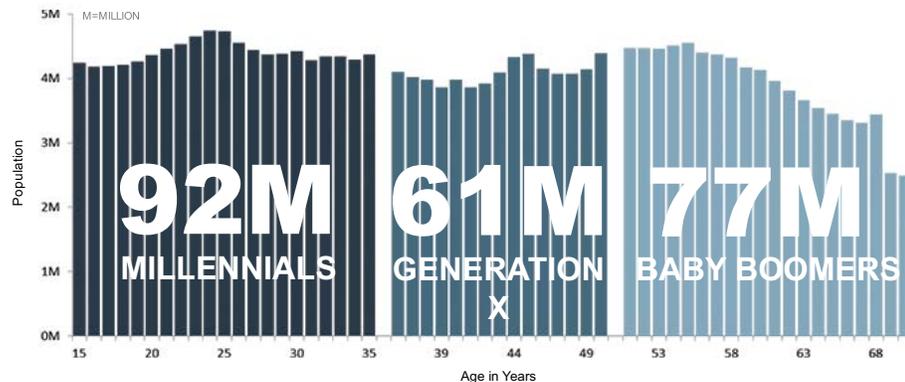
have the best opportunity at experiencing pricing power and rising returns on invested capital. Below are the profit themes we have identified for 2016-2017 that should drive investment returns:

1. Millennials: What Investors Need to Know
2. Digital Disruption: Crossing the Digital Divide
3. The Internet of Things: Gets Personal
4. Data Wars: Moving at the Speed of Data
5. Biotechnology: Emerging Trends
6. Health Care: The Next Stages of Reform and Innovation
7. Fiscal Spending: Reawakened
8. U.S. Energy: Renaissance Isn't Dead

1. Millennials: What Investors Need to Know

The Millennial generation (or Generation Y) is the largest in U.S. history, made up of 92 million individuals compared with 61 million Generation X'ers and 77 million Baby Boomers.¹ (See Exhibit 1 below.) The median age for Millennials is 26 versus 62 for Baby Boomers.²

Exhibit 1: The Rise of Generation Y



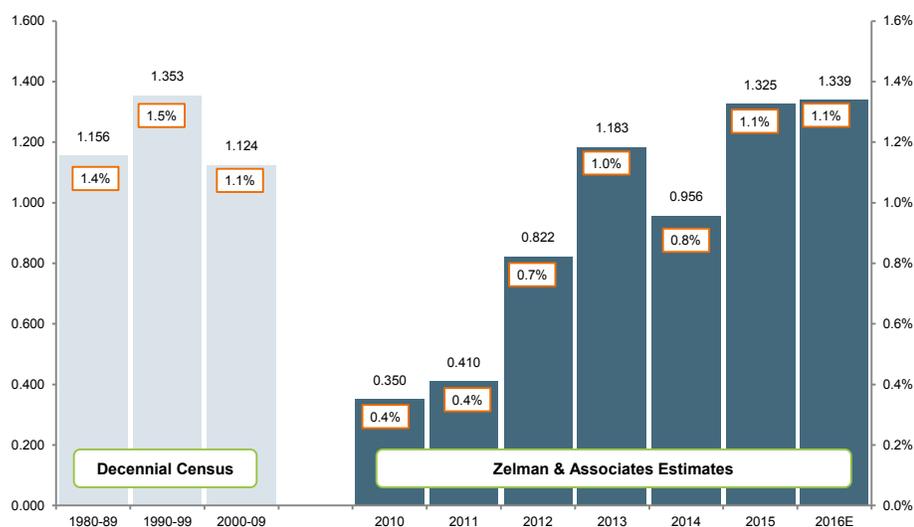
Source: U.S. Census Bureau - 2014 National Population Projections.

The Millennial generation is now transitioning from the 15-24 age cohort, which has little discretionary spending power, into the 25-35 age cohort associated with household formations (as shown in Exhibit 2) and rising discretionary spending. This confluence of Millennials reaching “spending age” and Baby Boomers aging out of their spending years is expected to significantly affect consumption over the next decade. We believe this demographic transition will pressure consumer spending dollars by roughly 1% a year until 2019, at which point spending should then accelerate. The composition of

spending dollars will likely be affected even more dramatically.

Millennials have been influenced by dramatic events, such as 9/11, terrorism, school shootings and the global financial crisis. They are also the most connected generation, growing up in an “iDevice” world with helicopter parents who scheduled every moment of their childhood and catered to their needs. Varying economic conditions, technology adoption and behavioral differences have driven different spending priorities in the Millennial cohort.

Exhibit 2: A Pickup in New Households Is Emerging



Source: U.S. Census Bureau, Zelman & Associates analysis. Annual household formation in units in thousands - left. Annual percentage change in households - right.

We believe the following are among the most critical factors for future investment decisions related to this demographic theme:

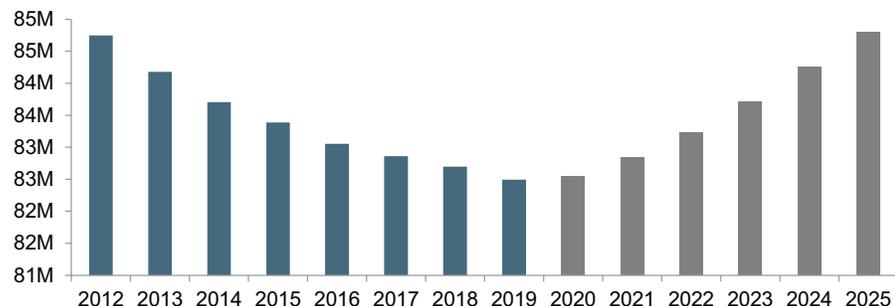
- **Homebuyers.** Household formations are likely to stay above trend and create strong demand for housing. The U.S. has a shortage of entry-level housing. (See Exhibit 2 above).
- **Marriage Can Wait.** Millennials are getting married and having children later in life than previous generations, with a median marriage age of nearly 30 versus 23 in 1970.³
- **E-commerce-Biased.** Millennials are more likely to purchase goods via e-commerce than in a physical store, and they are likely to compare prices across channels in real time, with mobile representing the fastest-growing part of e-commerce.
- **Rental Culture.** Millennials are more likely to rent than own an asset.
- **Experiences.** Millennials appear to be more interested in “experiences” than

material goods. Interestingly, Baby Boomers are also showing more interest in creating memories than buying more goods, especially apparel and accessories. This will have far-reaching impacts on traditional spending patterns.

- **Health-Conscious.** Millennials are more conscious about health and wellness (for themselves and their communities) than previous generations. Baby Boomers are adopting healthier lifestyles in order to extend their lifespan. These trends are very positive for companies associated with healthy living and alternative energy solutions, but have negative implications for alcohol, tobacco, and restaurants (especially fast food).
- **Social Media.** This affects spending decisions more than traditional advertising.
- **Debt.** The Millennial generation has lower financial obligations but also lower income than previous generations. They often have more student-loan debt but less credit card and mortgage debt.
- **(In)Disposable Income.** A larger percentage of disposable personal income among Millennials is spent on fixed housing and education, due to lower income levels and inflation in these expenditures. Millennials are also less interested in material possessions, and they are not brand-conscious.

The Millennial consumer will represent the highest percentage of peak earners by 2020, and by 2025 will represent 50% of peak earners in the U.S. (See Exhibit 3 below.) No wonder consumer companies have begun to focus on the Millennial customer in such a big way. Addressing the Millennial customer requires a change in strategic direction for many companies, which combined with the digitalization of the economy, creates both opportunities and challenges. This is a major focus for our analysts during our management interviews. How do you compete with online retailing giants? How do you acquire a new customer? How is your marketing budget changing? Does your brand have authenticity? How do you retain Millennial employees?

Exhibit 3: A Recovery in Peak Earners...but not until 2020



Source: KeyBanc Capital Markets. Population between ages 35-54 has been falling because of aging boomers, but will grow again in 2020 because of aging millennials.

2. Digital Disruption: Crossing the Digital Divide

Many of the last few years' themes converged around a common phenomenon. Companies worldwide are facing the challenge of crossing the divide between their historic, analog world and the new, digital one.



Armed with smartphones, today's consumers are more connected than ever before. Millennials are the first truly digital generation, using their smartphones to manage their daily lives. These consumers have near-instant access to news, product data and locations, which is reshaping how they work, play, travel, and shop.

The implications of this shift from an analog to digital lifestyle are profound for the global economy. Companies are rethinking their business models and investment decisions to adapt to this shifting landscape. For many industries, today's analog leaders could yield to tomorrow's digital disruptors if they don't invest to cross this digital divide.

From our vantage point, consumer-facing industries are seeing the earliest effects from a shift to an always-on, mobile and customized digital economy. This trend has been evident for several years in the shopping and travel industries, thanks to companies like Amazon, Priceline, Uber and Airbnb. More recently, media and entertainment have shown signs of disruption with video streaming promoting over-the-top programming versus traditional cable subscriptions. Virtual reality is on deck in the next few years with further disruptive potential for the entertainment, education, and communications sectors.

As the digital consumer trend has taken hold, companies have needed to differentiate their products by providing a more customized, unique or readily available product. We anticipate more companies will provide same-day delivery services as a way to differentiate themselves from their web-based competitors. Such a shift may drive changes in the logistics industry.

Enterprise-facing companies have not been excluded from disruption. Thanks to bring-your-own-device (BYOD) and cloud-computing trends, business users are also ushering in disruptive change to commercial technology vendors. BYOD and architectural shifts to the cloud are putting traditional IT hardware, software and service vendors under immense pressure as workloads move away from them. We see growth across much of the legacy, on-premise technology industry as being challenged for the next several years as applications move from the current 10-15% cloud adoption to up to 40-50% by 2020. Recently, GE supported these trends by indicating it would reduce the number of its in-house data centers from 34 to 4 and move 60% of its applications to AWS over the next three years.⁴

On the other hand, industries that are more heavily regulated are better insulated from the current wave of disruption. The implicit cost of meeting regulatory statutes can slow the pace of digital innovation in areas like financial services, energy and health care. Nonetheless, despite the regulatory barriers, we still see growth opportunities for digital innovators in these sectors in coming years.

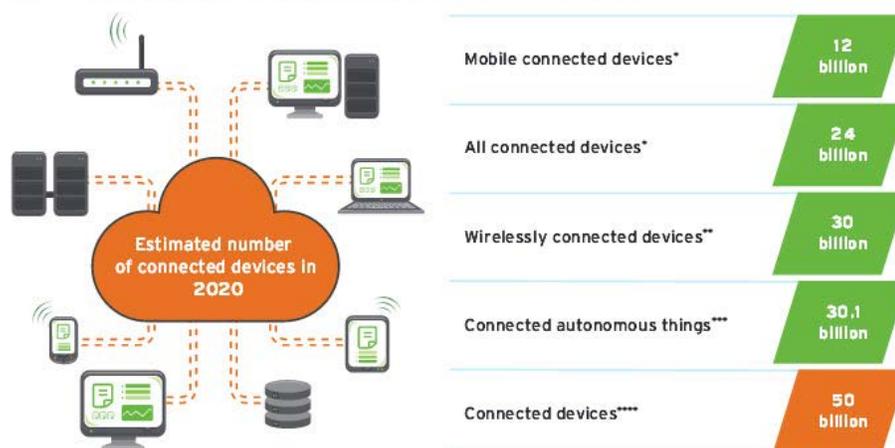
As digital disruption rises, companies are pivoting by moving to asset-light, subscription-based services. Companies are also leveraging shared infrastructure that can adapt quickly to rapidly changing trends. The net result is that capital expenditures (capex) is often rationalized and converted into operating expenditures (opex). We believe this substitution of capex for opex is one reason why the recovery in many capital-goods sectors has been subpar since the Great Recession. The reallocation of fixed assets into a more flexible, shared pool of infrastructure may also explain some of the muted inflation trends we are seeing across the global economy.

3. The Internet of Things: Gets Personal

One byproduct of the advancements made in mobility and cloud computing has been a surge in connectivity to monitor and manage more devices, from appliances to automobiles. This concept, dubbed the “Internet of Things” or IoT, is expected to grow from approximately 10 billion connected devices today to 50 billion by 2020. (See Exhibit 4 below.) IoT has been a recurring theme for our team over the past few years. In the past year, it has taken more shape around distinct applications and end markets.

Exhibit 4: Making Connections

IoT Drivers: Exponential Growth of Smart Devices and Sensors



Source: Cognizant, *GSMA, **ABI Research, ***IDC and ****Cisco.

We identify IoT in four general segments:

Wearables - Personal IoT

According to the U.S. Bureau of Labor Statistics, the average American is working more hours per week now than in the past 10 years. This potential decline in “free time” over this period has paved the way for technology to bridge the gap and boost personal productivity.

Recent examples of productivity-saving apps include Waze (crowdsourced GPS), Amazon’s Echo (home digital assistant) and GrubHub (food delivery). TiVo has even accelerated TV with its new turbo mode that can speed up TV by 33% even as you watch it. One segment of personal IoT that has seen strong uptake in the last year has been the wearables or smartwatch segment. Products like Fitbit and the Apple Watch are seeing rapid growth and provide some of these productivity-related apps. According to IDC, the smartwatch category can see a compound annual growth rate of 42.8% from 2015-2019.⁵

Wearables are also providing improved health-tracking features, which can be a key reason for purchase. Several consumers have claimed to have been saved from heart attacks due to blood pressure monitoring. The sensors in these devices generate large amounts of data. For example, IBM predicts a person could generate 1mil gigabytes of health-related data over his or her lifetime, which is the equivalent of more than 300 million books. We believe the real investment opportunity is less in the devices

themselves, but much more in the companies poised to benefit from the data created, stored and analyzed from such significant long-term trends.

The Automated Home

Home automation is a big opportunity for IoT, but it is a complex and fragmented market where major leaders have not yet emerged. However, in the past year, we have seen strong uptake in personal-security-related offerings. Consumers and business are monitoring their properties 24x7 through the cloud and often with video surveillance. Netgear estimates that less than 5% of U.S. homes have wireless cameras installed, but Netgear and NPD report seeing 30% growth in U.S. retail sales for this category in 2016.⁶ AVG, a software security company, also reports 72% of family data plan texts pertain to locating family members.⁷

The proliferation of personally identifiable information, or PII, is a rapidly growing segment of data thanks to these consumer and home automation trends. Companies that collect this data are being targeted by cyber criminals. The new vulnerabilities around PII are incentivizing companies to focus more on cybersecurity, redundancy and data sovereignty (where their data reside). This focus is supporting a new wave in data-center construction, often outside the U.S.

The Car of the Future – Lighter, Connected and Intelligent

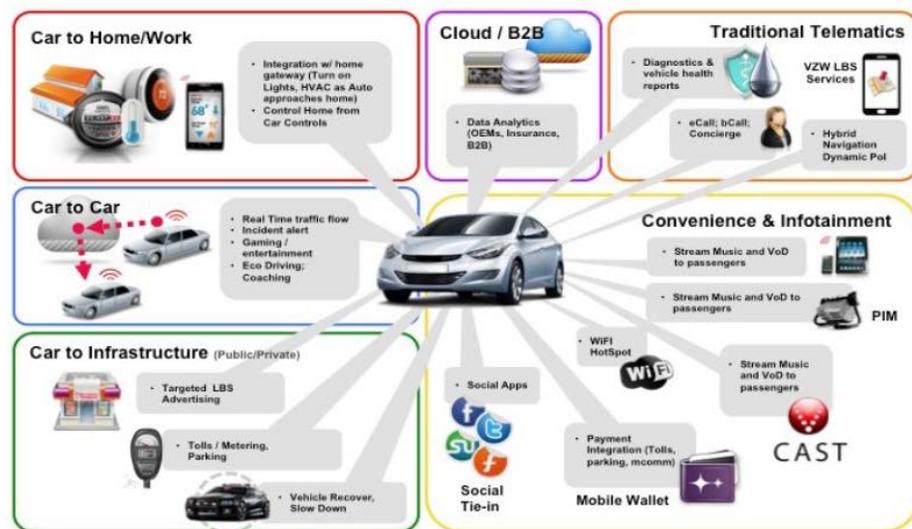
The reach of IoT has also stretched across industries. A notable manifestation is in automobiles, driven in part by the need to improve safety, control and connectivity. One example has been around since the late 1990s: Telematics applications, such as General Motors' OnStar suite of services, communicate information about a vehicle, including automatic crash notification, stolen vehicle assistance, diagnostics and turn-by-turn directions.

Today, connectivity is extending from our phones and into our cars.⁸ Gartner predicts that 250 million connected cars will be on the road by 2020⁹. In the future, cars will also be better connected to one another in accident avoidance and other driver-safety-related uses. Setting the pace for delivering innovative features for today's car buyers are new models from Tesla, Audi and BMW. Some of these features include improved safety, navigation, fuel efficiency and infotainment options.

We are quite positive on the growth in electronic content in cars to serve these new applications, as detailed in Exhibit 5 on the next page. According to research provider Sanford C. Bernstein & Co., LLC, the average car contains \$318 in semiconductor content, and the increase in content is expected to grow 2% to 4% each year¹⁰. Hybrids and electrics can represent an incremental growth driver because these vehicles can contain double the content of today's combustion-engine cars. Premium automobiles average 80% more in content due to their rich safety, fuel-efficiency and entertainment options. Over time, more of these features will become standard in high-volume models and drive incremental growth for well-positioned semiconductor and sensor vendors. Additionally, Gregory K. Hinckley, the president of Mentor Graphics, a leading electronic hardware and software provider, said this at the 17th Annual Needham Growth Conference:

“So 15 years ago, an automobile’s electronics consisted of a radio; it consisted of an ignition, the headlights and a horn. Today, a modern S-Class has 200 unique microprocessors in it. It has 2.5 miles of wiring across 14 independent networks. And the part which I think is really amazing is that an F-35 fighter aircraft, supposedly the most advanced, I believe it is the most advanced aircraft in the world, has something like 7.5 million lines of code, while the current generation of S-Class has 65 million lines of code.”¹¹

Exhibit 5: Who Makes the Car



Source: Carvoyant.

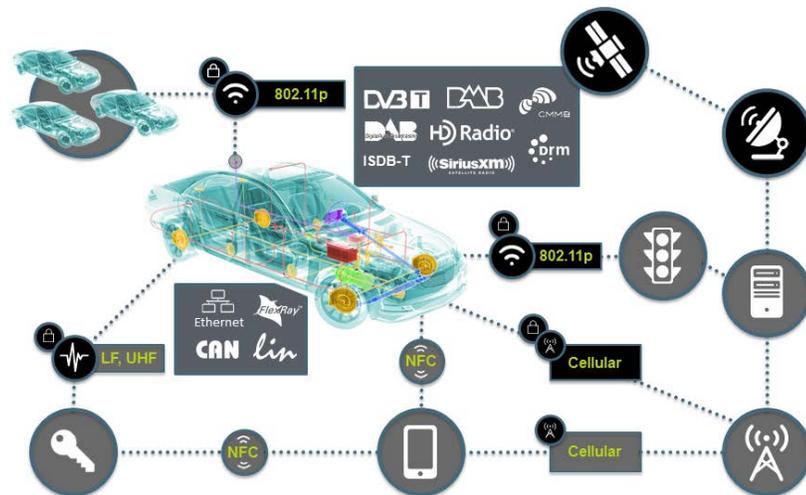
As a result of these advances, the automobile has rapidly evolved into a lighter, more energy-efficient, intelligent and connected driving machine. Although news headlines have focused on fully autonomous driving, we do not believe these functionalities will be widely available until after 2020.

For this theme, we see the most compelling investment opportunities in the providers of advanced safety features. Auto accidents are a leading cause of death, but a second line of defense is rapidly developing for drivers. Collision warning systems, blind-spot assistance, pedestrian detectors and automatic emergency braking are recent product developments intended to save lives. These features are available on many premium car models today, and we expect them to be more widely available in three to five years. In Europe, for example, automobiles need to have advanced safety features in order to achieve 4- or 5-star ratings, and we believe the U.S. will likely follow Europe’s lead, propelling a relatively small \$2 billion market to potentially a \$40 billion market opportunity in the future.¹² Among the companies exposed to this theme, we are most interested in sensor and electronics companies that provide the foundation for these advanced safety systems. Accident frequency rates impact other adjacent industries like auto insurance, collision repair, and automobile auctions, and as such, investors need to be aware of this secular trend.

Government-imposed corporate average fuel economy (CAFE) standards are forcing auto manufacturers to build cars that are more energy-efficient. Electric and hybrid electric vehicles are dramatically more fuel-efficient than combustion engines, but consumer demand for these cars has been inconsistent. Tesla has successfully stimulated demand at the high end, and its more affordable Model 3 garnered record pre-orders. We are skeptical that electric vehicles can command more than a small share of the automobile market in our investment horizon, but are watching developments closely to gauge long-term adoption. Another option for OEMs is “lightweighting,” a more evolutionary trend where aluminum and plastic are substituted for steel content. Given the success of Ford’s F-150 redesign, we expect to see similar innovation from other OEMs.

As illustrated by Exhibit 6, cars are also becoming more connected, now including capabilities like in-car Bluetooth and Wi-Fi, which have become more common in new automobiles. Today, in-car connectivity is primarily used for recreational purposes, such as Internet radio; however, it can evolve to enable advanced safety features and eventually fully autonomous driving. The National Highway Traffic Safety Administration (NHTSA) believes that vehicle-to-vehicle communication and vehicle-to-infrastructure communication will save lives, ease traffic congestion and reduce emissions. As a result, we would not be surprised to see the NHTSA mandate connectivity at some point in the future.

Exhibit 6: Connected Cars



Car to Car, Car to Infrastructure, Car to Portable, Inside the Car

Source: NXP Semiconductors Netherlands N.V.

The technologies facilitating autonomous driving are moving at a very fast pace. However, in addition to solving complex driving algorithms, auto manufacturers also need to tackle regulatory and insurance issues before fully autonomous vehicles will be allowed on highways and roads. While it is early for investors to focus on this market opportunity, we are excited about where the industry is today and what the future will bring.

Mass Manufacturing to Mass Customization

One of the great promises of IoT is the ability to quickly make changes, whether to the temperature settings on a home thermostat or to a setting in a car's navigation system. This shortening of the change process also has applications in the production of three-dimensional (3D) objects.

3D printing technology, also referred to as additive manufacturing, has been around for more than 30 years. However, it was not until recently that a wide range of customers began to adopt it because of falling prices, improved software and broadening usability. In this technology, computer-aided design (CAD) software is used to create a blueprint for 3D products, and the printers deposit layers of sand, powder or plastic in an additive process to make a 3D product. The use of 3D printers has expanded beyond the realm of universities and laboratories and is now being used by architects for building prototypes, by aerospace engineers for engine parts and by orthopedic implant makers for hip and knee replacements. Large electronics companies are also using them to build consumer electronics products.

As investment in this industry has grown, improvements in CAD software have reduced product lifecycles, in turn leading to greater demand. Falling prices and expanding applications of 3D printers have propelled them into the mainstream. However, at this point, they are generally not in consumers' homes and are not yet used for mass manufacturing. Even though 3D printing has grown at a breakneck pace over the past few years, the size of the industry remains modest at approximately \$3 billion in annual sales. This is tiny when compared to the total size of the trillion-dollar global manufacturing market and even the subset of the global machine-tool market.

Growing adoption of the technology bodes well for years of robust growth ahead. In fact, Wohlers Associates, one of the leading firms studying 3D manufacturing, published in its 2016 industry report that the CAGR of the industry grew by almost 26% during 2015.¹³ IBM's Paul Brody offered a stark prediction for 3D printer adoption in 2013 that rings true today: "If you build a factory today that is not using 3D printing and advanced robotics, then there's a very real risk that your capital investment will never live to see a decent return. It will be obsolete long before you've finished paying for it."¹⁴

There are several players and competing technologies in 3D printing. Picking the winners will be challenging, but this revolutionary technology could radically transform the manufacturing of products both at home and across sectors, so from an investment perspective, it cannot be ignored.

Machine tools are ripe for change. These blunt instruments that performed competently for decades are being replaced by internet-enabled machines that help complete a feedback loop with their operators. Sensors and microchips embedded in manufacturing tools are now able to alert operators when maintenance should be performed or warn of a potential bottleneck. Robots are also replacing humans in warehouses and on factory floors. As a result, a highly automated factory today can produce the same output with one-tenth the labor. Machine vision technology — used to provide imaging-based automatic inspection and analysis for such applications as process control and robot guidance — minimizes defects while robots work 24 hours a day, 7 days a week. The payback on investments in advanced manufacturing technology is generally split evenly

between productivity improvements and labor savings.

With factories investing in automation, this industrial revolution bears little resemblance to the Rust Belt images from 50 years ago. It is, however, transforming the manufacturing economy, creating winners and losers along the way.

4. Data Wars: Moving at the Speed of Data

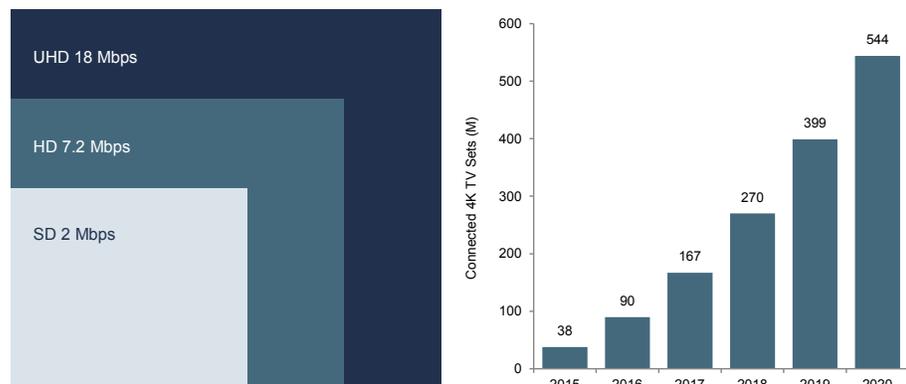
User trends continue to drive exponential growth of data and traffic. Social media now accounts for 90% of traffic¹⁵ thanks to apps like Instagram and Periscope, and users checking their social media site an average of 14 times a day. This effect is magnified at companies like Facebook, where a data inquiry can lead to a 900x increase in traffic data within its own network.¹⁶

This explosion in data due to mobility, video streaming and social media are putting strains on network performance. This chronic “need for speed” is creating bottlenecks in network performance and unlocking investment opportunities for equipment, semiconductor and service companies that alleviate these bottlenecks ranging from the internet data center to the home.

Bottom Line: As the user device experience deepens, consumers expect immediate gratification! However, due to continued strong traffic growth, web pages are actually loading more slowly. The net result is internet impatience. Every 100-millisecond delay can cost an e-commerce site 1% of revenue.¹⁷ Webscale and cloud companies are responding by raising capex to build new data centers, outsourcing more to third-party data centers and/or leasing more dark fiber between their data centers to reduce any network latency to improve performance.

Consumer appetite for bandwidth remains insatiable too. Since 2002, peak network speeds in the U.S. have grown from 1.5 mbps to 1g, or an increase of 67 times!¹⁸ Despite this speed improvement, only 21% of U.S. homes have enough bandwidth to stream in 4k today.¹⁹ Yet, Strategy Analytics estimates 11 million homes, or one of eight North American homes, will have a 4k TV set by the end of 2016.²⁰ These sets will be able to stream 4k content that is 4 times the file size of traditional HD and will further strain home broadband networks. (See Exhibit 7 below.)

Exhibit 7: Increasing Video Definition: By 2020, More than 40 Percent of Connected Flat-Panel TV Sets Will Be 4K



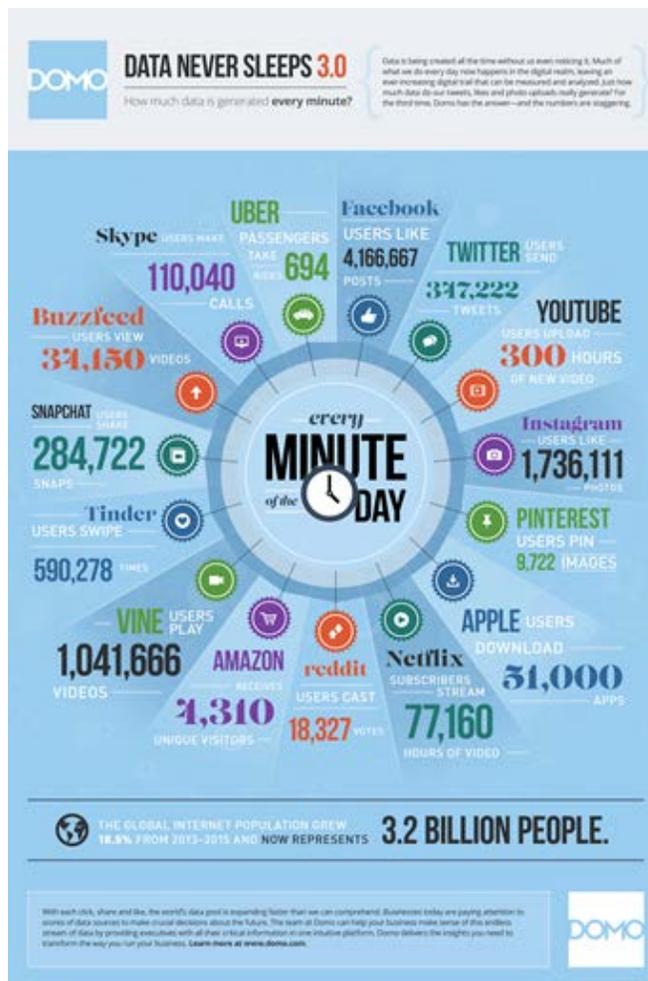
Source: Cisco VNI Global IP Traffic Forecast, 2015-2020.

Bandwidth demands are also increasing within the home because of device proliferation. Netgear estimates the average U.S. home has 12 devices connected to a wireless router. Consumer demand for bandwidth is also strong outside the home. Ericsson indicates consumer mobile data demand could increase by 6 times over the next five years.²¹

Given the prospects for years of traffic growth from content-rich applications and device proliferation, we see opportunities to invest in companies that provide the infrastructure to manage, move, store, and analyze this data in cloud-based architectures.

In a world that is experiencing changes that are the equivalent of the Industrial Revolution at the turn of the 19th century, we are witnessing the change from the Boomer generation's defining statement of "Money Never Sleeps" (Gordon Gekko in Wall Street) to the Millennial generation's defining statement of "Data Never Sleeps." (See Exhibit 8 below.)

Exhibit 8: 24/7 Data Stream



Source: Domo.

5. Biotechnology: Emerging Trends

Biosimilars

Generic drugs, which are copies of small molecule medications, have existed for decades. The ability to consistently manufacture exact copies of these drugs – which include oral medications, like pills and capsules, and topical treatments, like creams and ointments – is a difficult process but certainly not impossible. The prospect of creating commercially available biosimilars – generic copies of biotech drugs – has always proven far more daunting for several reasons:

- First, biotech drugs are far more complicated to manufacture than small molecule drugs and require greater capital expenditures and knowledge. Biotech drugs are manufactured in a living system, such as plant or animal cells, and tend to be large, complex molecules. Any company attempting to enter the biosimilar market would have to invest in bioreactors, mass spectrometers and other similarly high-priced laboratory equipment, which would require seasoned Ph.D.'s and other well-trained individuals to properly operate them.
- Second, the U.S. Food & Drug Administration has historically cast a dim view on such drugs and has seemed reluctant to yield to market entrants. While it has always set a high bar that some may view as overly cautious, the FDA would likely respond by saying that such caution has been prudent.
- Finally, doctors have resisted the idea of switching their patients from proven biotech drugs that, while expensive, do save lives.

However, the environment has changed meaningfully in the recent past. Many biotech firms that are well-capitalized and, in some cases, well-known have invested in the requisite equipment and people to create copies of some of the largest biotech drugs on the market. The combined annual sales of these drugs are well north of \$50 billion, and according to Evercore-ISI, more than 50 biosimilars are currently in various stages of clinical development in the U.S.²²

The FDA seems more open to approvals than it has been in the past, possibly because of progress in Europe, where biosimilars have been a safe and cheaper alternative to branded biotech drugs for several years. An equally likely scenario is that the industry has risen to meet the high standards for biosimilars that the FDA has always imposed. Either way, the regulatory environment for biosimilars has never seemed more inviting. In March 2015, the FDA approved its first biosimilar named Zarxio which compares to Amgen's Neulasta.

As prices of biotech drugs have risen, managed-care firms have steadily restricted availability through requirements for prior authorization, larger co-pays and tiered formularies. According to Express Scripts, the collective inflation for biotech drugs was roughly 30% in 2014, the highest annual increase on record.²³ In several surveys, doctors' frustration with the daily hassle of seeking prior authorization for their patients has reached fever pitch, preferring instead to have drugs at their disposal whose prices are lower than branded biotech and are favored by managed care.

Gene Therapy

Gene therapy is the therapeutic delivery of genes, typically proteins, into a patient's cells to treat disease. The genes are generally delivered through a virus, resulting in an involved manufacturing process that requires customization for individual patients. The development and manufacture of gene therapies have typically been very costly.

Over the past two years, more than 10 gene therapy companies have gone public. Even though the space has recently attracted a great deal of capital, gene therapy is not a very new concept; the first recorded use of a gene-therapy drug in a clinical trial occurred in 1972.²⁴ Since then, there have been some failures, including Dendreon, which became a publicly traded company, rose to prominence and then was ultimately forced to declare bankruptcy because its treatment for prostate cancer never generated enough demand. More recently, another gene-therapy company, Celladon, reported a clinical failure, which drove the stock down 80%.

The promise of gene therapy is unprecedented. Several gene-therapy companies have reported "complete responses" - in other words, a cure, in illnesses that have been typically deemed terminal.

Two primary challenges exist when investing in gene-therapy companies. The first is that clinical trials typically include no more than 10 patients, which makes the trials very risky. If one adverse event occurs, such as an unfortunate death, the trial could be doomed. This heightened binary risk makes investing in these companies tricky.

Assuming a gene-therapy company successfully develops a product and receives FDA approval, we encounter the second challenge of investing in gene-therapy stocks: affordability. Gene-therapy companies generally describe their drugs as one-time cures and estimate charging \$1 million for them. In reality, many of these will not be cures. Patients may not respond at all to the treatments or may need another treatment at some point in the future. We will likely see significant pushback on price from managed-care organizations and patients. In small patient populations – like orphan indications, or drugs intended to treat diseases so rare that sponsors are reluctant to develop them under usual marketing conditions – the uproar to high prices will likely be far more muted than in larger patient populations, such as cancer.

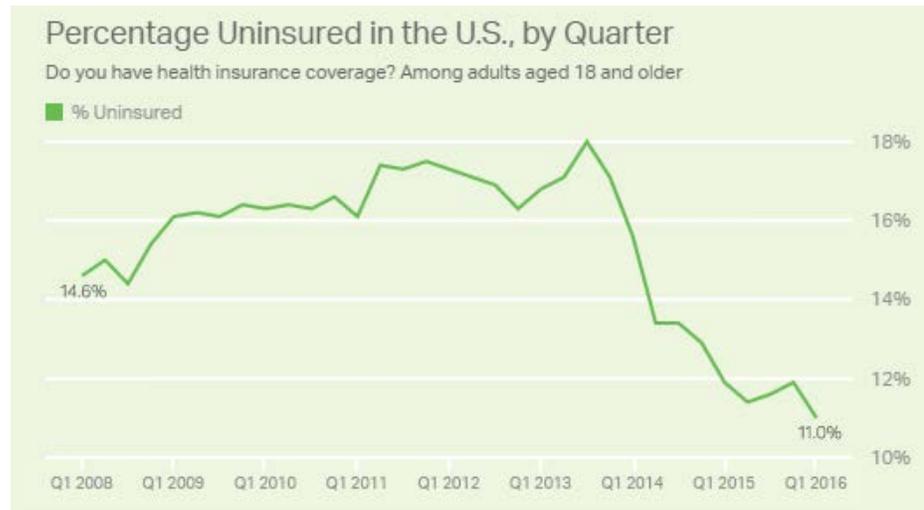
Gene therapy is an area that we continue to watch, given potential investment opportunities, but we remain cautious because of the significant risks.

6. Health Care: The Next Stages of Reform and Innovation

A Health Care Evolution

The primary objective of the Affordable Care Act (ACA) is to increase health-insurance coverage for Americans. As Exhibit 9 illustrates, the percentage of uninsured has fallen from a high of approximately 18% to 11% as of March 31, 2016, according to Gallup data. Wider insurance coverage has led to higher consumption of health care, which has benefited health-care providers through increased utilization and lower bad-debt expenses, as well as suppliers of health-care products and services.

Exhibit 9: A Drop in the Uninsured Population



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The aforementioned benefits of the ACA have contributed to multi-year outperformance in the Health Care sector. As we move through 2016 and beyond, we are cognizant that the tailwinds from the ACA may diminish. It is estimated that federal spending on health care increased by approximately \$125 billion over the past two years related to ACA, or an increase of 4% in national health-care expenditures on programs aimed at increasing the insured population.²⁵ This has led to increased utilization from the newly insured as pent-up demand for procedures such as knee and hip surgeries has benefited medical equipment and supply companies, as well as hospitals, as previously mentioned.

The rate of change in the newly insured is slowing. Incremental Medicaid expansion is a politically charged policy topic, and 2016 will not likely be a year of meaningful expansion. In addition, the health-care exchanges have not been working smoothly, and overall enrollment is projected to fall short of Health and Human Services' projections. Large insurance companies such as UnitedHealthcare have struggled to operate successfully within the exchanges and have publicly questioned the sustainability of operating within the exchange marketplace.

The uptake within the exchanges has skewed toward a higher-risk pool, which tends to comprise lower-income and higher acuity populations. Furthermore, the plans most often chosen have been the less expensive ones that offer the least amount of benefits. The offset to cheaper plans is higher out-of-pocket expenses – this ultimately leads to less affordability of health-care consumption – therefore, a disincentive for health-care utilization. Finally, demographic shifts are causing an increase in the Medicare population at the expense of the commercially insured demographic cohort. While Medicare participants consume more health care, Medicare plans typically pay less than commercial plans, thereby reducing profit margins to providers and suppliers.

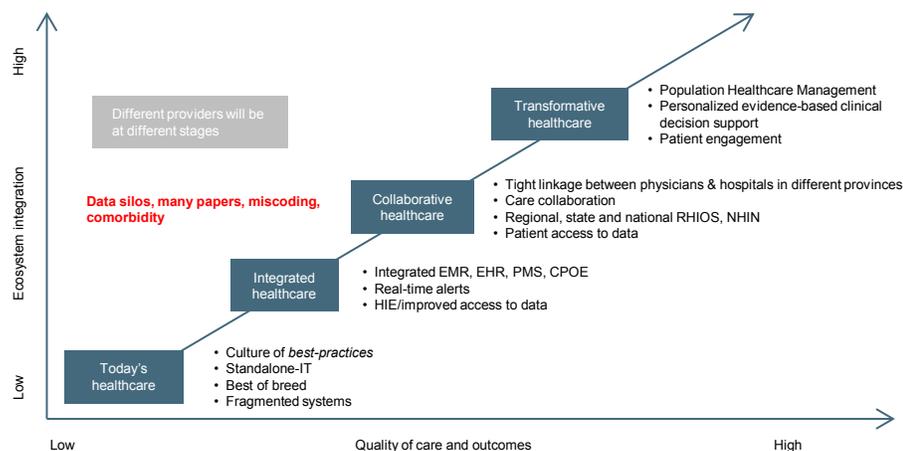
At the margin, we expect ACA-related tailwinds will dissipate and potentially turn to headwinds. Utilization and pricing are the key topics we are monitoring most closely. As 2016 is a presidential election year, we expect pricing to remain a headline risk. Our favorite investment ideas are companies that provide a better mousetrap that enables market-share gains, pricing power and end-market growth. Also, we are focused on areas within Health Care that rest outside the politically charged regulatory environment, such as dental and pet/veterinary care. Finally, we continue to explore new disruptive technologies and models such as digital health care, which remains thematic and relevant.

Health-Care Digitalization

The digitalization of health care remains a longer-term byproduct of reform. We have identified three primary areas: business intelligence-driven opportunities, population health management and big data/predictive analytics. We continue to see long-duration investment opportunities in the sector, and our attention is on innovative, disruptive technologies aimed at high return on investment (ROI) solutions. Exhibit 10 provides a blueprint of health-care digitalization:

Exhibit 10: Blueprint of Digitalization

The Opportunity to *Transform* Healthcare



Source: HP Development Company, L.P.

Several large trends are driving the digital health theme, starting with health-care reform. First and foremost, the government incentivized health-care providers to go digital through the \$20 billion Meaningful Use stimulus program. This established health-care IT as the platform for change, benefiting many vendors of electronic medical record systems, clinical and practice management systems, and workflow solutions. Moving forward, the focus is on optimizing these systems.

Second is simply the continued migration of consumers and physicians online. This demographic shift is enabling consumer-driven health care, shifts in advertising, consumer engagement, connected health, and population health. Areas of opportunity include telemedicine, health-oriented media, and wearable/ wellness companies.

Third, employer and payers shifting costs onto consumers/ employees is a core driver of consumer-driven health care. Opportunities abound for companies to provide digital tools that enable consumers to control their health-care consumption and make informed decisions.

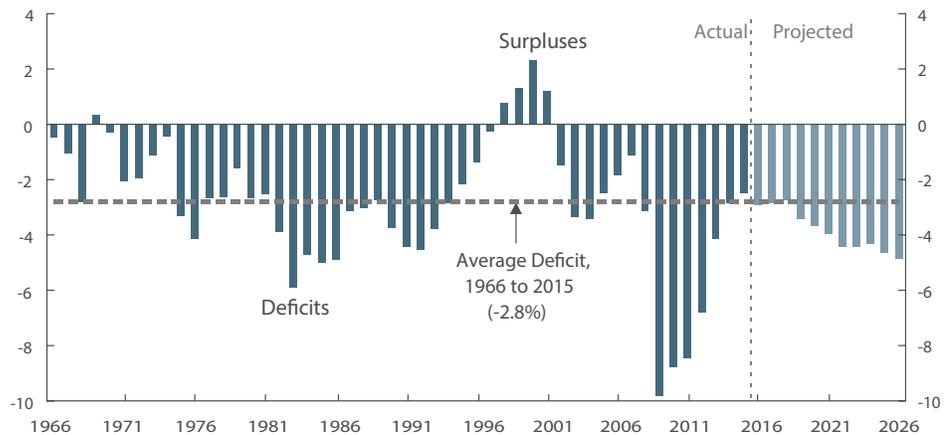
Finally, now that the health-care IT infrastructure is in place, Big Data analytics is an opportunity to bend the health care cost curve and provide a wide array of solutions to providers.

7. Fiscal Spending: Reawakened

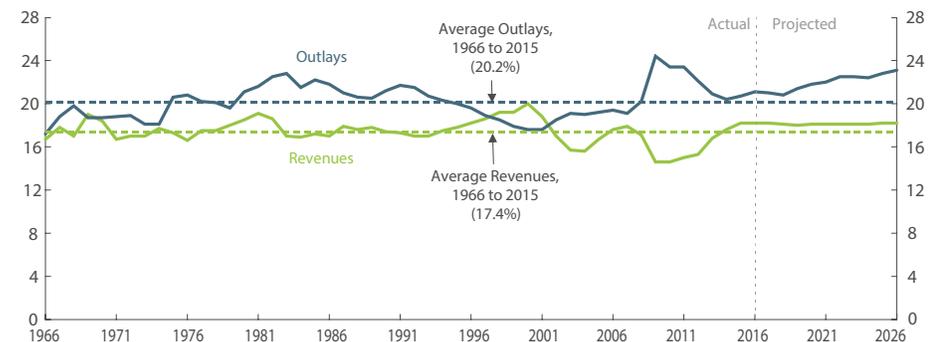
The economic cycle has reached a natural transition as the baton is passed from monetary easing to fiscal spending. While the U.S. budget remains in deficit, it is the smallest since 2008. State and local government expenditures are growing again, a trend that began in 2014, and federal spending followed, inflecting positive in 2015, as shown in Exhibit 11. We see this trend in higher government outlays continuing in 2016, which should benefit government contractors in many industries.

Exhibit 11: Improving Federal Budget Deficit = Rising Federal Spending

Total Deficits and Surpluses



Total Revenues and Outlays



Source: Congressional Budget Office. Percentage of gross domestic product.

The new federal highway bill, known as the FAST Act (Fixing America's Surface Transportation), has received a lot of press coverage. Its goal is to increase federal highway spending from the current run rate of \$40 billion annually to \$46 billion by 2020. In addition, with this multi-year funding source in place, state and local transportation authorities will likely grow more confident about funding new projects with their own coffers, which would create a multiplier effect. Infrastructure in the U.S. is clearly in need of upgrades, which we believe creates attractive investment opportunities, particularly among construction and materials companies.

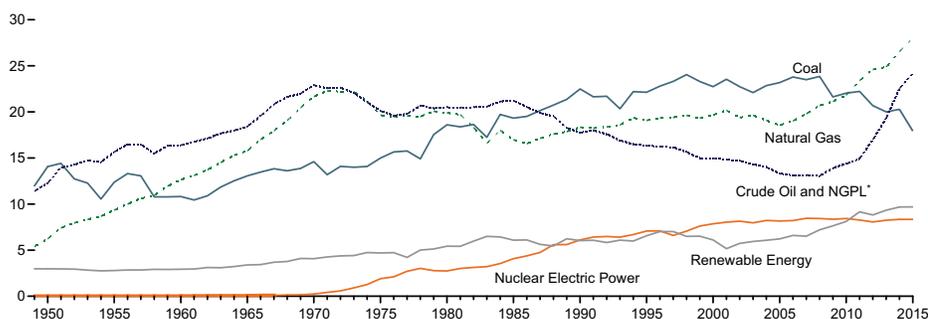
We also view the defense sector as another significant area of government spending that offers opportunities for investors. The defense budget declined each year from 2010 through 2014, but subsequently stabilized in 2015, and we expect it to grow in 2016. We are most excited about programs tied to cybersecurity, intelligence and surveillance, which are the faster-growing areas within the budget. We believe U.S. defense companies will also see strong demand in international markets, especially from NATO and the Middle East. Several defense hardware and service vendors are well positioned to capitalize on this improved market environment.

In addition to infrastructure and defense spending, we see select opportunities in a few other areas. For example, spending on renewable energy should remain robust in 2016. In December 2015, Congress passed a bill that continues incentives for both solar and wind electricity generation, including a 30% investment tax credit for solar that was extended for three years. In addition, the 2.3-cent production tax credit for wind was extended for at least another year. In the Health Care sector, the National Institute of Health's budget is also expected to grow 3.3% in 2016. While this is a modest increase, spending has been down for a full decade. For investors, the inflection in the growth rate can be more powerful than the absolute level of growth, so we also see investment opportunities for suppliers in this market.

8. U.S. Energy: Renaissance Isn't Dead

The collapse in commodity prices does not mean the U.S. energy renaissance is dead. On the contrary, Exhibit 12 highlights the technology-driven explosion in U.S. oil and gas production.

Exhibit 12: Surging Production



Source: U.S. Energy Administration. Quadrillion Btu. By source, 1949-2015. *Natural gas plant liquids.

Prices today are below threshold economics for most producers in the U.S. This will result in a major speed bump for the energy industry, but by no means does it change the big picture: The U.S. is a major swing oil producer. Economics 101 will work in 2016; low prices will cause supply to fall and demand to rise. The world will probably need the U.S. to start ramping up production to meet demand by 2017.

Foremost, we are focused on companies with balance sheets that can weather the 2016 speed bump and be poised to take future market share. We are more interested in business models leveraged to volume growth versus commodity prices. We believe natural gas infrastructure is a compelling area to invest in volume growth, as U.S. natural gas prices remain well below international prices. Significant infrastructure will be built to take advantage of the arbitrage between domestic and international prices, and while the pace of infrastructure building will be slower than we previously expected, billions of dollars will be spent nonetheless. Some examples of these projects include LNG export facilities, chemical plants, pipelines and processing plants.

In last year's paper, we wrote about the impact of the energy renaissance on the U.S. dollar, trade balances, foreign policy, and the consumer. These have all played out. U.S. dollar strength and crashing commodity prices caused an industrial recession in the U.S. This put stress on credit markets, which, if persistent, will impact the business cycle. We should see somewhat of a reversal of recent trends in 2016. U.S. oil production will fall, imports will rise and more U.S. dollars will be created. This should take some pressure off the dollar, industrial earnings and the credit cycle.

End Notes

1. United States Census Bureau, "Population Projections - Projected Population by Single Year of Age, Sex, Race, and Hispanic Origin for the United States: 2014 to 2060," April 15, 2015. <http://www.census.gov/population/projections/data/national/2014/downloadablefiles.html>. Accessed May 4, 2015.
2. Ibid.
3. Goldman Sachs, Millennials Coming of Age, <http://www.goldmansachs.com/our-thinking/pages/millennials/>
4. "About General Electric," Amazon Web Services case studies. Accessed June 7, 2016. <https://aws.amazon.com/solutions/case-studies/general-electric/>
5. "IDC Forecasts Worldwide Shipments of Wearables to Surpass 200 Million in 2019, Driven by Strong Smartwatch Growth," IDC press release, Dec. 17, 2015. <http://www.businesswire.com/news/home/20151217005178/en/IDC-Forecasts-Worldwide-Shipments-Wearables-Surpass-200>
6. Netgear Corporate Overview, April 27, 2016. http://files.shareholder.com/downloads/NTGR/2203082270x0x888131/91159AF7-857E-421F-AF20-B46136A6C89A/NTGR_IR_Presentation_1Q16_042716.pdf
7. AVG Analyst Day, 2015, May 12, 2015. <http://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=5&cad=rja&uact=8&ved=0ahUKewjD2-3D2pjNAhWjHJoKHRhBAvQQFgg0MAQ&url=http%3A%2F%2Fphx.corporate-ir.net%2FExternal.File%3Fitem%3DUGFyZW50SUQ9Mjg3t%3D1&usq=AFQjCNEgiesnumxNwURFJrI3OZm7aZni6A>
8. GSMA, "GSMA Connected Car Forum," <http://www.gsma.com/connectedliving/automotive/gsma-connected-car-forum/>. Accessed April 15, 2015.
9. <http://www.computerworld.com/article/2875572/gartner-foresees-250m-connected-vehicles-on-the-road-by-2020.html>
10. Mark Li, et al, "Global Semis and Autos: Automated Driving, Electric Cars et al? Qualifying the Opportunity for Silicon," Sanford C. Bernstein & Co., LLC, March 25, 2015.
11. Gregory K. Hinckley, 17th Annual Needham Growth Conference, January 14, 2015.
12. "Self-Driving-Vehicle Features Could Represent a \$42 Billion Market by 2025," The Boston Consulting Group press release, January 8, 2015. <https://www.bcg.com/media/PressReleaseDetails.aspx?id=tcm:12-180096>. Accessed April 15, 2015.
13. <https://www.wohlersassociates.com/press71.html>
14. Paul Brody, "The Software Defined Supply Chain: How it will change product design and the competitive landscape in every industry," Siemens Global Innovation Summit, March 22, 2013. <http://www.slideshare.net/pbrody/the-software-defined-supply-chain>
15. Integrated Device Technology Inc., 2015 Analyst Day Call, May 27, 2015. <http://www.nasdaq.com/aspx/call-transcript.aspx?StoryId=3217236&Title=integrated-device-technology-s-idi-ceo-greg-waters-hosts-2015-analyst-day-transcript->
16. Facebook; also, Goldman comm tech 7/15/15
17. Akamai Investor Summit 2016, March 7, 2016. <http://evt.dispeak.com/akamai/ir/summit2016/live.html>
18. FBR Research – summer 2016; a gigaworld conference
19. Akamai: Only 21% of U.S. homes have enough bandwidth to stream 4K. <http://www.fiercecable.com/story/akamai-only-21-us-homes-have-enough-bandwidth-stream-4k/2015-09-23>
20. John Archer, "Everybody Wants 4K: New Research Shows Massive UHD TV Sales Surge," Forbes, May 25, 2016. <http://www.forbes.com/sites/johnarcher/2016/05/25/4k-tvs-explode-new-research-shows-massive-sales-surge/#dc0bdd815f52>
21. Qorvo Analyst Day 2015. http://files.shareholder.com/downloads/TQNT/0x0x862130/AE874105-639E-4427-B103-FE1B9F3E1ACB/Analyst_Day_Deck_111615_FINAL.pdf
22. Charley Grant, "Big Pharma's Unfamiliar Biosimilar Threat," The Wall Street Journal. March 22, 2015. <http://www.wsj.com/articles/big-pharmas-unfamiliar-biosimilar-threat-heard-on-the-street-1427053839>. Accessed March 27, 2015.
23. Ibid.
24. Ben Hirschler, "TIMELINE-Milestones in gene therapy," Thomson Reuters, April 27, 2015. <http://www.reuters.com/article/2015/04/27/health-genetherapy-timeline-idUSL5N0XK41J20150427>. Accessed April 28, 2015.
25. Strategas Investment Strategy Report, November 30, 2015.

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