



DEFLATIONARY TECHNOLOGY

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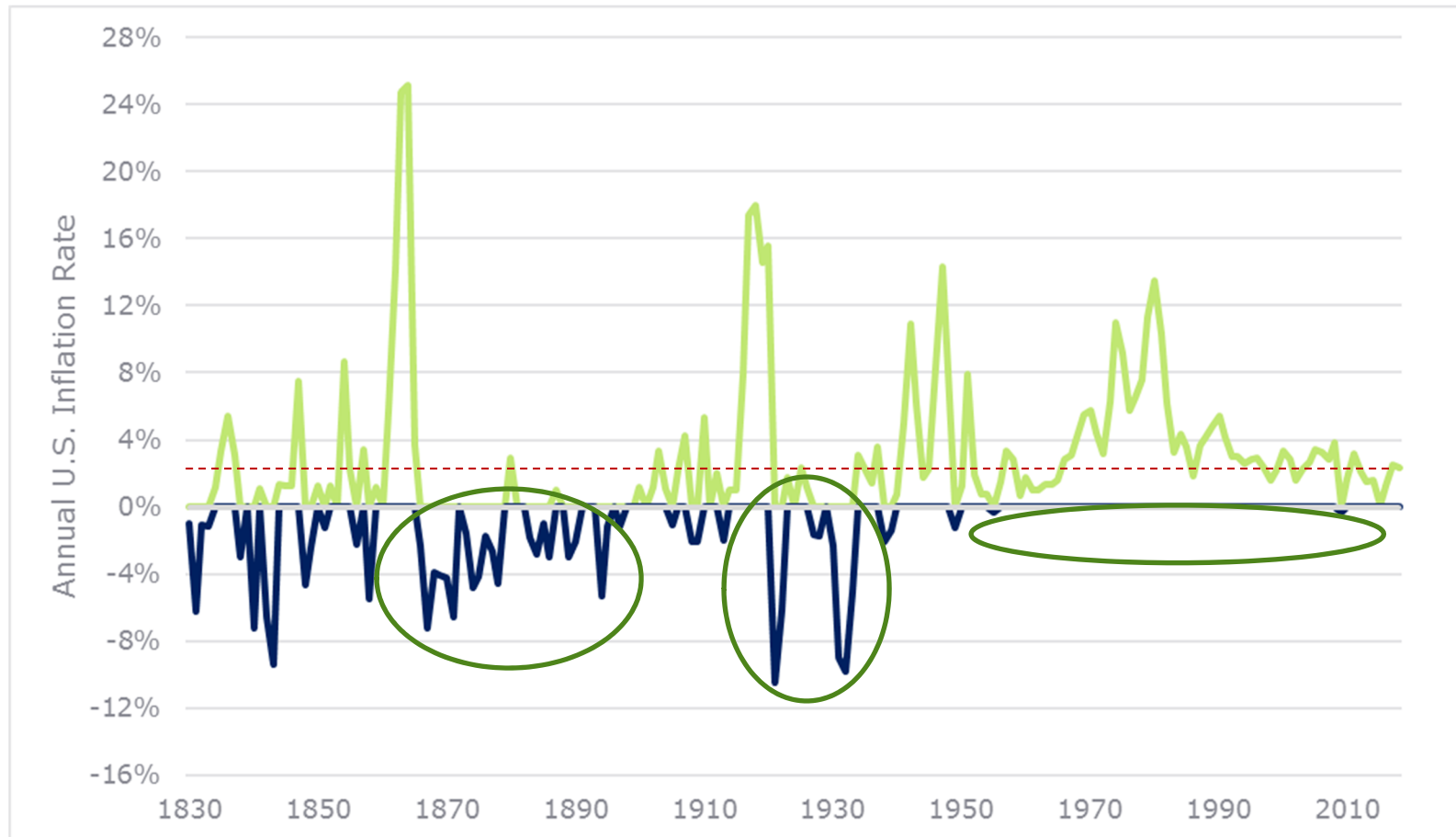
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WHAT IS DEFLATION?

- The decrease in the price of goods/services or the increase in the value of money in an economy over a period of time
- Deflation is not an unusual historical event



SOME INFLATION/DEFLATION DRIVERS

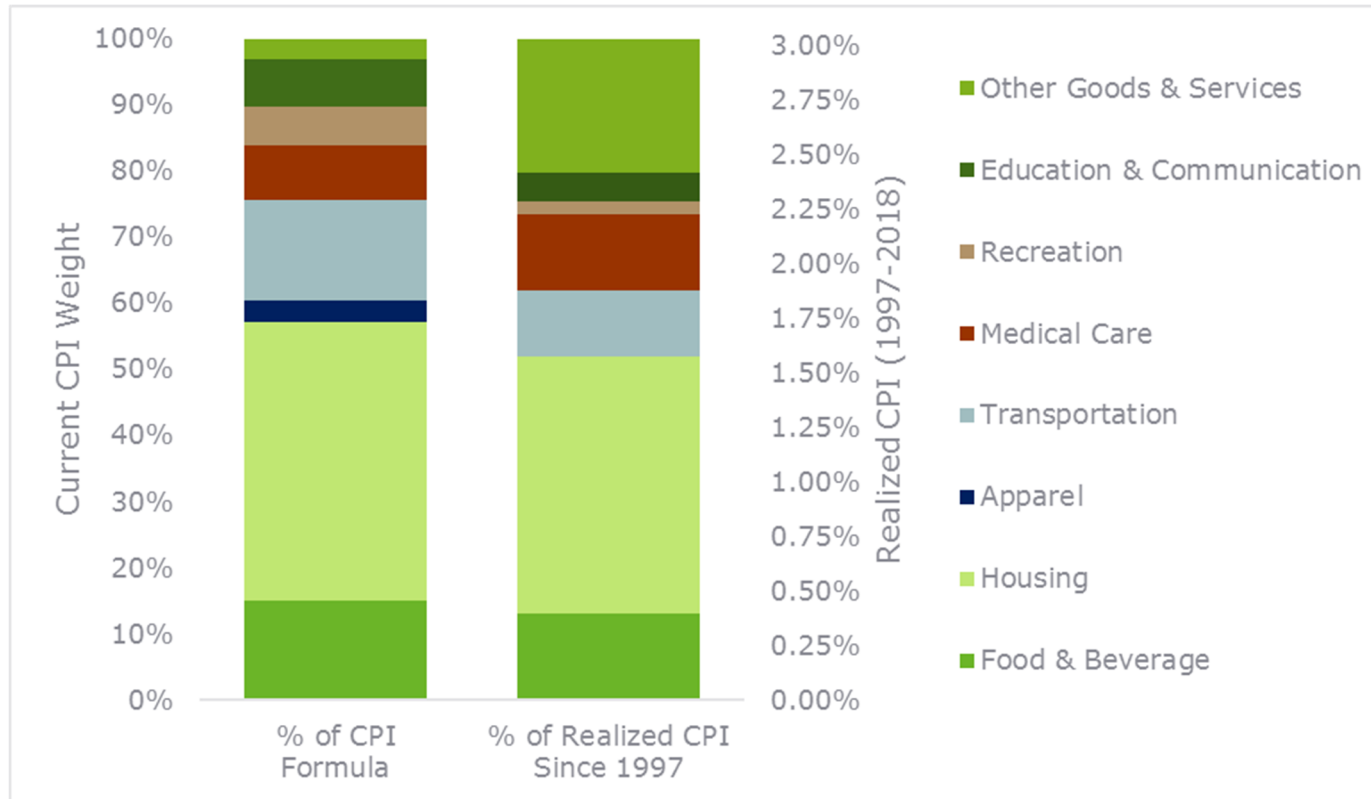
IN THE PAST:

Inflationary Pressures	Deflationary Pressures
Credit Expansion	International Trade
Oil Supply Shocks	Doubling of Global Labor Force
Labor Union Negotiating Power	

MORE RECENTLY:

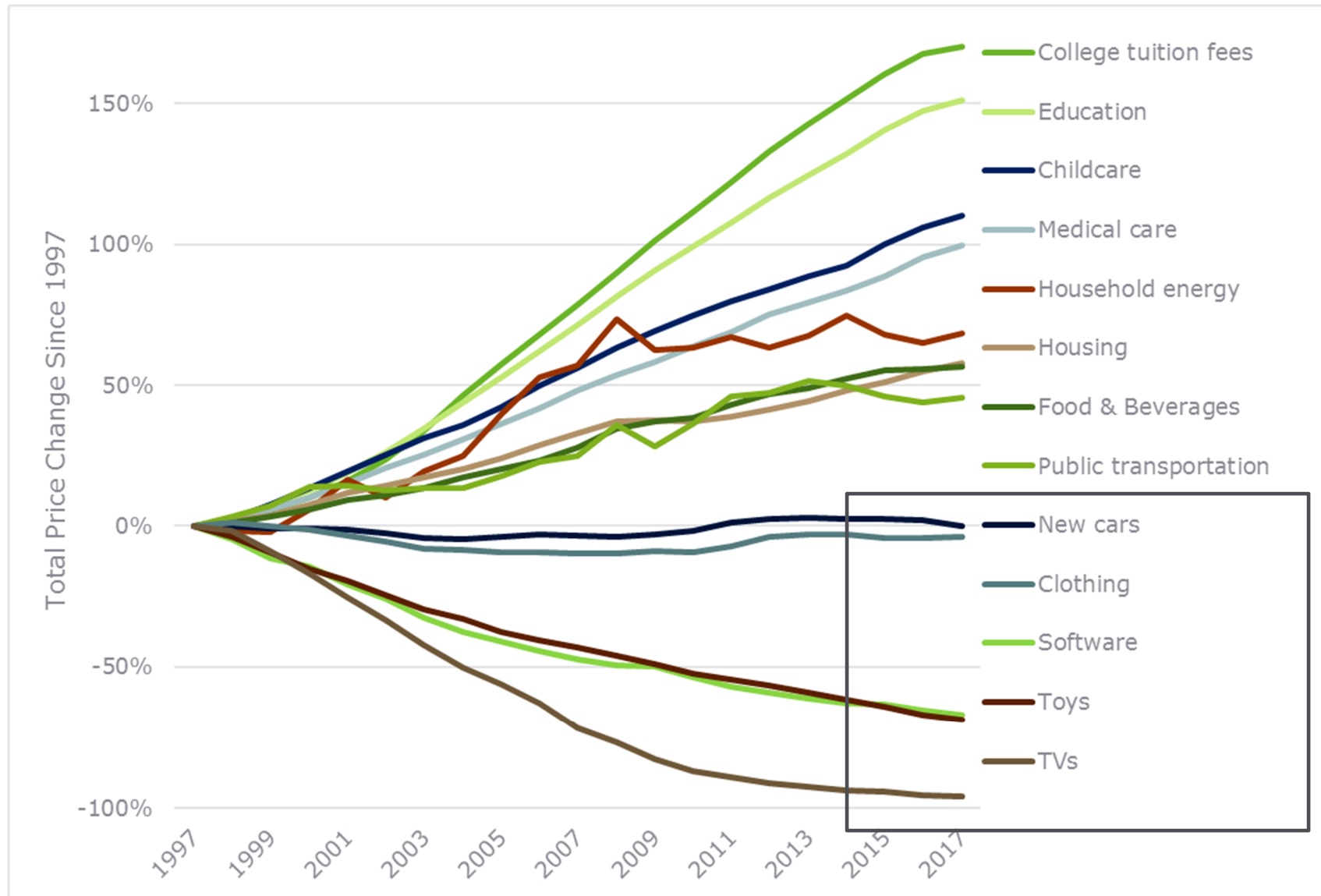
Inflationary Pressures	Deflationary Pressures
Quantitative Easing	Technology
Protectionism	Falling Input Costs
Climate Change?	Supply Chain Optimization
	Demographic Changes

DEFLATIONARY IMPACTS MAY BE HIDDEN



- **Only 1 out of 8 major CPI categories deflating since 1997**
- **Energy flows into both transportation and housing**
- **Economists often focus on core inflation which excludes food & energy**

DEFLATION IS ALREADY HERE



WHAT MAKES TODAY'S TECH DIFFERENT?

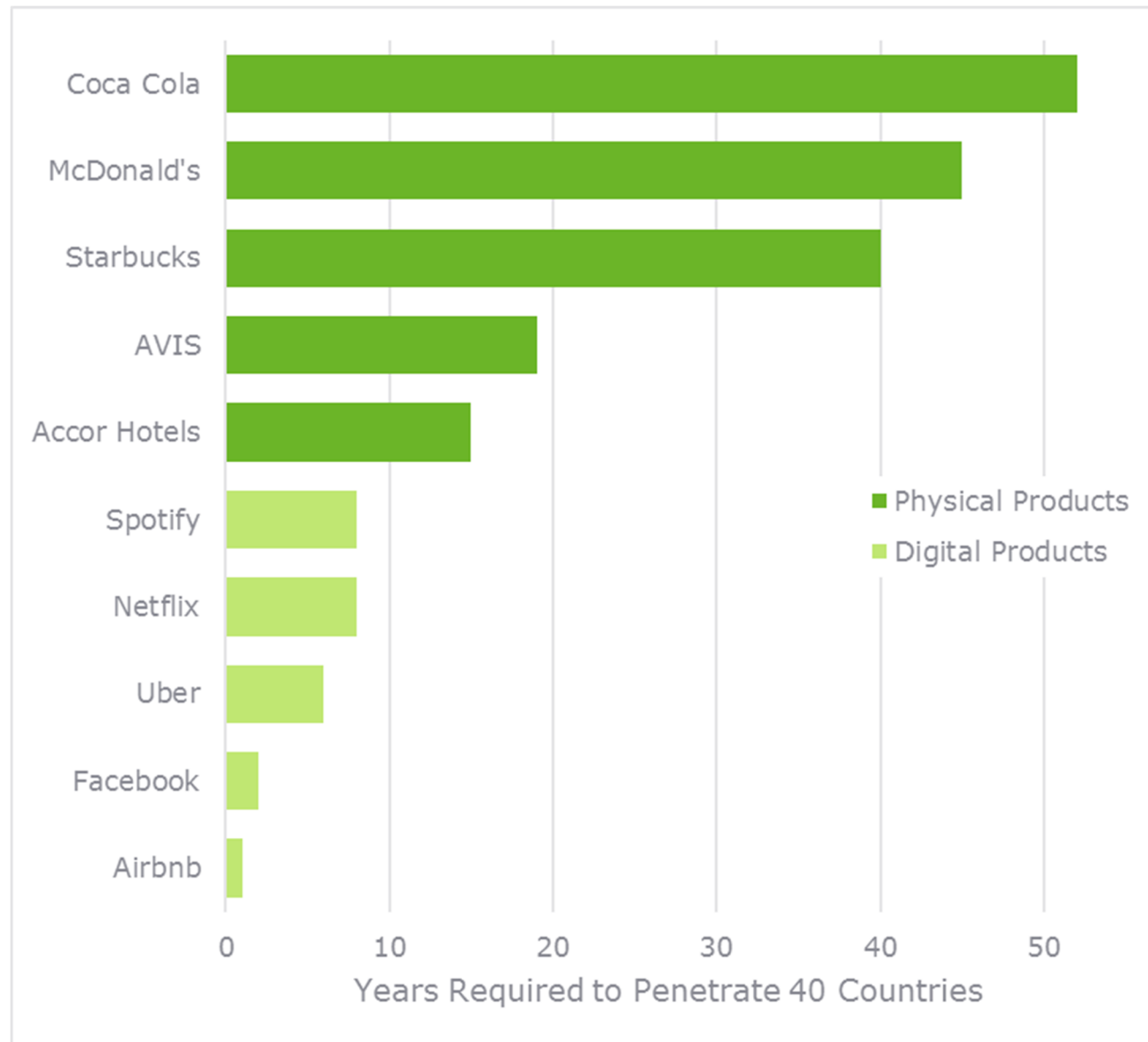
- **Digitization**
- **Price transparency**
- **Downward pressure on input costs**

DIGITIZATION

- Digital apps replacing physical products at a fraction of the cost and with minimal incremental costs

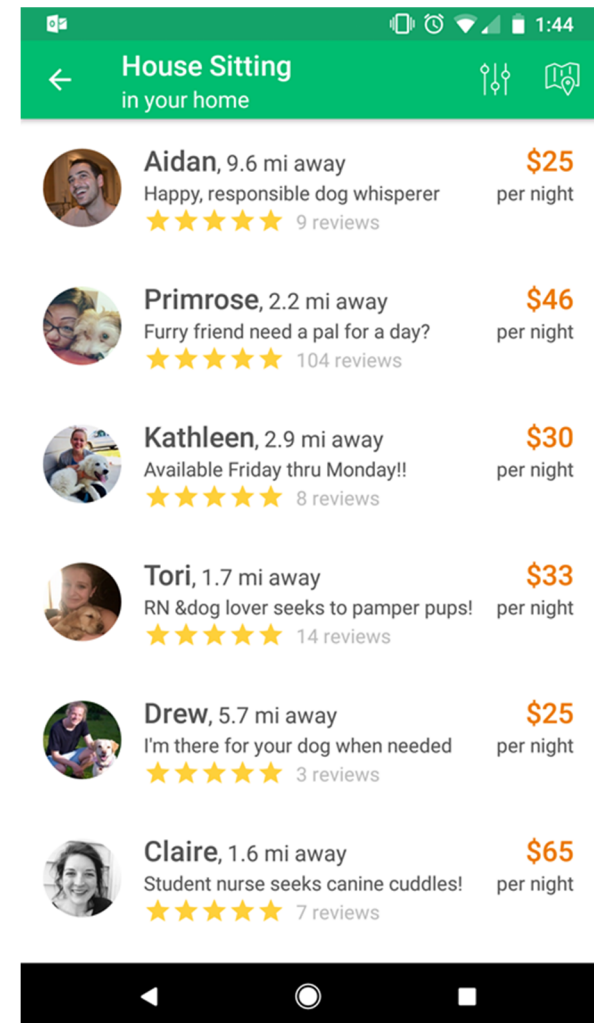


DIGITAL DISRUPTION CAN BE QUICK



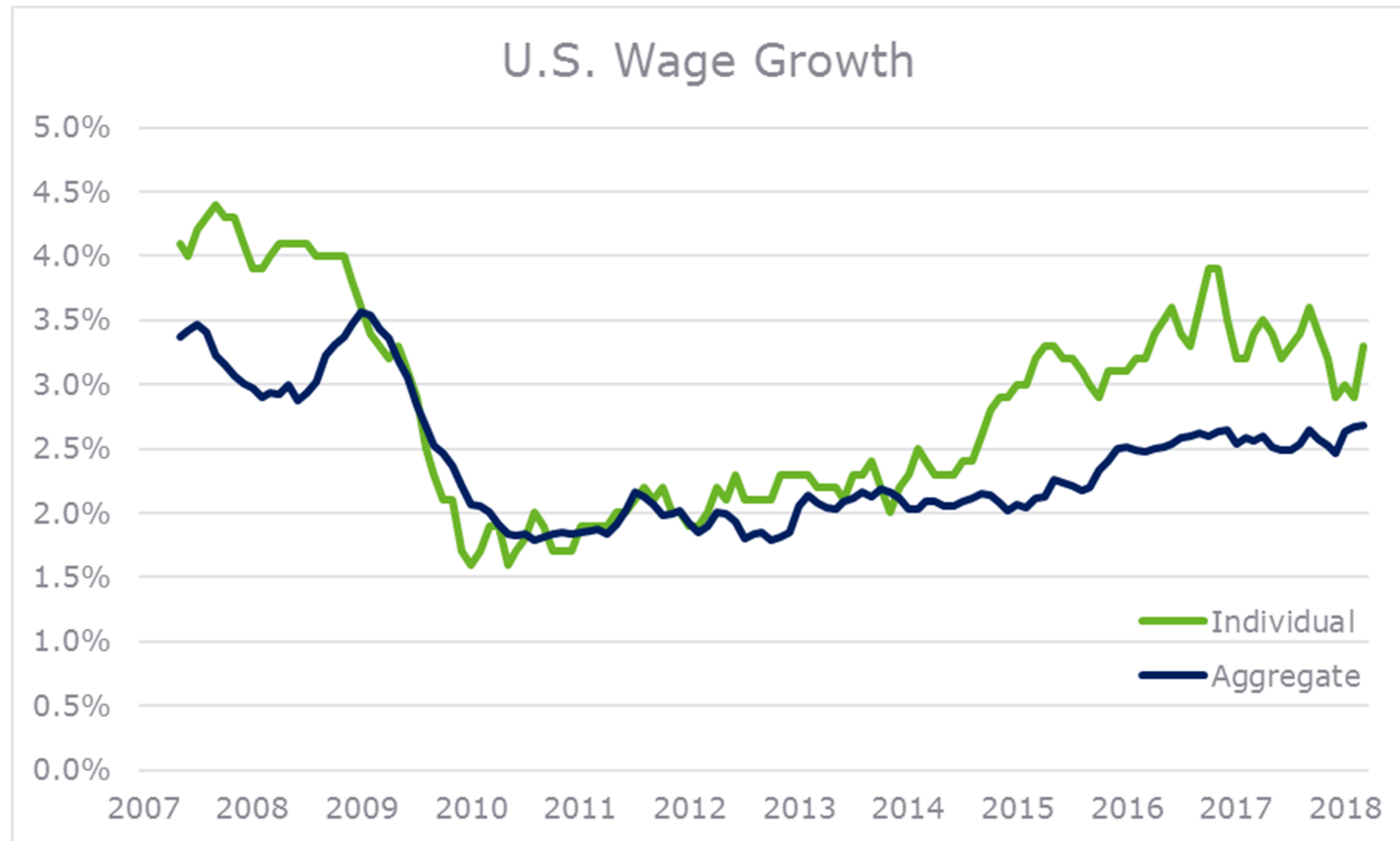
Source: Arrowgrass. Estimates based on company reporting, Reuters, AdWeek, Wikipedia

PRICE TRANSPARENCY



DOWNWARD PRESSURE ON INPUT COSTS

- **Technology and automation putting pressure on the two largest input costs, wages and commodities**



Source: Atlanta Fed, St. Louis Fed. 3 month average of annual growth.

CAVEAT ON TECHNOLOGICAL PREDICTIONS

A Timeline of Very Bad Future Predictions

1800  “Rail travel at high speed is not possible, because passengers, unable to breathe, would die of asphyxia.” Dr. Dionysys Larder, Professor of Natural Philosophy & Astronomy, University College London	1880  “Everyone acquainted with the subject will recognize it as a conspicuous failure.” Henry Morton, president of the Stevens Institute of Technology, on Edison's light bulb	1916  “The idea that cavalry will be replaced by these iron coaches is absurd. It is little short of treasonous.” Comment of Aide-de-camp to Field Marshal Haig, at tank demonstration	1946  “Television won't last because people will soon get tired of staring at a plywood box every night.” Darryl Zanuck, movie producer, 20th Century Fox
1859  “Drill for oil? You mean drill into the ground to try and find oil? You're crazy!” Associates of Edwin L. Drake refusing his suggestion to drill for oil in 1859 (Later that year, Drake succeeded in drilling the first oil well.)	1902  “Flight by machines heavier than air is unpractical and insignificant, if not utterly impossible.” Simon Newcomb, Canadian-American astronomer and mathematician, 18 months before the Wright Brothers' flight at Kittyhawk	1916  “The cinema is little more than a fad. It's canned drama. What audiences really want to see is flesh and blood on the stage.” Charlie Chaplin, actor, producer, director, and studio founder	1977  “There is no reason for any individual to have a computer in his home.” Ken Olson, president, chairman and founder of Digital Equipment Corporation
1876  “This telephone has too many shortcomings to be seriously considered as a means of communication.” Western Union internal memo	1903  “The horse is here to stay, but the automobile is only a novelty, a fad.” The president of the Michigan Savings Bank, advising Henry Ford's lawyer not to invest in the Ford Motor Company	1921  “The wireless music box has no imaginable commercial value. Who would pay for a message sent to no one in particular?” Associates of commercial radio and television pioneer, David Sarnoff, responding to his call for investment in the radio	1995  “The truth is no online database will replace your daily newspaper...” Clifford Stoll, Newsweek article entitled <i>The Internet? Bah!</i>

Source: Infographic City

OUTLOOK

OUTLOOK FOR TECHNOLOGICAL DISRUPTION

- **Expect retail goods and services to continue to face disruption over the next several years, leading to more pressure on pricing**
- **Increasing disruption in energy and healthcare should be somewhat deflationary**
- **While technology continues to impact food and real estate, pricing looks to be less affected in the near term**

OUTLOOK FOR DEFLATION

- **Realized inflation will be a result of technological change and (many) other factors**
 - Scenario 1: Pockets of deflation help offset other inflationary forces
 - Scenario 2: Sustained or more extreme deflation

ASSET ALLOCATION CONSIDERATIONS

POSITIONING FOR TECHNOLOGICAL DISRUPTION

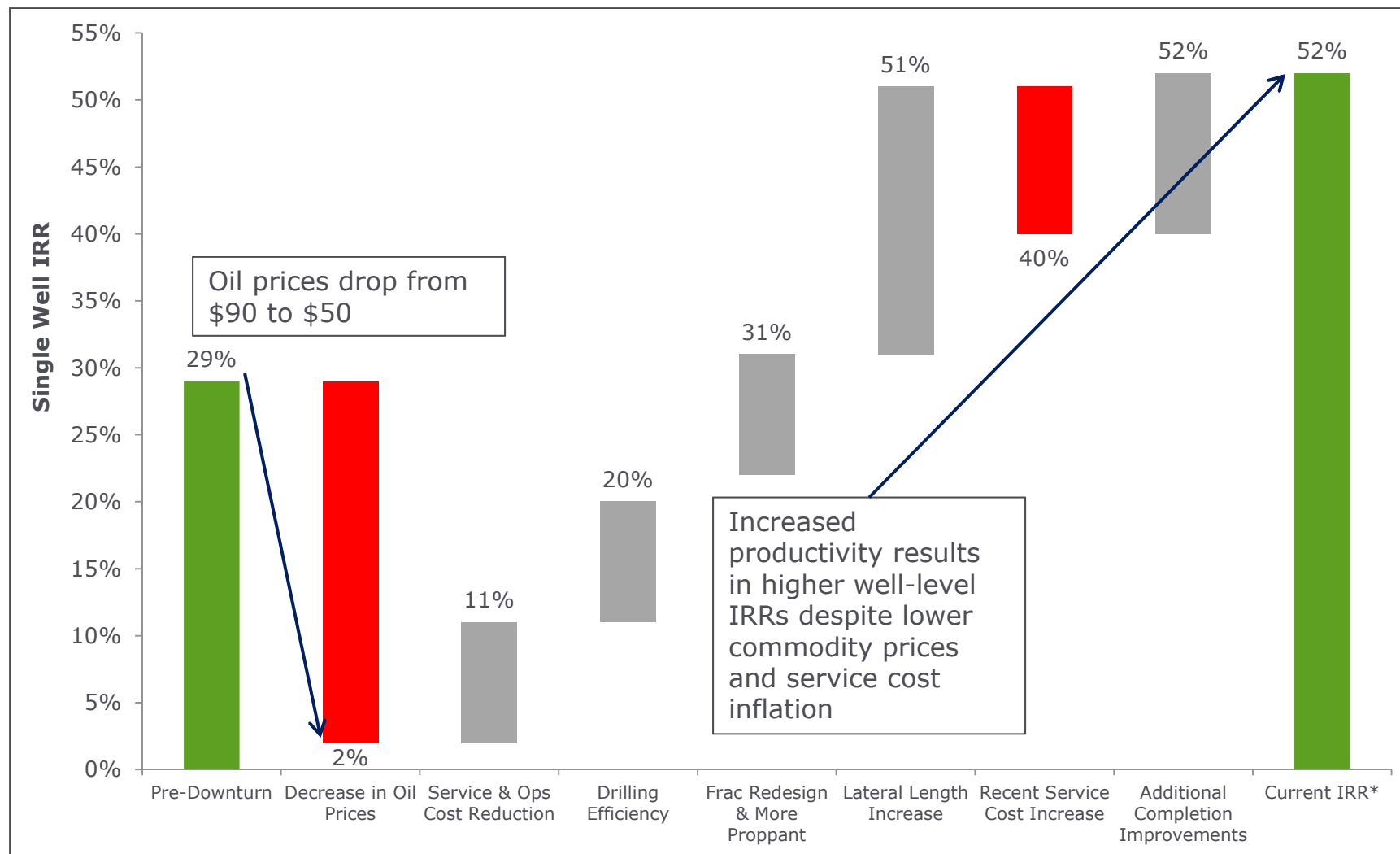
- **Active management: avoiding losers from disruptive technology as important as finding winners**
- **At the margin, private equity over public equity**
- **Private equity example: Signia Venture Partners III**
 - Venture capital fund targeting early-stage investments in technology companies working in mobile and data & analytics
 - Disruptive technologies include virtual reality, machine learning, and artificial intelligence
- **Hedge fund example: Arrowgrass Inflection Fund**
 - Partnering with academia, identify disruptive trends
 - Challenge fundamental analysis by viewing public companies through a disruptive lens
 - Uses derivatives to limit broad market beta

ASSET ALLOCATION CONSIDERATIONS

POSITIONING FOR DEFLATION

- **Build a portfolio with something that provides liquidity in different economic regimes**
- **Example: “safe haven” fixed income**
 - Treasuries, TIPS, Cash
- **Recognize that equity valuations may look distorted relative to history**
- **Don’t shy away from inflation-sensitive assets, but own the equity, not the commodity**
 - Enhanced return potential through private and public equities despite lower commodity prices through technology

TECHNOLOGY DRIVING PRODUCTIVITY



Note: For illustrative purposes only. Information in this chart represents actual drilling results from and NGP portfolio company operating in the Permian Basin from June 30, 2014 to June 30, 2016.



CONCLUSIONS

- **Technological advances have muted inflationary forces over past several years, driven by digitization, price transparency, and input cost pressure**
- **All economic sectors are not impacted equally**
- **Continued advancement could create the first deflationary environment since the 1940's, although near to mid-term inflationary spikes remain possible**
- **Positioning a portfolio is challenging given a wide range of outcomes for both timing and scale**
- **Underscores the need for liquidity and diversification, and supports active management in some cases**

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