

Creative Disruption

A Transforming World

It is the BofAML view that we have entered a period of accelerated innovation driven by three ecosystems of creative disruption: the Internet-of-Things (IoT); the Sharing Economy; and On-Line Services. The consumer wins: tech makes things easier, less time-consuming, less uncertain, and less costly. Corporations will be disrupted: incumbents are threatened, innovators will win.

Creative Disruption & Markets

Creative disruption of tech helps explain the divide between Wall Street and Main Street. Growing tech/biotech earnings are bullish for the US dollar. We believe the economy may be larger and growing more quickly than standard statistics suggest. Tech is “micro deflationary,” but we do not believe it is “macro deflationary.”

Creative Disruption & Earth

Technology has disrupted the energy sector immensely, allowing the US to become the world’s largest oil producer with just 2.6% of the world’s reserves. The Cleantech Revolution means that wind and solar power could make up 80% of new generation capacity in the next decade and a half.

Creative Disruption & People and Government

Robotics could worsen labor market inequality: the number of industrial robots is up 72% in the past 10 years while the number of US manufacturing jobs is down 16%. Meanwhile, medical advances and the positive impact of tech on food production are increasing the longevity of the population. Technology poses major government policy issues with regard to income inequality, privacy and cybersecurity.

The Catalysts of Creative Disruption

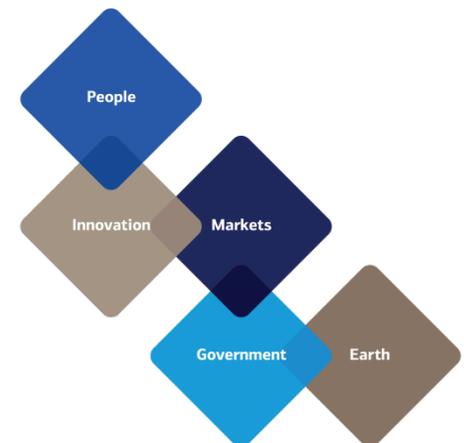
BofAML identifies three ecosystems of creative disruption: the Internet-of-Things (IoT); the Sharing Economy; and On-Line Services. IoT is expected to be a \$7tn industry by 2020, the Sharing Economy has a potential market opportunity of over \$450bn, and local consumer On-Line Services has a potential market opportunity of \$500bn. These ecosystems are the catalysts for creative disruption. They reduce barriers to entry for a new business down to imagination and the ability to maximize the ecosystem; they allow companies to improve productivity, reach new customers, introduce products and services faster than ever before; and they level the playing field between large, small and new companies, redefining competitive advantage.

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A Transforming World



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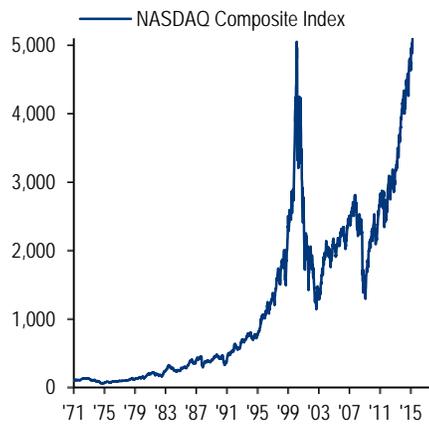
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Chart 1: The Nasdaq index



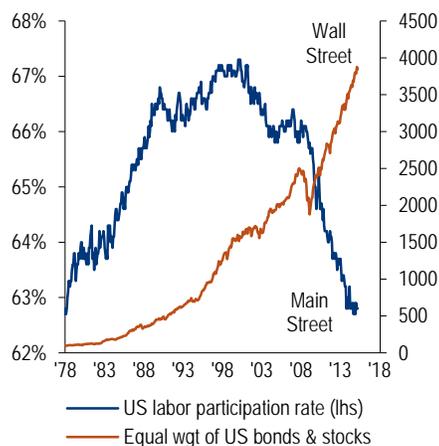
Source: BofA Merrill Lynch Global Investment Strategy, Bloomberg

A Transforming World

We live in an era where new technological, human, political, environmental and monetary frontiers are being incessantly breached. Just in 2015, the following investment milestones have been recorded and reported:

- The market cap of US tech and biotech companies exceeded that of all the companies in Emerging Markets and all the companies in the Eurozone.
- Solar Impulse 2, a plane powered solely by the sun, completed the sixth leg of its global circumnavigation.
- Tesla’s Elon Musk tweeted. “Autonomous driving is almost a solved problem – we’ll be there in a few years.”
- Europe’s Large Hadron Collider amped-up, to search the subatomic for a sign of super-symmetry.
- Chinese scientists genetically modified a gene in the human embryo.
- A vaccine for malaria (of which in 2013 there were 198 million cases) was found effective in infants and young children.
- 44% of the state of California is now experiencing “exceptional drought.”
- As of March, more than half of all Syrians were forced to flee their homes; 7.6 million are displaced within Syria; 3.9 million live as refugees overseas; and half a million are pregnant women in need of maternal care.
- A humanoid robot receptionist, ChihiraAico, currently greets customers at Mitsukoshi’s department store in Nihonbashi, Tokyo.
- Dubai plans to introduce robocops within two years “to provide better services without hiring more people.”
- Number of unemployed men and women in the EU: 23,887,000
- Number of interest rate cuts by global central banks since Lehman: 572
- Amount of government bonds trading with a negative yield: \$5.9tn

Chart 2: Wall Street and Main Street



Source: BofA Merrill Lynch Global Investment Strategy, BLS, Bloomberg

As ever, Wall Street mirrors these times. As technological and monetary boundaries continue to be pierced, new highs in the price of corporate stocks and bonds have been reached in 2015, simultaneously with new lows in the price of money. And, 5,500 days after its March 2000 high, the Nasdaq Composite Index closed at a new all-time high on 24 April 2015 (Chart 1).

We believe the two mega-trends of liquidity and technology help explain the disconnection between Wall Street and Main Street (Chart 2). Of liquidity much has been written. Less documented is the “creative disruption” of new technologies, which could be raising productivity (and thus equity prices), reducing prices of commodities, goods and services (a positive for bond prices), as well as disrupting labor markets and contributing to income inequality.

Creative Disruption

At BofAML we see cyclical and secular trends transforming the world at a rapid and meaningful pace. In 2014 we launched our Transforming World framework to analyze investment themes driving and disrupting asset markets. See prior Transforming World publications ([link](#)) ([link](#)). This report outlines the “creative disruption” of technology, on our five investment clusters of Markets, Earth, People, Government, and, of course, on Innovation itself.

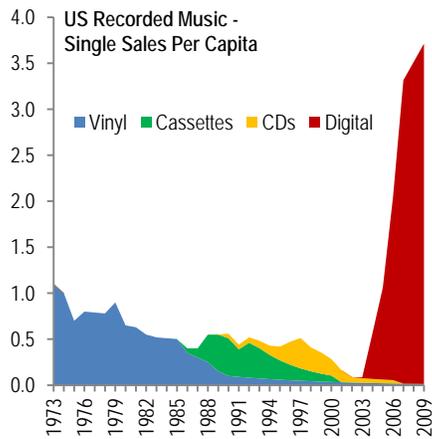
Some of our key findings are as follows:

- We have entered a period of accelerated innovation driven by three ecosystems of creative disruption: the Internet-of-Things (IoT); the Sharing Economy; and On-Line Services.
- The consumer wins: tech makes things easier, less time-consuming, less uncertain, and less costly.
- Businesses will be disrupted: incumbents are threatened, innovators win.
- The economy may be larger and growing more quickly than standard statistics suggest.
- The tech productivity debate remains unresolved. Pessimists argue easy gains from IT development and deployment are behind us; optimists say newer innovations are not adequately measured, and productivity gains are imminent. Tech is “micro deflationary” but not “macro deflationary.”
- Technology has disrupted energy immensely, allowing the US to become the world’s largest oil producer with just 2.6% of the world’s reserves.
- Innovation means wind and solar power will make up 80% of new generation capacity to 2030, posing growing threats for fossil fuels-reliant utilities.
- Robotics will accelerate. The number of industrial robots is up 72% in the last 10 years, while the number of US manufacturing jobs is down 16%.
- Medical advances and the positive impact of technology on food production is increasing the longevity of the population.
- Technology poses major government-policy issues with regard to income inequality, privacy, and cybersecurity.
- BofAML analysts identify three ecosystems of creative disruption: the Internet-of-Things (IoT), the Sharing Economy, and On-Line Services.
- IoT is expected to be a \$7tn industry by 2020, the Sharing Economy is presently worth over \$450bn, and local consumer On-Line Services is already a \$500bn business.
- Financial innovation from m-banking to e-banking to digital currency to the rise of “roboadvisors” is transforming the world of banking and asset management.

The Innovation Cluster

Innovation and the disruptive role of technology is a theme-rich cluster as the corporate and government world shifts from one of “too big to fail” to one of “too big to succeed” via eCommerce, eSecurity, robotics and genomics. Today’s technological disruption is universal, and trends in data transportability, cloud wars, the generational shift away from ownership toward experience, wearable tech, and crowd funding will create substantial divergence in investment winners and losers in coming years, in our view. Technology is having a dramatic impact on the economy and markets, and on every one of our Transforming World clusters of Markets, Earth, People, Government and Innovation.

Chart 3: Music sales since 1973

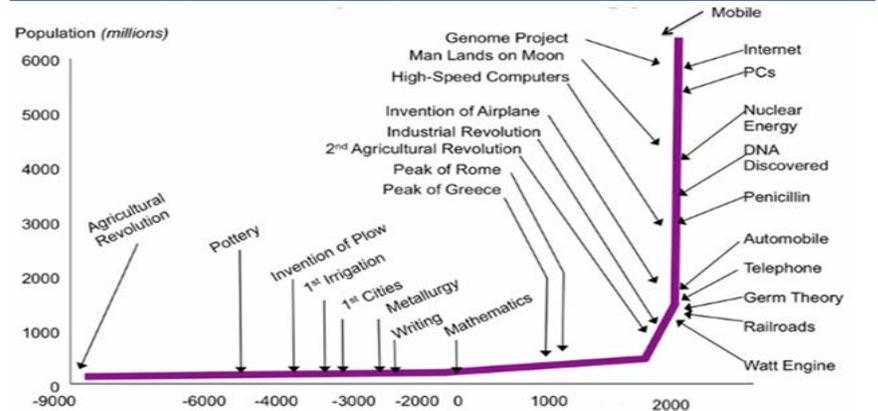


Source: BofA Merrill Lynch Global Investment Strategy, Recording Industry Association of America

BofAML’s View of Creative Disruption

The “creative disruption” of technology has always been present but is arguably accelerating in pace and impact today. Take a look at digital music sales (Chart3), the impact of Craigslist on the classified industry, Amazon on retail, Google on advertising, Skype on telecommunications, LinkedIn on recruitment, AirBnB on hotels, and so on. In coming years, autonomous autos, human genomics, social robots, Lethal Autonomous Robots are all likely to impact human lives as well as the demand, price and efficiency of existing products. Basically, the speed at which technology is changing in what has been dubbed the “Second Machine Age” has the potential to quickly change the economy, the business sector and society (Chart 4). Always creative, always disruptive, there will be many winners and losers.

Chart 4: Human population and technological innovation



Source: BofA Merrill Lynch Global Investment Strategy, Robert Fogel, University of Chicago

The BofAML view is that we have entered a period of accelerated innovation, made possible by the confluence of many complimentary enabling technologies required to change a business model. Think of it like this – big technology innovations often require many smaller technology advances first. This is the building block approach to disruption – and we believe the majority of building blocks are now in place.

Advances in semiconductors, data information technology systems and communications, as well as software, internet infrastructure, cloud, and software applications have put the tools and building blocks required to create a disruptive shift directly into the hands of innovators with the knowledge in a particular industry or market.

Three Ecosystems of Creative Disruption

BofAML identifies three ecosystems of creative disruption: the Internet-of-Things (IoT); the Sharing Economy; and On-Line Services. IoT is expected to be a \$7tn industry by 2020, the Sharing Economy presents a market opportunity of over \$450bn, and local consumer On-Line Services is also potentially a \$500bn industry. These ecosystems are the catalysts for creative disruption. They reduce barriers to entry for a new business down to imagination and the ability to maximize the ecosystem; they allow companies to improve productivity, reach new customers, introduce products and services faster than ever before; and they level the playing field between large, small and new companies, redefining competitive advantage.

As we look at the disruptions that our research analysts highlight across many industries and companies, we see commonality in how the innovations come about. These commonalities appear to us to be based on several different disruptive models or distinct ecosystems.

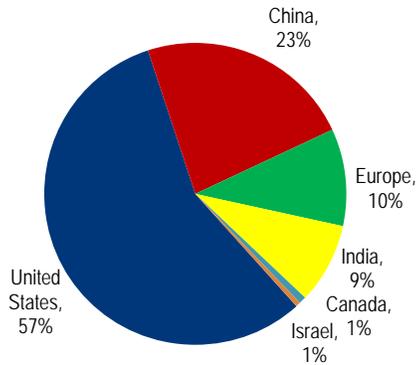
- **Internet of Things:** depends on Machine to Machine (M2M) technology.
- **Sharing Economy:** depends on the ability to change what people are willing to do, driven by social networking.
- **On-line Services:** depend on technology to drive improvements in traditional services.

The fact that these ecosystems provide development platforms and models for innovators is the driver of the acceleration in creative disruption. Within each of the ecosystems, platforms for specific applications are being developed that require expertise in the vertical where a company will compete, but the underlying building blocks are similar.

Table 1: Many disruptions reflect similar technology ecosystems

Ecosystem 1	Ecosystem 2	Ecosystem 3
Internet of Things (IoT)	The Sharing Economy	Services shift on-Line
The offer	The offer	The offer
Unprecedented Monitoring and Management Capability that will greatly enhance corporate and consumer efficiency and productivity. A \$7tn industry by 2020E	Sharing Assets is becoming less time consuming and costly. A survey of US adults indicated 83% would share rather than own if it was easy. Both B2C and C2C benefit	Faster, more convenient services. Better results from sophisticated customer experience with on-line payments, background checks, reviews, dynamic pricing,
Key technology enablers	Key technology enablers	Key technology enablers
<ul style="list-style-type: none"> • Affordable Sensors & Data Monitors • Mobile Operating systems • Mobile Communications • Big Data - both Storage & Analytics • Machine Learning, M2M 	<ul style="list-style-type: none"> • Mobile Operating Systems • Smartphone Capability • Big Data Analytics • Cybersecurity 	<ul style="list-style-type: none"> • eCommerce shipping logistics and IoT shipping companies • Mobile connectivity • Financial Technology • Big Data analytics
Issues	Issues	Issues
Artificial Intelligence (AI) mis-perception	Potential unforeseen impact on asset prices	Shift more of the economy to a service base and impact brick and mortar businesses

Chart 5: Venture Capital mega-investment



Source: BofA Merrill Lynch Global Investment Strategy, EY: Venture Capital Review, 2014

Creative Disruption & Markets

The impact of technology is writ large across financial markets in 2015. The share of tech and biotech within global corporate earnings is at a 20-year high (Chart 6). And the market cap of US tech and biotech companies recently exceeded that of all the companies in Emerging Markets and all the companies in the Eurozone.

Tech is unquestionably a US-led industry. Ernst & Young estimates that the US attracts 57% of large-scale global venture capital investment (Chart 5). The World Intellectual Property Organization reports that the US filed 29% of global IP applications in 2014. Global capital flows to tech industries is bullish for the US dollar.

More controversially, technology can help explain the disconnection between Wall Street and Main Street. Of liquidity, much has been written. Less documented is the “creative disruption” of new technologies, which could be raising productivity (and thus equity prices), reducing prices of commodities, goods and services (a positive for bond prices), as well as disrupting labor markets and contributing to income inequality. As was the case in the roaring '20s, dramatic technological change is causing investors to discount (and perhaps eventually to over-price) “abundance,” better resource allocation and a boom in profits and productivity. BofAML already warned of the potential for a speculative fervor based on tech to emerge (see the iBubble scenario – [link](#)).

Chart 6: IT and BioTech earnings as a percent of MSCI ACWI World earnings

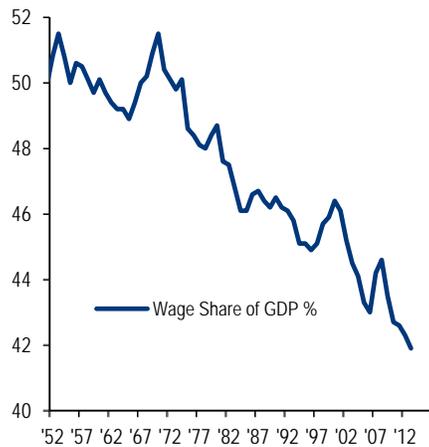


Source: BofA Merrill Lynch Global Investment Strategy MSCI DataStream,

Tech & the Macro

The macro debate on the impact of technology on the economy and the financial markets is still contentious and unsettled, as is the quantification of technology and innovation on economic growth, inflation, productivity and profits. Below we present the bear case, the bull case, and some thoughts of our own.

Chart 7: Falling share of output as wages



Source: BofA Merrill Lynch Global Investment Strategy, BLS, Haver Analytics

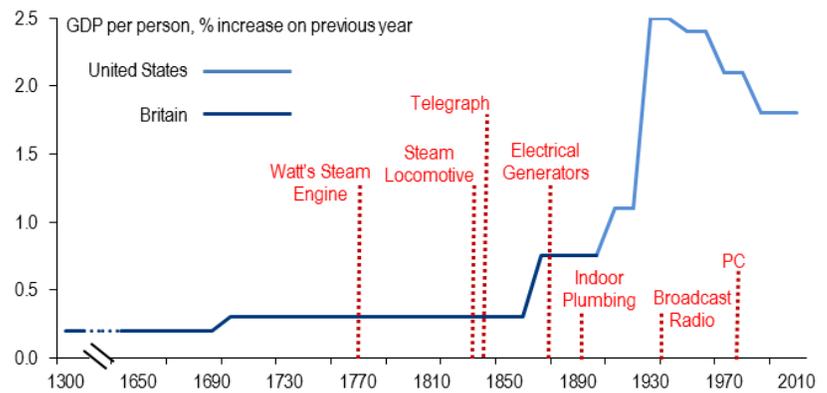
The Bear Case

The bear case is that big technology boosts to growth, income and productivity are largely behind us, and that today's technology is more "disruptive" than "creative" for economic activity.

For example, Economist Robert J. Gordon in a National Bureau of Economic Research (NBER) paper argues that major technological advances in the internal-combustion engine, telecommunications and electricity demonstrably boosted productivity over the last two centuries. The impact of computers in recent decades needs to be placed in this context, as part of "one big wave" of change (Chart 9). Gordon argues that computers have not prevented the productivity from "cresting." This is the popular "productivity paradox," which notes the apparent contradiction between the remarkable advances in computer power and the relatively slow growth of productivity in the economy in recent decades. As Economist Robert Solow put it in 1987, "You can see the computer age everywhere but in the productivity statistics."

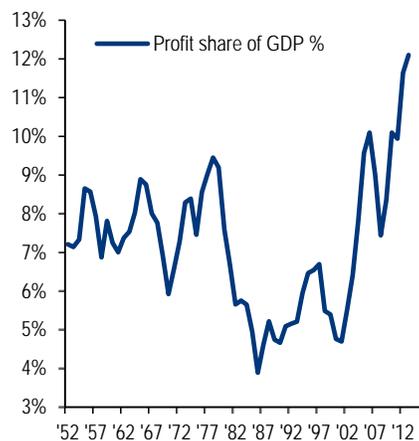
More recently, venture capitalist Peter Thiel also pointed to the relative lack of progress in transportation and medicine since the early 1970s as evidence that technology is proving far less transformative than hyped. As Thiel has infamously argued: "We wanted flying cars, instead we got 140 characters."

Chart 9: One big wave



Source: BofA Merrill Lynch Global Investment Strategy, "Is US Economic Growth Over?", by Robert Gordon, NBER Working Paper, 2012: *The Economist*

Chart 8: Rising share of output to profits



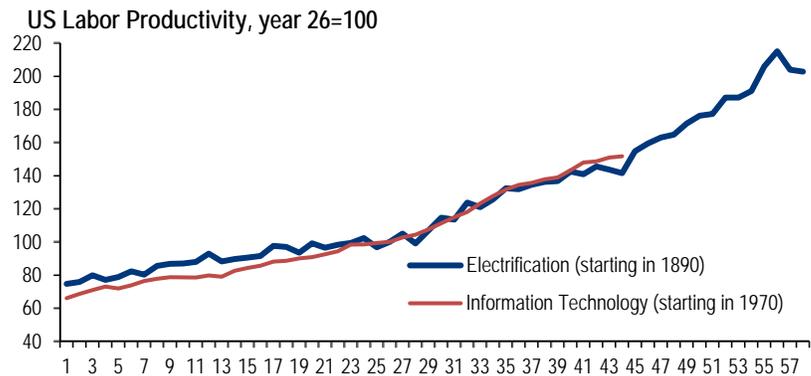
Source: BofA Merrill Lynch Global Investment Strategy, Bureau of Economic Analysis, Federal Reserve

And, of course, there is the bearish view of "technological unemployment," which could retard economic growth and consumer spending. The historic argument for "technological unemployment" is extremely thin. After all, the unemployment rate today in the US – the economy where technological disruption is most embraced – is just 5.5%. Still the speed and breadth of technological disruption may exacerbate the contrasting secular trends in profits and wages as a share of GDP (Charts 7 and 8). The number of industrial robots is up 72% in the last 10 years, while the number of US manufacturing jobs is down 16%. The Boston Consulting Group recently predicted that machines, which now account for 10% of all manufacturing tasks, are likely to perform about 25% of them by 2025. More pertinently, in the future, machines will perform more and more tasks in banking, logistics, health care and other service sector industries.

The Bull Case

The bull case begins with the reality that there is a long lag between innovation and the general application of a technology that can improve life, as well as raise economic growth and productivity. After all, it took decades after the innovation of electricity in the 1880s for economic growth to prosper directly. US labor productivity improved in fits and starts following the innovation of electricity, but eventually, large productivity gains were recorded (see economist Chad Syverson's *Will History Repeat Itself* paper). Syverson's research shows that the boost to productivity from tech is proceeding at a similar pace to that of electricity (Chart 10).

Chart 10: IT echoing electrification

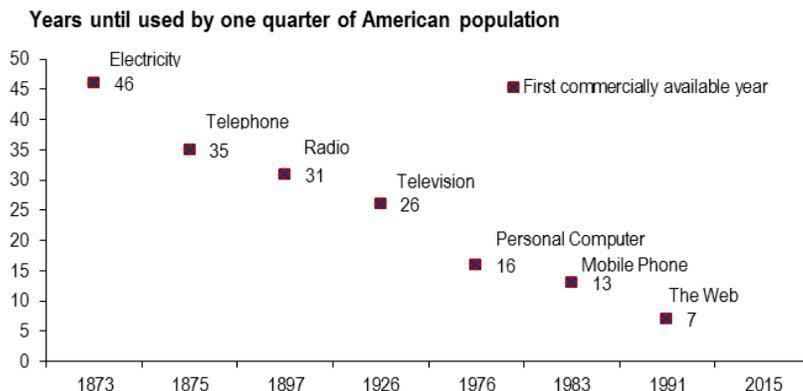


Source: BofA Merrill Lynch Global Investment Strategy, Chad Syverson: University of Chicago, Kendrick (1961), Byrne, Oliner, and Sichel (2013)

The bolder bull case is encapsulated in the book *The Second Machine Age* by Erik Brynjolfsson and Andrew McAfee, which argues that the global economy is on the cusp of a dramatic growth spurt driven by smart machines that can take full advantage of advances in computer processing, artificial intelligence, networked communication and the digitization of just about everything. They suggest that we are on the cusp of seismic change fuelled by accumulation of advances such as the capacity of algorithms to handle data growing exponentially, autonomous vehicles, three-dimensional printing, and so on.

Ray Kurzweil, director of engineering at Google, inventor, and futurist, shows that the length of time it takes for technological innovation to become commercialized and available to the mass market has declined at each stage of innovation (Chart 9). He predicted that by 2023, the average \$1,000 laptop will be able to calculate at the speed of the human brain. Kurzweil argues the exponential growth in computing capacity will lead to what he calls the "Singularity," as "artificial intelligences" surpass human beings as the smartest and most capable life forms on Earth.

Chart 11: Technology adoption rate decline



Source: BofA Merrill Lynch Global Investment Strategy, Ray Kurzweil, Singularity.com

BofAML on Tech & the Macro

“Creative disruption,” the rapid shift of market power due to emerging technologies, is much more of a microeconomic than a macroeconomic phenomenon. It has a stronger impact on relative performance across firms and industries, and reallocations among them. Yet there are potentially broader implications for productivity and growth — both their measurement and otherwise — as well as wages and employment, and possibly inflation.

BofAML Senior US Economist Michael Hanson makes the following four key macro points on growth, productivity, employment/wages and inflation below.

On growth: GDP cannot count what is not bought

GDP measures the value added of all goods and services produced in a given time period. But in order to be counted, the good or service in question needs to be transacted at some price, typically market determined. A variety of economic transactions are outside the market, however, and thus missed completely by GDP calculations even though they matter for overall well-being. As the sharing economy grows, and more transactions are not directly monetized, the uncounted part of GDP rises. This presents a challenge to the utility of GDP statistics. Put another way, the economy may be larger and growing more quickly than standard statistics suggest.

This is not a new problem, of course. US government statistical agencies have long tried to incorporate intangibles of one form or another into GDP measurement¹. But current GDP only indirectly captures investment and consumption of data. And adding internet services distributed for free (email, cloud storage, music streaming, etc.) is a much larger challenge for measuring the size of the economy.

¹ For example, in the 1990s the Bureau of Economic Analysis (BEA) made a series of comprehensive revisions to GDP that incorporated better measures of the prices of high-tech goods, added new technology-based services that previously were uncounted, and included software as part of business investment. In the 2000s, the BEA added R&D accounts to GDP; during that time the share of prices adjusted for tech-induced quality changes rose to 20% of the total. More recently, intellectual capital was added to the investment component of the GDP accounts as part of the 2013 revisions, which means spending on patents and copyrights, for example, are now seen as investments instead of pure expenditures – the same treatment given to software in 1999.

How much should these items be valued? Economic research on individual items suggests they could be large: Brynjolfsson and Oh (2012), for example, estimate that the internet created around \$2600 of value per user per year – equivalent to adding 0.3% to reported GDP. But we lack a comprehensive way of consistently valuing these services.

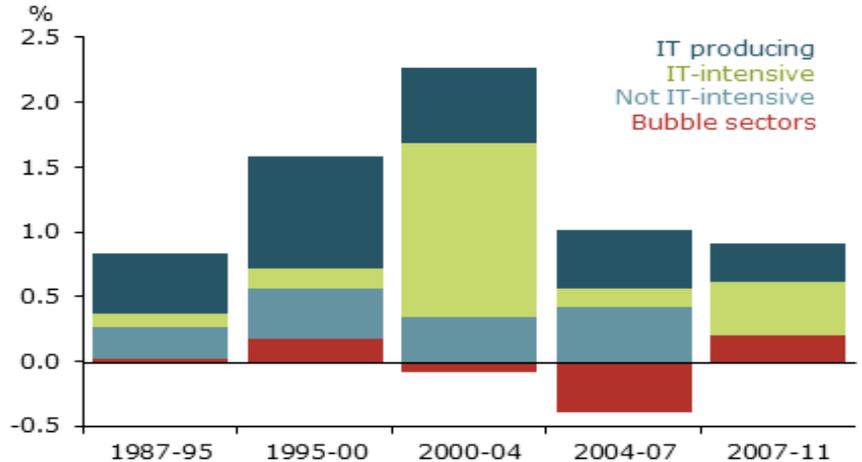
More broadly, a large portion of official government statistics is collected via surveys that use clever statistical approaches to approximate a broader population, but have unavoidable sampling errors and potential biases. Social scientists have just started to investigate the plethora of digitized data collected directly through various government programs, licensing and public reporting requirements, and the like. Such “administrative data” may be able to better quantify what is going on in the broader economy than current data releases – once the data become “big,” distributed more broadly, and are subject to sophisticated analytics. There may be privacy issues – not to mention political pressure to stop reporting data that disagree with an individual’s ideology, or bend it to support particular interest groups – but this represents a promising means to improve the cost-benefit of government programs and limit waste. Even governments need not be immune to creative disruption.

On productivity: the debate rages

The challenges of counting up GDP on a quarter-by-quarter basis may pale in comparison to measuring the longer-run contribution of technology to economic growth, namely productivity. To a first approximation, the difference between output and the contribution of observed inputs like capital and labor has some claim to be a measure of productivity: if more output can be produced with the same inputs, we must be more productive. This gap is an inferred measure of total factor productivity (TFP), often called the “Solow residual” based on pioneering research on growth and productivity by Robert Solow in the 1950s and 1960s.

While this is by far and away the most common way to measure productivity, it is far from perfect. John Fernald at the San Francisco Fed has developed a more comprehensive measure of utilization-adjusted TFP. His work has turned up several interesting attributes of US productivity growth in the last few decades. Chart 12 shows that information technology (IT)-producing sectors were the largest contributors to TFP growth between 1987 and 2000. While they were still sizable in the first half of the 2000s, the sectors that were intensive *users* of IT added substantially to TFP growth. This finding is consistent with the widely held view that it takes time for innovations to disseminate through the economy. (See Syverson above.) Production had to be reorganized to take advantage of the development and promulgation of IT.

Chart 12: Contributions by industry type to TFP growth (Fernald and Wang, 2015)



Source: BofA Merrill Lynch US Economics, Federal Reserve Bank of San Francisco

However, the striking finding of Fernald is that productivity growth slowed sharply in the years *before* the global financial crisis (2004-2007), largely because IT-producing sectors slowed slightly, while intensive IT-using sectors slowed dramatically. In the data available since the Great Recession struck, the TFP contributions of IT-producing sectors have shrunk further, while those of intensive IT-using sectors have only recovered modestly.

Overall, TFP growth remains much lower post-crisis than before; as discussed above, this is an active area of debate among economists. The pessimistic view (held by Fernald) is that the easy gains from IT development and deployment have already run their course. The optimistic view is that newer innovations are not being adequately measured in the data, and they either will be on the rise or there is a lag in the diffusion (much like IT in the 2000s). Extrapolating the recent trends supports the pessimists; assuming the recent trends will not apply in the future is the prerogative of the optimists.

On employment & wages: the outcome is inequality

One of the great concerns of innovation is the potential disruptive effect upon the labor market. “Technological unemployment” is a long-held fear that is more relevant for certain individuals than whole economies – at least for now. The greater challenge is how creative disruption can give rise to winner-take-all and monopolistic outcomes. These can actually create incentives for entrenched incumbents to spend more effectively defending their monopoly rents than to innovate further: consider Microsoft’s defense of its Windows operation system near-monopoly for a time. Similarly, the first to market may benefit from sizable first-mover advantages that create strong network effects for the first, rather than the best, technology. In addition, digital innovations create much larger reach for any given entrepreneur, as near-zero marginal cost allows firms to scale up easily. All of these trends tend to concentrate market power and wealth, and thus can exacerbate trends toward greater inequality.

In addition, skill-biased technological change rewards the highly educated and highly skilled over others. More recently, innovative uses of data collection, processing and automation have reached well beyond the factory floor: bank tellers, x-ray technicians, paralegals, secretaries, and many other service positions that once were middle-skill and middle income have been disappearing

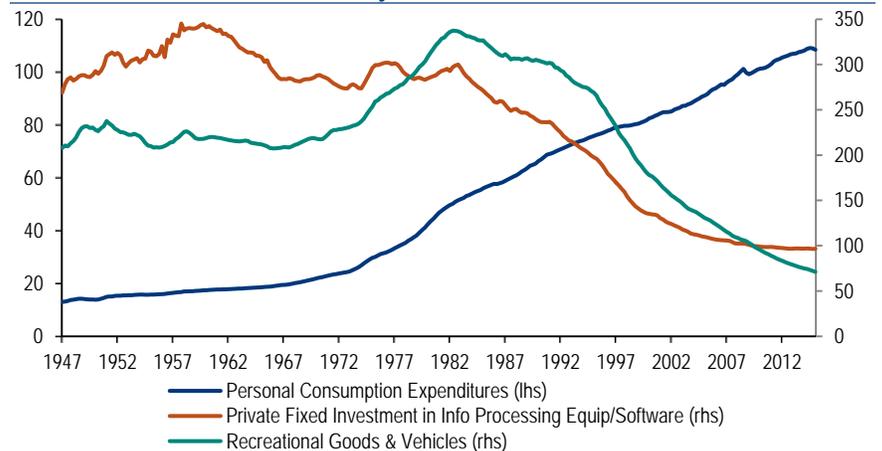
to the relentless rise of innovation. It may be only a matter of time before jobs we now consider higher skill and higher wage are similarly replaced. As just one example, sophisticated automated systems for wealth management are already under development. Like so many digital services, these have low marginal costs and scale easily, resulting in much lower costs to produce and thus prices for consumers – but also fewer opportunities for employees.

The limiting case here would be general purpose robots that are effective substitutes for human labor but at a fraction of the cost. In that case, widespread unemployment could be an outcome – it depends on whether there develops a large enough sector in the economy where humans have a comparative advantage. This could be the arts and entertainment, or personal care services, or areas that involve deeper analytical thinking that is not amenable to existing forms of AI. The transitions from agriculture to manufacturing, and then manufacturing to services, were feared by some to result in mass unemployment. What happened instead is that some old jobs gradually disappeared as technological progress supplanted them, while new – often unanticipated – jobs arose in their place. This was not always ideal for individual workers, who may have found it very difficult or near impossible to make the kind of transitions needed to gain new work, but overall neither of these transitions caused a massive rise in unemployment. The same may well be true for the next transition.

On deflation: yes, but in a micro not a macro sense

Beyond the labor market, another concern is that the creative disruption of technological progress is inherently deflationary. Chart 13 shows that the secular downtrend in the price of durable consumption goods for recreation (all tech-related) and business investment in ICT equipment and in software has not led to a pronounced slowdown in the overall personal consumption price index. In other words, the "micro deflation" of technology has not had overall implications for the traditional measurement of inflation.

Chart 13: Micro-deflation is not economy-wide



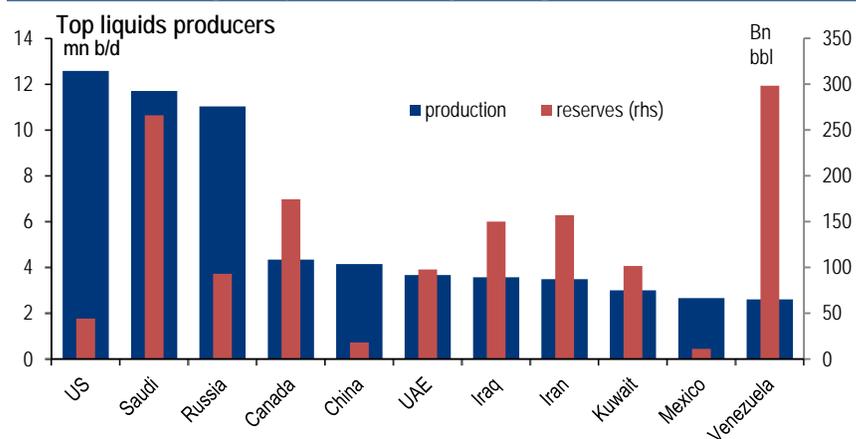
Source: BofA Merrill Lynch US Economics, Bureau of Economic Analysis, Haver Analytics

Creative Disruption & Earth

- A good example of tech disruption is in the energy industry, where the death of OPEC was caused by technology.
- Technology has allowed the US to become the world's largest oil producer with just 2.6% of the world's oil reserves. We forecast that crude oil demand will fall by 3.5m barrels a day in the next 3-4 years solely due to fuel efficiency gains driven by new technologies.
- Cleantech innovation is also allowing solar and wind to become disruptive.

The US is now the world's largest producer of crude oil and liquids, producing 12.6 million barrels a day. And yet the US has just 2.6% of global oil reserves. Compare this to Venezuela, a country with 18% of the world's oil reserves, but the current ability to produce just 2.6 million b/d (Chart 14). How did this happen? Technology.

Chart 14: US is the largest oil producer with only 2.6% of global reserves



Source: BofA Merrill Lynch Global Commodity Research, BP, IEA

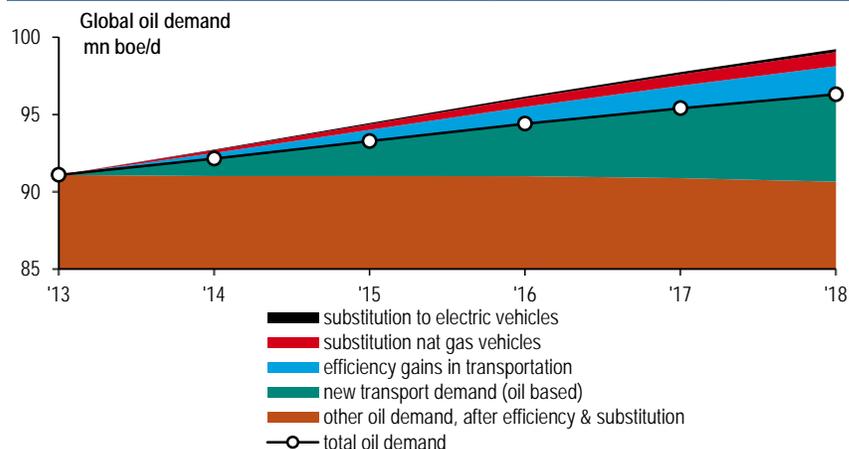
Shale gas extraction is not a new technology. Shale was first extracted in Fredonia, New York, in 1825. Driven by the oil crisis of the 1970s, the U.S. government started incentivizing shale technology improvements through tax credits in 1980s, and by 1998, Mitchell Energy was in a position to use new technologies, such as micro-seismic imaging, to achieve economic shale fracture. The big inflection point for shale production arrived in 2005 for natural gas and 2007 for oil. Since then supply has increased sharply.

Head of BofAML Commodity Strategy Francisco Blanch and Strategist Max Denery calculate that the productivity of US shale wells has increased by roughly 50% in the last five years thanks to technological improvements, allowing increased fracking stages and a longer length of horizontal drilling. New drilling techniques have also reduced drilling times, thus lowering the cost of production. The increased supply of energy has been so dramatic that OPEC dominance of oil markets has effectively been ended by advances in fracking technology, which increased production and productivity, and dramatically reduced the cost of oil.

Blanch and Denery also calculate that via a rapid increase in fuel efficiency around the world, especially in the US, technology will reduce oil demand by 3.5 million b/d by 2018, or 0.7 million b/d of potential incremental demand every year

(Chart 15). Note miles per gallon of new vehicles sold in the US has increased from 25 to 31 miles in just six years. Just as fracking technology has led to the break-up of OPEC's powerful cartel, new technological advances in electric cars, natural gas vehicles, and energy storage are threatening to break up the oil industry's monopoly on the transportation sector. As a Saudi oil minister once said: the Stone Age did not end because of a lack of stones. It is now increasingly clear that neither will the Oil Age end because of a lack of oil.

Chart 15: New technological advances are disrupting oil's transport monopoly



Source: BofA Merrill Lynch Global Commodity Research, EIA

BofAML's view on the Cleantech Revolution

According to Sarbjit Nahal, "Cleantech" – including solar and wind – continues to gain traction with more than \$300bn in new investments in 2014 (+15% YoY), and renewables including hydro now accounting for a growing share of power production (13% in the US; 19% in the UK; 22% in China – source: BNEF). According to Nahal's [analysis](#) of long-term global needs, wind and solar panels are likely to dominate 2015-30 global electricity generation capacity additions (up to 80% joint share). Building new coal, nuclear and hydro plants is increasingly more difficult, thus wind, solar and, to an extent gas, seem the most viable options. Cleantech power generation capacity is expected to reach 279GW by 2030. China's low-carbon additions from 2015-30E are expected to be equivalent to 90% of US 2015 capacity – source: BNEF).

Technology is also allowing solar power to prove disruptive, Nahal notes. Installed pricing, including equipment, customer acquisition, permitting and financing costs, continues to fall sharply ([link](#)), while demand grows strongly. The decline in cost, and increasing efficiency of solar panels, could lead to large innovative disruptions to the way existing utility businesses operate. We at BofAML expect global solar demand to grow 15% YoY in CY15 (versus 18% in CY14) amid low poly-silicon prices and rational capacity additions ([link](#)).

Low cost is also making [wind](#) a more established energy source. The levelized cost of energy (LCOE) of onshore wind has fallen significantly in the past five to six years, helped by factors such as technological improvements in turbine efficiency, better wind sites and cheaper financing. We estimate that onshore wind is either the cheapest or close to being the cheapest source of energy in most regions globally. In some parts of the world, onshore wind does not need any subsidies (for example, LatAm), while in others it is still more expensive than existing fossil generation (EU/US) but is still competitive with new plants.

Energy storage is also emerging as the “Holy Grail” technological breakthrough that could change how energy is produced, consumed and valued. Storage is the ultimate goal of cleantech because it enables: (1) the electrification of transport; (2) the smoothing of renewable intermittency; and (3) the elimination of spatial and temporal price disparities. Home and grid-scale battery storage solutions are likely to see greater near-term adoption due to lower costs of \$225/kwh today and down to \$100 or less by 2020, net metering, as well as high electricity prices.

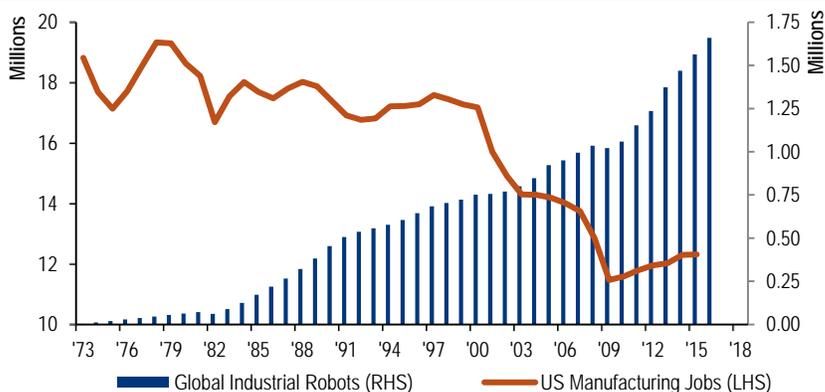
Disruption, People and Government

- Robotics could worsen labor market inequality. The number of industrial robots is up 72% in the last 10 years while the number of US manufacturing jobs is down 16%.
- Medical advances and the positive impact of tech on food production is increasing the longevity of the population.
- Technology poses huge government policy issues with regard to income inequality, privacy and cybersecurity.

Nike, Inc. employed 106,000 fewer contract workers in 2013 because of greater automation. The number of industrial robots is up 72% in the last 10 years while the number of US manufacturing jobs is down 16% (Chart 19). Oxford University recently forecast that 45% of all US jobs will be replaced by robots within the next 20 years.

The trend to automation continues to be driven by a corporate focus on cost competitiveness, outsourcing of engineering functions, increasing quality requirements and rising wage inflation across emerging markets. In our view, companies that should benefit from robotics include those involved in industrial automation and robots, robotic surgery, control systems and equipment, and industrial PCs/smart planet.

Chart 16: Jobs versus robots

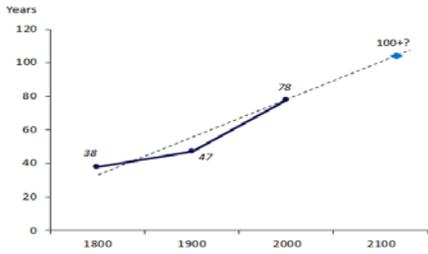


Source: BofA Merrill Lynch Global Investment Strategy, IFR Statistical Department, US Bureau of Labor Statistics

While robots threaten to reduce wages and employment, even more controversially the fields of biotech and genomics have the potential to “square the circle” and extend life and the nature of life, arguably changing the distribution of skills across a population. Bank of America Merrill Lynch Head of Global Wealth and Retirement Solutions Andy Sieg notes that health care improvements keep lowering the death rate (Chart 17). In the last two centuries the average lifespan doubled (Chart 18). This has enormous implications for Sieg’s world of

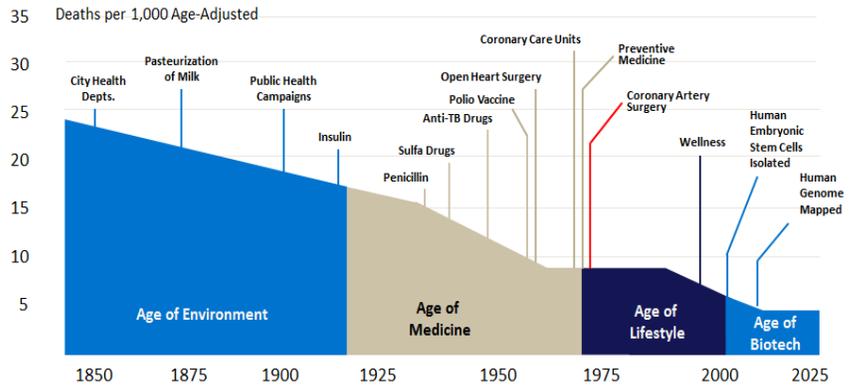
financial planning since the over-50-year-old population in the US controls up to 80% of US aggregate net worth. The average wealth of US households headed by adults aged 50 or above is roughly \$765,000, compared with just \$225,000 for those headed by 25-50 year-olds (source: Oxford Economics).

Chart 18: The last two centuries have seen a doubling of the average lifespan...



Source: BofA Merrill Lynch Global Investment Strategy, US Census Bureau

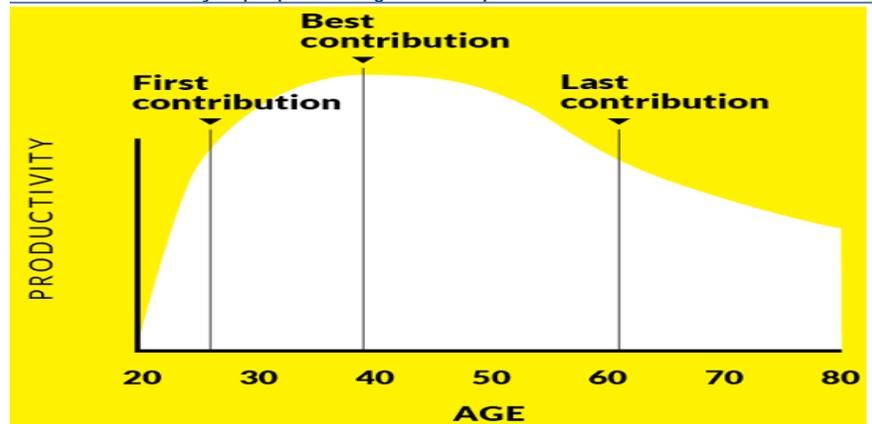
Chart 17: Health care improvements keep lowering the death rate



Source: BofA Merrill Lynch Global Investment Strategy, AgeWave

Not all agree this is a good thing. Oncologist and bioethicist Ezekiel Emanuel argues that life after 75 becomes a slow and arduous decline, where creativity is stunted, productivity collapses and one is an increasing burden on one's progeny. "The age-creativity curve (Chart 19), especially the decline, endures across cultures and throughout history, suggesting some deep underlying biological determinism probably related to brain plasticity."

Chart 19: Productivity of people with high creative potential



Source: BofA Merrill Lynch Global Investment Strategy, Ezekiel J. Emanuel, *The Atlantic*

The creative disruption of technology likely will create a host of issues for government: the "cost" of war will be reduced; cybersecurity is already a big issue; and income inequality may worsen as technology creates and concentrates wealth, widening the divide between the prosperity of capital relative to labor. On the flip side, governments willing to ignore vested interests and allow state-protected monopolies to benefit from creative disruption stand to gain a lot.

BofAML on Cybersecurity

Sarbjit Nahal and team have closely studied the issue of cybersecurity. They estimate the number of cyber-attacks per day rose to an estimated 118,000 per day in 2014, up 48% from 2012 (source: PwC). Between 90-100% of companies are being hit, with US companies facing an average of 138 successful attacks per week (up 176% over five years – source: Ponemon). Recent major attacks include Anthem, Sony, eBay, Home Depot, JP Morgan and Target. Worryingly, 70% of breaches are going undetected (source: Verizon) – and the attacks are becoming more sophisticated, with hackers spending an average of 205 days in systems before discovery. Only 31% of organizations are able to discover breaches using their own cyber resources (source: FireEye). The average successful cyber-attack cost \$12.7 million per US company in 2014 (up 96% over five years – source: Ponemon). Cyber-attacks are also becoming a homeland security threat, with some of the fastest growth in attacks in the US coming against energy infrastructure and critical manufacturing (source: DoHS). Cyber-crime costs the global economy an estimated \$0.5 trillion annually (source: CSIS, McAfee).

With cybersecurity attacks and critical infrastructure breakdowns now recognized among the top five global risks today (source: WEF), global spending on cybersecurity reached \$71bn in 2014 (up 7.9% YoY – source: Garner). We expect companies to increase investment significantly, with spending reaching \$76.9bn in 2015E (source: Gartner). There are increasing signs of regulation in both the US and Europe. In our view, companies that should benefit from cybersecurity include content security, network security, data protection, hardware based on software blades, identification and analyzing machine-generated big data.

Creative Disruption & Innovation

It is the BofAML view that we have entered a period of accelerated innovation. This has been made possible by the confluence of complementary enabling technologies that are required to complete a change in the way business is done. Think of it like this – big technology innovations often require many smaller technology advances first.

This is the building block approach to disruption – and the majority of building blocks are now in place. Advances in semiconductors, data information technology systems and communications, as well as software, internet infrastructure, cloud, and software applications have put the tools and building blocks required to create a disruptive shift directly into the hands of innovators with the knowledge in a particular industry or market.

As we look at the disruptions that our research analysts highlight across many industries and companies, we see commonality in how the innovations come about. These commonalities appear to be based on several different disruptive models or distinct ecosystems. The three ecosystems we see consistently repeated are Internet of Things, which depends on Machine to Machine technology; the Sharing Economy, which depends on the ability to change what people are willing to do driven by social networking; and On-line Services, which depend on technology to drive improvements in traditional services. These were highlighted in BofAML Global Research Internet Analyst Justin Post and team's impactful *US Internet Primer*, 23 January 2015 ([link](#)).

The fact that these ecosystems provide development platforms and models for innovators is the driver of the acceleration in creative disruption. Within each of these ecosystems, platforms for specific applications are being developed that require expertise in the vertical a company will compete in, but the underlying building blocks are similar. Greater detail on the trends described can be found in BofAML Global Research Internet Analyst Kash Rangan's *Cloud Wars (Part VI)* ([link](#)).

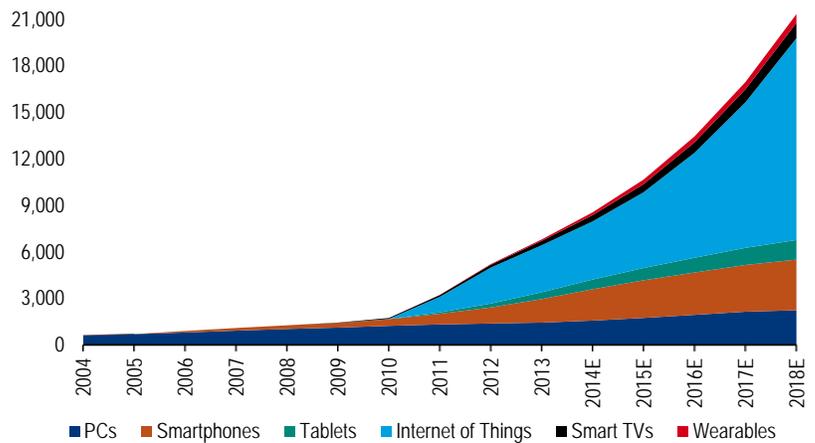
Table 2: Many disruptions reflect similar technology ecosystems

Ecosystem 1	Ecosystem 2	Ecosystem 3
Internet of Things (IoT)	The Sharing Economy	Services shift on-Line
The offer Unprecedented Monitoring and Management Capability that will greatly enhance corporate and consumer efficiency and productivity. A \$7tn industry by 2020E	The offer Sharing Assets is becoming less time consuming and costly. A survey of US adults indicated 83% would share rather than own if it was easy. Both B2C and C2C benefit	The offer Faster, more convenient services. Better results from sophisticated customer experience with on-line payments, background checks, reviews, dynamic pricing,
Key technology enablers <ul style="list-style-type: none"> • Affordable Sensors and Data Monitors • Mobile Operating systems • Mobile Communications • Big Data - both Storage & Analytics • Machine Learning, M2M 	Key technology enablers <ul style="list-style-type: none"> • Mobile Operating Systems • Smartphone Capability • Big Data Analytics • Cybersecurity 	Key technology enablers <ul style="list-style-type: none"> • eCommerce shipping logistics and IoT shipping companies • Mobile connectivity • Financial Technology • Big Data analytics
Issues Artificial Intelligence (AI) mis-perception	Issues Potential unforeseen impact on asset prices	Issues Shift more of the economy to a service base and impact brick and mortar businesses

Internet of Things Ecosystem

The explosion in connected devices is laying the foundation for IoT disruption. Our internet team estimates that connected devices will double in the next three years to reach 20bn by 2018.

Chart 20: Connected Devices Global Installed Base (Millions)

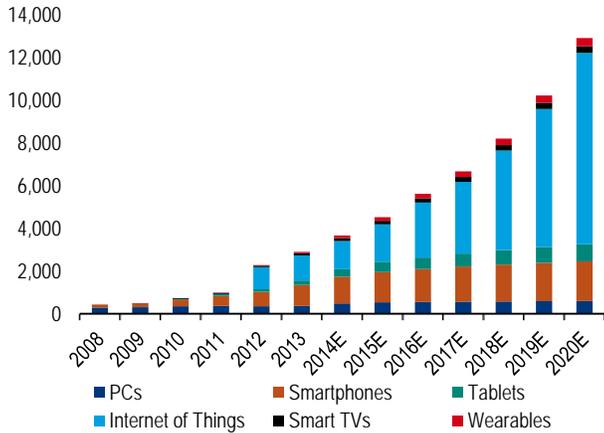


Source: BofA Merrill Lynch Global Research estimates, Strategy Analytics, IDC, Gartner, Machina Research, Bloomberg

The Internet of Things is the broadest ecosystem in terms of the technologies needed to effectively change the established order of things. Hardware, from chips and sensors, to mobile communications, to operating systems, and Big

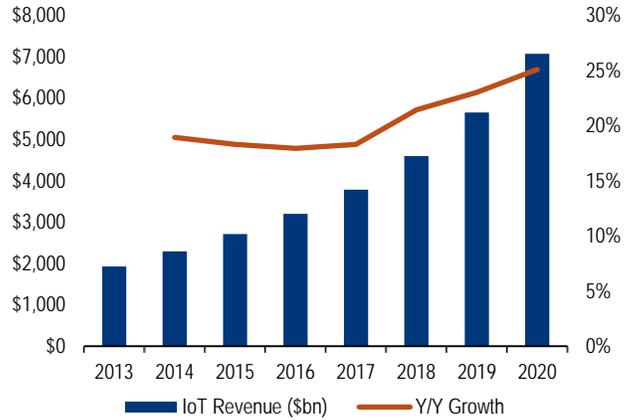
Data and Machine Learning all are needed. The dramatic changes under way in the shift to modern industrialization are clear examples.

Chart 21: Annual devices sales for Internet devices (millions)



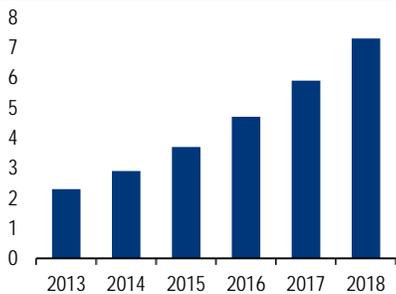
Source: BofA Merrill Lynch Global Research estimates, Strategy Analytics, Gartner, IDC, Machina Research

Chart 22: Global IoT revenue (billions)



Source: BofA Merrill Lynch Global Research, IDC

Chart 23: M2M connections (bn)



Source: BofA Merrill Lynch Global Research, Cisco, VNI

Modern Industrial Wave leverages M2M IoT

According to Cisco, over half of internet traffic will originate from non-PC devices by 2018, some of which will be driven by IoT machine to machine (M2M) devices. M2M devices are those that interact with other internet connected devices without human intervention, such as smart meters, smart cars, health monitors, and tracking tags. BofAML Analyst Sameer Chopra notes in his M2M primer, *M2M: The Third Wave of Mobile industry growth, 10 March 2014* ([link](#)) that M2M could account for 4% of global mobile service revenue by 2018 up from 1% last year, for a 30% CAGR.

M2M enables the ability to take large numbers of measurements (through myriad affordable sensors – semiconductor technology) send it to the internet (wired or near field technology (NFC), store the data in high speed memory (new database software platforms, data storage, and semiconductor technology) and then apply machine learning and predictive analysis algorithms (software, Statistics, high speed microprocessors) that can "learn" from the huge amount of data in Real Time and jam all this into robots or other production machines without human intervention.

Semiconductor manufacturing has already entered this wave of modern industrialization. Megafabs costing \$10 billion or more are being run "lights out," with nobody inside during production. Robotic systems move the wafers everywhere in the fab. Sensors in processing tools constantly adjust to keep quality and accuracy on target. One machine tells the next machine what the process output was so that the next machine can properly calibrate for the incoming wafers. Machines tell when they need maintenance – no scheduled down time, only as needed. This ability has helped lead to massive consolidation in the semiconductor business as companies like *Intel* drastically reduced production overhead time using this technology, even as the number of processing steps doubled and complexity increased.

GE is aggressively pursuing this as well on its factory floors to boost productivity. The company has stated that overall GDP could get a 1% annual boost over the next 10 years from this disruption in the way manufacturing companies run their

factories. Automotive manufacturing is another area that has been labor intensive, but suppliers, and eventually car companies, are looking at modern industrial techniques to offset rising labor costs and deal with ever increasing model variants.

IoT key for consumer innovation as well

IoT is opening new ways to connect with consumers as well. This may be through in-car automotive platforms, wearable devices, smart watches, smart advertising or household appliances. *Salesforce* CEO Mark Benioff announced last fall at the TechCrunch Disrupt conference in San Francisco that his company created a \$100mn venture fund to focus on mobile apps and connected products – one aim of which is to insure the company’s *Salesforce 1* platform is adopted across all form factors including new wearables. (See [link](#) to *TechCrunch Disrupt 2014 Takeaways*, 9 September 2014, by *Kash Rangan*).

As Exhibit 1 shows, M2M IoT is the platform for many of the application that are exciting consumers today from self-driving cars, better health management, easier eCommerce access and personnel security.

Exhibit 1: M2M applications map



Source: BofAML Global Research, M2M Primer, Sameer Chopra

Healthcare disruption leverages IoT ecosystem aspects

New technologies have slashed the cost of whole genome analysis from roughly \$300mn in 2003 to \$1,000 today, driving rapid change in the genetic analysis market. This next generation of genetic sequencing technology (NGS) is disrupting well established markets like the \$2bn reproductive and genetic health market.

Illumina, Inc. (See [link](#) to BofAML Life Science Tools and Diagnostics Analyst Derik De Bruin's, *ILMN positioned to benefit in NIPT, 8 April 2015*) has developed a non-invasive prenatal test (NIPT) that can dramatically cut the need for amniocentesis reducing risk of miscarriages. At the same time, NIPT can expand the market well beyond high risk pregnancies. The key to all this is to be able to sequence at a very large scale that is similar to computational analysis being used in the world of interconnected devices. Illumina developed DNA Microarrays to get the huge data and Genomic computing, which is a different approach than other companies use called sequencing by synthesis (SBS), which leverages massively parallel processing.

Even helping us to feed the world

With the global population expected to grow from 7.2bn today to 9.6bn by 2050E, the world will need to produce 70% more food to ensure global [food security](#). Aided by advancement in the IoT and big data, developments like precision agriculture (PA) are optimizing the use of agri-inputs to increase production and profits – and could change the way we look at farming and could allow machines to keep up with population growth.

It is a farming management concept that enables the use of information technology, satellite positioning (GNSS) data, remote sensing and proximal data gathering to increase yields, minimize agri-inputs and improve sustainability of agricultural production. PA combines advanced sensor technologies, satellite imagery and computing power with appropriate farming practices such as tillage, seeding, fertilizer and pesticide application, harvesting and animal husbandry.

PA is expected to grow from US\$1.5-2.0bn today to become a US\$4.55bn market by 2020E and a US\$6.34bn market by 2022E (source: MarketsandMarkets, Research and Markets). The US is the most mature market with 70% penetration of precision technologies (source: Alix Partners), but EMs are seeing the fastest growth.

Monsanto continues to grow its Climate Corp platform

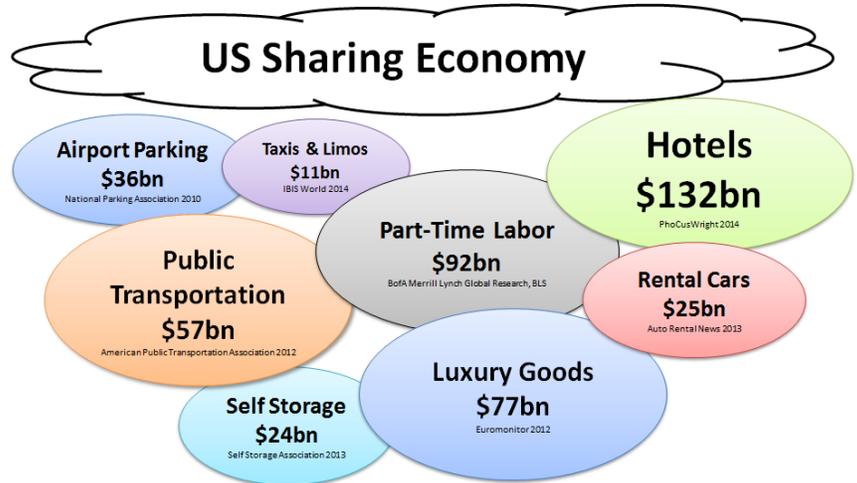
Monsanto's Integrated Farming Systems (IFS) initiative, including Climate Corp's hyper local climate forecasting, creates unique capability and new products and gives the company an early mover advantage monetizing big data. A farmer faces 40 in-season decisions from planting through harvest based on weather, crop conditions, and timing. Through its IFS initiative and Climate Corp platform, Monsanto currently addresses five of those decisions by helping farmers with seed selection, planting start date, nitrogen application, harvest dry-down and variable-rate planting recommendations for individual fields. (See the BofAML Agricultural Chemicals outlook for 2015 [report](#).)

The Sharing Economy Ecosystem

In the age of smartphones and big data, consumer-to-consumer (C2C) rental and lending has become easier, less time-consuming, less uncertain and less costly. As a result, people are rapidly changing what they are willing to do – rent out their home short term to strangers, finance a purchase on-line, and get help from someone they have never met. The key here is that people *trust* the technology to deliver what they expect more conveniently than owning it themselves or using traditional means. So security, reviews, fast communications, well developed apps, strong operating systems and easier to use smartphones are the foundation for this ecosystem.

Driven by the ease of smartphone use, the Sharing Economy likely will capture a larger piece of the \$400bn of combined spending on hotel, car rental, taxi, luxury goods, self-storage, and parking and transportation services each year in the US. Companies such as *Lyft*, *Sidecar*, *AirBnB*, *RentTheRunway*, *Getaround*, *Park Circa*, and other leaders in the sector like Uber will drive a new wave of C2C commerce and enable some to build a full-time business and straddle the line between B2C and C2C.

Exhibit 2: Some examples of the sharing economy market opportunity



Source: BofA Merrill Lynch Global Research

Justin Post and team segmented the sharing economy into the following four large groups: room sharing, ride and auto sharing, property sharing, and asset sharing. As many are familiar with the first three, we focus on the last, asset sharing, which has major implications for financial firms of all types.

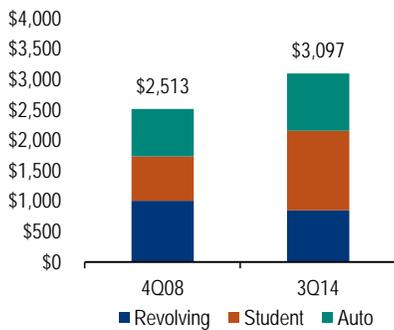
Asset Sharing (Lending) and Investing

Peer-to-peer lending eliminates some of the complexity and high cost of traditional lending and by eliminating administrative, marketing, and infrastructure costs. Borrowers often are able to secure funding at a competitive or lower rate than through traditional sources.

The ability to crowd fund start-ups and raise follow-on rounds of equity and debt through on-line venture funding led one major Silicon Valley technology venture capitalist to note recently that venture capital is essentially dead, but no one told some of the new companies yet. The attraction to startups is again lower cost of funding. Importantly, this means that crowd funding types of finance reduce the amount of control (ownership) that entrepreneurs must give up in their companies.

In combination, peer to peer lending and on-line business financing pose issues for traditional banks and finance firms over time. These non-bank lending networks provide peer-to-peer opportunities for accredited investors to refinance loans from creditworthy borrowers. There are arguments about the size of the applicable creditworthy qualified consumer debt outstanding to be financed through these types of companies. The range of estimates is from 5% to 12% of the US consumer debt market. This still is a meaningful hundreds of billions of dollars opportunity that can be taken from traditional lenders. Some examples of lenders include:

Chart 24: Major consumer debt segments (ex. mortgage, \$bn)



Source: BofA Merrill Lynch Global Research, Federal Reserve G.19 Data

- **LendingClub** sources funds from individuals and institutions and allows its customers to borrow up to \$35,000 based on creditworthiness determined by a proprietary scoring system (Model Rank). The company has funded \$6.2bn in loans to-date and revenue in 2013 was up 188% to \$98mn. The company went public in 2014 at an initial market cap of over \$5bn.
- **Kickstarter** launched in 2009 as a way for entrepreneurs to receive funding for projects. It has generated over \$1bn in funding from 7.6 million people for 76,000 projects.
- **Prosper** is a private company that launched in 2009. It has over 2 million members and has funded over \$2bn in loans to-date. Using a person's FICO score and various financial metrics (Bankcard utilization, available credit, credit inquiries) Prosper assigns a Prosper Score (1-10) to each borrower to determine the credit quality of each borrow and appropriate interest rates.

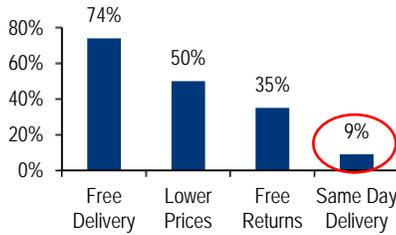
Financial Technology (FinTech) Roiling Market Participants

Disruptive technologies have historically been focused on trading execution in the financial markets, automating price quoting and trading in the B2B capital markets. The equities and foreign exchange asset classes have been at the forefront of these changes. Fixed income markets are quickly following in response to regulatory pressures and market structure inefficiencies.

The next wave of disruption in capital markets is focused on advisory functions that support execution: Research, Sales and Investment Banking. We categorize this wave of disruption into three broad categories: i) communication, ii) content and iii) idea discovery.

- **Communication:** Instant message communication between capital markets' participants is critical to market efficiency and today that communication largely occurs within closed communities like Bloomberg. **Symphony** was recently formed by 15 sell side and buy side companies to provide an open platform for communities of financial services professionals to communicate via instant message securely and efficiently using compliant standards and end-to-end encryption. Ultimately they will offer a low cost alternative to expensive, closed platform communication systems such as **Bloomberg**.
- **Content:** As execution becomes commoditized, we believe capital markets will become increasingly dependent on content. By content, we mean products like corporate access events, research reports, financial models, emails and analytical tools that the sell side distributes to the buy side. Finding content is a consistent problem across capital markets. Aggregated platforms like **Bloomberg, Thomson Reuters and FactSet** have not invested in search optimization which has created opportunities for companies with financial services domain expertise to implement Google-like semantic and natural language search across content repositories.
- **Idea discovery:** The processes and tools used by capital markets' participants to discover and quickly evaluate new investment ideas also have some new entrants. Companies like **Kensho** and **EidoSearch** produce correlations across events, security prices and other data. Very large amounts of data are processed in near real-time and displayed in clean, intuitive user interfaces, creating a new class of analytics tools for investment professionals.

Chart 25: Which motivates you to shop more online?

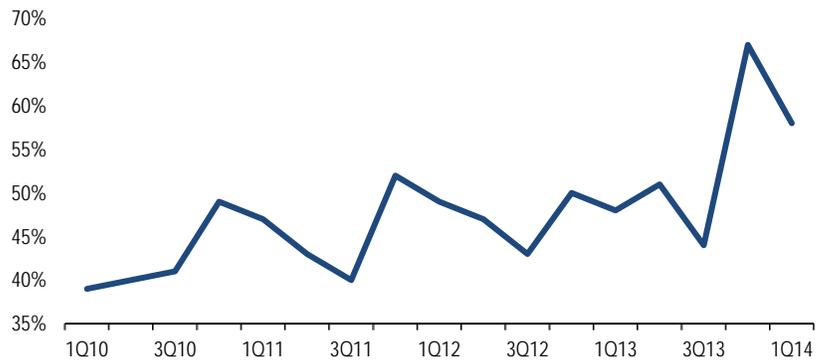


Source: BofA Merrill Lynch Global Research, Boston Consulting Group

On-Line Service Ecosystem

Like the sharing ecosystem, shifting to on-line services requires people to change what they are willing to do. Social networking spreads the reviews and acceptability of moving to not only on-line eCommerce, but more services. The key to this ecosystem is both convenience and price. The battles in local eCommerce delivery pricing clearly show how tightly tied are these two consumer demands. According to the Boston Consulting Group, free delivery ranked as the most important factor for consumers when purchasing online. Immediacy of purchase is one of the advantages brick and mortar retailers maintain. But with Amazon's two-day Prime shipping service, and other fast and free shipping offers by online retailers improving, the timing and cost gap has closed.

Chart 26: Free shipping as a percentage of eCommerce transactions



Source: BofA Merrill Lynch Global Research, comScore

Household, personal and business services

Beyond eRetailing and eFood delivery that most everyone is familiar with, consumer spending may become an over \$500bn market opportunity in local services each year, and online staffing is estimated well over a \$1bn market. However, the process of soliciting service, receiving offers, and evaluating potential part-time service workers can be time consuming and unsatisfying for service seekers. A growing number of companies are building marketplaces to take care of these issues. The services ecosystem provides the building blocks to deliver a sophisticated customer experience, with rapid response, on-line payments, background checks, reviews and even the ability to price shop without the hassle this traditionally entails.

Examples of leading personal and business service providers that could shift the competitive dynamics, especially in larger cities include:

- **TaskRabbit** has over 25,000 contractors on its network and operates in 19 US cities as well as one city in the UK. The company takes a 20% service fee on each task.
- **Thumbtack** guarantees a response within 24 hours and operates in all 50 US states, as well as US territories. Service workers buy credits (\$1.67 each) to submit a quote for a project, and the number of credits required depends on the type of service needed.
- **Handy** was founded in 2011 in 29 US cities, as well as two cities in Canada and five in the UK.
- **Cookening** connects food lovers and helps users attend or host a dinner party where each attendant participates in food preparation.

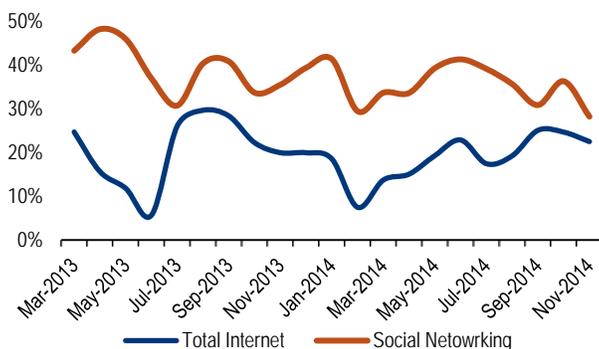
- **Zaarly, NeedTo, and Done** make it quick and easy to outsource daily errands to local people.
- **Gleen and Wype** provide on-demand, mobile car washing services.
- **Angie's List** and IAC's **HomeAdvisor** connect homeowners with qualified contractors such as roofers, electricians, and plumbers.
- **Care.com** has the largest network of care providers servicing childcare, homecare, senior care, and pet care.
- **Elance-Odesk** formed after the merger of the two companies in 2013. It caters specifically to companies looking to outsource business and technology support including web development, design, marketing, and programming. The company keeps 10% of the job fees.
- **99 designs** has a community of nearly 1 million designers that will help businesses create a wide variety of business products including logos, business cards, web apps, and even t-shirts.

Social Networking at Core of Sharing, Service

Social networking remains one of the fastest growth areas of the Internet, with user and usage time outpacing overall Internet growth. Mobile growth may be the biggest driver as mobile devices are well suited for social use (messaging, photo sharing, and information dissemination). While the gap has closed a bit, social networking minutes continue to outpace total Internet minute growth in the US, driving continued social networking time share gains.

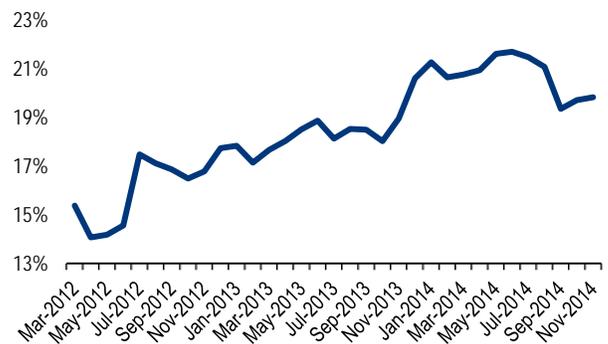
The information dissemination aspect of social networking has allowed this medium to rapidly gain trust among users, which is a key aspect of getting people to change their behavior. This is a new phenomenon with no real parallel in history for indoctrinating masses into voluntarily changing behavior. Businesses are recognizing this, and using it to gain competitive advantage. New social networking companies keep coming to market with rapid adoption by special interest groups. Examples include private companies such as *Pinterest, Snapchat, Yik Yak, Secret, LINE, and WeChat*, as well as IAC's *Vimeo and Tinder*, and Yahoo's *Tumblr*.

Chart 27: PC + mobile minutes by category (US only)



Source: BoFA Merrill Lynch Global Research, comScore

Chart 28: Social networking minutes as % total PC+mobile minutes



Source: BoFA Merrill Lynch Global Research, comScore

Important Disclosures

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