INTERNET TRENDS 2016 – CODE CONFERENCE

Mary Meeker
June 1, 2016

kpcb.com/InternetTrends

KPCB | KLEINER PERKINS CAUFIELD BYERS

Outline

1) Global Internet Trends
2) Global Macro Trends
3) Advertising / Commerce + Brand Trends
4) Re-Imagining Communication – Video / Image / Messaging
5) Re-Imagining Human-Computer Interfaces – Voice / Transportation
6) China = Internet Leader on Many Metrics
   (Provided by Hillhouse Capital)
7) Public / Private Company Data
8) Data as a Platform / Data Privacy

Thanks...

KPCB Partners

Especially Alex Tran / Dino Becirovic / Alexander Krey / Cindy Cheng who helped develop the ideas / presentation we hope you find useful...

Hillhouse Capital

Especially Liang Wu...his / their contribution of the China section of Internet Trends provides an especially thoughtful overview of the largest market of Internet users in the world...

Participants in Evolution of Internet Connectivity

From creators to consumers who keep us on our toes 24x7...and the people who directly help us prepare this presentation...

Kara & Walt

For continuing to do what you do so well...

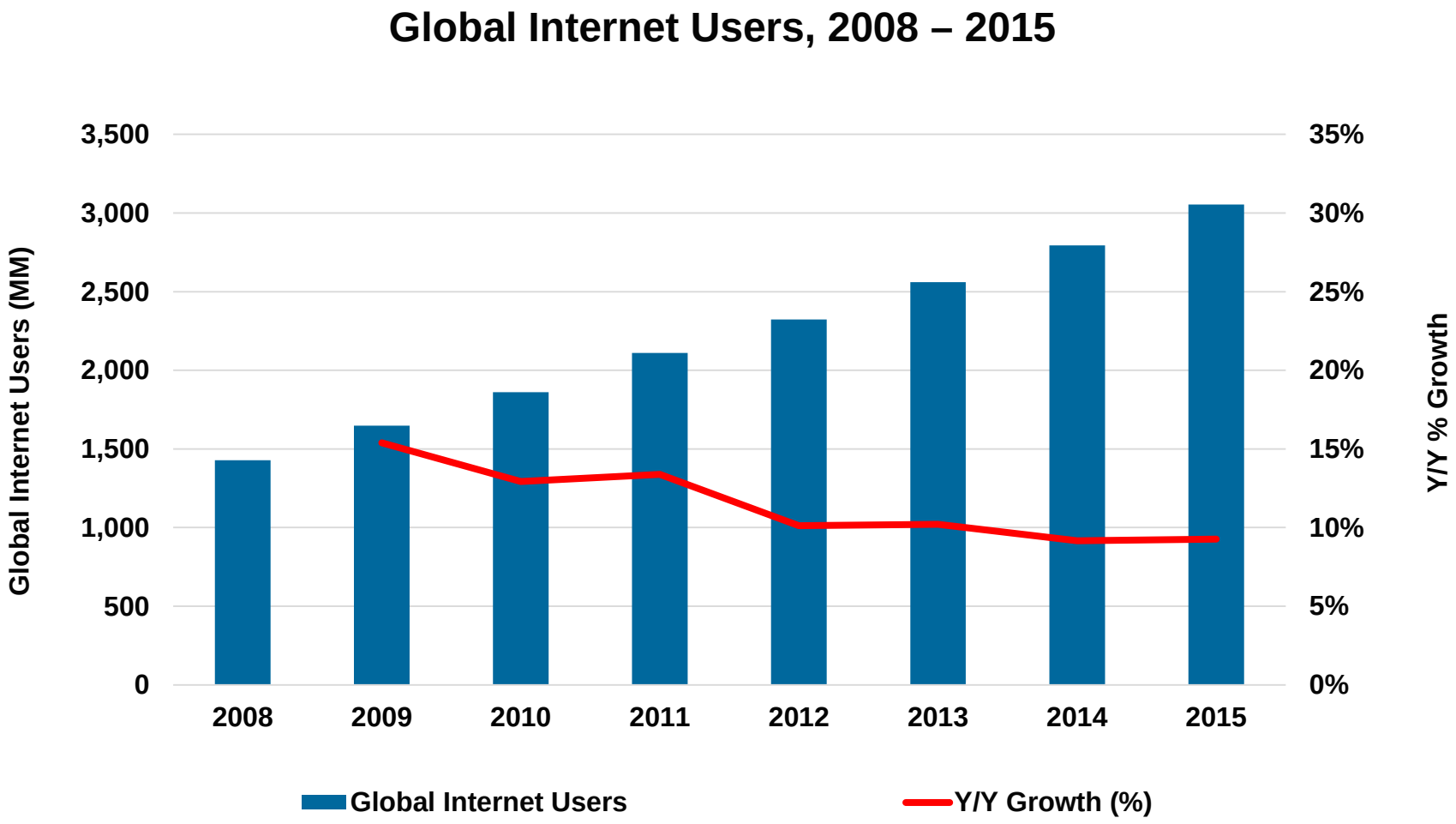
GLOBAL INTERNET TRENDS

Global Internet Users @ 3B

Growth Flat =
+9% vs. +9% Y/Y...
+7% Y/Y (Excluding India)

Source: United Nations / International Telecommunications Union, US Census Bureau. Internet user data is as of mid-year. Internet user data for: China from CNNIC, Iran from Islamic Republic News Agency, citing data released by the National Internet Development Center, India from IAMAI, Indonesia from APJII / eMarketer.

Global Internet Users = 3B @ 42% Penetration... +9% vs. +9% Y/Y...+7% (Excluding India)



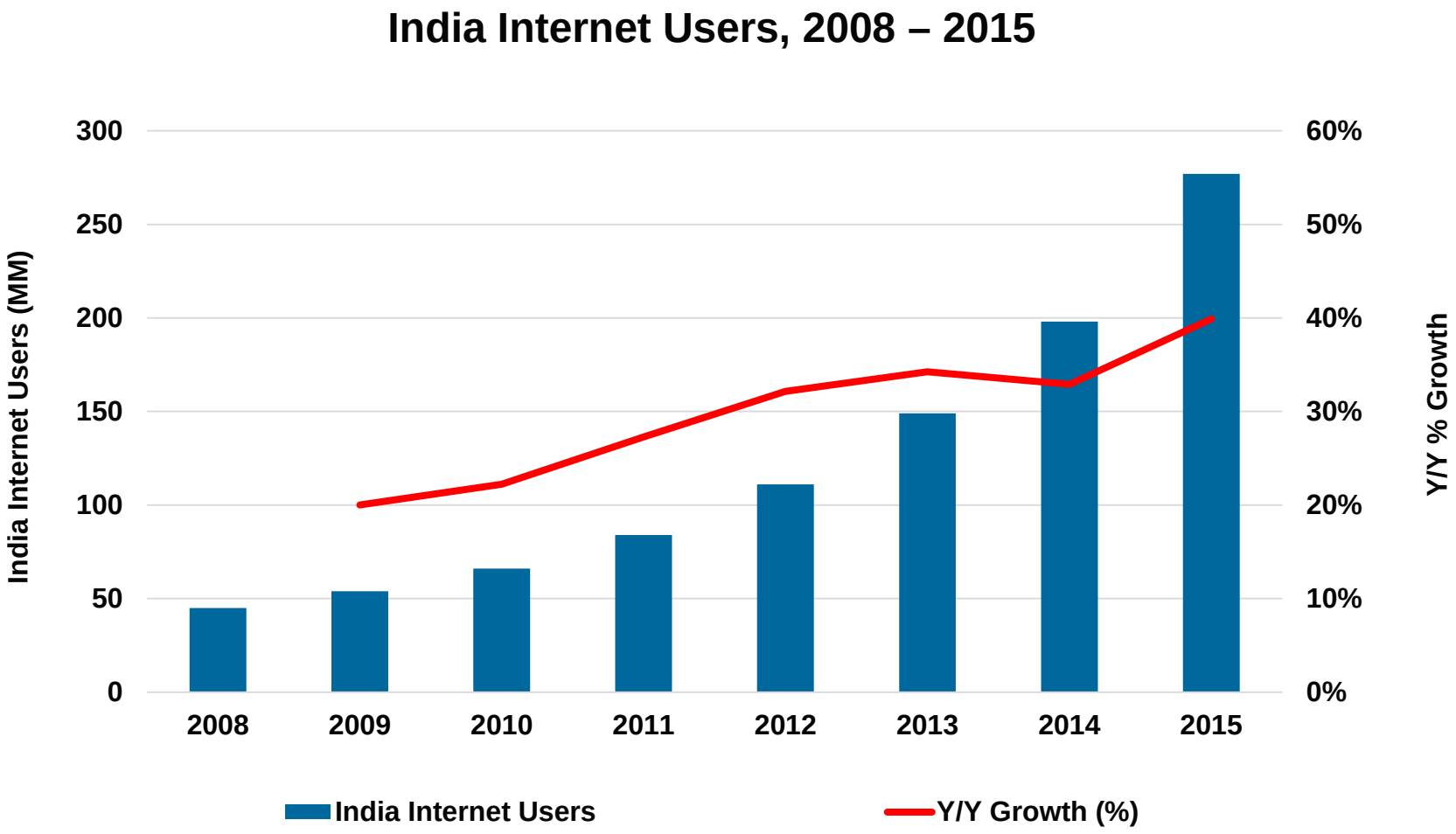
Source: United Nations / International Telecommunications Union, US Census Bureau. Internet user data is as of mid-year. Internet user data for: China from CNNIC, Iran from Islamic Republic News Agency, citing data released by the National Internet Development Center, India from IAMAI, Indonesia from APJII / eMarketer.

India Internet User Growth Accelerating = +40% vs. +33% Y/Y...

@ 277MM Users... India Passed USA to Become #2 Global User Market Behind China

Source: United Nations / International Telecommunications Union, US Census Bureau. Internet user data is as of mid-year. Internet user data for: China from CNNIC, India from IAMAI. India users as of 10/2015 was 317MM per IAMAI; USA total population at 12/2015 (inclusive of all ages) was 323MM per US Census.

India Internet Users = 277MM @ 22% Penetration... +40% vs. +33% Y/Y



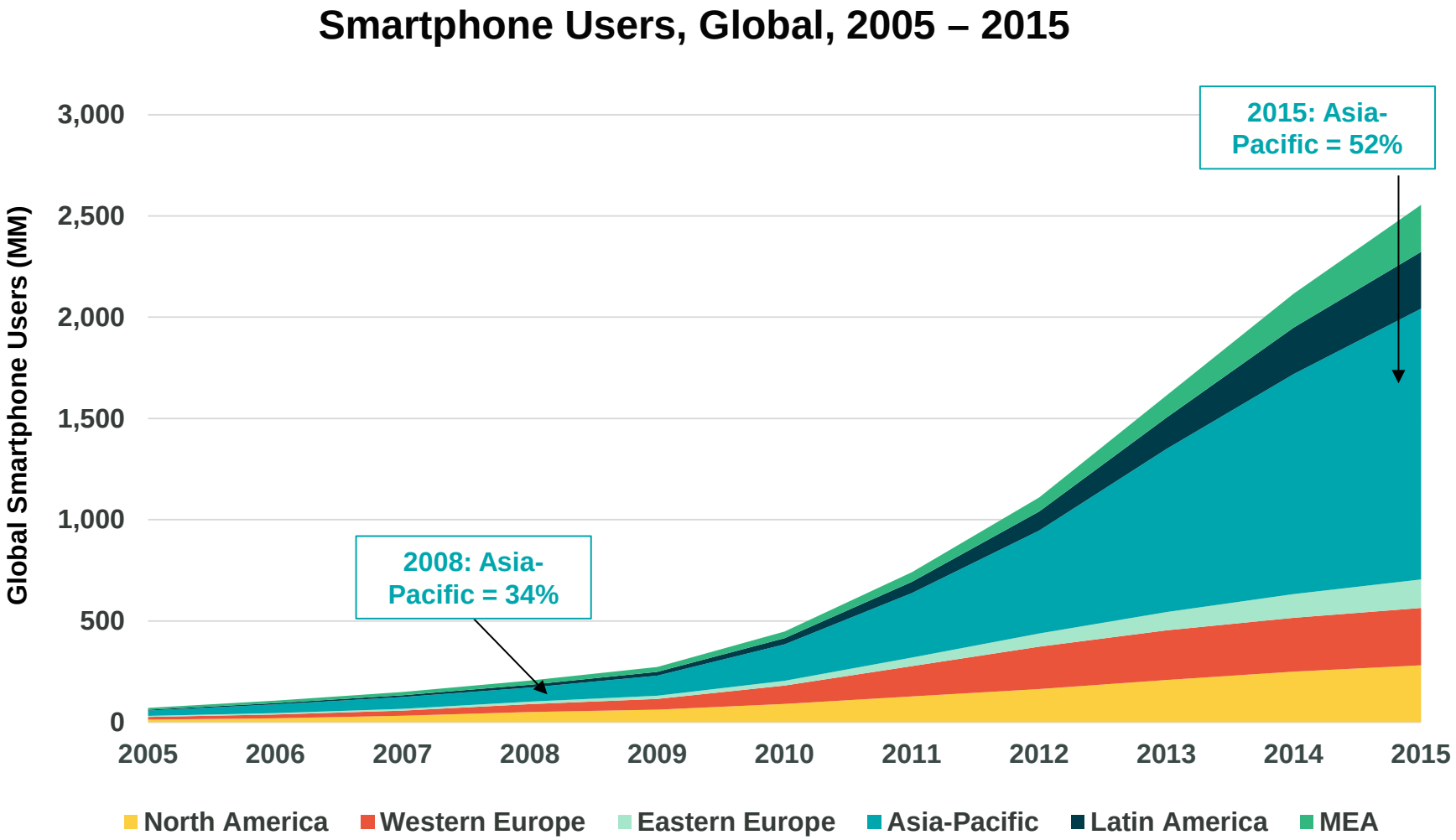
Source: IAMAI. Uses mid-year figures.

Global Smartphone Users Slowing = +21% vs. +31% Y/Y

Global Smartphone Unit Shipments Slowing Dramatically = +10% vs. +28% Y/Y

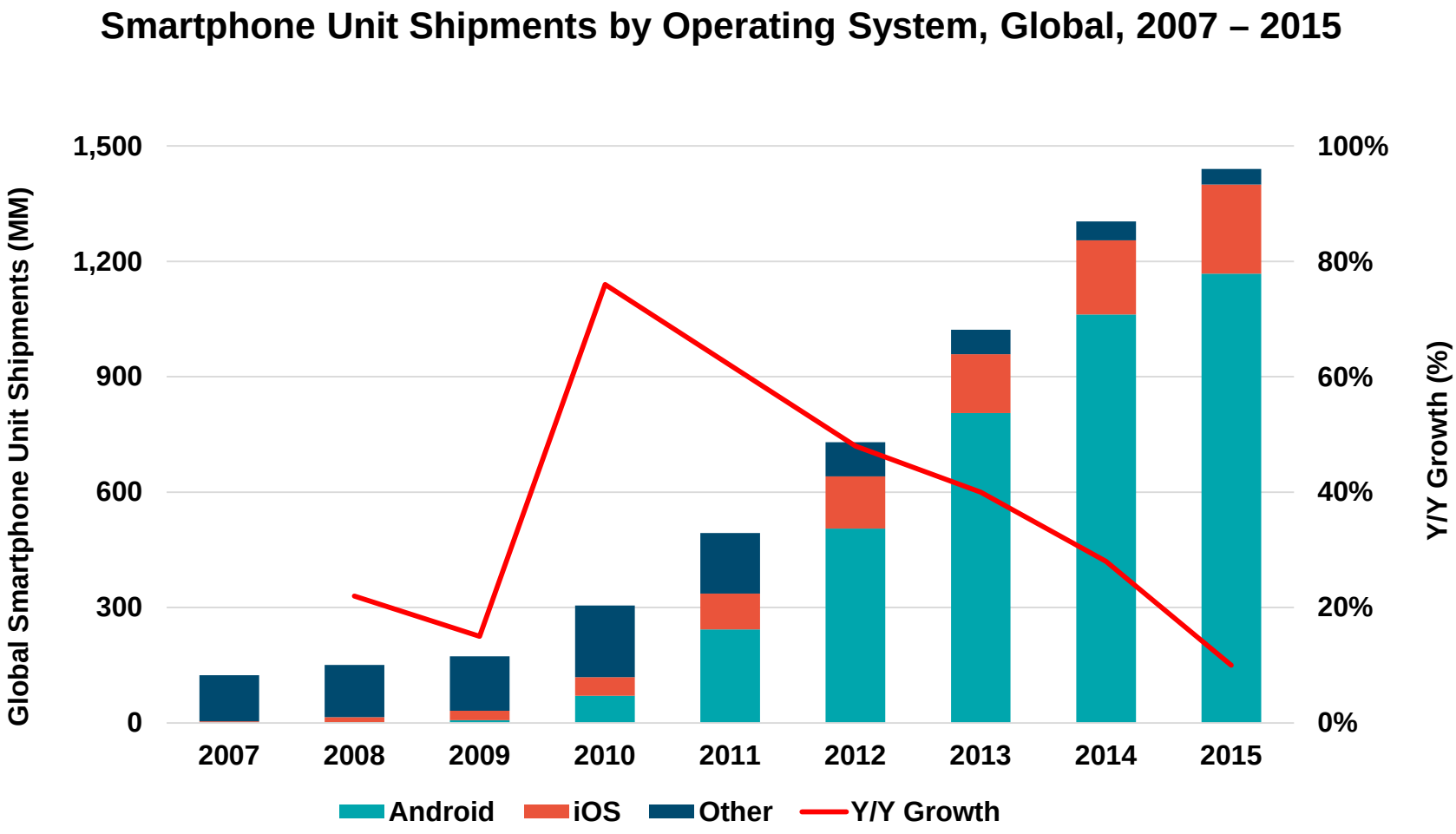
Source: Nakono Research (2/16), Morgan Stanley Research (5/16).
"Smartphone Users" represented by installed base.

Global Smartphone User Growth Slowing...
Largest Market (Asia-Pacific) = +23% vs. +35% Y/Y



Source: Nakono Research (2/16).
* "Smartphone Users" represented by installed base.

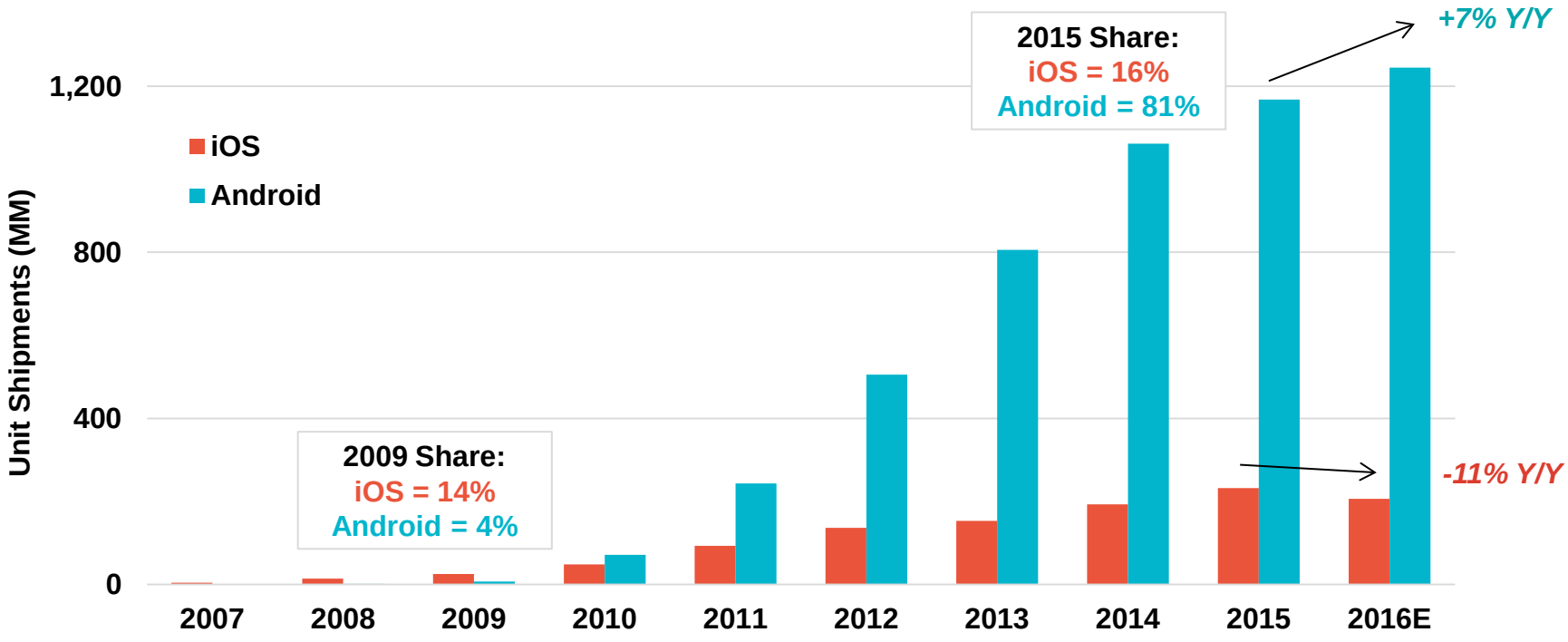
Global Smartphone Units Slowing Dramatically...
After 5 Years of High Growth @ +10% vs. +28% Y/Y



Source: Morgan Stanley Research, 5/16.

Android Smartphone Share Gains Continue vs. iOS... Android ASP Declines Continue...Delta to iOS @ ~3x

Smartphone Unit Shipments, iOS vs. Android, Global, 2007 – 2016E



iOS ASP ($)	**$594**	**$621**	**$623**	**$703**	**$712**	**$686**	**$669**	**$680**	**$717**	**$651**
Y/Y Growth	–	*4%*	*0%*	*13%*	*1%*	*-4%*	*-2%*	*2%*	*5%*	*-9%*

Android ASP	**–**	**$403**	**$435**	**$441**	**$380**	**$318**	**$272**	**$237**	**$216**	**$208**
Y/Y Growth	–	–	*8%*	*1%*	*-14%*	*-16%*	*-15%*	*-13%*	*-8%*	*-4%*

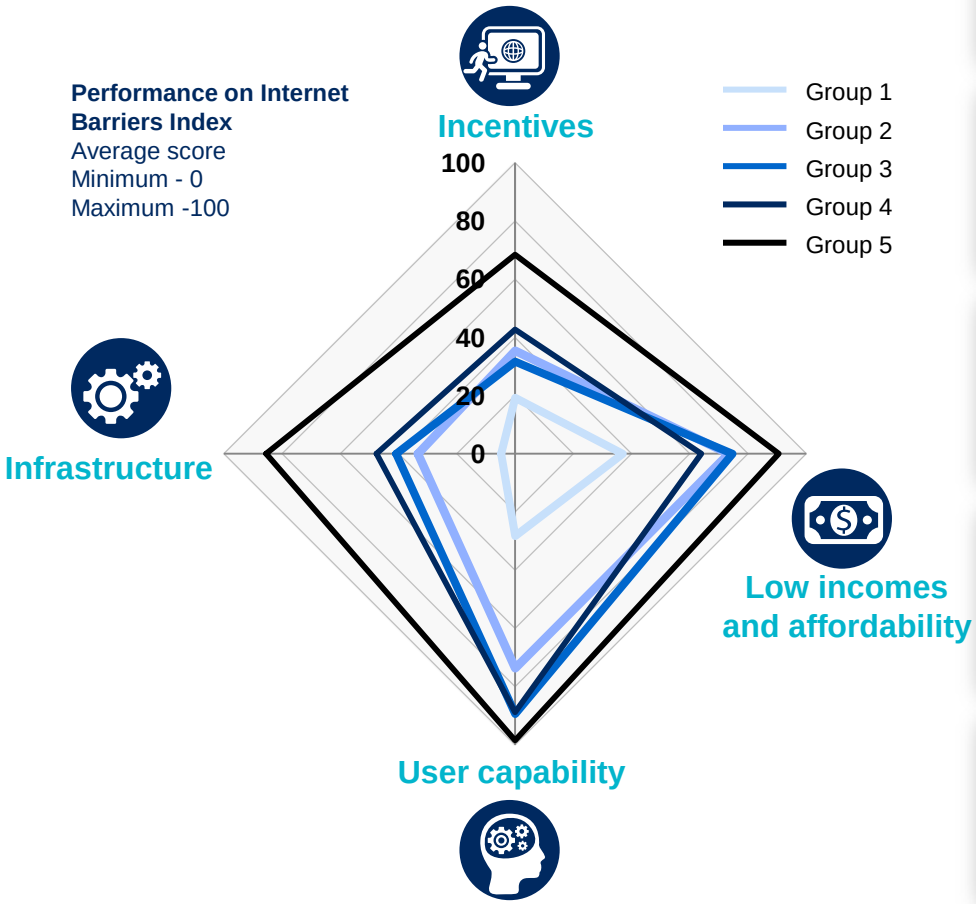
Source: Morgan Stanley Research, 5/16.

New Internet Users =

Continue to be Harder to Garner Owing to High Penetration in Developed Markets

With Already High Mobile Penetration in More Developed / Affluent Countries... New Users in Less Developed / Affluent Countries Harder to Garner, per McKinsey

Countries fall into one of 5 groups based on barriers they face to Internet adoption



Group 1: High barriers across the board; offline populations that are young, rural, and have low literacy

Countries: Bangladesh, Ethiopia, Nigeria, Pakistan, Tanzania
Offline population, 2014: 548 million
Internet penetration, 2014: 18%

Group 2: Medium to high barriers with larger challenges in incentives and infrastructure; mixed demographics

Countries: Egypt, India, Indonesia, Philippines, Thailand
Offline population, 2014: 1,438 million
Internet penetration, 2014: 20%

Group 3: Medium barriers with greatest challenge in incentives; rural and literate offline populations

Countries: China, Sri Lanka, Vietnam
Offline population, 2014: 753 million
Internet penetration, 2014: 49%

Group 4: Medium barriers with greatest challenge in low incomes and affordability; offline populations predominantly urban / literate / low income

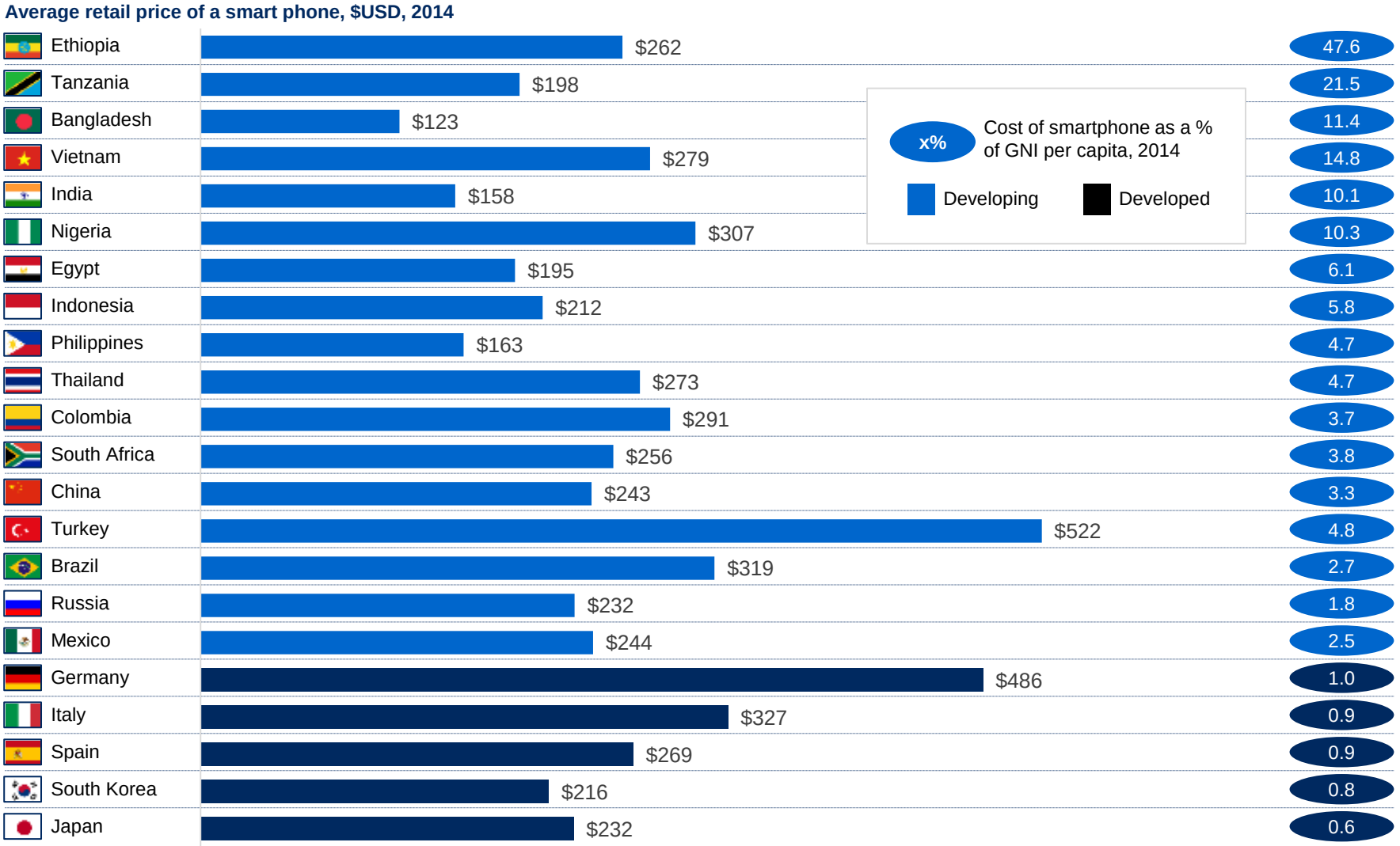
Countries: Brazil, Colombia, Mexico, South Africa, Turkey
Offline population, 2014: 244 million
Internet penetration, 2014: 52%

Group 5: Low barriers across the board; offline populations that are highly literate and disproportionately low income and female

Countries: Germany, Italy, Japan, Korea, Russia, USA
Offline population, 2014: 147 million
Internet penetration, 2014: 82%

Source: World Bank; McKinsey analysis from Internet Barriers Index

Smartphone Cost in Many Developing Markets = Material % of Per Capita Income... 15% (Vietnam) / 10% (Nigeria) / 10% (India) / 6% (Indonesia), per McKinsey

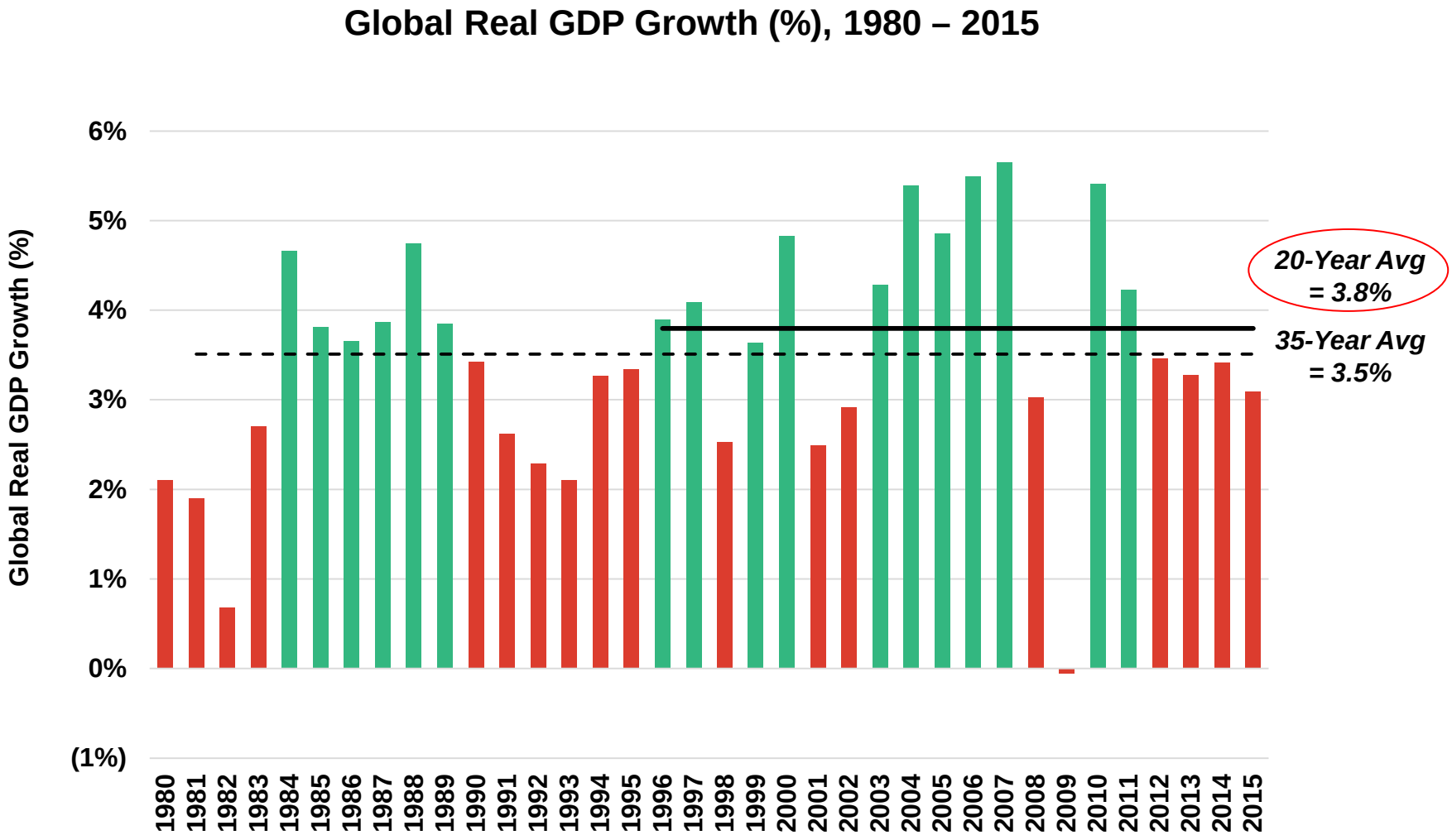


Source: McKinsey, Euromonitor, (smartphone prices); World Bank, estimates (GNI p.c., Atlas method)
Note: Reflects true prices as paid by the consumer at point-of-sale; includes taxes and subsidies. Excludes data plan costs.

GLOBAL MACRO TRENDS

Global Economic Growth = Slowing

Global GDP Growth Slowing = Growth in 6 of Last 8 Years @ Below 20-Year Average



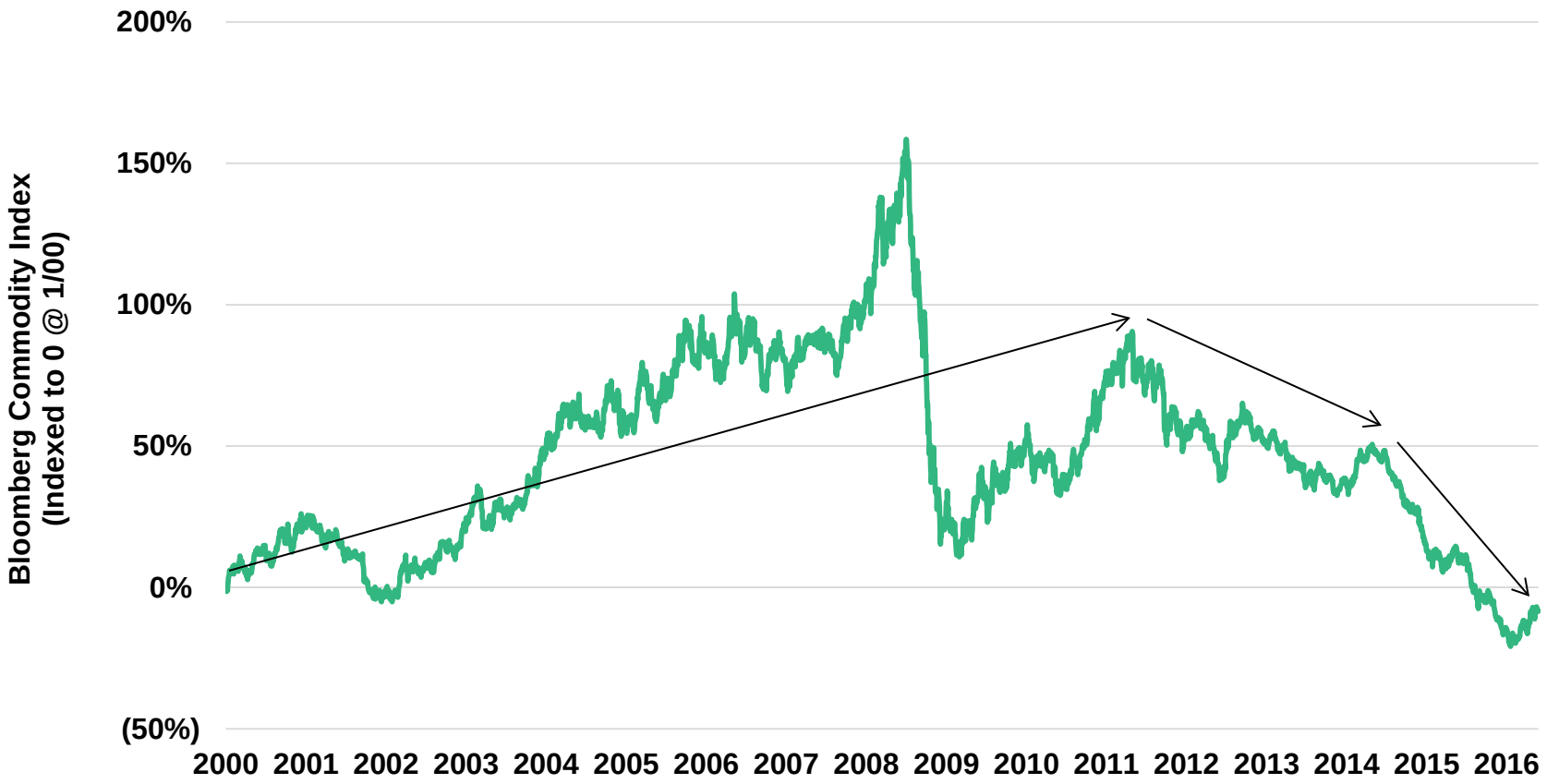
Source: IMF WEO, 4/16. Stephen Roach, "A World Turned Inside Out," Yale Jackson Institute for Global Affairs, 5/16.
Note: GDP growth based on constant prices (real GDP growth).

Commodity Price Trends =

In Part, Tell Tale of Slowing Global Growth

Commodity Prices Down = -39% Since 5/14 vs. -8% Annual Average (5/11-4/14) & +6% (1/00-4/11)

Global Commodity Prices, Bloomberg Commodity Index (Indexed to 0 @ 1/00), 2000 – 2016YTD



Source: Morgan Stanley, Bloomberg as of 5/25/16
Note: Bloomberg Commodity Index represents 22 globally traded commodities, weighted as: 31% Energy, 23% Grains, 17% Industrial Metals, 16% Precious Metals, 7% Softs (Sugar, Coffee, Cotton), and 6% Livestock.

Global Growth Engines = Evolve Over Time

Global Growth Engines @ ~2/3 of Global GDP Growth...
1985 = N. America + Europe + Japan
2015 = China + Emerging Asia

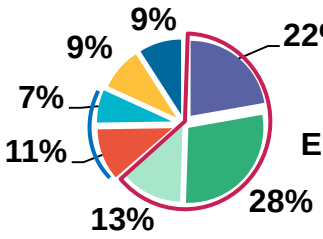
Real GDP Growth Contribution by Region, 1985 / 2015

(Based on Purchasing Power Parity)

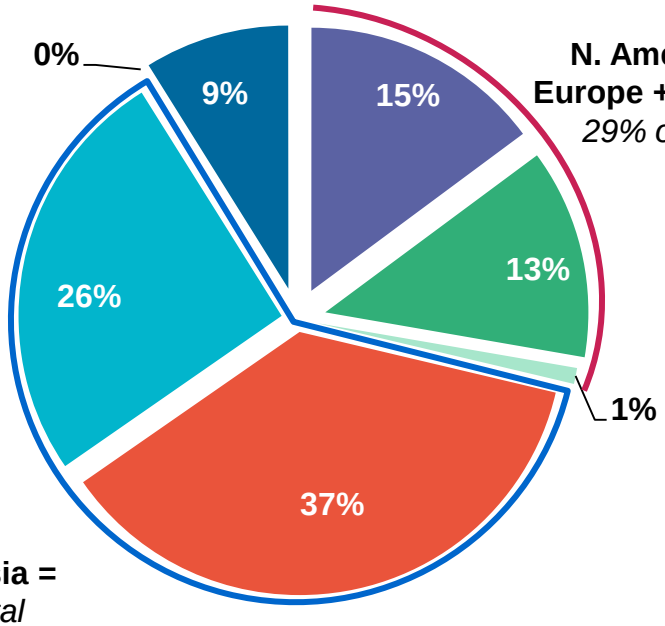
1985
$19T = World GDP
+4% Y/Y

2015
$114T = World GDP
+3% Y/Y

China + Emerging Asia = *18% of Total*



N. America + Europe + Japan = *63% of Total*



China + Emerging Asia = *63% of Total*

N. America + Europe + Japan = *29% of Total*

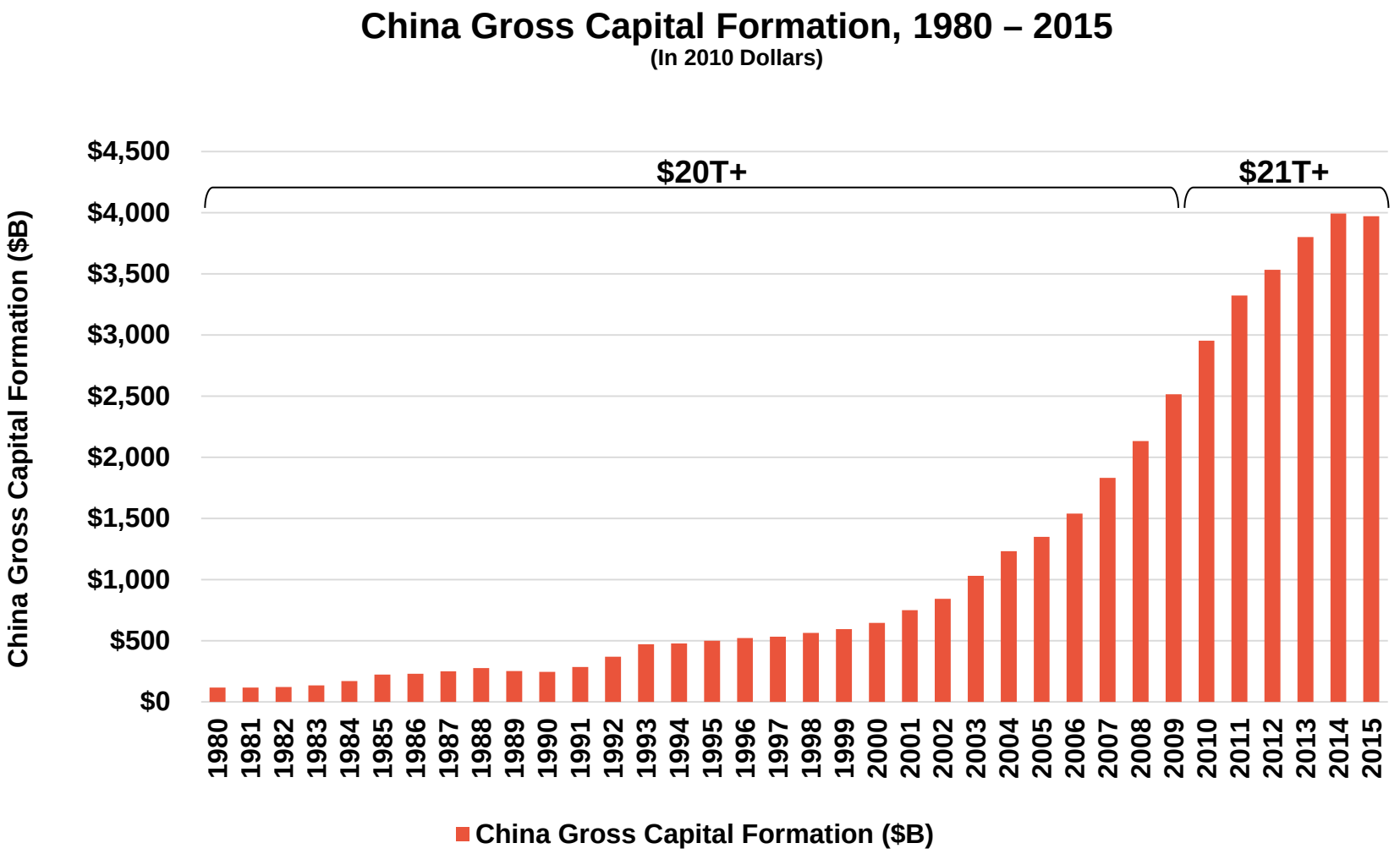
Europe | N. America | Japan | China | Emerging Asia (ex-China) | Lat Am | Middle East, Africa, Other

Source: IMF WEO, 4/16. GDP growth based on constant prices (real GDP growth). PPP = Purchasing Power Parity exchange rate, national currency per international dollar. GDP PPP = GDP adjusted by PPP rate. Emerging Asia includes Bangladesh, Cambodia, India, Indonesia, Lao, Malaysia, Mongolia, Myanmar, Nepal, Philippines, Sri Lanka, Thailand, Vietnam and others and excludes China. GDP growth contribution based on annual snapshots stated above and not necessarily reflective of secular trends.

China's
Gross Capital Formation
(Capital Equipment /
Roads / Buildings...)

Past 6 Years >
Previous 30 Years

China Gross Capital Formation = Slowing...
Sum of Past 6 Years > Previous 30 Years



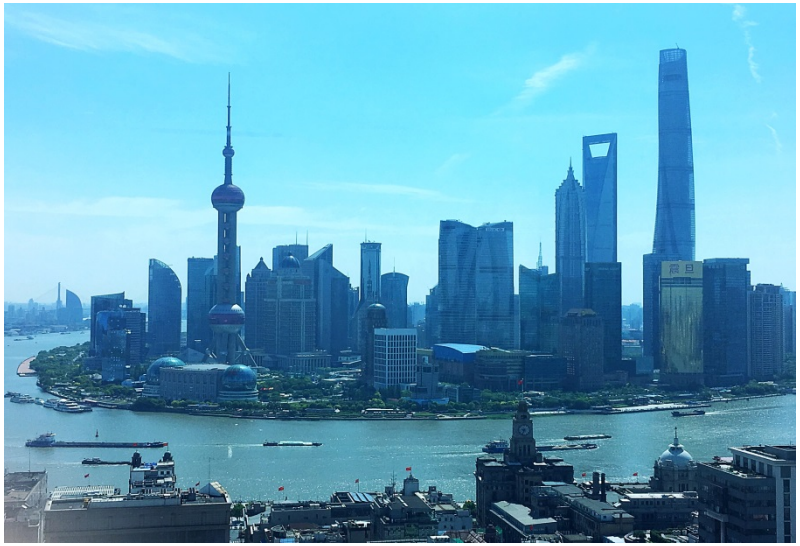
Source: China National Bureau of Statistics, 5/16. Assumes constant FX rate RMB/USD @ 6.5.
Amounts are inflation adjusted to 2010 dollars based on IMF data on inflation rates (yearly average).
Gross capital formation = gross fixed capital formation (majority) + changes in inventory. Gross fixed capital formation includes land improvements (fences, ditches, drains, and so on); plant, machinery, and equipment purchases; and the construction of roads, railways, and the like, including schools, offices, hospitals, private residential dwellings, and commercial and industrial buildings. It also includes the value of draught animals, breeding stock and animals for milk, for wool and for recreational purposes, and newly increased forest with economic value.

Shanghai Area Over Past 2+ Decades = Illustrates Magnitude of China (& Emerging Asia) Growth

Shanghai, China, Pudong District

1987

2016



Source: Reuters/Stringer, Carlos Barria, Yichen Guo.

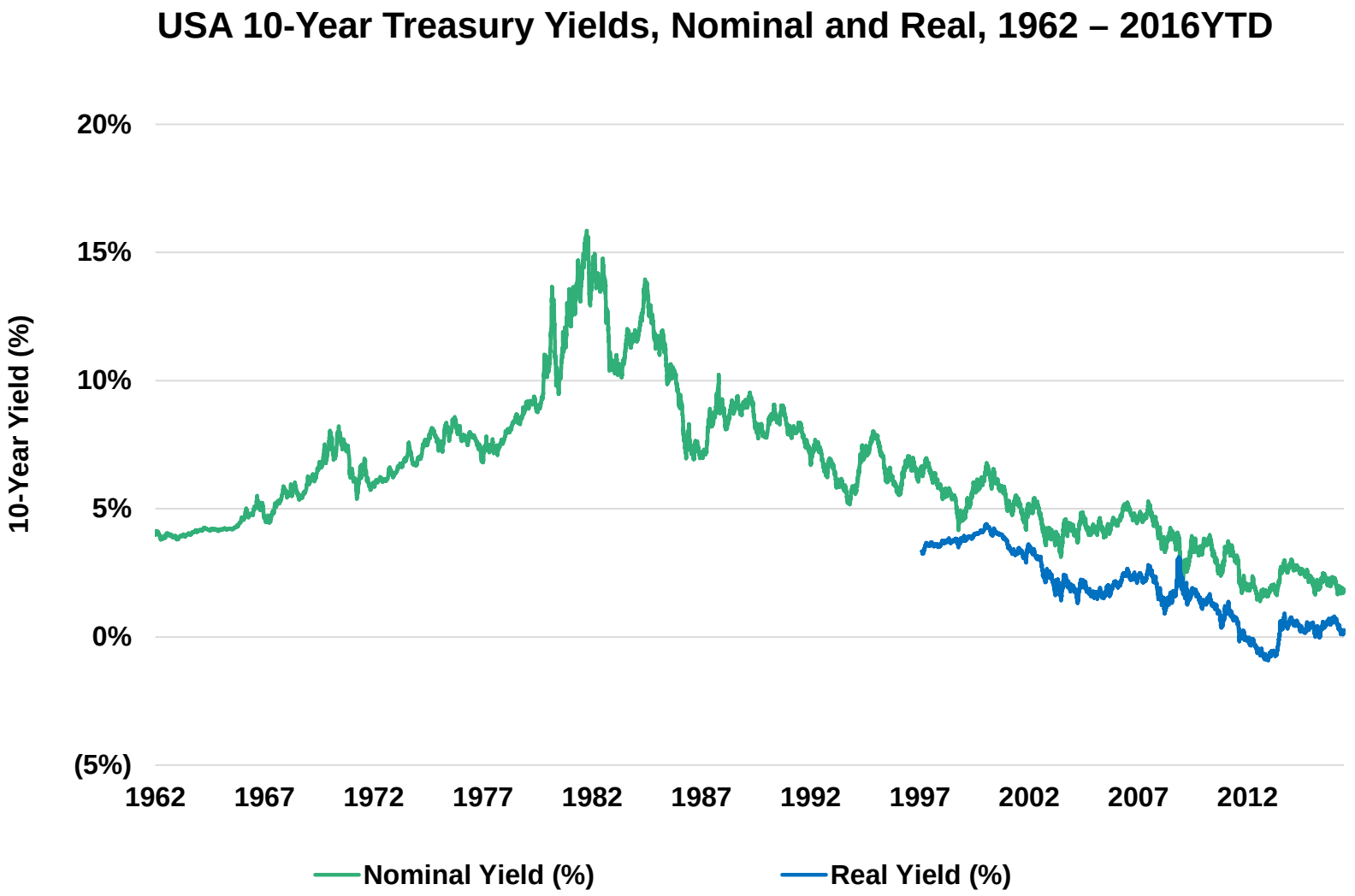
Re-Imagination of China Over Past 3+ Decades – World's Population Leader + #3 in Land Mass –

Helped Drive Incremental Global Growth of Likes Which is Difficult to Repeat

Interest Rates Have Fallen to Historically Low Levels =

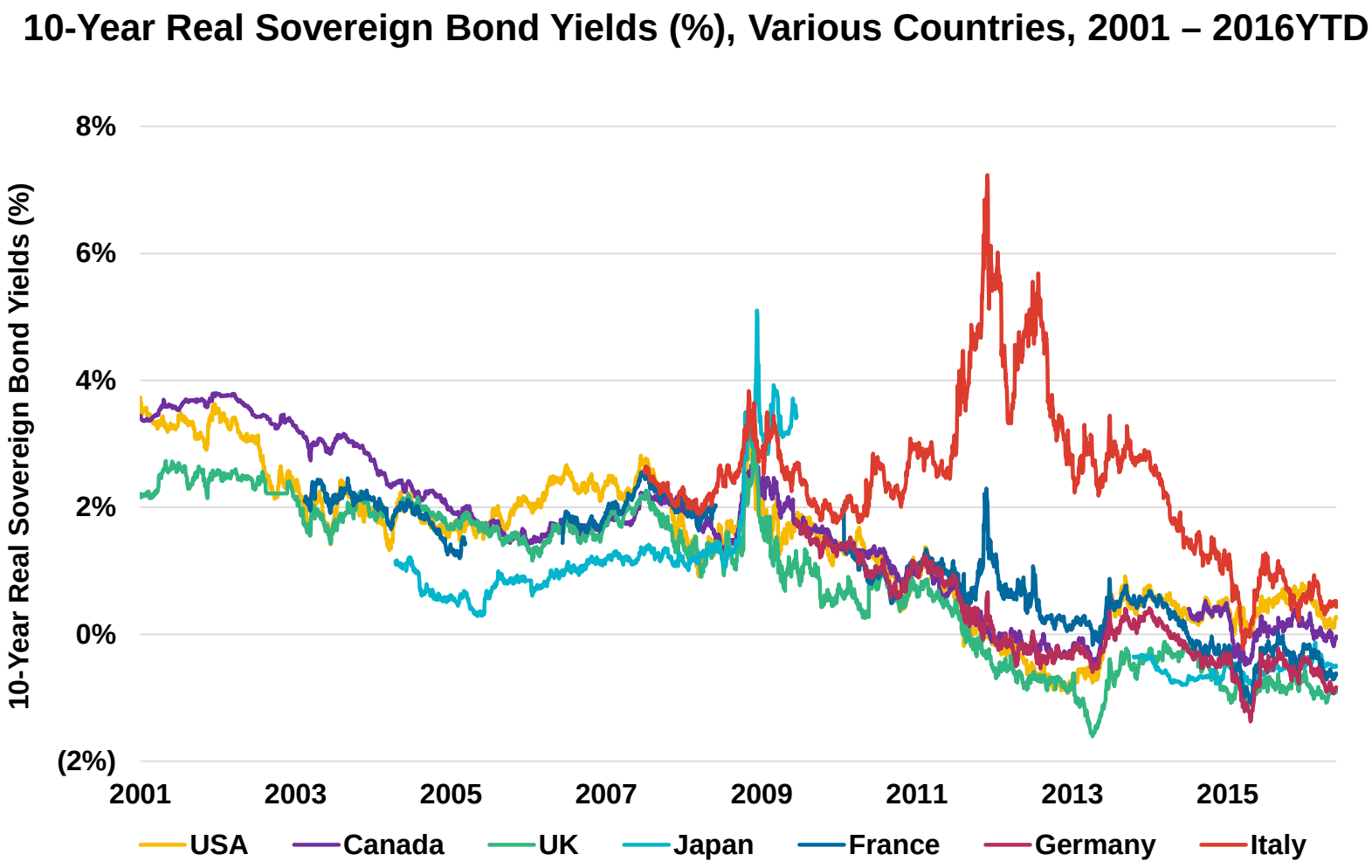
Interest Rate Trends = Can be Indicative of Perception for Growth Outlook

USA 10-Year Treasury Yield = Low by Historical Standards



Source: Morgan Stanley, Bloomberg, 5/16
Note: Real rates based on USGGT10Y Index on Bloomberg, which measures yield to maturity (pre-tax) on Generic 10-Year USA government inflation-index bonds.

Global 10-Year Bond Yields = Have Trended Down



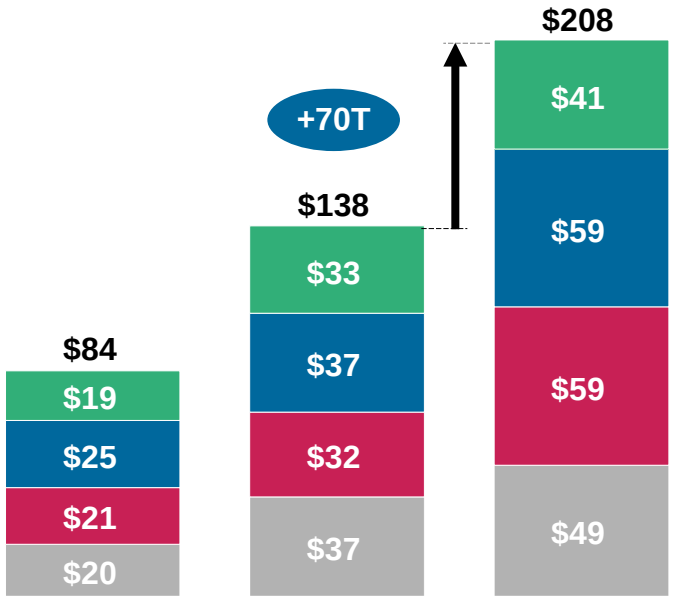
Source: Morgan Stanley, Bloomberg, 5/16.
Note: Real rates based on yield to maturity on 10-year inflation-indexed treasury security for each country.

Total Global Debt Loads
Over 2 Decades =

High & Rising Faster Than GDP

Global Government Debt @ 66% Average Debt / GDP (2015) & Up... +9% Annually Over 8 Years vs. +2% GDP Growth* for 50 Major Countries

Global Debt By Type ($T, Constant 2014 FX), Q4:00 – Q2:15

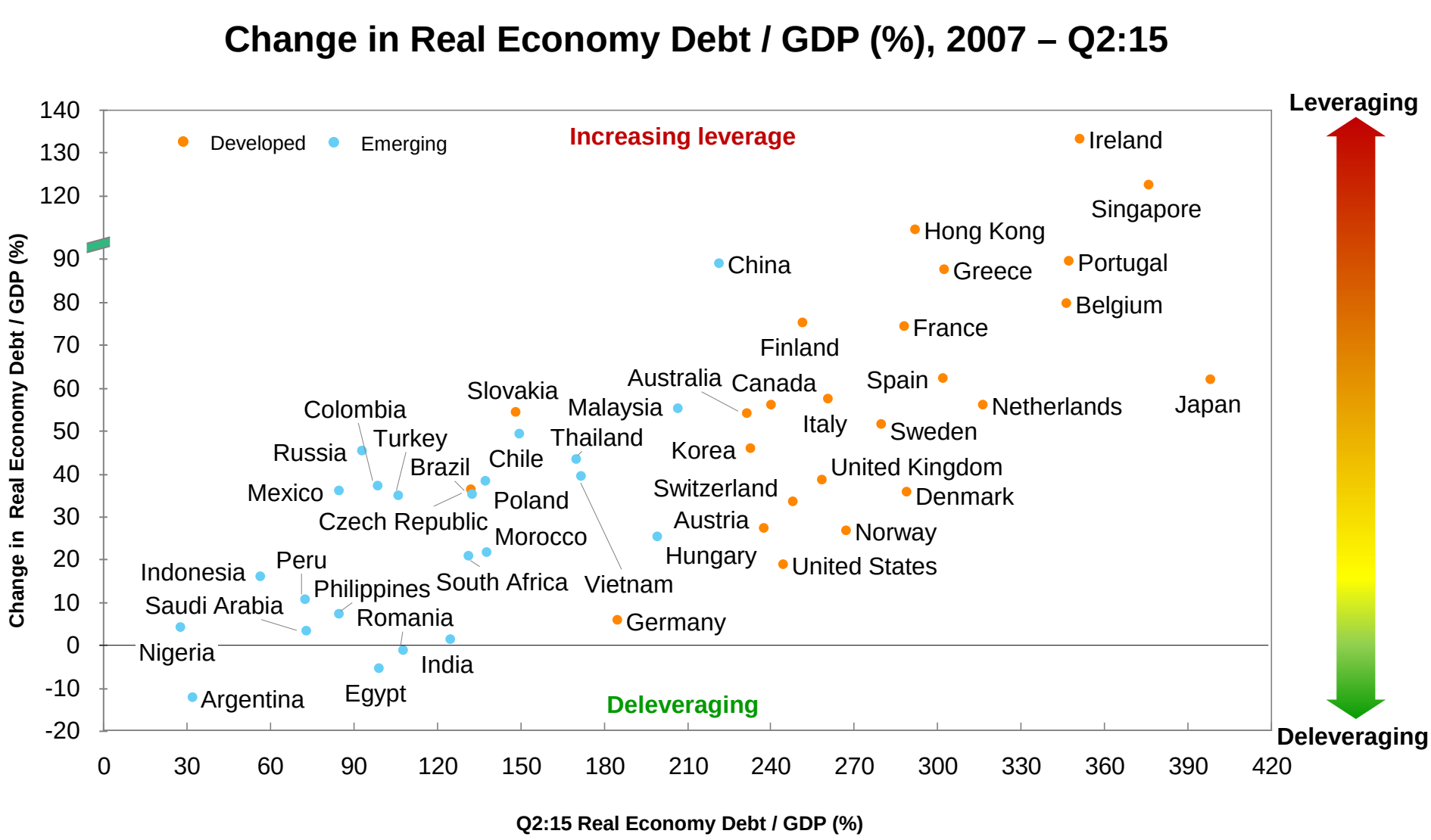


	Compound annual growth rate (%) 2000–2007	2007–Q2:15
Household	8.5	3.0
Corporate	5.7	6.4
Government	5.9	8.7
Financial	9.6	3.7
GDP Growth*:	4.1	2.2

	Q4:00	Q4:07	Q2:15
Total debt as % of GDP	250	274	299

Source: McKinsey Global Institute (3/16), IMF.
*GDP growth rate based on constant prices and calculated as average of average growth rates across 50 countries from 2000-2007 and 2008-2015.

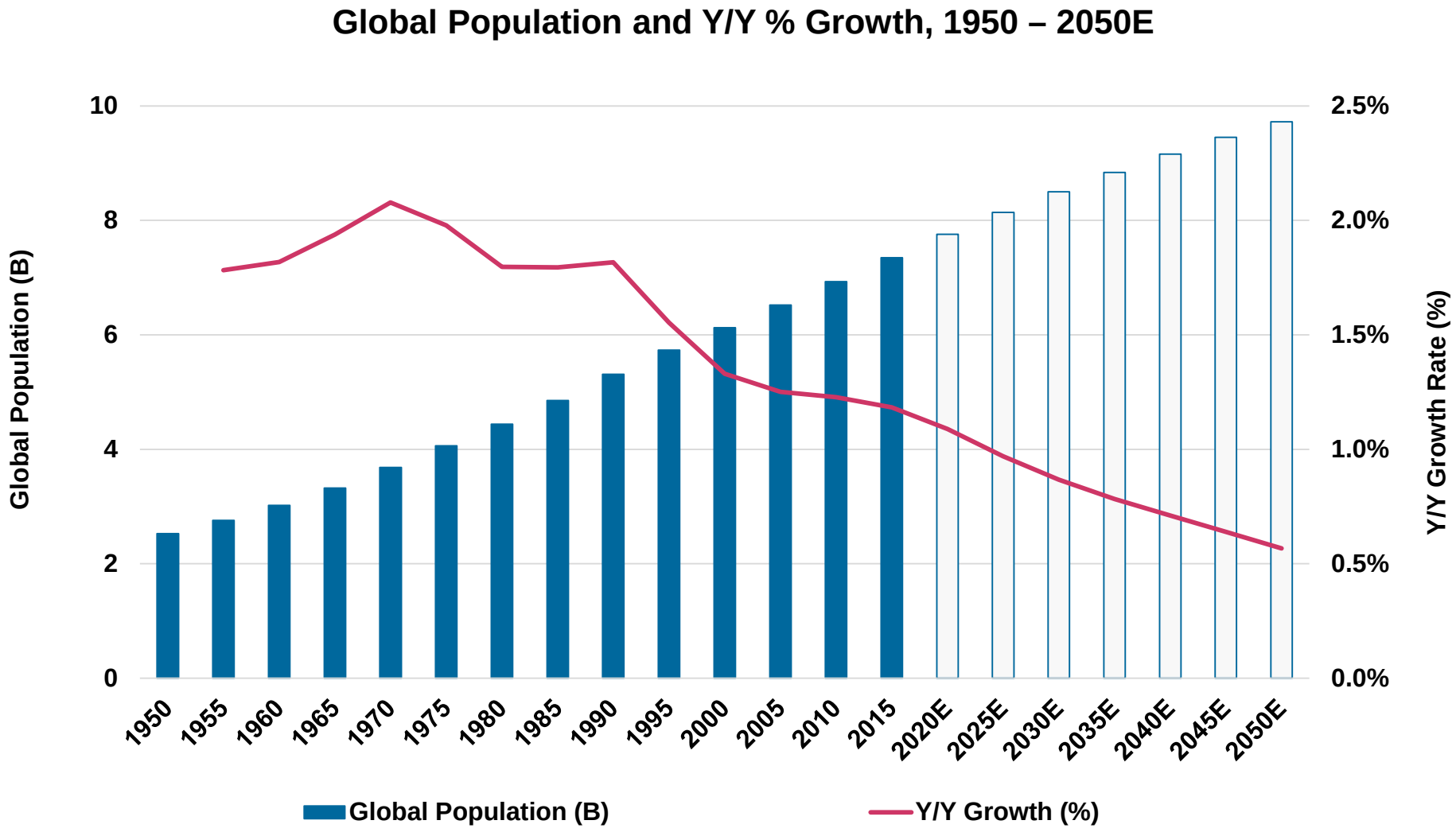
Total Debt-to-GDP Ratios = High & Up in Most Major Countries... @ 202% Average vs. 147% (2000)*



Source: McKinsey Global Institute (3/16). Debt includes that owed by households, non-financial corporates, and governments (i.e. excludes financial sector debt).
*Country inclusion per McKinsey; includes top developed countries by GDP and representative geographic selection of emerging countries.

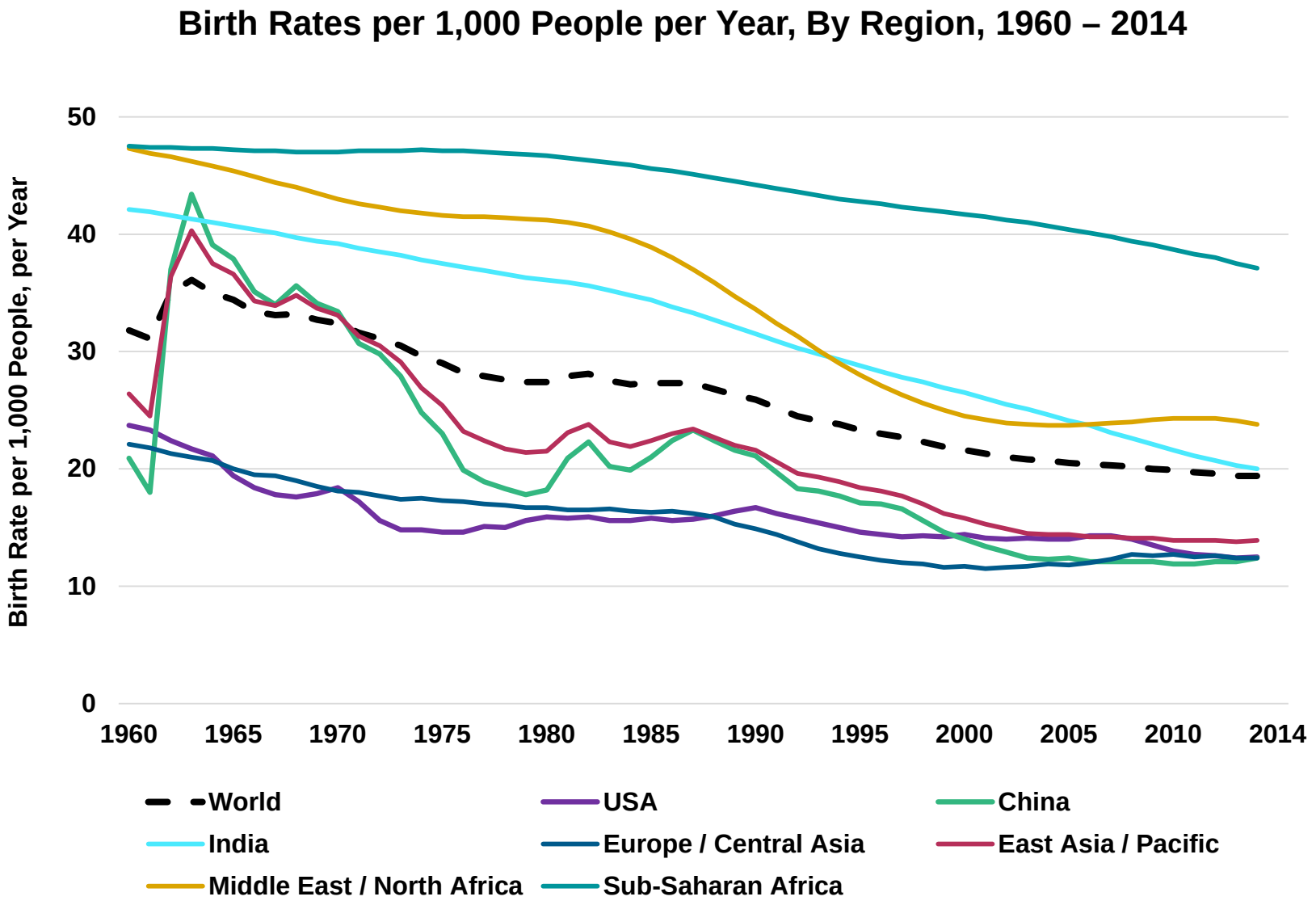
Demographic Trends =
Slowing Population Growth...
Slowing Birthrates +
Rising Lifespans

World Population Growth Rate Slowing = +1.2% vs. +2.0% (1975)



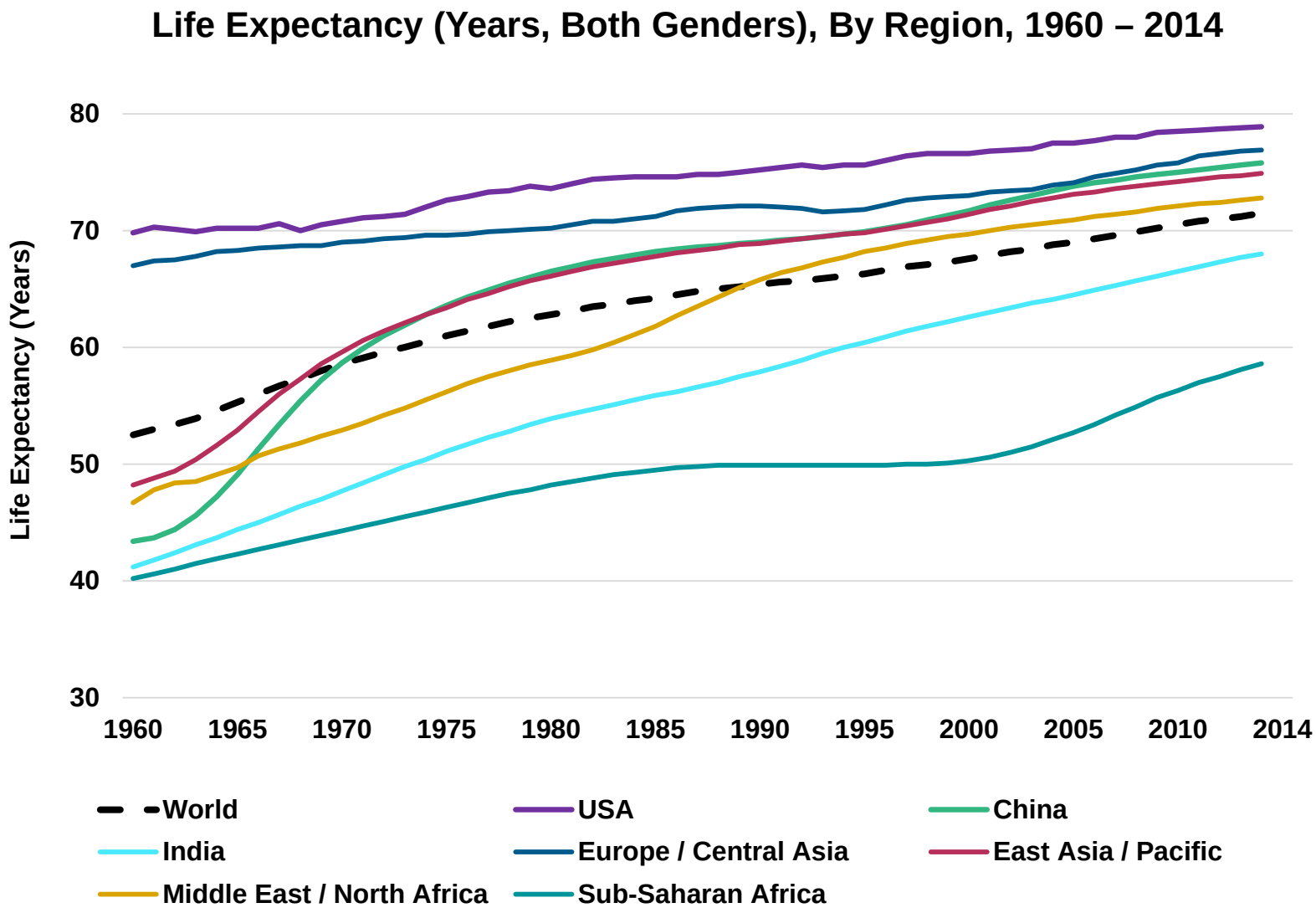
Source: U.N. Population Division
Note: Growth Rates based on CAGRs over 5 Year Periods.

Global Birth Rates = Down 39% Since 1960 (1% Annual Average Decline)



Source: World Bank World Development Indicators
Note: Represents birth rates per 1,000 people per year.

Global Life Expectancy @ 72 Years = Up 36% Since 1960 (0.6% Annual Average Increase)



Source: World Bank World Development Indicators

Net, Net,
Economic Growth Slowing +
Margins for Error Declining =

Easy Growth Behind Us

5 Epic Growth Drivers Over Past 2 Decades = Losing Mojo

1) Connectivity Growth Slowing –
Internet Users rose to 3B from 35MM (1995)

2) Emerging Country Growth Slowing –
Underdeveloped regions developed – including China / Emerging Asia / Middle East which rose to 69% of global GDP growth from 43%...

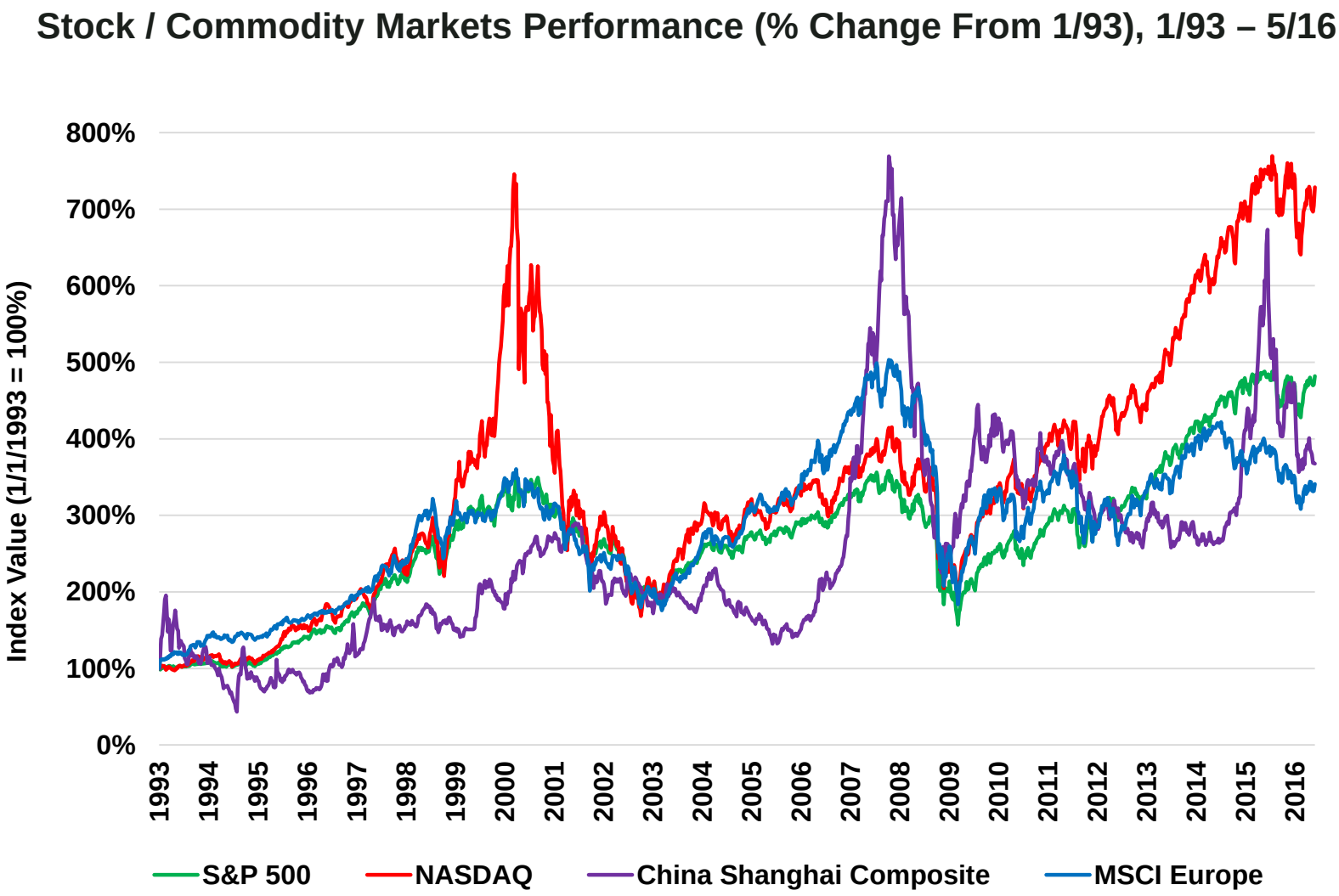
3) Government Debt Rising (& High) –
Spending rose to help support growth...Government debt-to-GDP rose to 66% from 51% (2000) for 50 major economies

4) Interest Rates Have Declined –
Helped fuel borrowing – USA 10-Year Nominal Treasury Yield fell to 1.9% (2016) from 6.6% (1995)

5) Population Growth Rate Slowing & Population Aging –
Higher birth rates helped drive labor force growth – population growth rate continued to fall – to 1.2% from 1.6% (1995)

Source: US Census, ITU, IMF, Stephen Roach, McKinsey, Bloomberg, US Bureau of Labor Statistics, UN Population Division

Several Up / Down Cycles in Past 2 Decades = Internet 1.0 (2000)...Property / Credit (2008)...



Source: Capital IQ.
Note: All values are indexed to 1 (100%) on Jan 1, 1993. Data as of 5/2716.

Adjusting to Slower Growth +
Higher Debt + Aging Population
Creates Rising Risks...

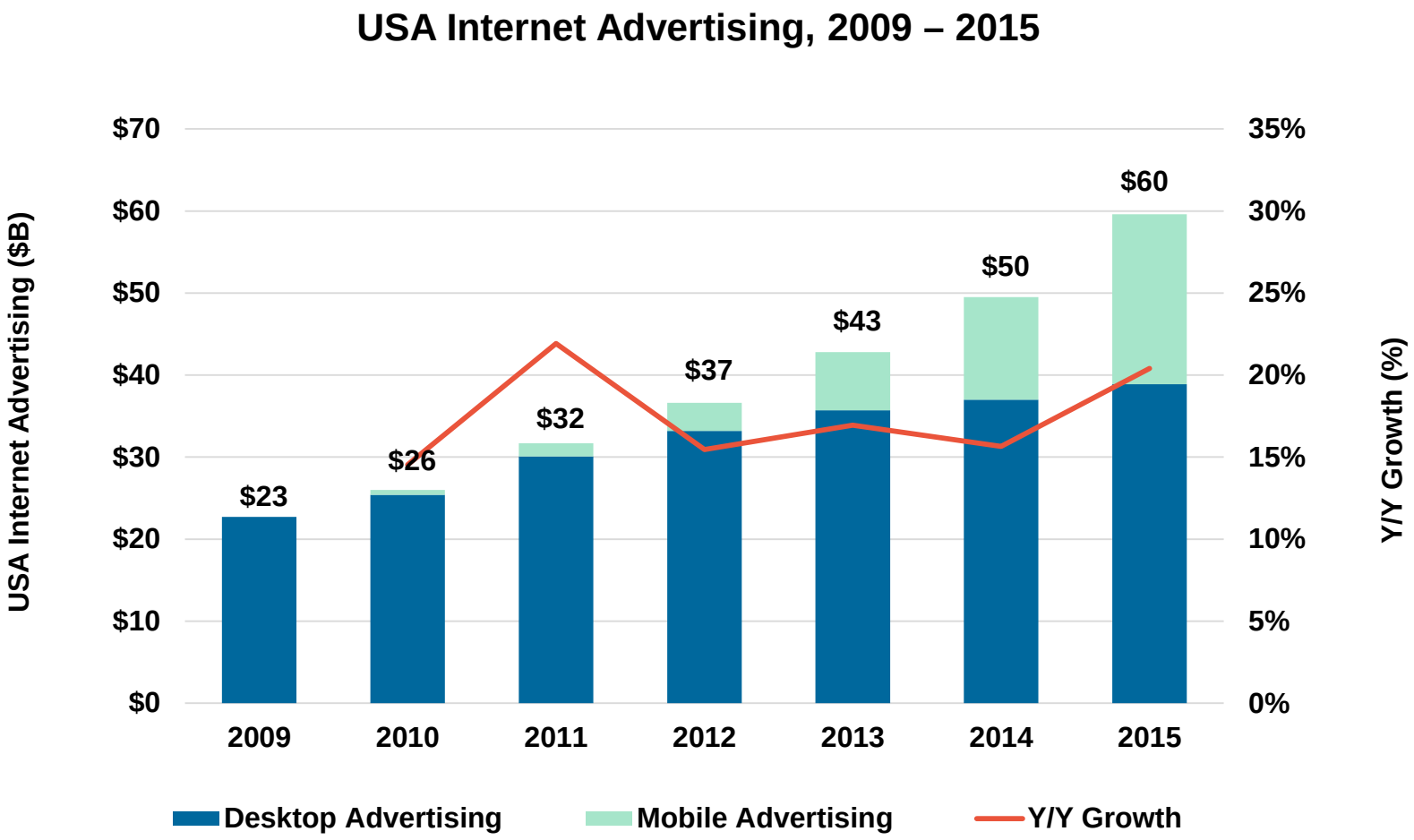
Creates Opportunities for Businesses that
Innovate / Increase Efficiency /
Lower Prices / Create Jobs –
Internet Can Be @ Core of This...

ADVERTISING /
COMMERCE + BRAND TRENDS

Online Advertising =

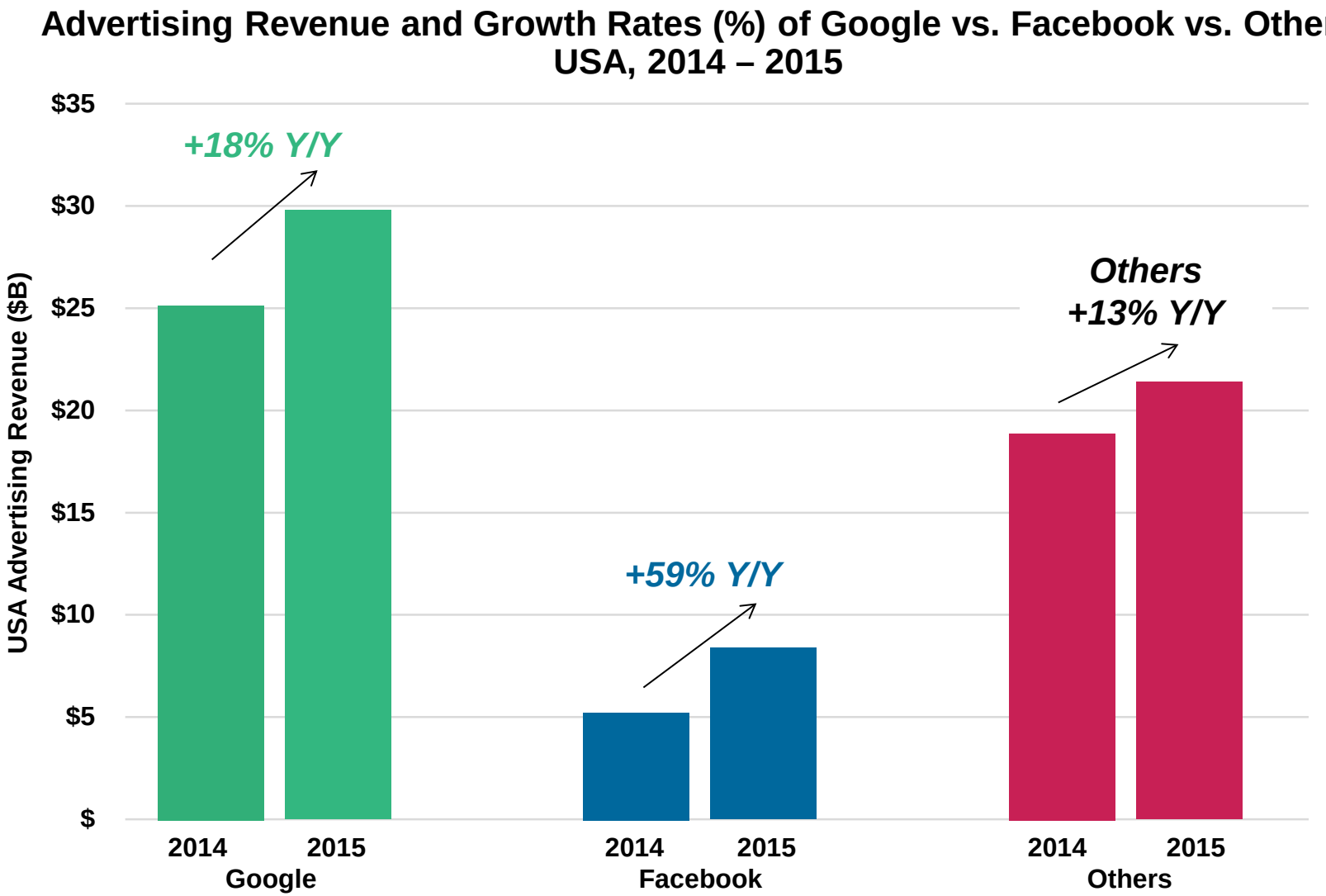
Mobile + Majors + Newcomers Continue to Crank Away

USA Internet Advertising Growth = Accelerating, +20% vs. +16% Y/Y... Owing to Mobile (+66%) vs. Desktop (+5%)



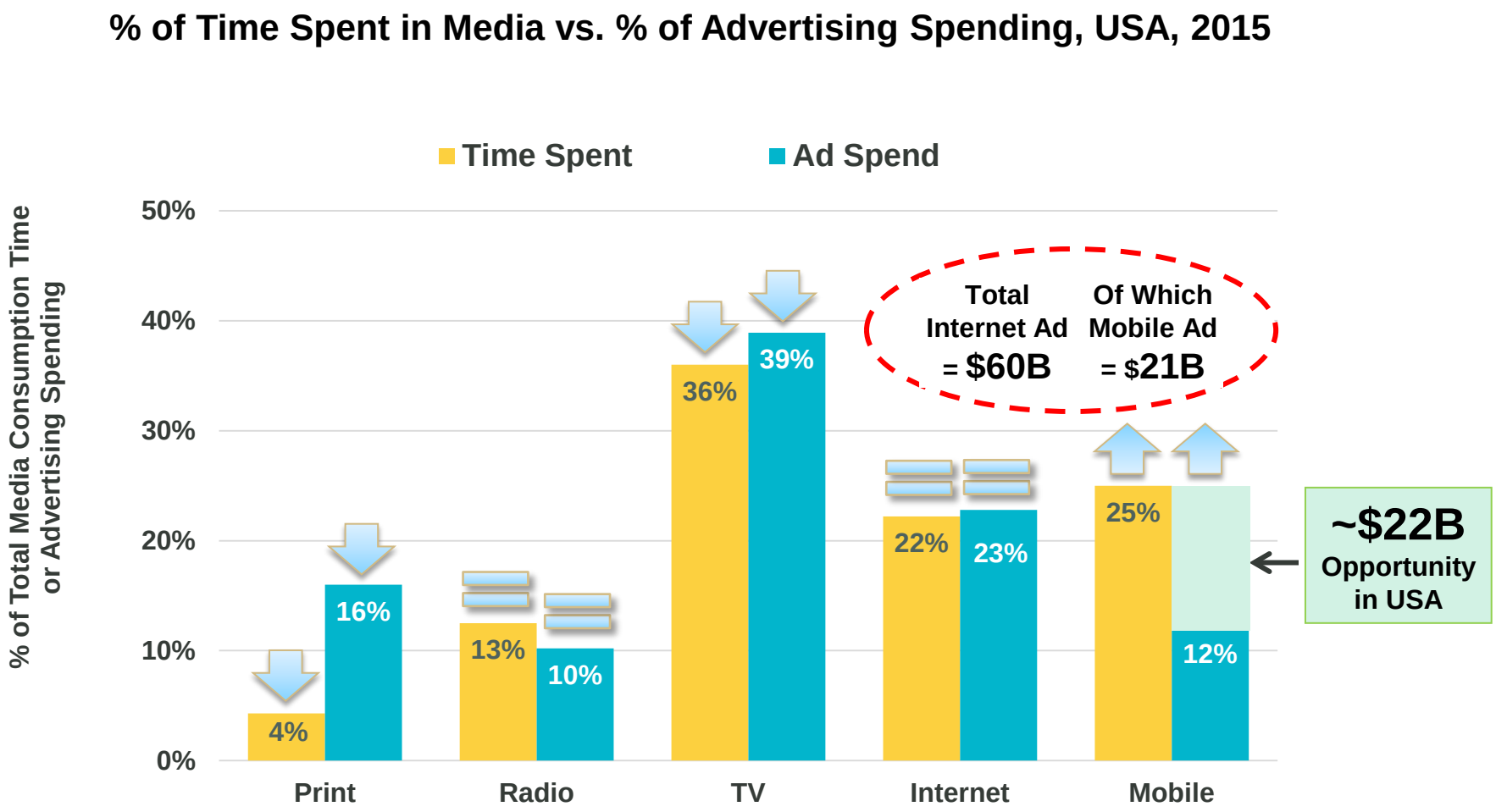
Source: 2015 IAB / PWC Internet Advertising Report.

Google + Facebook = 76% (& Rising) Share of Internet Advertising Growth, USA



Source: IAB / PWC 2015 Advertising Report, Facebook, Morgan Stanley Research
Note: Facebook revenue include Canada. Google USA ad revenue per Morgan Stanley estimates as company only discloses total ad revenue and total USA revenue. "Others" includes all other USA internet (mobile + desktop) advertising revenue ex-Google / Facebook.

@ Margin...
Advertisers Remain Over-Indexed to Legacy Media



Source: Advertising spend based on IAB data for full year 2015. Print includes newspaper and magazine. Internet includes desktop + laptop + other connected devices. ~$22B opportunity calculated assuming Mobile ad spend share equal its respective time spent share. Time spent share data based on eMarketer 4/16. Arrows denote Y/Y shift in percent share. Excludes out-of-home, video game, and cinema advertising.

Online Advertising Efficacy = Still Has Long Way to Go

Google Has Proven Effective Online Advertising Works...

Google = $75B Revenue (2015), +14% Y/Y / $510B Market Value (5/31/16)

...But Many Online (Video) Ads are Ineffective, per Unruly...

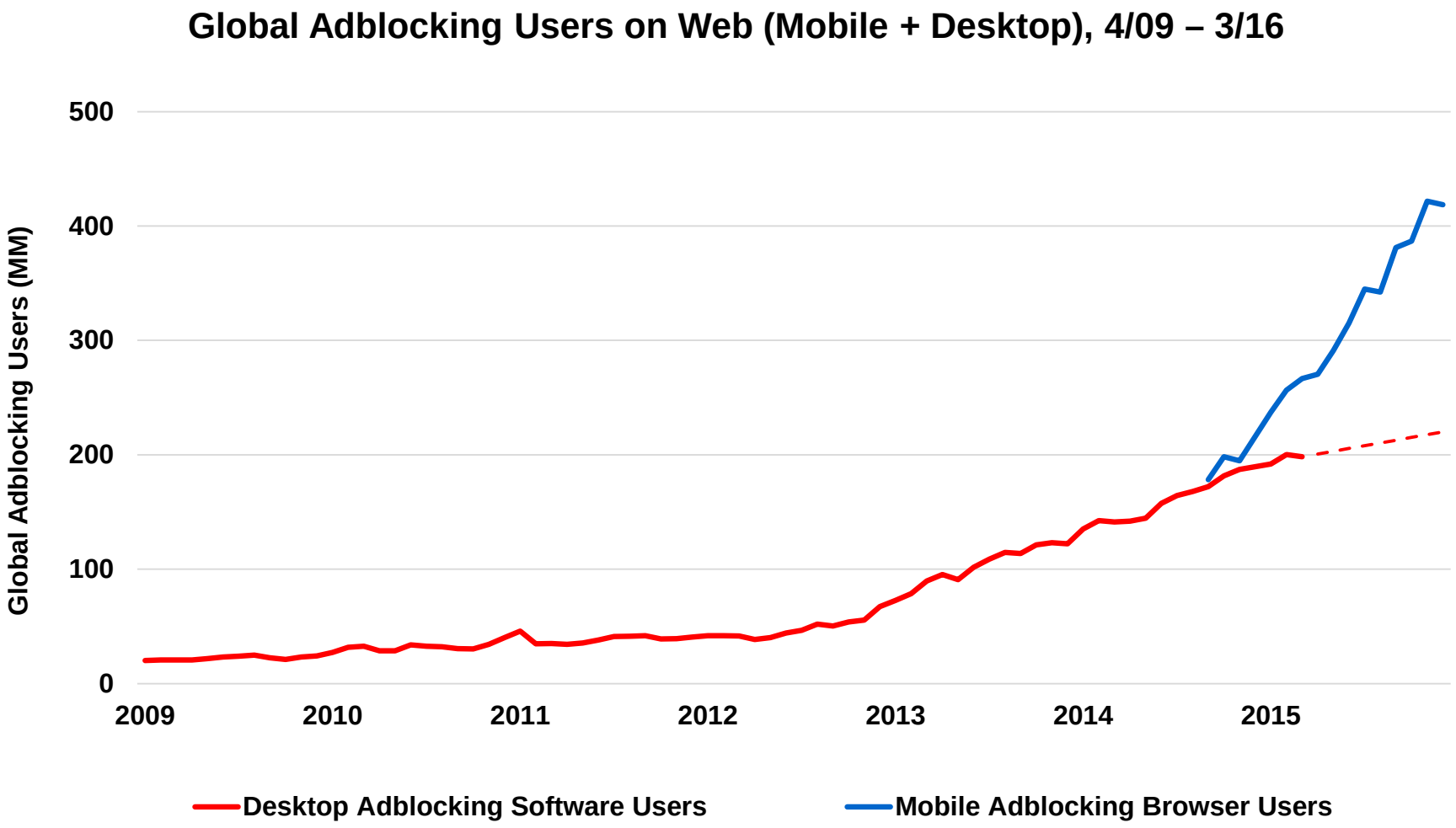
81% = Mute Video Ads
62% = Annoyed with / Put Off by Brand Forcing Pre-Roll Viewing
93% = Consider Using Ad Blocking Software

...But There are Ways Video Ads Can Work, per Unruly

1) Authentic
2) Entertaining
3) Evoke Emotion
4) Personal / Relatable
5) Useful
6) Viewer Control
7) Work with Sound Off
8) Non-Interruptive Ad Format

Source: CapitalIQ as of 5/31/16, Unruly Future Video Survey, July 2015. N = 3,200 internet users surveyed from the US, UK, Germany, Australia, Sweden, France, Indonesia and Japan.

Adblocking @ ~220MM Desktop Users (+16% Y/Y)...~420MM+ Mobile (+94%)... Majority in China / India / Indonesia = Call-to-Arms to Create Better Ads, per PageFair



Source: PageFair, 5/16. Dotted line represents estimated data. These two data sets have not been de-duplicated. The number of desktop adblockers after 6/15 are estimates based on the observed trend in desktop adblocking and provided by PageFair. Note that mobile adblocking refers to web / browser-based adblocking and not in-app adblocking.
Desktop adblocking estimates are for global monthly active users of desktop adblocking software between 4/09 – 6/15, as calculated in the PageFair & Adobe 2015 Adblocking Report. Mobile adblocking estimates are for global monthly active users of mobile browsers that block ads by default between 9/14 – 3/16, including the number of Digicel subscribers in the Caribbean (added 10/15), as calculated in the PageFair & Priori Data 2016 Adblocking Report.

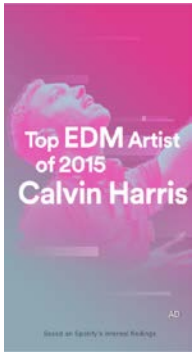
Video Ads that Work = Authentic / Entertaining / In-Context / Often Brief

Snapchat's 3V Advertising

Vertical *(Made for Mobiles) /* ***Video*** *(Great Way to Tell Story) /* ***Viewing*** *(Always Full Screen)*

Spotify (10-Second Ad) in...
Snapchat Live Stories + Discover

26MM+ Views, 12/15



+30% Lift in Subscription Intent, 2x More Effective Than Typical Mobile Channels

Furious 7 (10-Second Ad) in...
Ultra Music Festival Miami Live Story

14MM+ Views, 3/15

+3x Attendance Among Target Demo for Snapchatters vs. Non-Snapchatters = Opening Weekend Box Office

Source: Snapchat

Commerce + Brands =

Evolving Rapidly By / For This Generation

Each Generation Has Slightly Different Core Values + Expectations...

Shaped by Events that Occur in Their Lifetimes

Consumer Preference / Value Evolution by Generation, USA... Millennials = More Global / Optimistic / Tolerant..., per Acosta

	Silent	Baby Boomers	Gen X	Millennials
Birth Years	1928 – 1945	1946 – 1964	1965 – 1980	1981 – 1996
Year Most of Generation 18-33 Years Old	1963	1980	1998	2014
Summary	• Grew up during Great Depression • Fought 2nd "war to end all wars" • Went to college on G.I. Bill • Raised "nuclear" families in time of great prosperity + Cold War	• Grew up during time of idealism with TV + car for every suburban home • Apollo, Civil Rights, Women's Liberation • Disillusionment set in with assassination of JFK, Vietnam War, Watergate + increase in divorce rates	• Grew up during time of change politically, socially + economically • Experienced end of the Cold War, Reaganomics, shift from manufacturing to services economy, + AIDS epidemic • Rise of cable TV + PCs	• Grew up during digital era with internet, mobile computing, social media + streaming media on iPhones • Experiencing time of rising globalization, diversity in race + lifestyle, 9/11, war on terror, mass murder in schools + the Great Recession
Core Values	• **Discipline** • **Dedication** • **Family focus** • **Patriotism**	• **Anything is possible** • **Equal opportunity** • **Question authority** • **Personal gratification**	• **Independent** • **Pragmatic** • **Entrepreneurial** • **Self reliance**	• **Globally minded** • **Optimistic** • **Tolerant**
Work / Life Balance	• Work hard for job security	• Climb corporate ladder • Family time not first on list	• Work / life balance important • Don't want to repeat Boomer parents' workaholic lifestyles	• Expanded view on work / life balance including time for community service + self-development
Technology	• Have assimilated in order to keep in touch and stay informed	• Use technology as needed for work + increasingly to stay in touch through social media such as Facebook	• Technology assimilated seamlessly into day-to-day life	• Technology is integral • Early adopters who move technology forward
Financial Approach	• Save, save, save	• Buy now, pay later	• Cautious, conservative	• Earn to spend

Source: Acosta Inc., Pew Research
Image: Doomsteaddiner.net, Billboard.com, Metro.co.uk
Note: Data from Acosta as of 7/13. Pew Research Center tabulations of the March Current Population Surveys (1963, 1980, 1998, and 2014). Pew Research defines each generation and may differ from other sources as there are varying opinions on what years each generation begin and end.

Characteristic Evolution by Generation @ Peak Adult Years (18-33), USA... Millennials = More Urban / Diverse / Single...

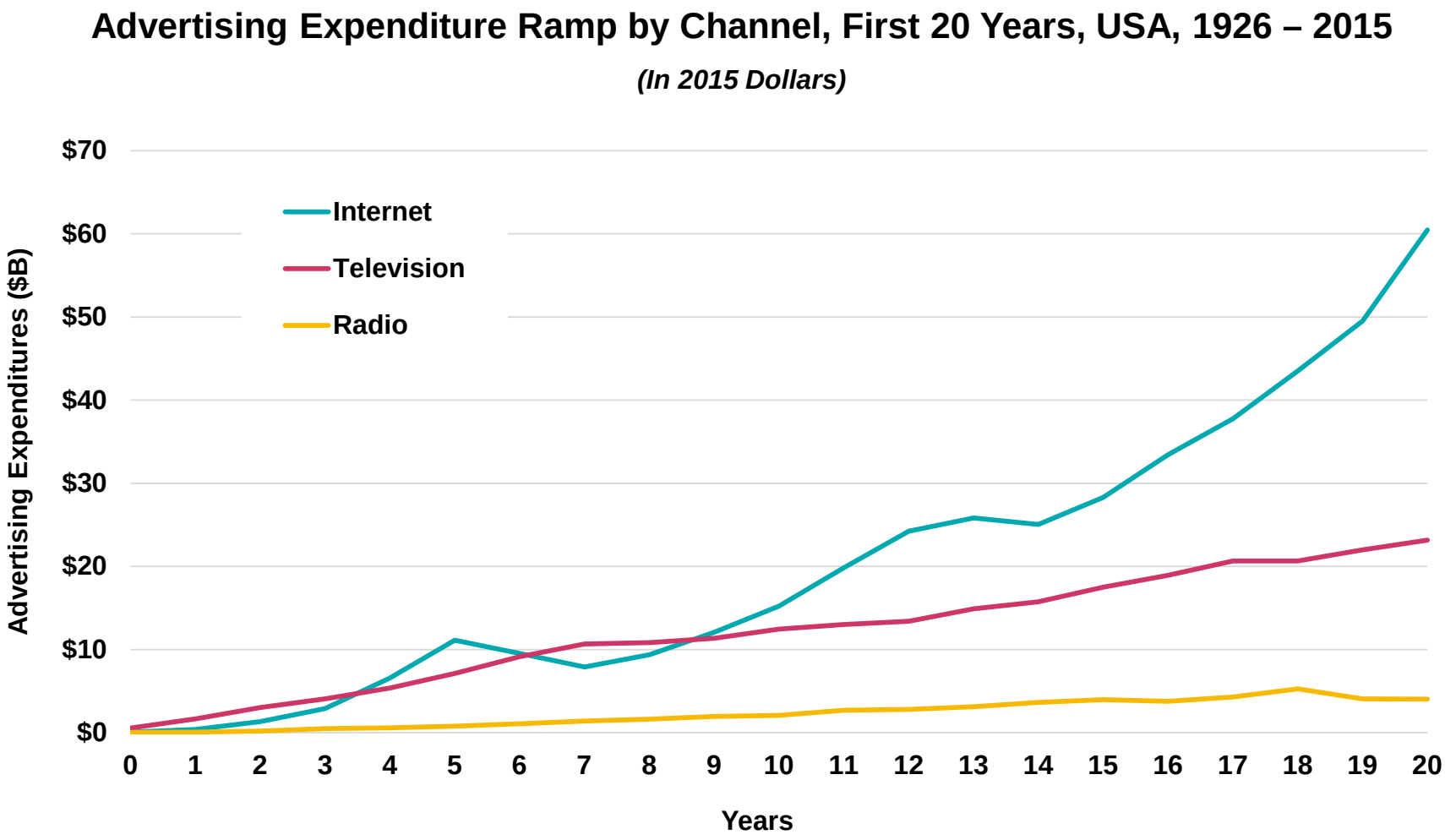
	Silent	Baby Boomers	Gen X	Millennials
Birth Years	1928 – 1945	1946 – 1964	1965 – 1980	1981 – 1996
Year Most of Generation 18-33 Years Old	1963	1980	1998	2014
Location When Ages 18-33 *Metropolitan as % Total*	64%	68%	83%	86%
Diversity When Ages 18-33 *White as % Total*	84%	77%	66%	57%
Marital Status When Ages 18-33 *Married as % Total*	64%	49%	38%	28%
Education by Gender When Ages 18-33 *% with Bachelor's Degree*	12% Male / 7% Female	17% Male / 14% Female	18% Male / 20% Female	21% Male / 27% Female
Employment Status by Gender When Ages 18-33 *Employed as % Total**	78% Male / 38% Female	78% Male / 60% Female	78% Male / 69% Female	68% Male / 63% Female
Median Household Income ** When Ages 18-33	N/A	$61,115	$64,469	$62,066
Population of Generation When Ages 18-33	35MM	61MM	60MM	68MM

Source: Pew Research
Image: Doomsteaddiner.net, Billboard.com, Metro.co.uk
Note: *Only shows those that were civilian employed (i.e. excludes armed forces, unemployed civilians, and those not in labor force). **Median household income shown in 2015 dollars. Pew Research Center tabulations of the March Current Population Surveys (1963, 1980, 1998, and 2014). Pew Research defines each generation and may differ from other sources as there are varying opinions on what years each generation begin and end.

Marketing Channels Evolve With Time...

Shaped by Evolution of Technology + Media

Each New Marketing Channel = Grew Faster... Internet > TV > Radio



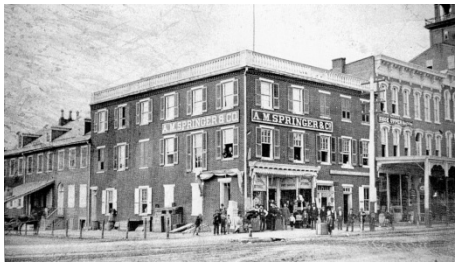
Source: McCann Erickson (1926-1979); Morgan Stanley Research, Magna, RAB, OAAA, IAB, NAA, PIB (1980-2015)
Note: Data adjusted for inflation and shown in 2015 U.S. dollars. Television consists of cable and broadcast television advertising. Radio consists of network, national spot, local spot, and streaming audio advertising. Internet consists of mobile and desktop advertising.

Retailing Channels Evolve With Time...

Shaped by Evolution of Technology + Distribution

Evolution of Commerce Over Past ~2 Centuries, USA = Stores → More Stores → Malls → E-Commerce

Corner / General Stores
1800s



Supermarkets
1930s

Discount Chains
1950-60s

Wholesale Clubs
1970-80s

Illustrative Generational Overlap

- Millennials
- Generation X
- Baby Boomers
- Silent Generation

Department Stores
Mid-1800s

Shopping Malls
1950s

Superstores
1960-80s

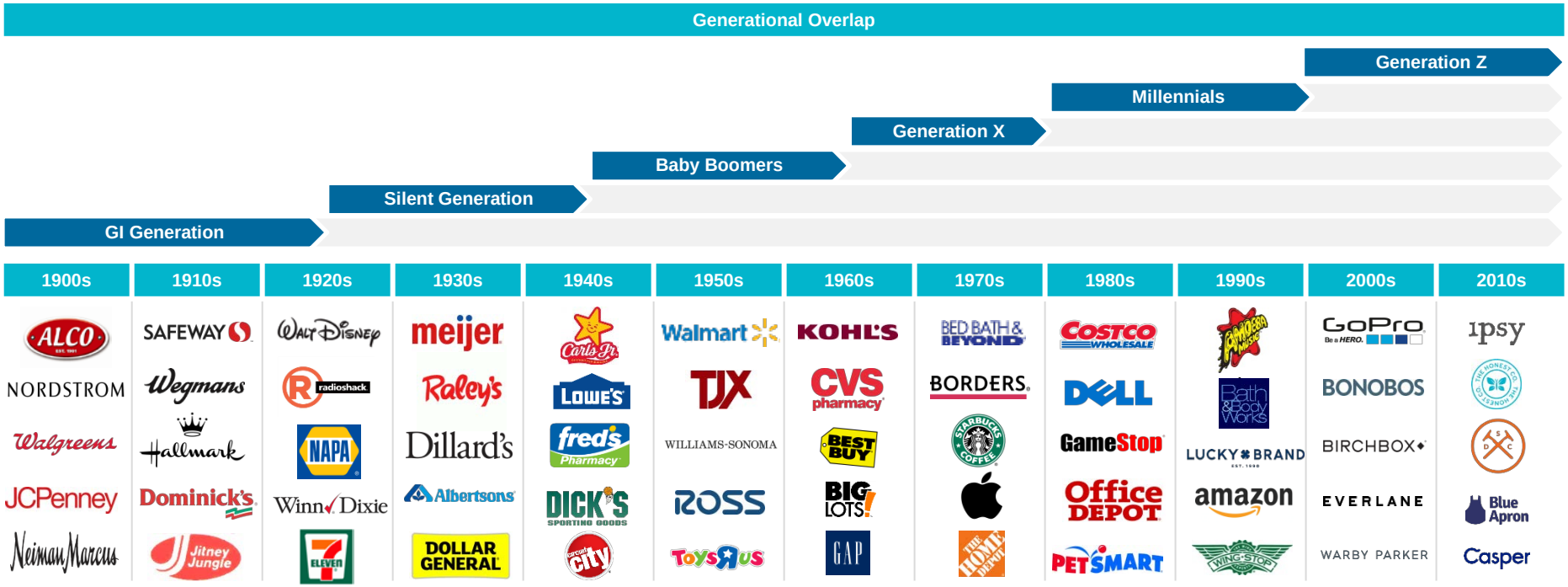
E-Commerce
1990s

@KPCB

Source: McKinsey
Image: Wikipedia.org, Barnumlanding.com, Cbsd.org, Dwell.com, Rediff.com, Freep.com, Corporate.walmart.com, Zdnet.com
Note: Millennials defined as those born between 1980 and 2000. In 2015, they are ages 15-35. Gen X defined as those born between 1965 and 1979. In 2015, they are ages 36-50. Boomers defined as those born between 1946-1964. In 2015, they are ages 51-70. Silents defined as those born between 1925 – 1945. In 2015, they are ages 71 – 90. Note there are varying opinions on what years each generation begin and end.

New / Emerging Retailers Optimize for Generational Change = J.C. Penney → Meijer → Walmart → Costco → Amazon → Casper

Retail Companies Founded by Decade (Illustrative Example), USA, 1900 – 2015

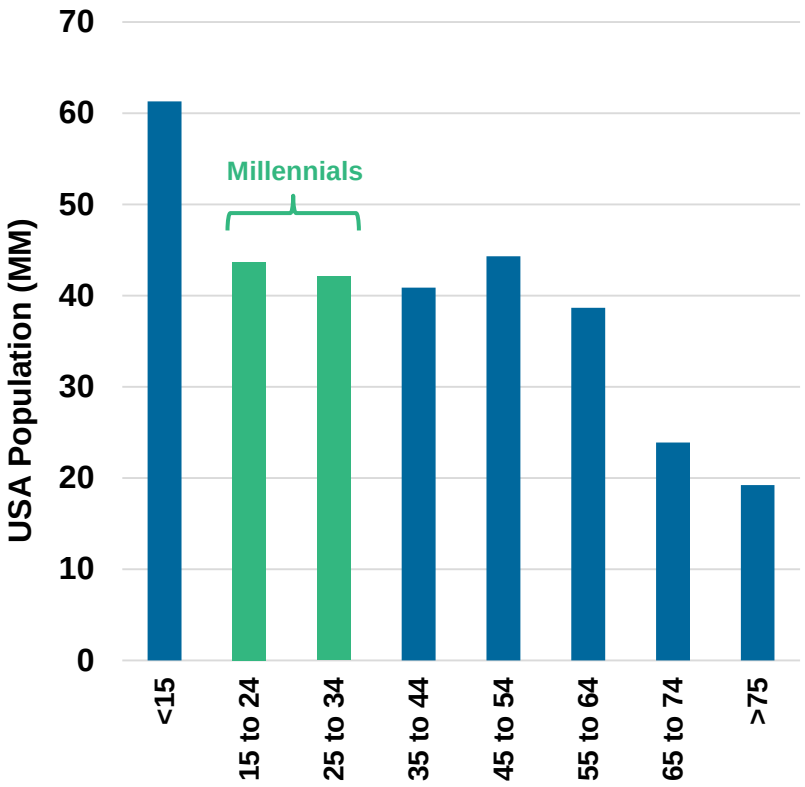


Source: KPCB, Retailindustry.about.com (1900s – 1980s), Ranker (1990s), Internet Retailer "2016 Top 500 Guide" (2000s – 2010s)
Note: Companies shown above in chronological order by founding year by decade. Companies from 2000s onwards selected as diverse set of fast-growing companies based on web sales data from the Internet Retailer "2016 Top 500 Guide." Gen Z defined as those born after 2000. In 2015, they are ages 0-15. Millennials defined as those born between 1980 and 2000. In 2015, they are ages 15-35. Gen X defined as those born between 1965 and 1979. In 2015, they are ages 36-50. Boomers defined as those born between 1946-1964. In 2015, they are ages 51-70. Silents defined as those born between 1925 – 1945. In 2015, they are ages 71 – 90. GI Generation defined as those born between 1900 – 1924. In 2015, they are age 91 – 115. Note there are varying opinions on what years each generation begin and end.

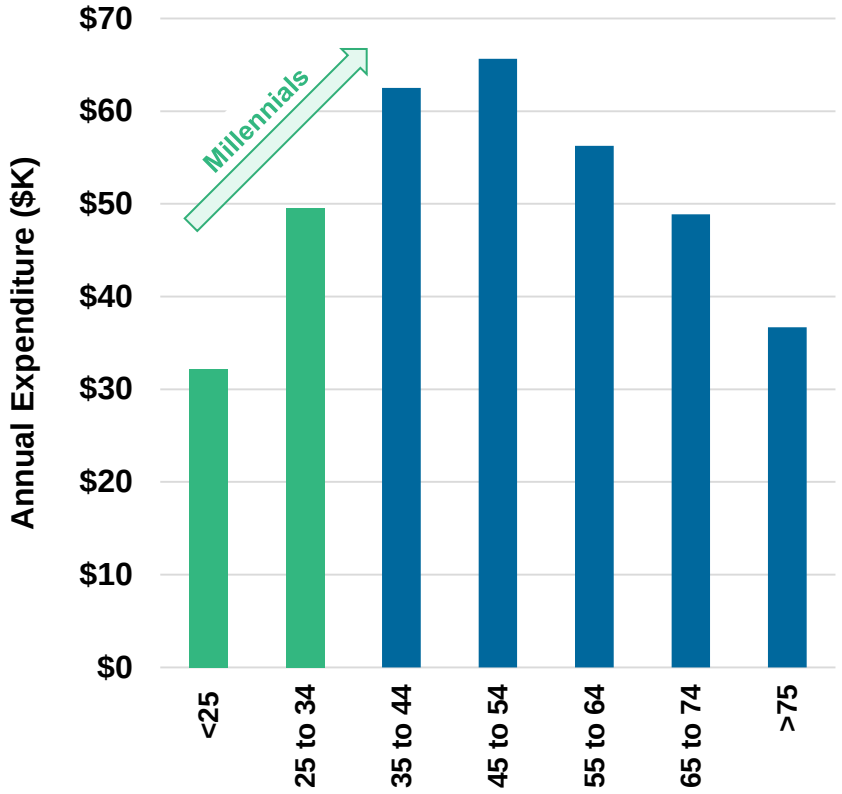
Millennials =
Impacting + Evolving Retail...

Millennials @ 27% of Population = Largest Generation, USA... Spending Power Should Rise Significantly in Next 10-20 Years

Population by Age Range, USA, 2014

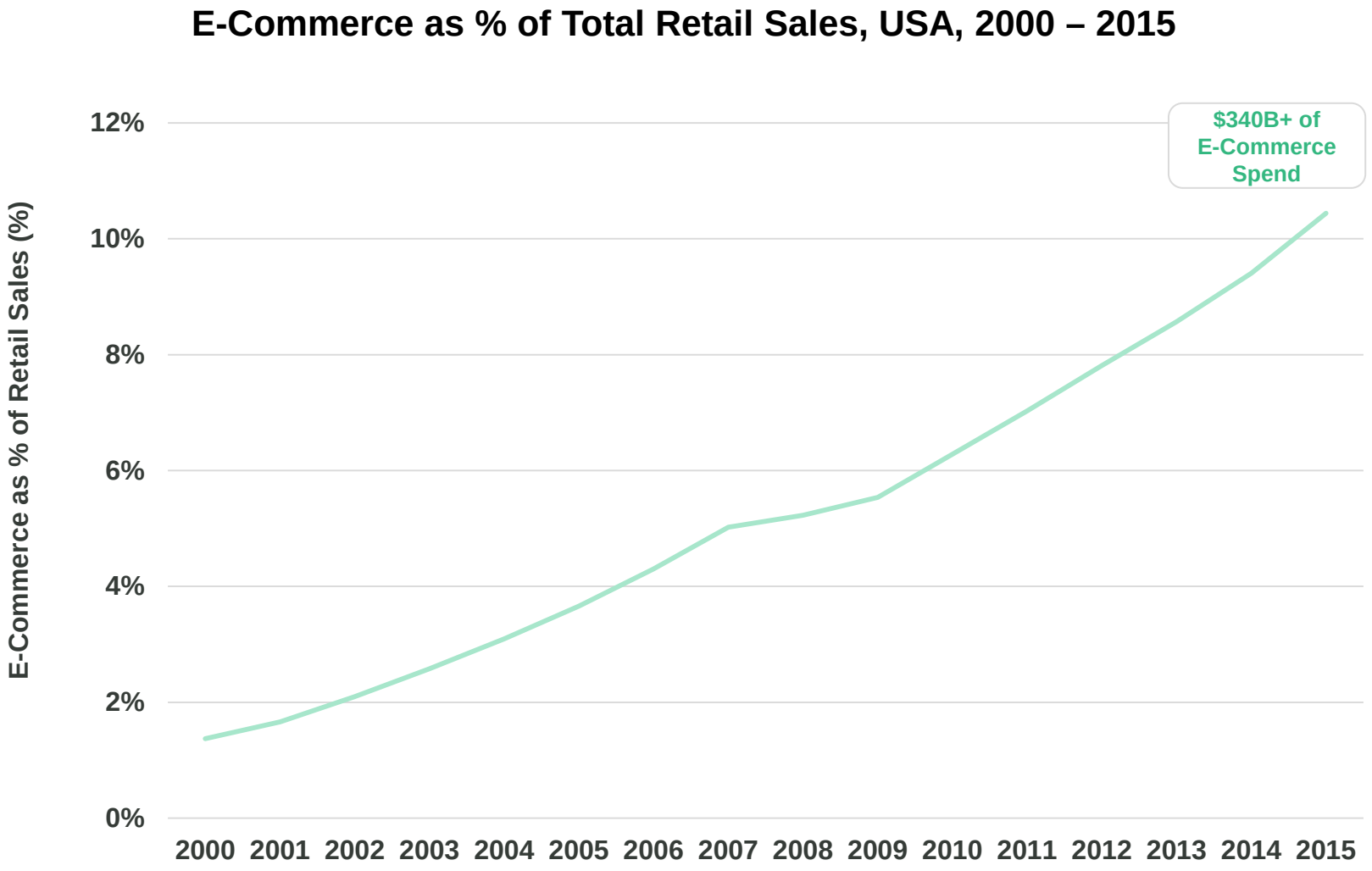


Household Expenditure, Annual Average, by Age of Reference Person, USA, 2014



Source: U.S. Census Bureau "2010-2014 American Community Survey 5-Year Estimates", Bureau of Labor Statistics "Consumer Expenditure Survey 2014"
Note: Millennials defined as persons born between 1980 – 2000. There are varying opinions on what years each generation begin and end.

Internet Continues to Ramp as Retail Distribution Channel = 10% of Retail Sales vs. <2% in 2000



Source: U.S. Census Bureau, Federal Reserve Bank of St. Louis (5/16)
Note: E-commerce and retail sales data are seasonally adjusted. Retail sales exclude food services, retail trade from gasoline stations, and retail trade from automobiles and other motor vehicles.

Retail =
Technology + Media + Distribution
Increasingly Intertwined

Retail – The New Normal = Drive Transaction Volume → Collect / Use Data → Launch New Products / Private Labels...

Amazon – Private Label Brand Launches, 2004 – 2015

Outdoor Furniture

Strathwood
2004

% Total Amazon Purchasers Which Purchased Home & Garden Products:
11%

Home Goods

Pinzon
2008

% Total Amazon Purchasers Which Purchased Household Products:
10%

Electronic Accessories

AmazonBasics
2009

% Total Amazon Purchasers Which Purchased Electronics (<$50) Products:
21%

Fashion Brands

Franklin & Freeman, Franklin Tailored, James & Erin, Lark & Ro, North Eleven, Scout + Ro, Society New York
2015

% Total Amazon Purchasers Which Purchased:

Men's Apparel – **12%**
Women's Clothing – **9%**

Source: Internet Retailer, Bizjournals.com, Cowen & Company Internet Retail Tracker
Image: Amazon.com, Milled.com
Note: Purchaser data based on Cowen & Company consumer tracking survey (n= ~2,500), as of 3/16. Data shown is percentage of Amazon purchasers who purchased items from a specific category.

...Products Become Brands...Brands Become Retailers... Retailers Become Products / Brands...Retailers Come Into Homes...

Less differentiation between products / brands / retailers as single products evolve into brands + consumers shop directly from brands + retailers leverage insights to develop own vertically-integrated brands...New distribution models emerging enabling direct-to-consumer commerce in the home...

Products → Brands
(Casper)

Brands → Retailers
(Warby Parker)

Retailers → Products / Brands
(Thrive Market)

New DTC Distribution Models
(Stitch Fix)

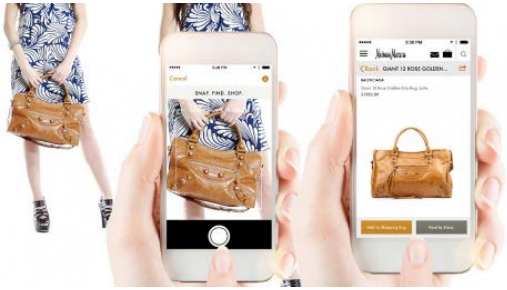
Image: Myjane.ru, CNBC.com, Vanityfair.com, Insidebusinessnyc.com, Funandfit.org, Thrivemarket.com, Thedustyrosestyle.com, Stitchfix.tumblr.com

...Physical Retailers Become Digital Retailers...
Digital Retailers Become Data-Optimized Physical Retailers...

Physical Retailers Evolving & Increasing E-Commerce Presence...New Products / Brands / Retailers Launching Physical Stores / Showrooms / Retail Channels...Omni-Channel is Key...Warby Parker @ $3K Annual Sales per Square Foot = One of Top Grossing Physical Retailers per Square Foot in USA

Offline → Online
(Neiman Marcus)

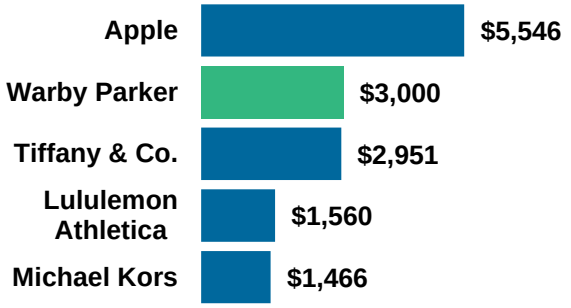
26% of F2015 Sales on Internet, +24% Y/Y



Online → Offline
(Warby Parker)

31 locations (5/16), up from 10 locations (12/14)

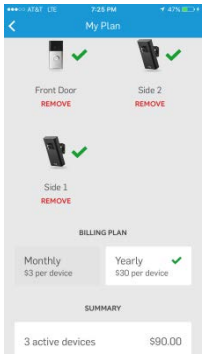
Top 5 Physical Retailers by Sales / Sq. Ft., USA, 2015*



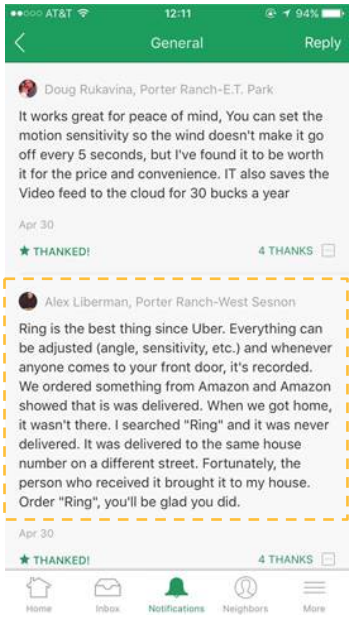
Source: Company filings, Fast Company, Time, eMarketer
Image: Pursuitist.com, Digiday.com, Warbyparker.com
Note: *Excludes gas stations. Based on sales figures from trailing 12 months. Warby Parker figures as of February 2015.

...Connected Product Users Easily Notified When to Buy / Upgrade... Can Benefit from Viral Sharing

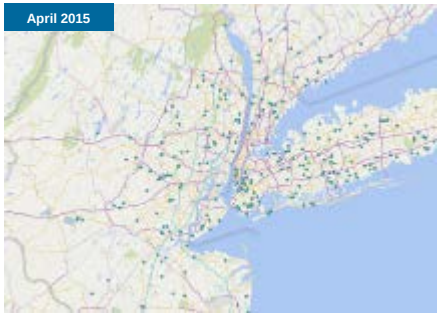
Ring Connected Devices with Sharable Content

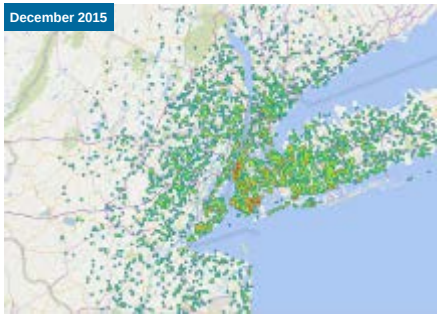


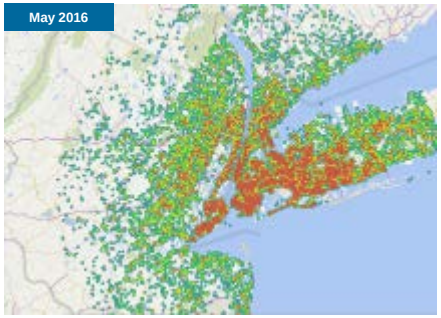
Sharing of Events Captured on Ring on Neighborhood Level – Nextdoor, TV...



Proliferation of Ring Connected Devices Serving Broader Communities







Source: Ring, Nextdoor, WLKY News
Image: Ring.com, Whas11.com

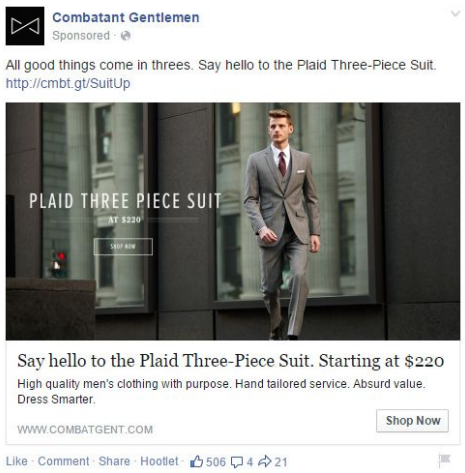
Internet-Enabled
Retailers / Products / Brands
On Rise =

Bolstered by
Always-On Connectivity +
Hyper-Targeted Marketing +
Images + Personalization

Hyper-Targeted Marketing = Driving Growth for Retailers / Products / Brands

Internet = Driving Force for New Product Introductions with Hypertargeting / Intent-Based Marketing via Facebook / Twitter / Instagram / Google...

Combatant Gentlemen

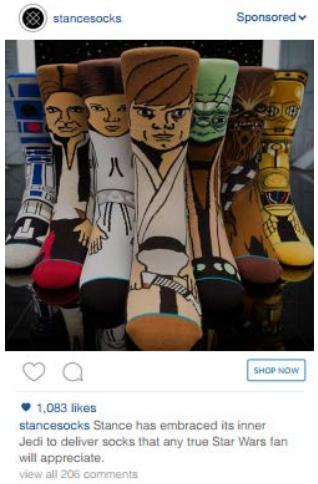


'Our customer acquisition strategy was Facebook. Our [target customer] typically spends a lot of time on Facebook...**Every $100 we spent on Facebook was worth $1,000 in sales. For us, it was a simple math equation**.'

'We target based on [Facebook] likes...For example, **we have a lot of guys in real estate who are climbing up the ladder. What we do is we put these guys into cohorts and we say, 'These are our real estate guys**.'

- Vishaal Melwani
CEO and Founder, Combatant Gentlemen

Stance



After noticing that its Instagram placements were outperforming all other placement types in its Star Wars collection launch campaign, Stance decided to create a dedicated ad set to maximize its ad spend against this placemen & build upon Instagram's unique visual nature and strong targeting capabilities.

Stance **targeted the ads to adults whose interests include the Star Wars movies, but excluded those interested only in specific Star Wars characters**. The 'Sock Wars' campaign generated an impressive **36% boost to return on ad spend**.

Source: One Million by One Million Blog, Instagram Business
Image: Pinterest.com, Instagram Business

Stitch Fix User Experience = Micro Data-Driven Engagement & Satisfaction... Data Collection + Personalization / Curation + Feedback...

Stitch Fix = Applying Netflix / Spotify-Like Content Discovery to Fashion...
Each Customer = Differentiated Experience...99.99% of Fixes Shipped = Unique

Data-Driven Onboarding Process = Mix of Art + Science

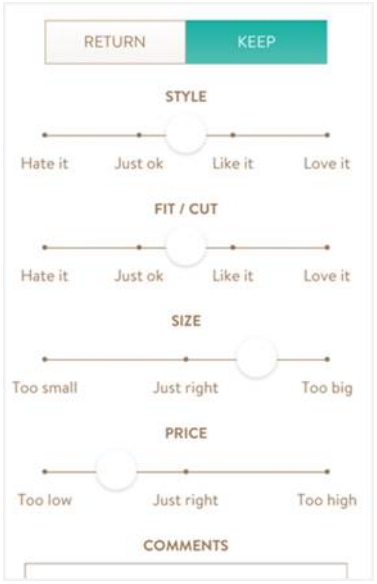
Collect data points on customer preferences / style / activities. 46% of active clients provide Pinterest profiles. Stylists use Pinterest boards + access to algorithms to help improve product selection

Ship 'Fixes' with Curated Items Based on Preferences / Style

Allows clients to try products selected by stylists in comfort of home / return items they don't like

Customer Preferences & Feedback

Collect information on customer experience to drive future product selection



@KPCB

Source: Stitch Fix
Image: Forbes.com

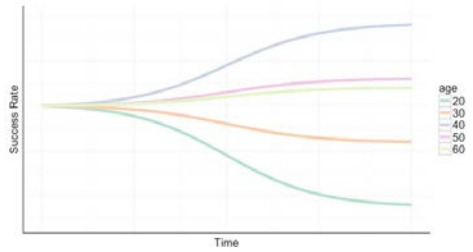
...Stitch Fix Back-End Experience = 39% of Clients Purchase Majority of Clothing from Stitch Fix vs. ~30% of Clients Y/Y

Stitch Fix = Data On Users + Data on Items + Constantly Improving Algorithms = Drive High Customer Satisfaction...100% of Purchases from Recommendations

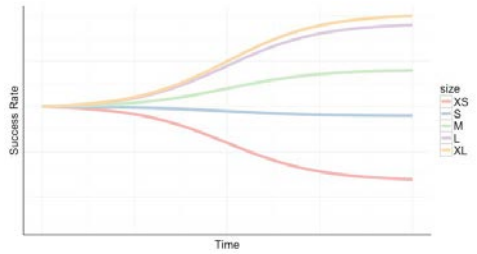
Data Collection on Item-by-Item Basis Coupled with User Insights

Stitch Fix captures 50-150 attributes on each item, uses algorithms + feedback to determine probability of success (i.e. item will be purchased) for specific demographics, allows stylists to better select items for clients

Example of Product Success Probability by Age

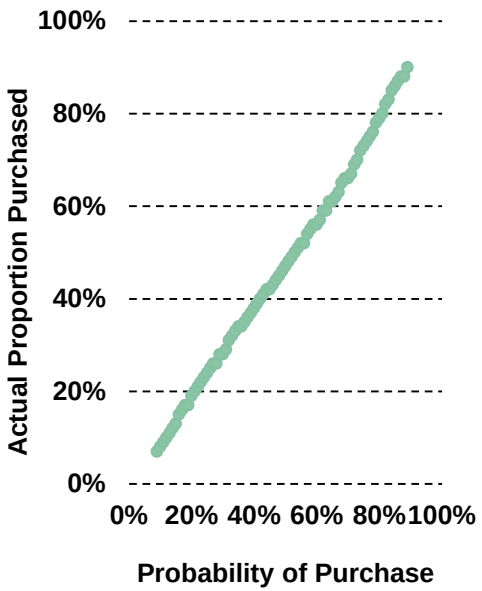


Example of Product Success Probability by Sizing



Data Networking Effect... Helps Stylist Predict Success of Items with Specific Client

The more information collected, the better the probability of success. Stitch Fix showing 1:1 correlation between probability of purchase per item and observed purchase rate over time



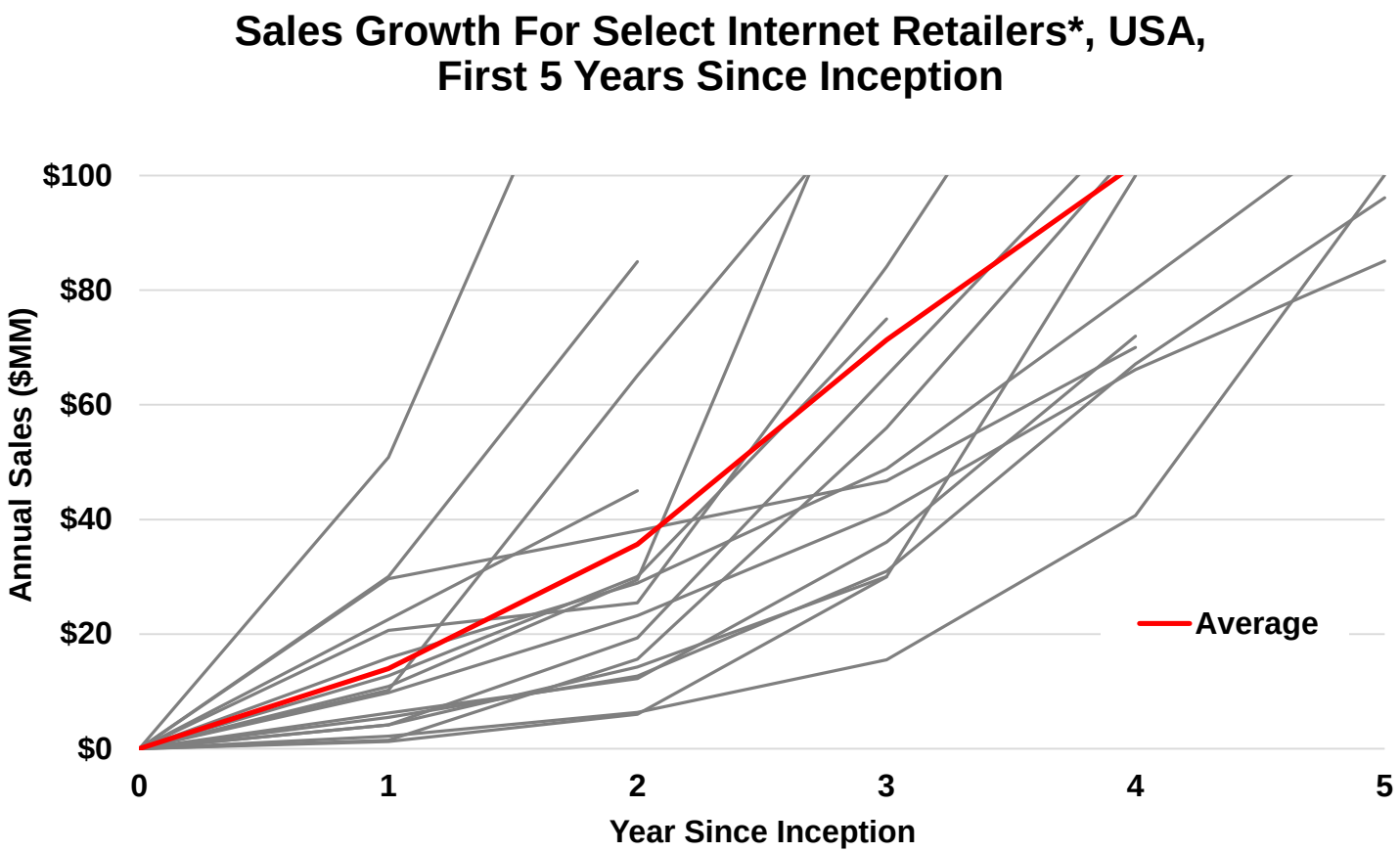
Strong Consumer Engagement / Anticipation...Increased Wallet Share...

39% of Stitch Fix clients get majority of clothing from Stitch Fix, up from ~30% of clients a year ago

Source: Stitch Fix
Image: Cheapmamachick.com

Many Internet Retailers / Brands @ $100MM in Annual Sales* in <5 Years... Took Nike = 14 Years / Lululemon = 9 / Under Armour = 8**

Viral Marketing / Sharing Mechanisms (Facebook / Instagram / Snapchat / Twitter...)
+ On-Demand Purchasing Options via Mobile / Web + Access to Growth Capital
+ Millennial Appeal = Enabling Rapid Growth for New Products / Brands / Retailers

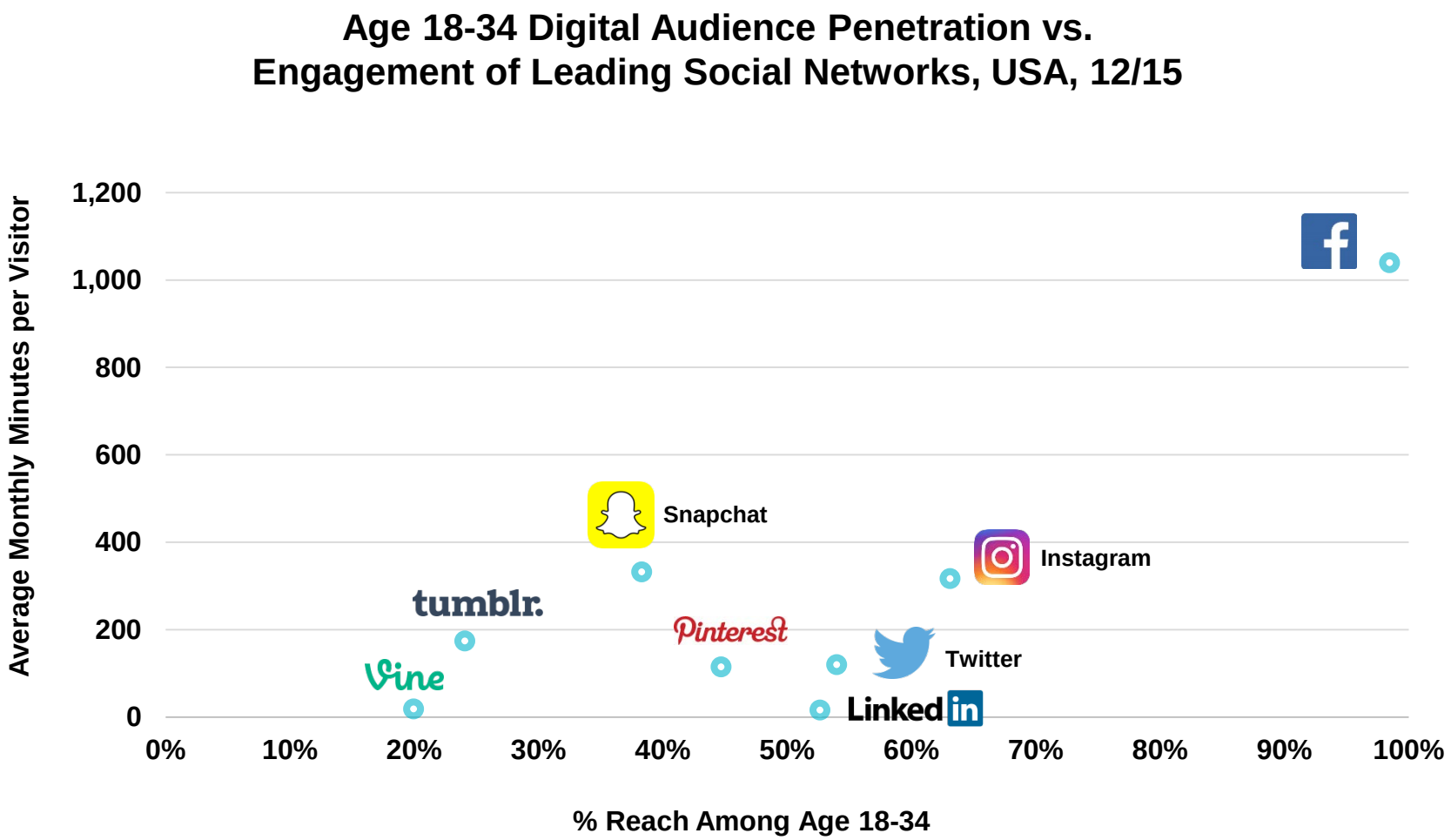


Source: Internet Retailer "2016 Top 500 Guide", company filings
Note: *Data only for e-commerce sales and shown in 2015 dollars. **Years to reach $100MM in annual revenue in 2015 dollars. Chart includes pure-play e-commerce retailers and evolved pure-play retailers. Companies shown include Birchbox, Blue Apron, Bonobos, Boxed, Casper, Dollar Shave Club, Everlane, FitBit, GoPro, Harry's, Honest Company, Ipsy, Nasty Gal, Rent the Runway, TheRealReal, Touch of Modern, and Warby Parker. The Top 500 Guide uses a combination of internal research staff and well-known e-commerce market measurement firms such as Compete, Compuware APM, comScore, ForeSee, Experian Marketing Services, StellaService and ROI Revolution to collect and verify information.

RE-IMAGINING COMMUNICATION VIA SOCIAL PLATFORMS –
– VIDEO
– IMAGE
– MESSAGING

Visual (Video + Image) Usage Continues to Rise

Millennial Social Network Engagement Leaders = Visual... Facebook / Snapchat / Instagram...



Source: ComScore Media Metrix Multi-Platform, 12/15.

Generation Z (Ages 1-20) = Communicates with Images

Attributes – Millennials vs. Gen Z

Millennials	vs	Gen Z
Tech Savvy: 2 screens at once		Tech Innate: 5 screens at once
Communicate with text		**Communicate with images**
Curators and Sharers		Creators and Collaborators
Now-focused		Future-focused
Optimists		Realists
Want to be discovered		Want to work for success

Source: "Engaging and Cultivating Millennials and Gen Z," Denison University and Ologie, 12/14.
Note: Gen Z defined in this report as those born after 1995. In 2016 they are ages 1-20. Note that there may be different opinions on which years each generation begins and ends.

Video Viewing Evolution Over Past Century =

Live → On-Demand → Semi-Live → Real-Live

Video Evolution = Accelerating
Live (Linear) → On-Demand → Semi-Live → Real-Live

Live (Linear)

Traditional TV
1926

Tune-In or
Miss Out

Mass Concurrent
Audience

Real-Time Buzz

On-Demand

DVR / Streaming
1999

Watch on
Own Terms

Mass Disparate
Audience

Anytime Buzz

NETFLIX

Semi-Live

Snapchat Stories
2013

Tune-In Within 24
Hours or Miss Out

Mostly Personal
Audience

Anytime Buzz

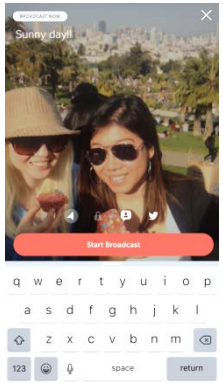
Real-Live

Periscope + Facebook Live
2015 / 2016

Tune-In / Watch
on Own Terms

Mass Audience,
yet Personal

Real Time + Anytime Buzz



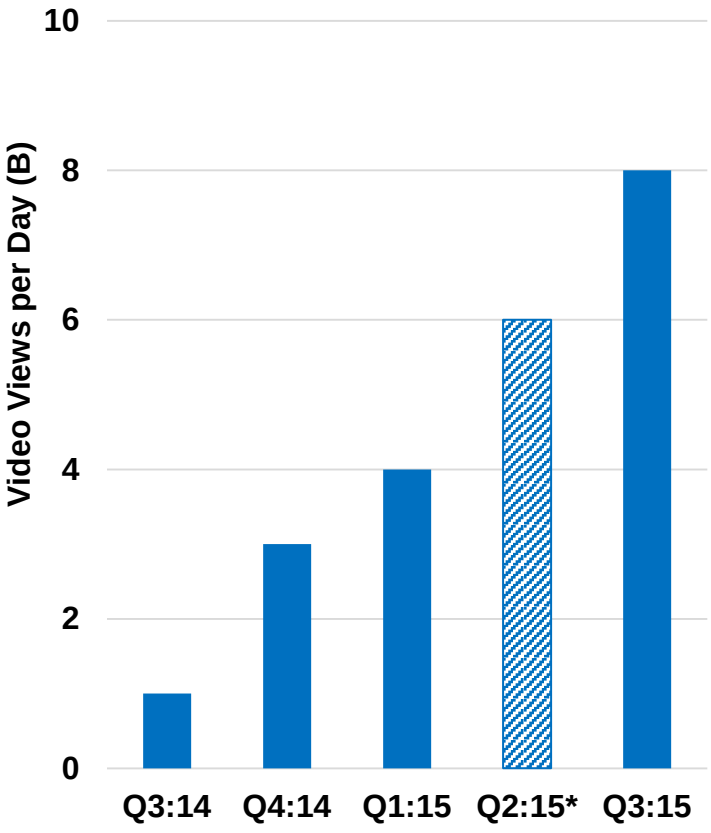
Images: Facebook, Twitter, Snapchat, Netflix, TiVopedia, BT.com
1926 - First television introduced by John Baird to members of the Royal Institution. 1999 - First DVR released by Tivo. 2013 – Snapchat Stories launched.

Video

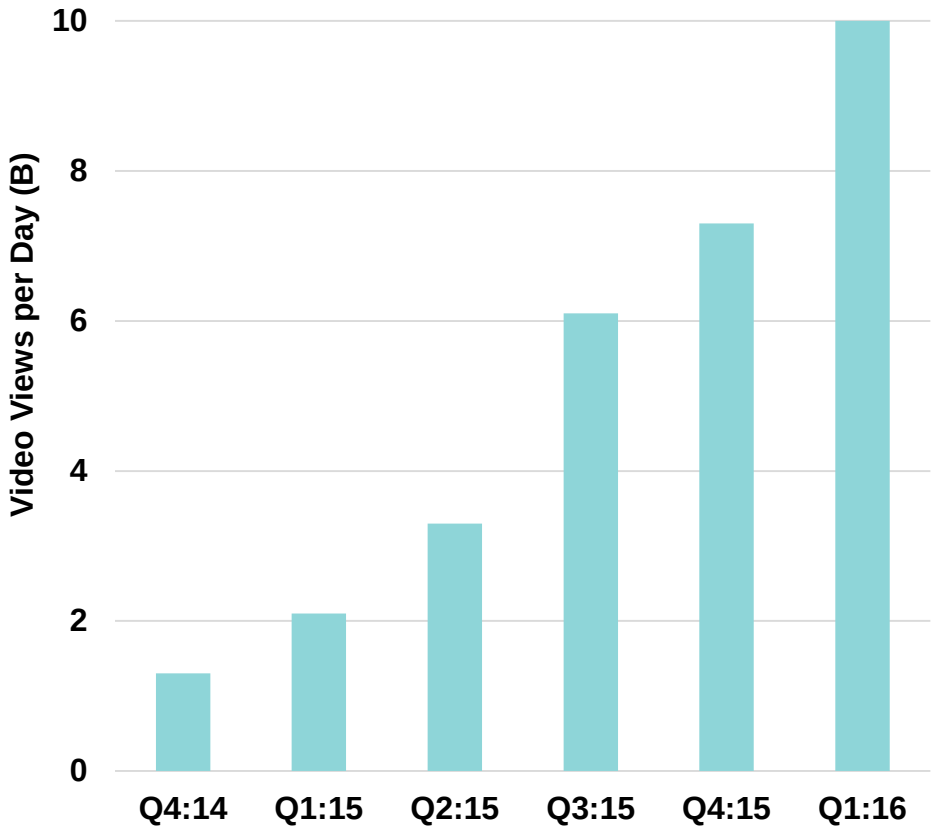
Usage / Sophistication / Relevance Continues to Grow Rapidly

User-Shared Video Views on Snapchat & Facebook = Growing Fast

Facebook Daily Video Views, Global, Q3:14 – Q3:15



Snapchat Daily Video Views, Global, Q4:14 – Q1:16



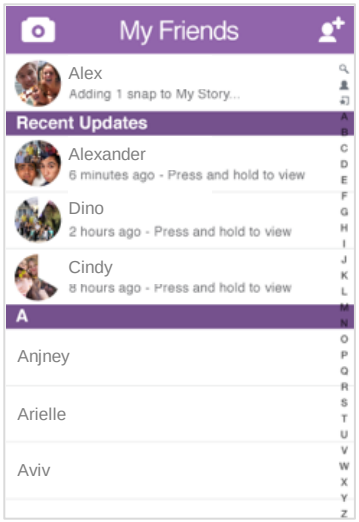
Source: Facebook, Snapchat. Q2:15 Facebook video views data based on KPCB estimate.
Facebook video views represent any video shown onscreen for >3 seconds (including autoplay). Snapchat video views counted instantaneously on load.

Smartphone Usage Increasingly =

Camera + Storytelling + Creativity + Messaging / Sharing

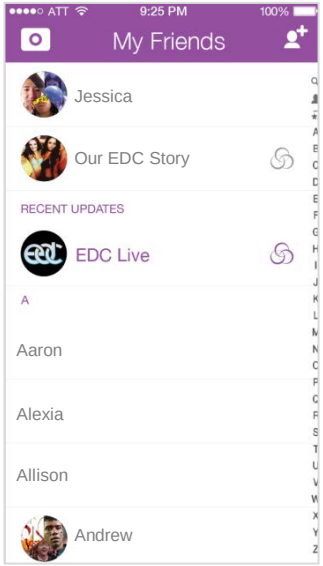
Snapchat Trifecta = Communications + Video + Platform...
Stories (Personal) → Live (Personal + Pro Curation) → Discover (Pro)

Stories (Personal)
10/13 Launch



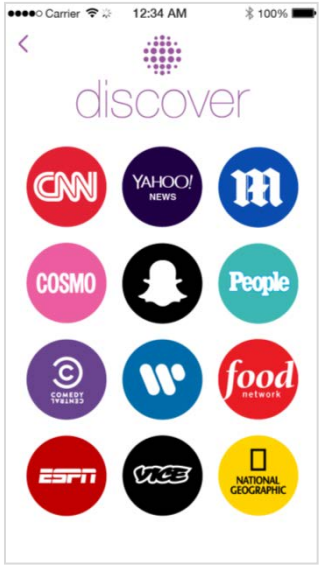
→

Live (Personal + Pro Curation)
6/14



→

Discover (Professional)
1/15



10–20MM Snapchatters View Live Stories Each Day

More Users Watched College Football and MTV Music Awards on Snapchat than Watched the Events on TV

70MM+ Snapchatters View Discover Each Month

Top Performing Channels Average 6 – 7 minutes per Snapchatter per Day

Source: Snapchat

Advertisers / Brands =
Finding Ways Into...

Camera-Based
Storytelling + Creativity +
Messaging / Sharing

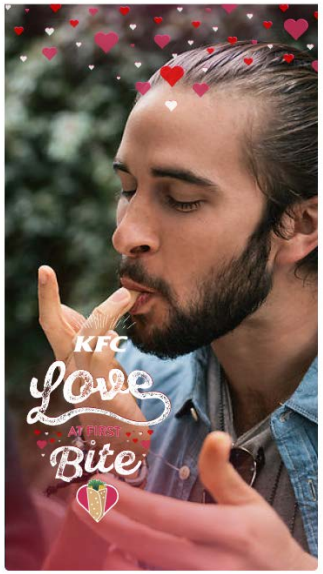
Brand Filters Integrated into Snapchat Snaps by Users... Often Geo-Fenced, in Venue

‘Love at First Bite’

by KFC

9MM+ Views

Geofilter offered @ 900+ KFCs in UK and applied 200K+ times, *12/15 – 2/16*



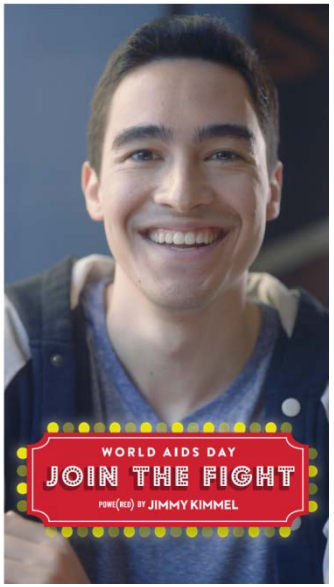
+23% Visitation Lift Within 7 Days of Seeing Friend’s Geofilter

‘World AIDS Day – Join the Fight’

by (RED)

76MM+ Views

Each time a geofilter was sent, Bill & Melinda Gates Foundation donated $3 to (RED)’s fight against AIDS *12/15*



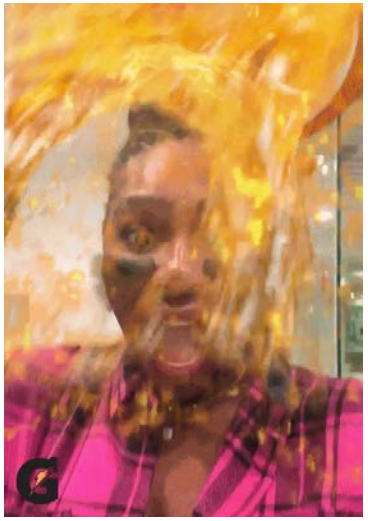
+90% Higher Likelihood of Donating to (RED) Among Those Who Saw Geofilter

Source: Snapchat

Branded Snapchat Lenses & Facebook Filters... Increasingly Applied by Users

Taco Bell Cinco de Mayo Lens
224MM Views on Snapchat
5/5/16

Gatorade Super Bowl Lens
165MM Views on Snapchat
2/7/16



Iron Man Filter from MSQRD
8MM+ Views on Facebook
3/9/16

Average Snapchatter Plays With Sponsored Lens for
20 Seconds

Source: Snapchat, Facebook
Time on sponsored lens excludes time taking and uploading image / video.

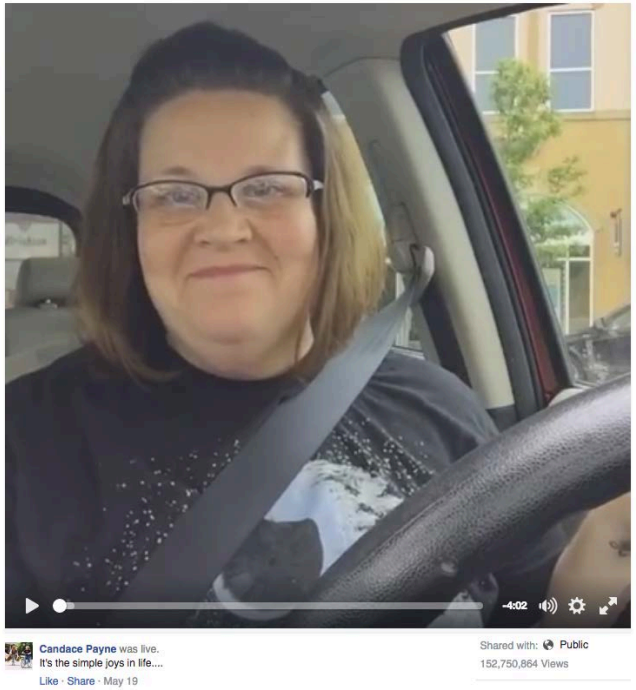
Real-Live =
Facebook Live...

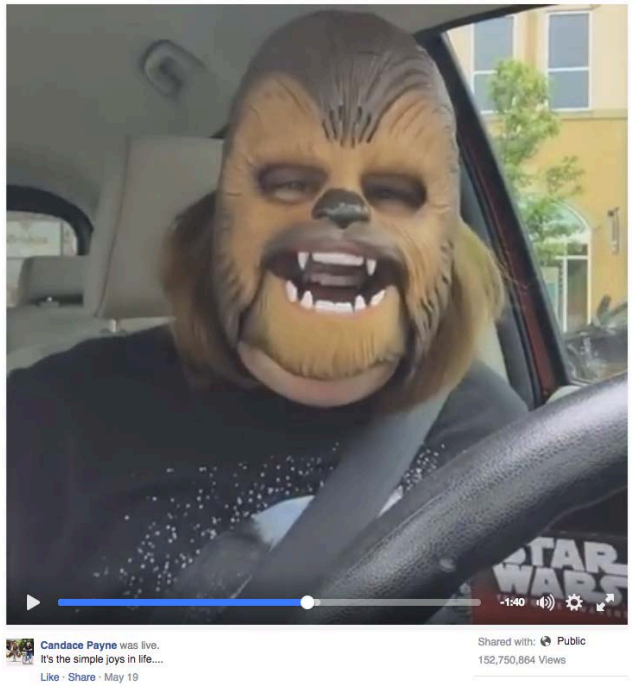
New Paradigm for
Live Broadcasting

UGC (User Generated Content) @ New Orders of Viewing Magnitude... Facebook Live = Raw / Authentic / Accessible for Creators & Consumers

Candace Payne in Chewbacca Mask on Facebook Live

Most Viewed Live Video @ 153MM+ Views, 5/16
Kohl's = Mentioned 2 Times in Video
Kohl's = Became Leading App in USA iOS App Store
Chewbacca Mask Demand Rose Dramatically





Source: Facebook

Live Sports Viewing =

Has Always Been Social But....

It's Just Getting Started

How Often are You Able to Watch a Game (on Sidelines or TV) with All Your Friends Who Share Your Team Love?

Live Streaming –
Wrapped with Social Media Tools – Helps Make that More of a Reality...

2016E = Milestone Year for 'Traditional' Live Streaming on Social Networks... NFL Live Broadcast TV of Thursday Night Football on Twitter (Fall 2016)

Hypothetical Mock-Up

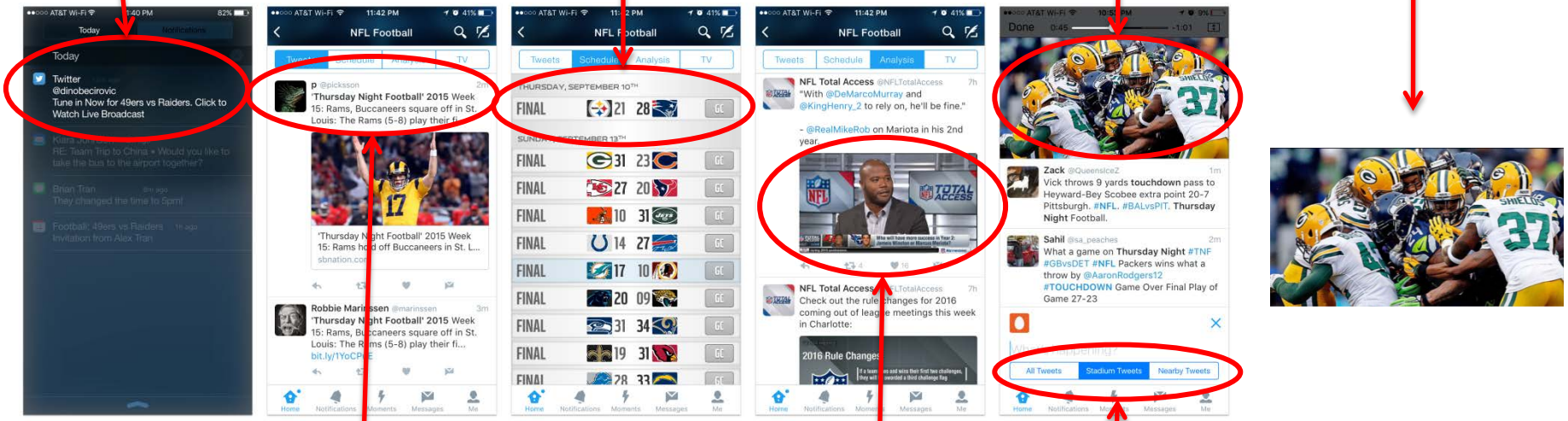
Complete Sports Viewing Platform =
Live Broadcast + Analysis + Scores + Replays + Notifications + Social Media Tools

Tune-In Notifications, Game Reminders, Breaking Actions

Scoreboard Allows Fans to Follow Play-by-Play

Vertical View = Live Broadcast + Tweets Dashboard for Social Media Engagement

Horizontal View = Unencumbered, Full-Screen, TV-like Viewing Experience



Tweets Engage Fans in Real-Time Conversation

Professional Commentary and Analysis

Toggle Between Tweets from Stadium / Nearby / All

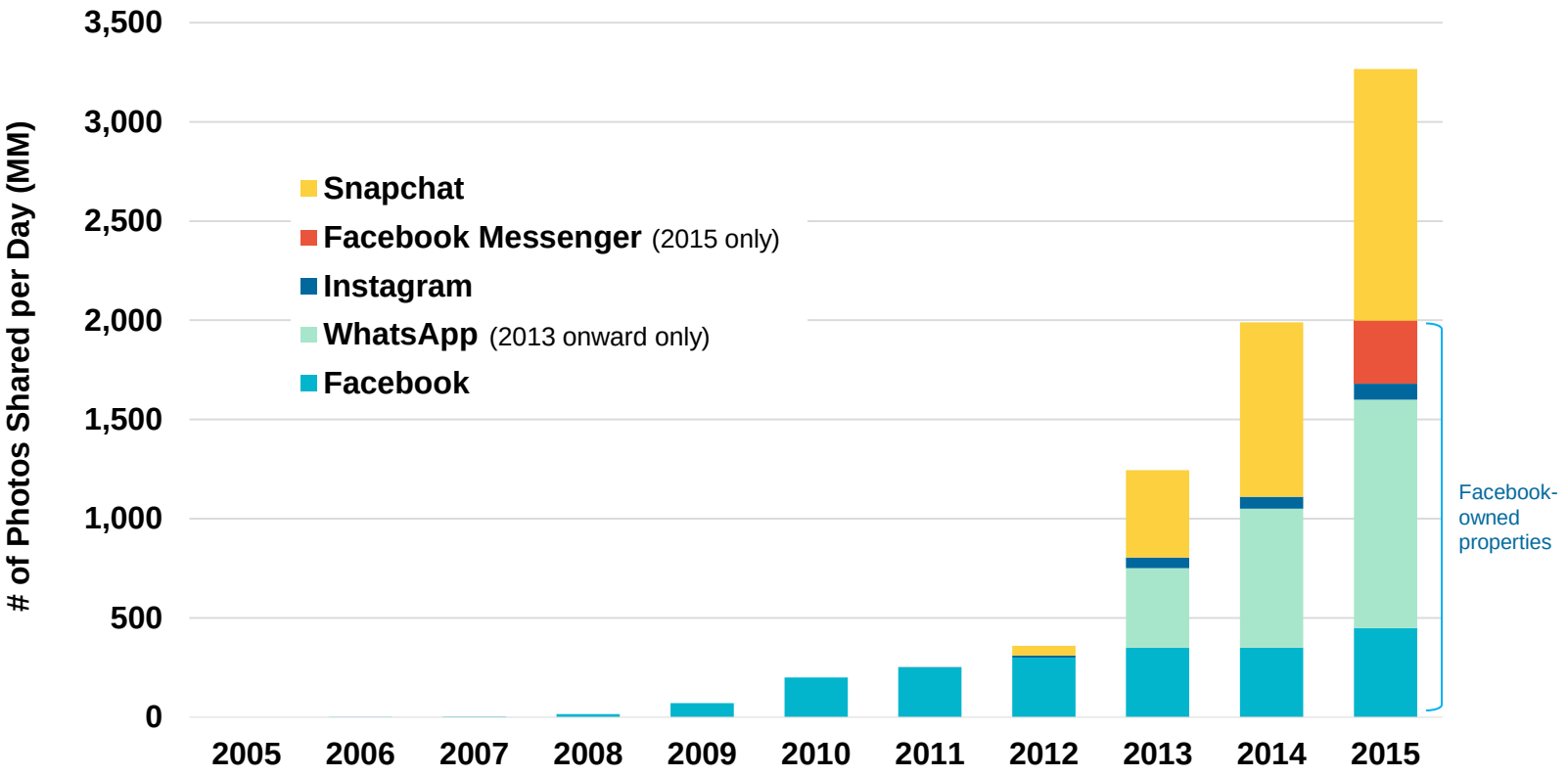
Source: KPCB Hypothetical Mock-Up.
Design provided by Brian Tran (KPCB Edge)

Image

Usage / Sophistication / Relevance Continues to Grow Rapidly

Image Growth Remains Strong

Daily Number of Photos Shared on Select Platforms, Global, 2005 – 2015



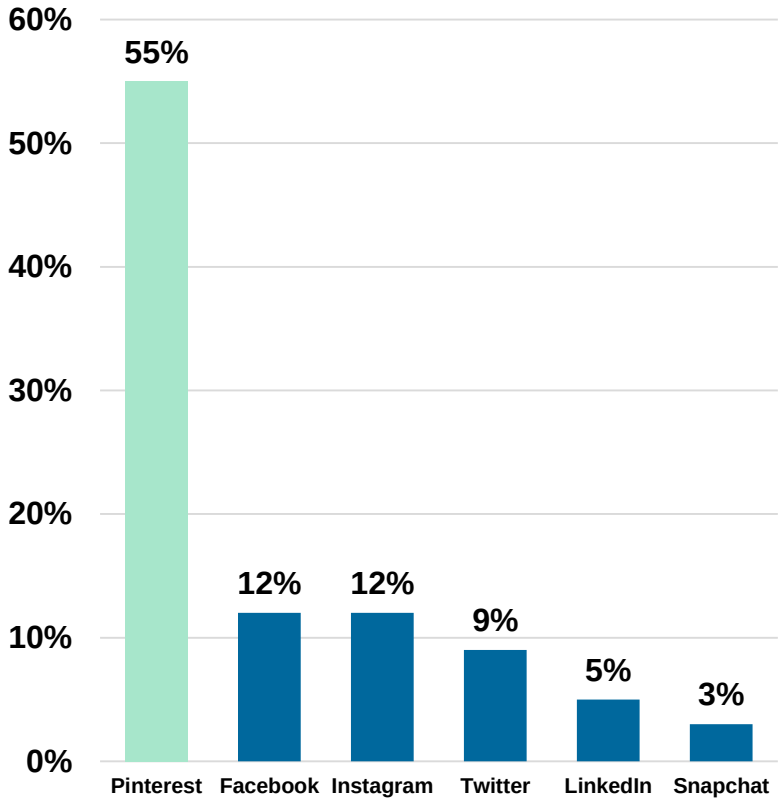
Source: Snapchat, Company disclosed information, KPCB estimates
Note: Snapchat data includes images and video. Snapchat stories are a compilation of images and video. WhatsApp data estimated based on average of photos shared disclosed in Q1:15 and Q1:16. Instagram data per Instagram press release. Messenger data per Facebook (~9.5B photos per month). Facebook shares ~2B photos per day across Facebook, Instagram, Messenger, and WhatsApp (2015).

Images =

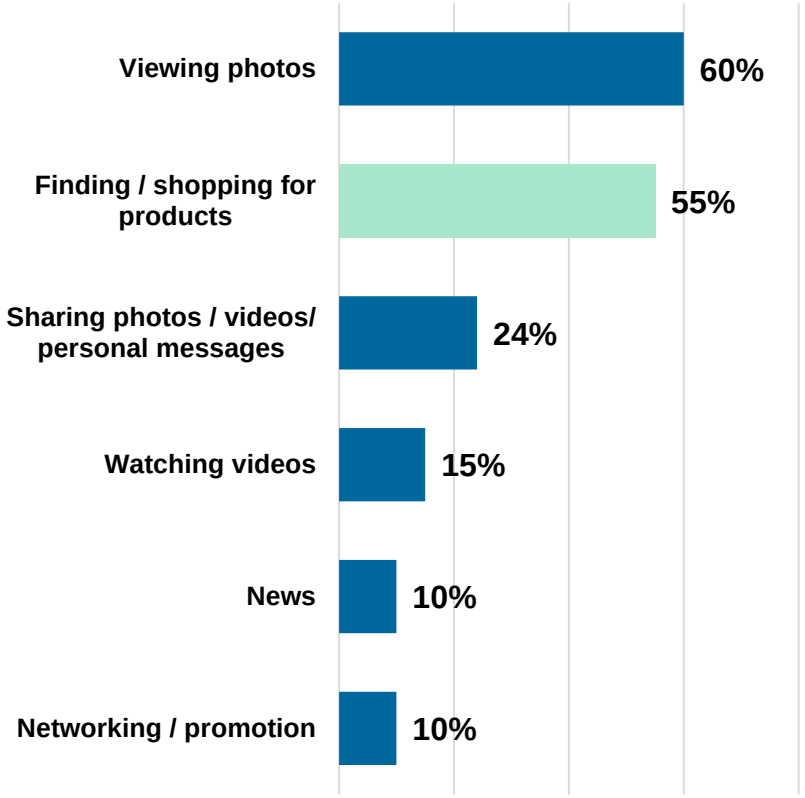
Monetization Options Rising

Image-Based Platforms Like Pinterest = Often Used for Finding Products / Shopping...

% of Users on Each Platform Who Utilize to Find / Shop for Products, USA, 4/16

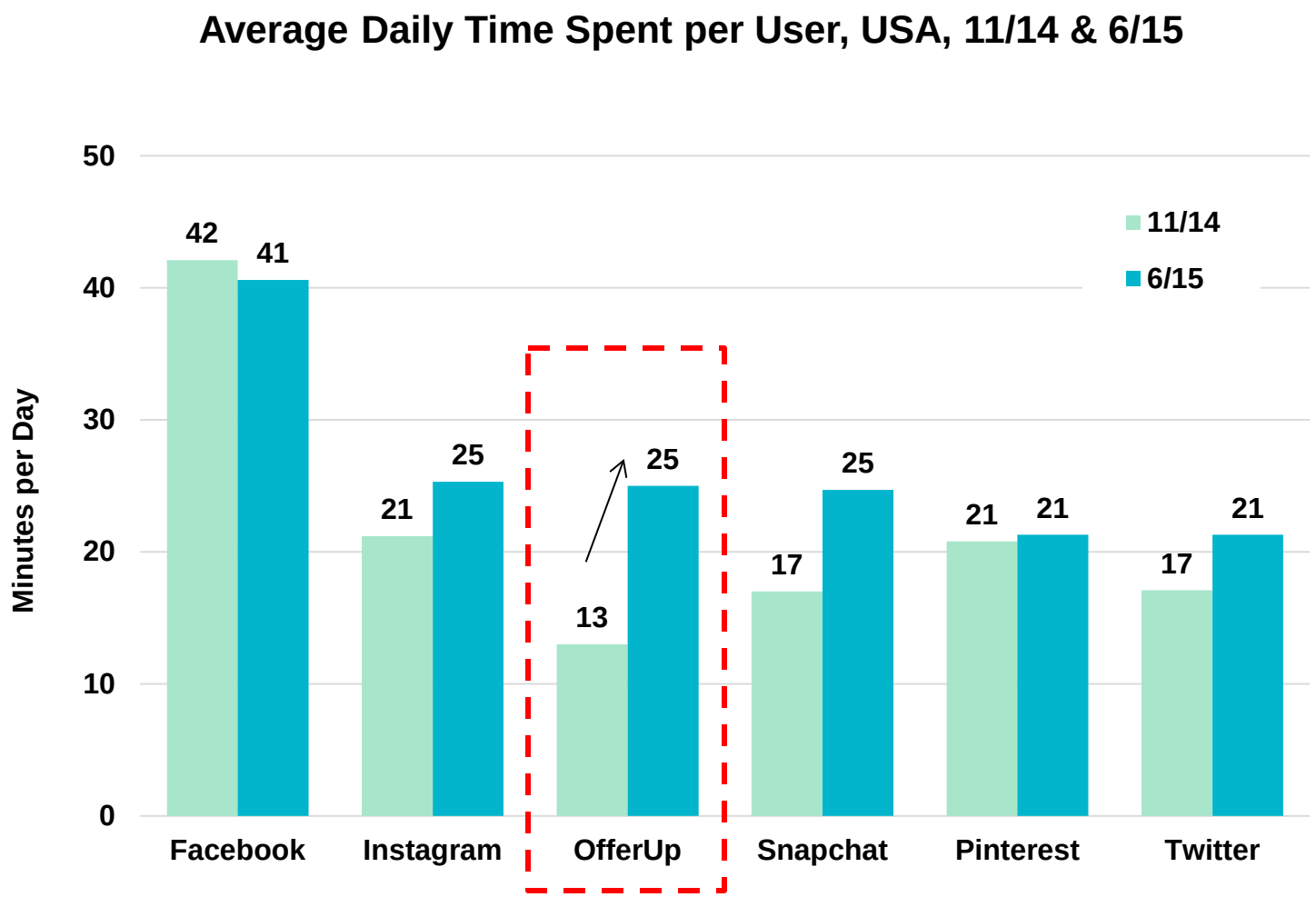


'What Do You Use Pinterest For?' (% of Respondents), USA, 4/16



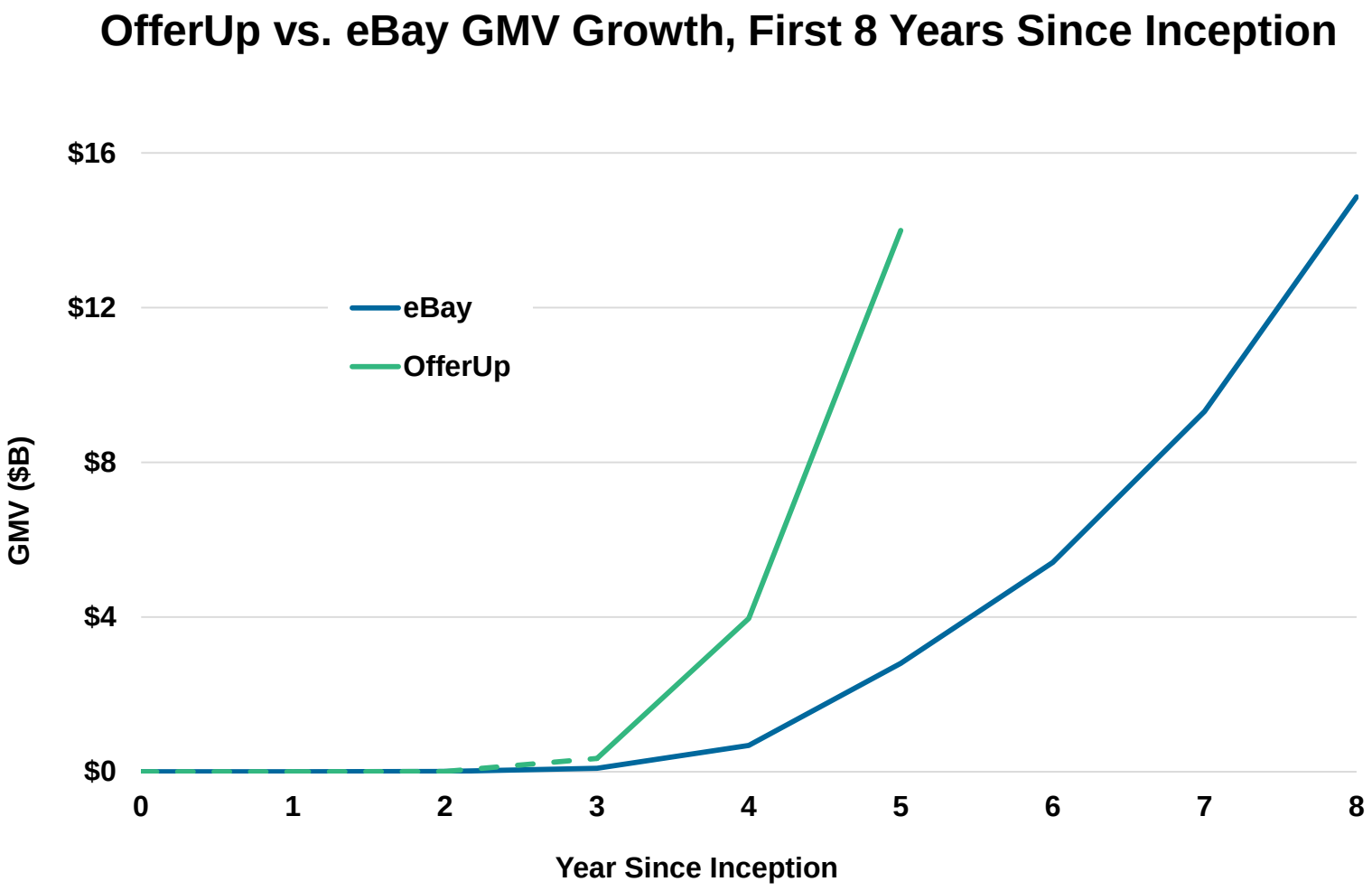
Source: Cowen & Company "ShopTalk Conference Takeaways: A Glimpse Into The Future of Retail & eCommerce" (05/16)
Note: Based on Cowen & Company proprietary Consumer Internet Survey from April / May 2016 of 2,500 US consumers, 30% of which where Pinterest MAUs as of 4/16.

...Image-Based Platforms Like OfferUp = High (& Rising) Engagement Levels & Used for Commerce...



Source: OfferUp, Cowen & Company "Twitter/Social User Survey 2.0: What's changed?"
Note: Based on SurveyMonkey survey conducted in June 2015 on 2,000 US persons aged 18+

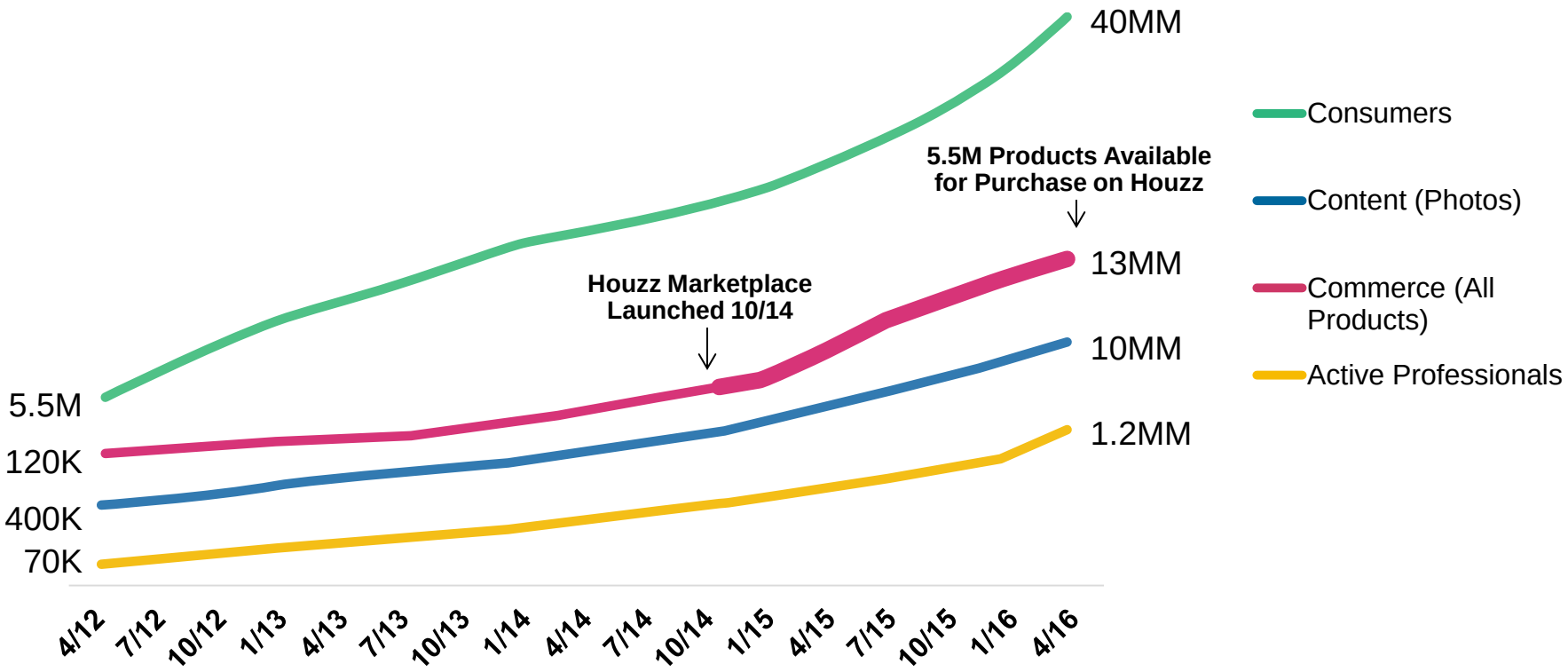
...Image-Based Peer-to-Peer (P2P) Marketplace OfferUp = Ramping Faster than eBay @ Same Stage...



Source: OfferUp, company filings, and KPCB estimates.
Note: Shown on a calendar year basis and in nominal dollars. eBay was launched in 1995 and OfferUp in 2011.

...Image-Based Platform Houzz = Content + Community + Commerce Continue to Ramp...

Houzz – Content (Photos) / Community (Professionals + Consumers) / Commerce (Products), 4/12 – 4/16



Source: Houzz
5.5MM products are available on Houzz for purchase directly within the app and on Houzz.com (Houzz Marketplace).
There are 13MM total products available on Houzz Marketplace + linked to merchant sites.

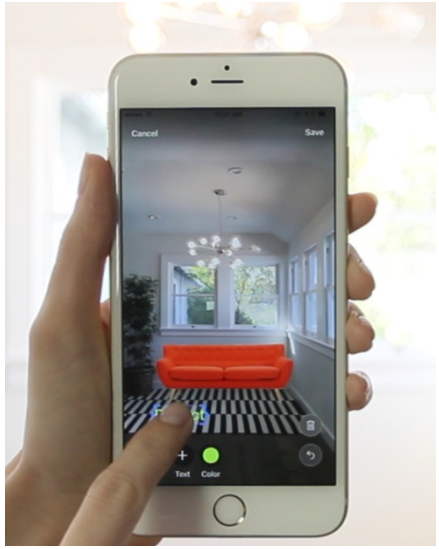
...Houzz Personalized Planning with Images = 3-4x Higher Engagement...5x Higher Purchase Conversion

View In My Room (2/16 Launch)

Pick a Product & Preview What It Looks Like In Any Room Through Camera

50% of Users Who Made a Purchase in Latest Version of Houzz App (Since 2/17/16) Used View In My Room

Users = 97% More Likely to Use Houzz Next Time They Shop...5.5x More Likely to Purchase... Spend 3x More Time in App



Sketch (12/15)

Add Products from Houzz Marketplace to Any Photo on Houzz or Your Own Sketch

Over 500K Sketches Saved Since Launch

Sketch Users = 5x More Likely to Purchase... Spend 4x More Time in App

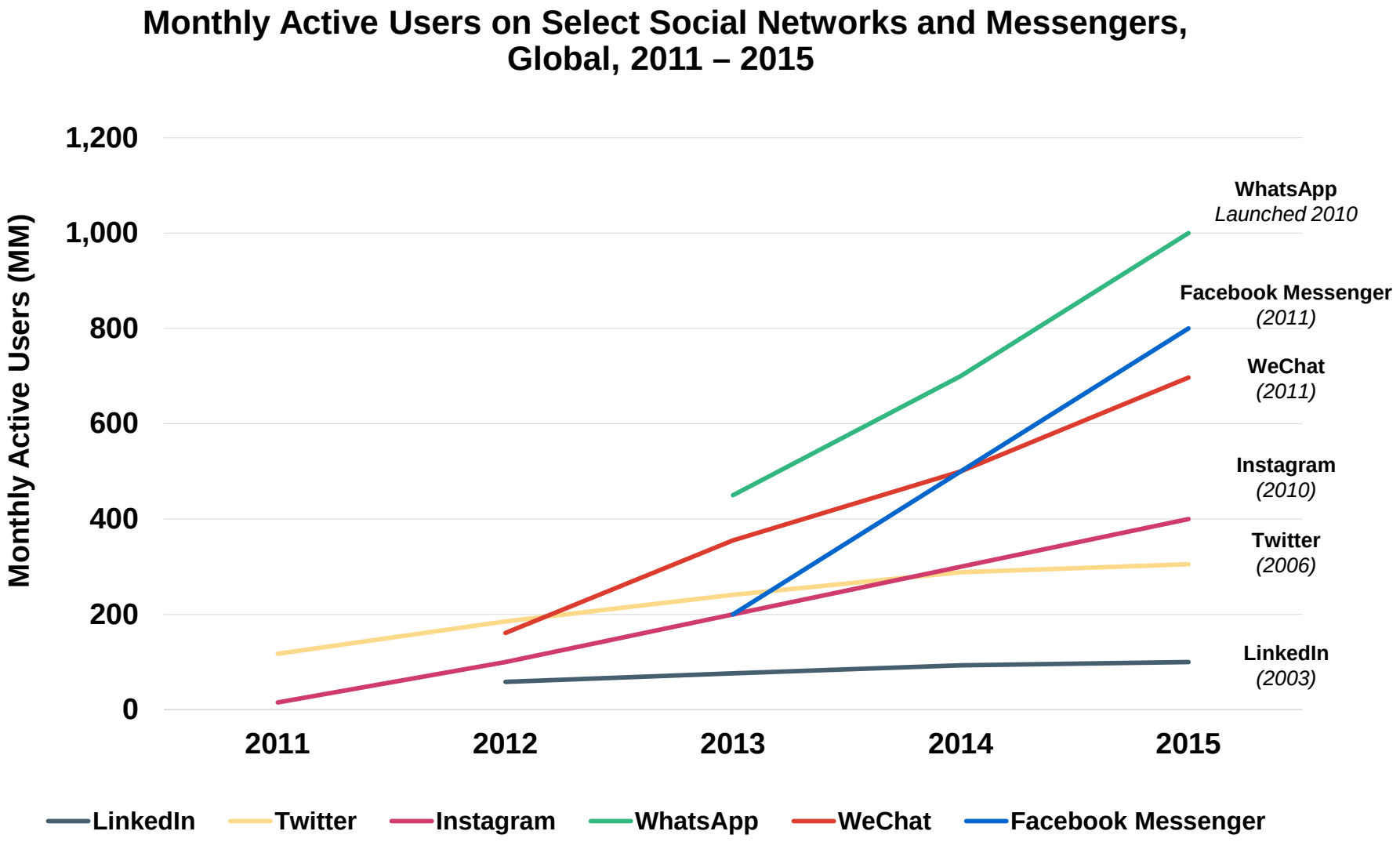
Source: Houzz

Messaging =

Evolving Rapidly

Messaging Leaders =
Strong User (+ Use) Growth

Messaging Continues to Grow Rapidly...
Leaders = WhatsApp / Facebook Messenger / WeChat



Source: Facebook, WhatsApp, Tencent, Instagram, Twitter, LinkedIn, Morgan Stanley Research
Note: 2013 data for Instagram and Facebook Messenger are approximated from statements made in early 2014. Twitter users excludes SMS fast followers.

Messaging =

Evolving from
Simple Social Conversations to
More Expressive Communication...

Messaging Platform Evolution = More Tools for Simple Self-Expression

Global Electronic Messaging Platforms – Evolution of Simple Self-Expression

Japanese Cell Phones – Type-Based Emoji
1990s

(^ _ ^)

AOL Instant Messenger – Convert Text Emoticon to Graphical Smiley
1997

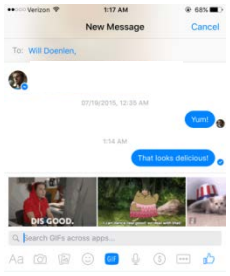
NTT DoCoMo-Emoji
1999

Apple iOS 5 – Native Emoji
2011

Line – Stickers
2011

Bitstrips – Bitmoji Personalized Emoji
2014

Facebook Messenger – GIF Keyboard
2015



Snapchat – Lenses
2015

Source: Wired, Company Statements, Press Releases.

...Messaging =

Evolving from
Simple Social Conversations to
Business-Related Conversations

Asia-Based Messaging Leaders = Continue to Expand Uses / Services Beyond Social Messaging

	KakaoTalk	WeChat	LINE
Name	**KakaoTalk**	**WeChat**	**LINE**
Launch	**March 2010**	**January 2011**	**June 2011**
Primary Country	**Korea**	**China**	**Japan**
Banking / Financial Services	Kakao Bank (11/15)	WeBank (1/15)	Debit Card (2016)
Enterprise	✘	Enterprise WeChat (3/16)	✘
Online-To-Offline (O2O)	Kakao Hairshop (1H:16E) Kakao Driver (1H:16E)	✓	Grocery Delivery (2015)
TV	Kakao TV (6/15)	✓	Line Live & Line TV (2015)
Video Calls / Chat	(6/15)	✓	✓
Taxi Services	Kakao Taxi (3/15)	✓	✓
Messaging	✓	✓	✓
Group Messaging	✓	✓	✓
Voice Calls	Free VoIP calls (2012)	WeChat Phonebook (2014)	✓
Payments	KakaoPay (2014)	(2013)	Line Pay (2014)
Stickers	(2012)	Sticker shop (2013)	(2011)
Games	Game Center (2012)	(2014)	(2011)
Commerce	Kakao Page (2013)	Delivery support w / Yixun (2013)	Line Mall (2013)
Media	Kakao Topic (2014)	✓	✓
QR Codes	✓	QR code identity (2012)	✓
User Stories / Moments	Kakao Story (2012)	WeChat Moments	Line Home (2012)
Developer Platform	KakaoDevelopers	WeChat API	Line Partner (2012)

New Services Added 2015 -16*

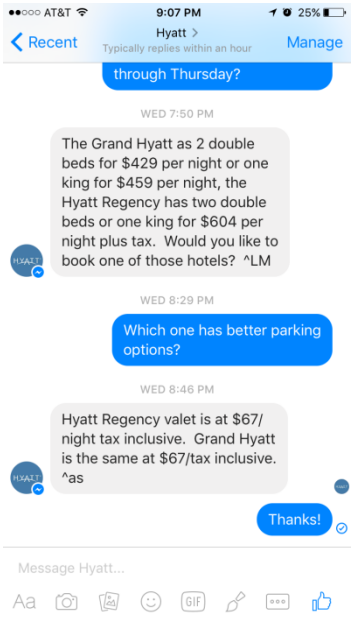
Previous Existing Services

Source: Company websites, press releases, Morgan Stanley Research.
*Blue shading denotes that at least one of the platforms listed has added new features since 2015. Some features for other platforms may have been added in prior years
Note: Enterprise denotes product made specifically for messaging or social networking within the enterprise, which is distinct from B2C messaging where businesses engage with current or potential customers.

Messaging Secret Sauce = Magic of the Thread = Conversational... Remembers Identity / Time / Specifics / Preferences / Context

Hyatt

Check Availability / Reservations / Order Room Service

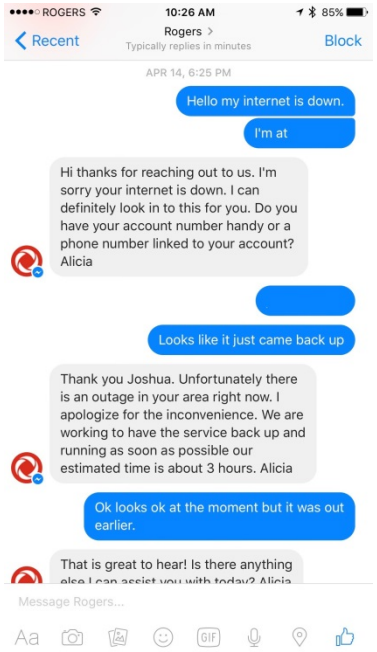


Started Offering Customer Service on Facebook Messenger in 11/15

+20x Increase in Messages Received by Hyatt Within ~1 Month

Rogers Communications

Ask Questions / Update Account / Set Up New Plan



Started Offering Customer Service on Facebook Messenger in 12/15

65% Increase in Customer Satisfaction
65% Decrease in Customer Complaints

Source: "Digital Transformation for Telecom Operators," by Deloitte, 2016. Wired.
The Commissioner for Complaints for Telecommunications Services (CCTS) reported a 65 per cent decrease in customer complaints between 8/15 and 1/16 compared to the previous six months

Messaging Platforms = Millions of Business Accounts Helping Facilitate Customer Service & Commerce...

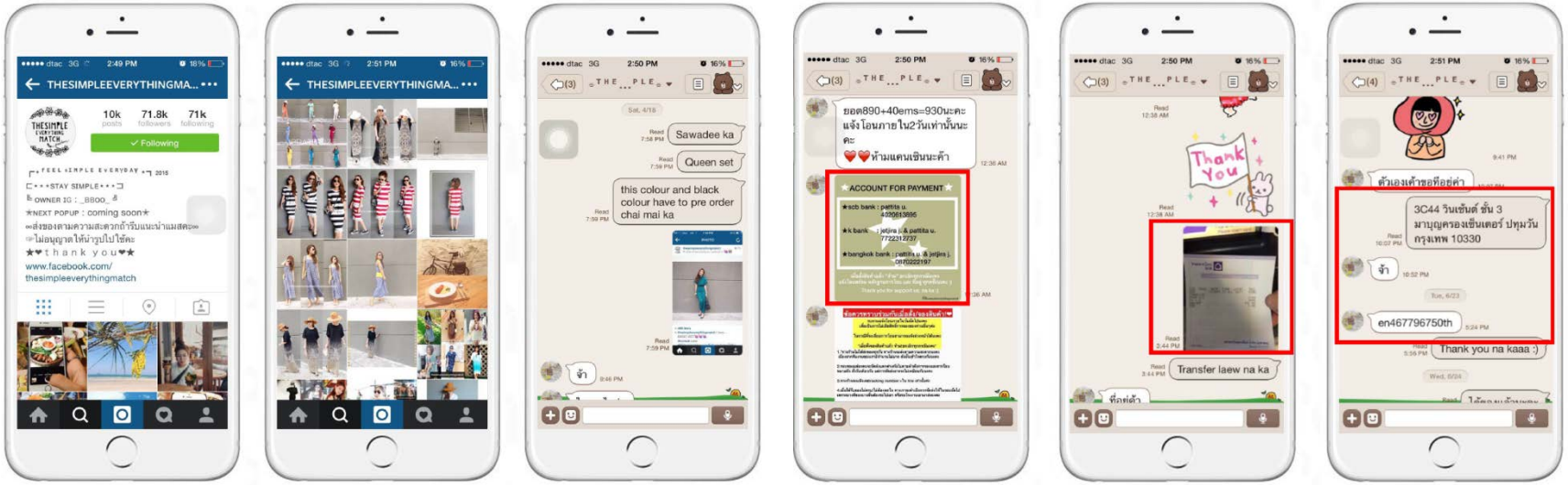
	Business / Official Accounts	Engagement	Payments	B2C Chat for SMEs	Advertising (Within Messengers)	Partnerships / Other Services
WeChat	**10MM+** Official Accounts	**~80%** Users Follow Official Accounts	**WeChat Pay (2013)**	**Official Accounts (2012)**	**Official Accounts (2012)**	**Weidian (2014)**
Facebook	**50MM+** Small Business Pages	**1B+** Messages / Month Between Businesses and Users, +2x Y/Y **80%** Businesses Active on Mobile	**Payments (2015)**	**Messaging via Pages (2011)** **Chatbots Platform (2016)**	**Sponsored Messages (2016)**	**Shopify & Zendesk Partnership (2015 / 2016)**
LINE	**2MM+** Line@ + Official Accounts	**--**	**Line Pay (2014)**	**Official Accounts & Line @ (2012 / 2015)** **Chatbots Platform (2016)**	**Official Accounts (2012)**	**Commerce / Stores on Line@ (2016)**

Source: WeChat, Line, Facebook Messenger, various press releases, "WeChat's Impact: A Report on WeChat Platform Data," by Grata (2/15)

...Messaging Platforms = Conversational Commerce Ramping

Shopper in Thailand on Instagram

Browsing Begins on Instagram...Conversation / Payment / Confirmation Ends on Line



Visit Instagram Shop | **Browse Products** | **Inquire About Product via Line** | **Get Payment Details** | **Confirm Payment** | **Ship & Track Order**

Source: Commerce + Mobile: Evolution of New Business Models in SEA, 7/15.

Best Ways for Businesses to Contact Millennials = Social Media & Chat... Worst Way = Telephone

Popularity of Business Contact Channels, by Age

Which channels are most popular with your age-profiled customers?
(% of contact centers)

	% of Centers Reporting Most Popular Contact Channels by Generation				
	Internet / Web Chat	**Social Media**	**Electronic Messaging (e.g. email, SMS)**	**Smartphone Application**	**Telephone**
Generation Y (born 1981-1999)	24% (1st choice)	24% (1st choice)	21% (3rd choice)	19% (4th choice)	12% (5th choice)
Generation X (born 1961-1980)	21% (3rd choice)	12% (4th choice)	28% (2nd choice)	11% (5th choice)	29% (1st choice)
Baby Boomers (born 1945-1960)	7% (3rd choice)	2% (5th choice)	24% (2nd choice)	3% (4th choice)	64% (1st choice)
Silent Generation (born before 1944)	2% (3rd choice)	1% (4th choice)	6% (2nd choice)	1% (5th choice)	90% (1st choice)

Source: "Global Contact Center Benchmarking Report," Dimension Data, 2015.
N = 717 Contact Centers, Global. Results are shown based on contact centers that actually tracked channel popularity. Percentage may not add up to 100 owing to rounding.
Generation Y is typically referred to as "Millennials"

Android / iOS Home Screens (Like Portals in Internet 1.0) = Mobile Power Alleys (~2008-2016)...

Messaging Leaders = Want to Change That

Average Global Mobile User = ~33 Apps...12 Apps Used Daily... 80% of Time Spent in 3 Apps

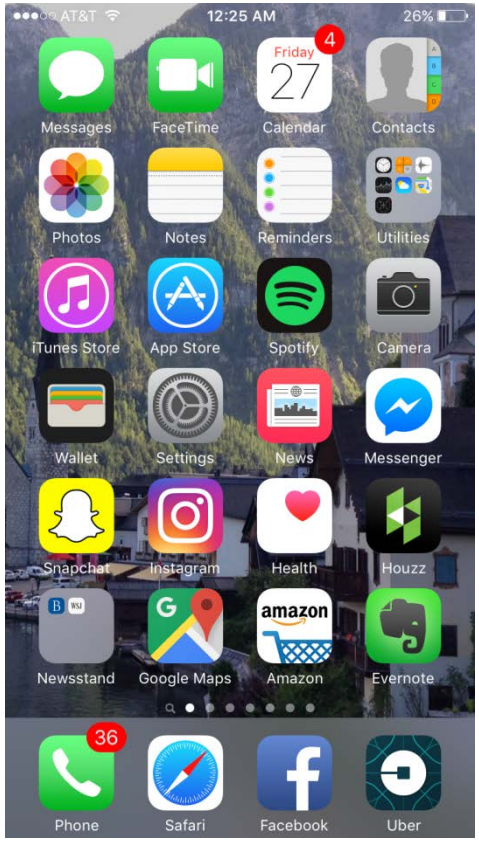
Day in Life of a Mobile User, 2016

	Average # Apps Installed on Device*	Average Number of Apps Used Daily	Average Number of Apps Accounting for 80%+ of App Usage	Time Spent on Phone (per Day)	Most Commonly Used Apps
USA	37	12	3	5 Hours	Facebook Chrome YouTube
Worldwide	33	12	3	4 Hours	Facebook WhatsApp Chrome

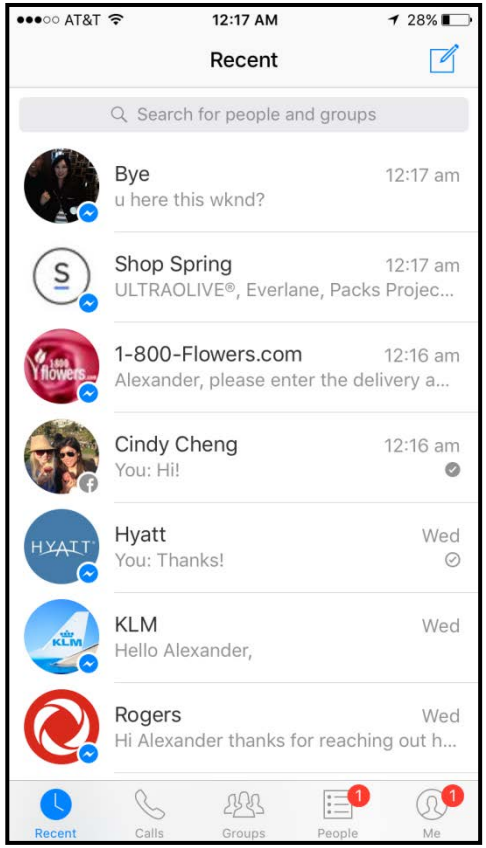
Source: SimilarWeb, 5/16.
*Apps installed does not include pre-installed apps. Most commonly used apps includes preloads.

Messaging Apps = Increasingly Becoming Second Home Screen...

iOS
Home Screen



Facebook Messenger
Inbox



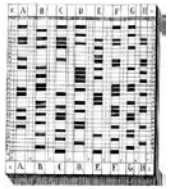
RE-IMAGINING HUMAN / COMPUTER INTERFACES –
– VOICE
– TRANSPORTATION

Re-Imagining Voice = A New Paradigm in Human-Computer Interaction

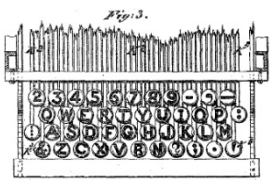
Evolution of Basic Human-Computer Interaction Over ***~2 Centuries*** *=*

Innovations Every Decade Over Past 75 Years

Human-Computer Interaction (1830s – 2015), USA = Touch 1.0 → Touch 2.0 → Touch 3.0 → Voice



Punch Cards for Informatics
1832



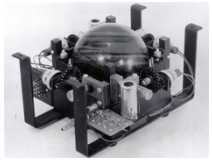
QWERTY Keyboard
1872

Electromechanical Computer (Z3)
1941

Electronic Computer (ENIAC)
1943

Paper Tape Reader (Harvard Mark I)
1944

Mainframe Computers (IBM SSEC)
1948



Trackball
1952

Joystick
1967

Microcomputers (IBM Mark-8)
1974

Portable Computer (IBM 5100)
1975

Commercial Use of Window-Based GUI (Xerox Star)
1981

Commercial Use of Mouse (Apple Lisa)
1983

Commercial Use of Mobile Computing (PalmPilot)
1996

Touch + Camera - based Mobile Computing (iPhone 2G)
2007

Voice on Mobile (Siri)
2011

Voice on Connected / Ambient Devices (Amazon Echo)
2014

@KPCB

Source: University of Calgary, "History of Computer Interfaces" (Saul Greenberg)

Voice as
Computing Interface =

Why Now?

Voice = Should Be Most Efficient Form of Computing Input

Voice Interfaces – Consumer Benefits

1) **Fast**
   Humans can speak 150 vs. type 40 words per minute, on average...

2) **Easy**
   Convenient, hands-free, instant...

3) **Personalized + Context-Driven / Keyboard Free**
   Ability to understand wide context of questions based on prior questions / interactions / location / other semantics

Voice Interfaces – Unique Qualities

1) **Random Access vs. Hierarchical GUI**
   Think Google Search vs. Yahoo! Directory...

2) **Low Cost + Small Footprint**
   Requires microphone / speaker / processor / connectivity – great for Internet of Things...

3) **Requires Natural Language Recognition & Processing**

Source: Learn2Type.com, National Center for Voice and Speech, Steve Cheng, Global Product Lead for Voice Search, Google

Person to Machine (P2M) Voice Interaction Adoption Keys = 99% Accuracy in Understanding & Meaning + Low Latency

As speech recognition accuracy goes from say 95% to 99%, all of us in the room will go from barely using it today to using it all the time. Most people underestimate the difference between 95% and 99% accuracy – ***99% is a game changer****...*

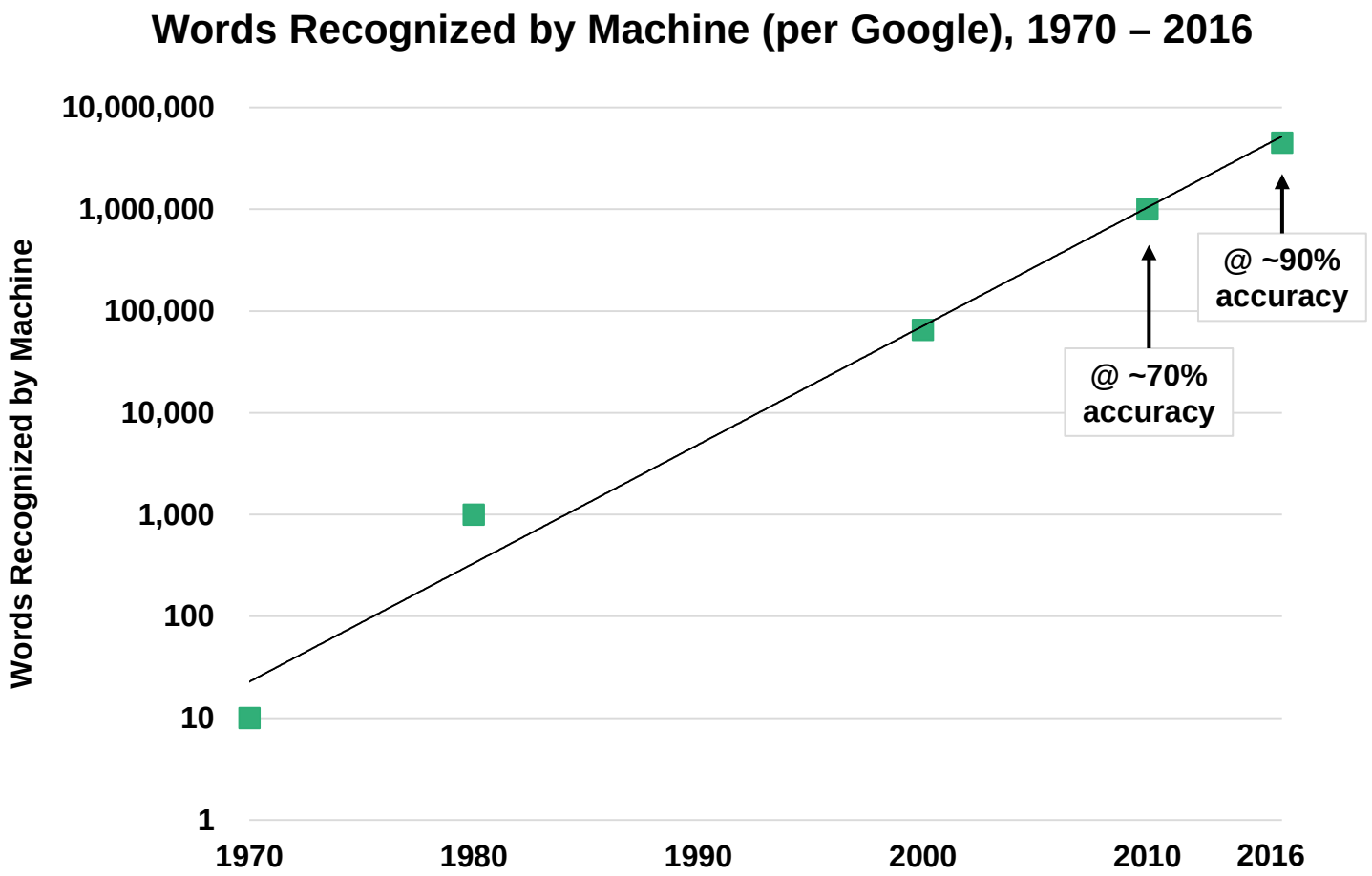
No one wants to wait 10 seconds for a response*. Accuracy, followed by latency, are the two key metrics for a production speech system...*

- **ANDREW NG, CHIEF SCIENTIST AT BAIDU**

Source: Andrew Ng, Chief Scientist, Baidu
Note: P2M = person to machine.

Machine Speech Recognition @ Human Level Recognition for... Voice Search in Low Noise Environment, per Google

Next Frontier = *Recognition in heavy background noise in far-field & across diverse speaker characteristics (accents, pitch...)*

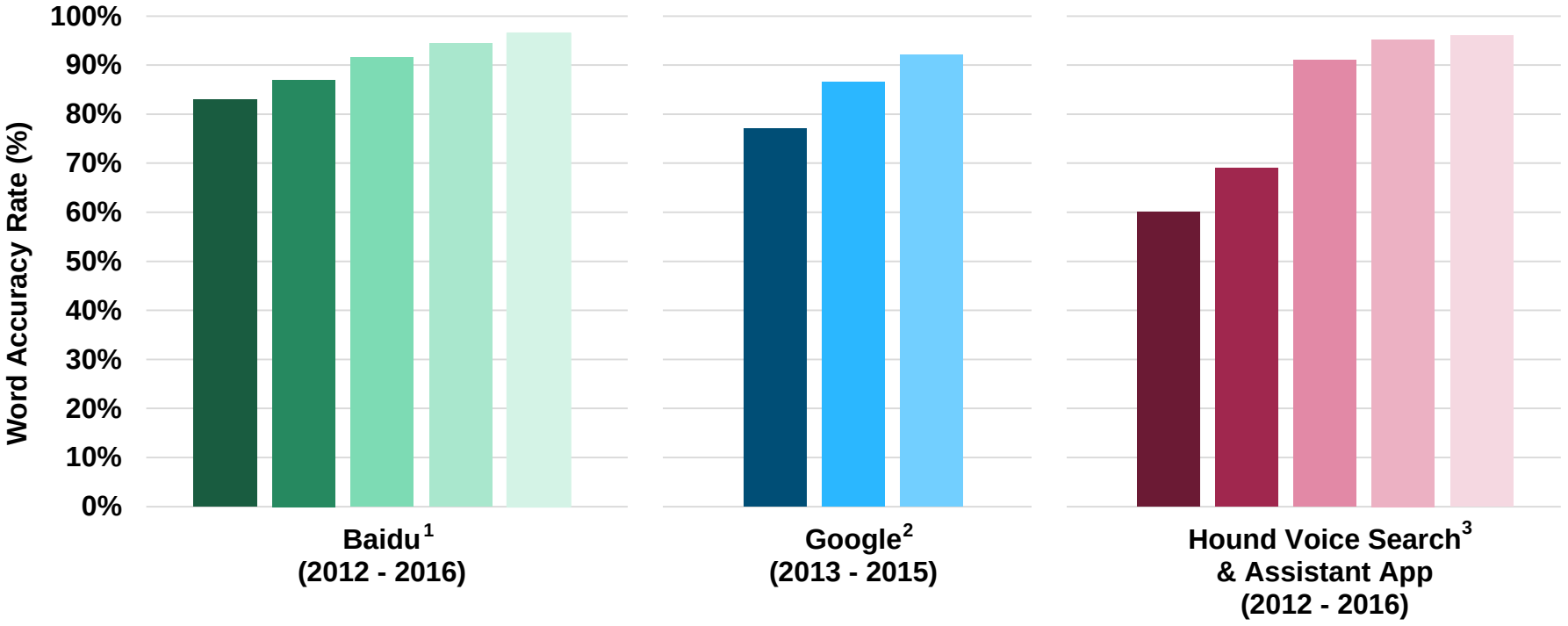


Source: Johan Schalkwyk, Voice Technology and Research Lead, Google
Note: For the English language.

Voice Word Accuracy Rates Improving Rapidly... +90% Accuracy for Major Platforms

Word Accuracy Rates by Platform*, 2012 – 2016

**Word accuracy rate definitions are unique to each company...see footnotes for more details*



Source: Baidu, Google, VentureBeat, SoundHound
Note: *Word Error Rate (WER) definitions are specific to each company. Word accuracy rate = 1 - WER. (1) Data shown is word accuracy rate on Mandarin speech recognition on one of Baidu's speech tasks. Real world mobile phone speech data is very noisy and hard for humans to transcribe. A 3.5% WER is better than what most native speakers can accomplish on this task. WER across different datasets and languages are generally not comparable. (2) Data as of 5/15 and refers to recognition accuracy for English language. Word error rate is evaluated using real world search data which is extremely diverse and more error prone than typical human dialogue. (3) Data as of 1/16 and refers to recognition accuracy for English language. Word accuracy rate based on data collected from thousands of speakers and real world queries with noise and accents.

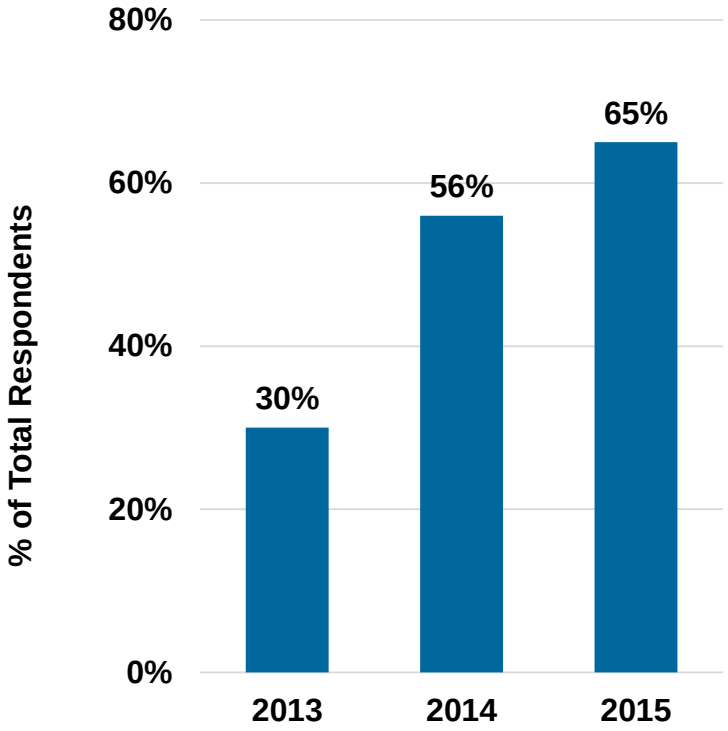
Computing Interface...

Evolving from Keyboards to Microphones & Keyboards =

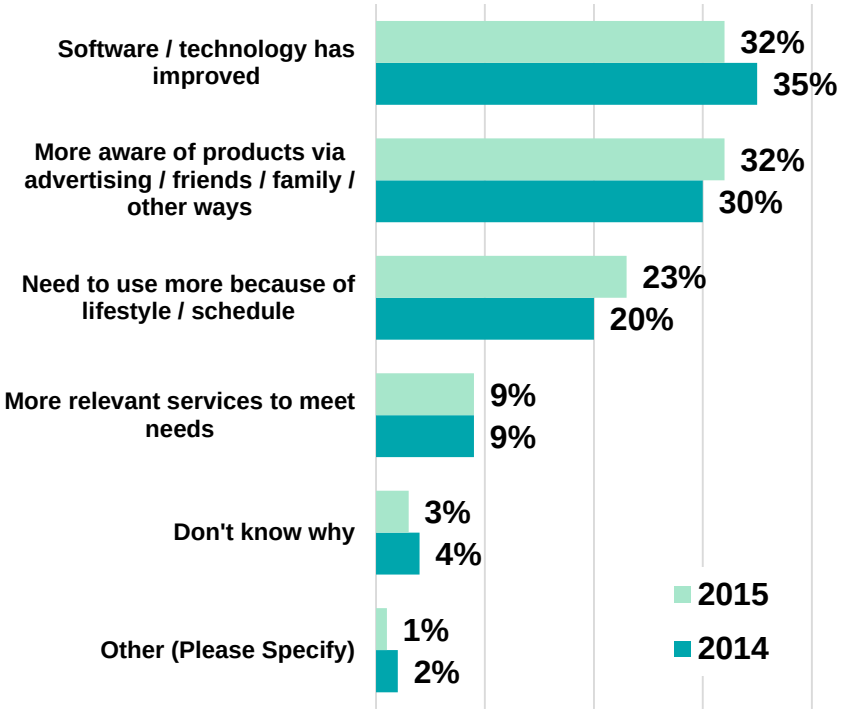
Still Early Innings

Mobile Voice Assistant Usage = Rising Quickly... Primarily Driven By Technology Improvements

% of Smartphone Owners Using Voice Assistants Annually, USA, 2013 – 2015



Voice Assistant Usage – Primary Reason for Change, % of Respondents, USA, 2014 – 2015

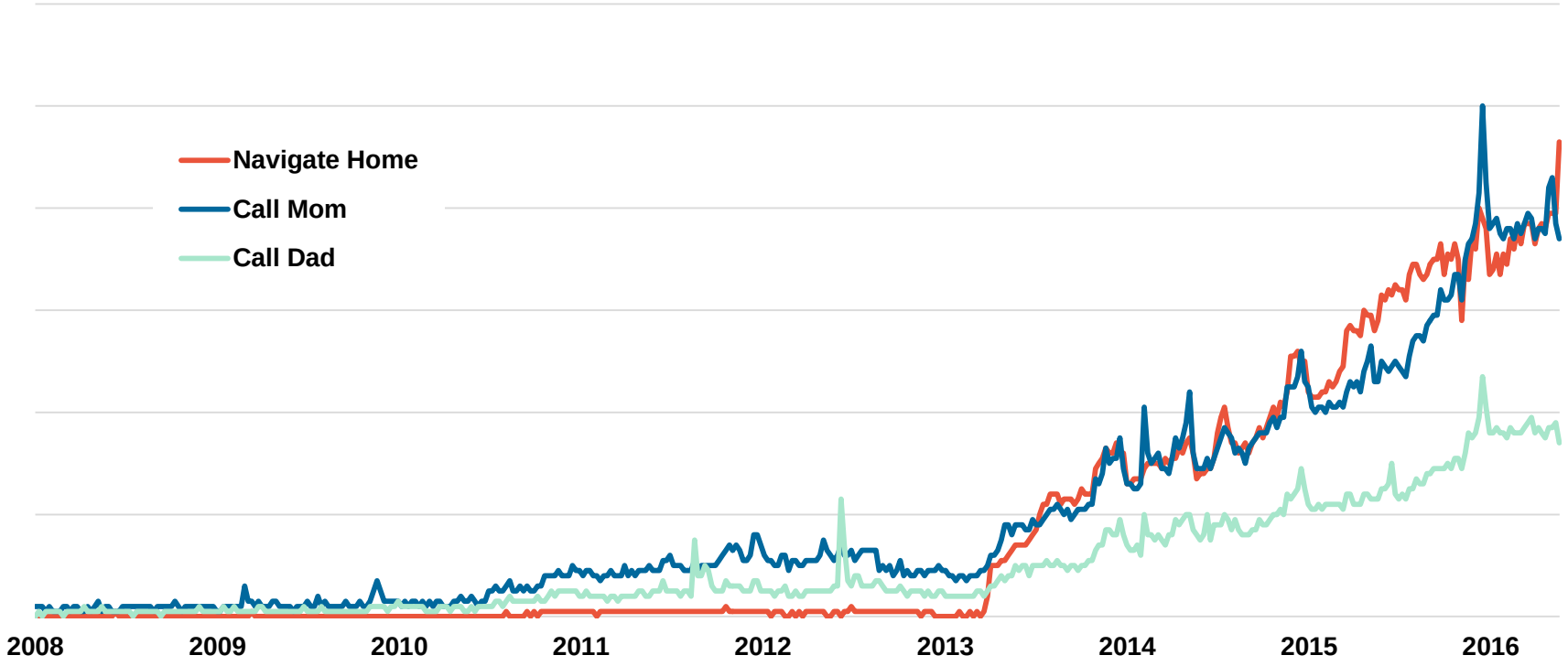


Source: Thrive Analytics, "Local Search Reports" 2013-2015
Note: Results highlighted in these charts are from the 2013, 2014, and/or 2015 Local Search surveys. These surveys were conducted via an online panel with representative sample sizes for the national population in the US. There were 1,102, 2,058, and 2,125 US smartphone owners that completed the surveys in 2013, 2014 and 2015 respectively.

Google Voice Search Queries = Up >35x Since 2008 & >7x Since 2010, per Google Trends

Google Trends imply queries associated with voice-related commands have risen >35x since 2008 after launch of iPhone & Google Voice Search

Google Trends, Worldwide, 2008 – 2016

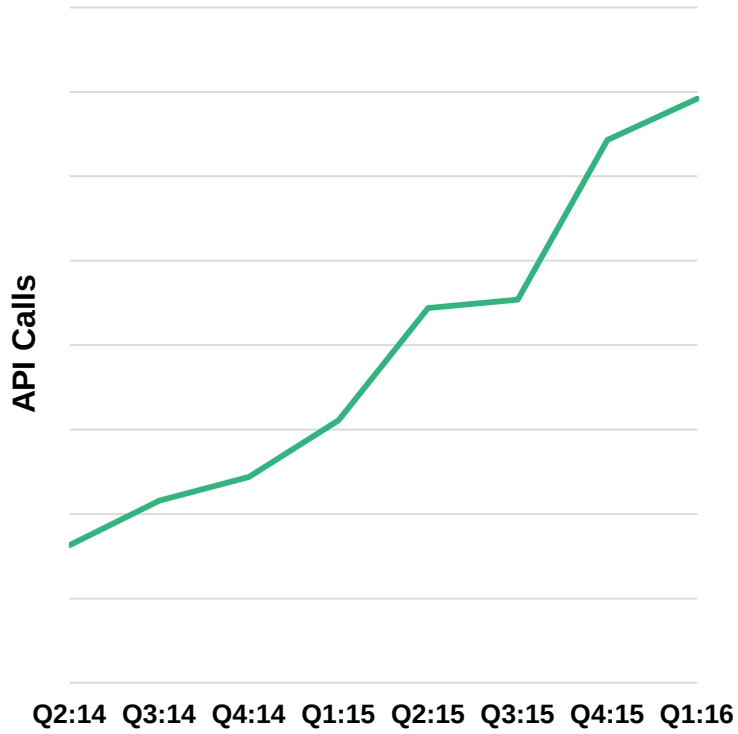


Source: Google Trends
Note: Assume command-based queries are voice searches given lack of relevance for keyword-based search. Aggregate growth values determined using growth in Google Trends for three queries listed above.

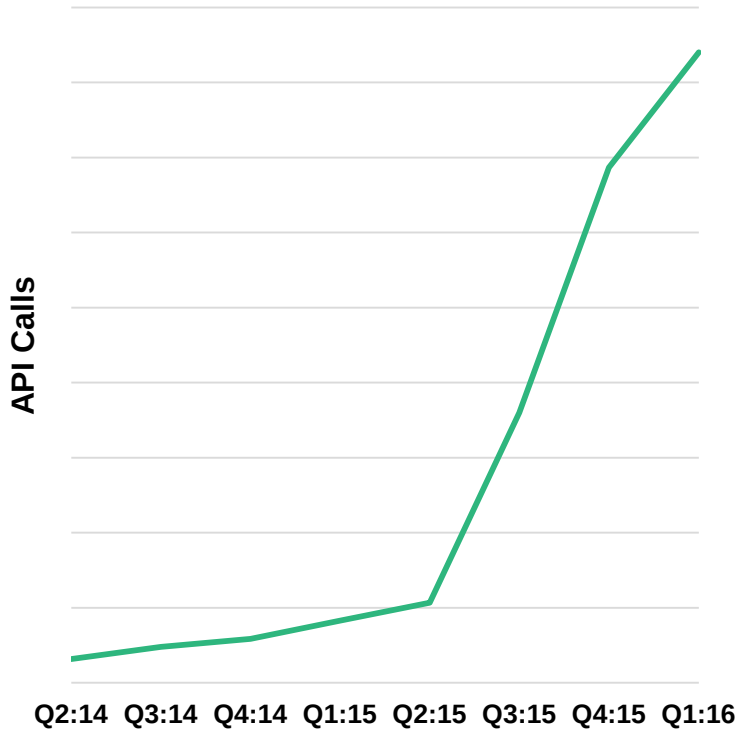
Baidu Voice = Input Growth >4x...Output >26x, Since Q2:14

Usage across all Baidu products growing rapidly...typing Chinese on small cellphone keyboard even more difficult than typing English...Text-to-Speech supplements speech recognition & key component of man-machine communications using voice

Baidu Speech Recognition Daily Usage by API Calls, Global, 2014 – 2016[1]



Baidu Text to Speech (TTS) Daily Usage by API Calls, Global, 2014 – 2016[2]

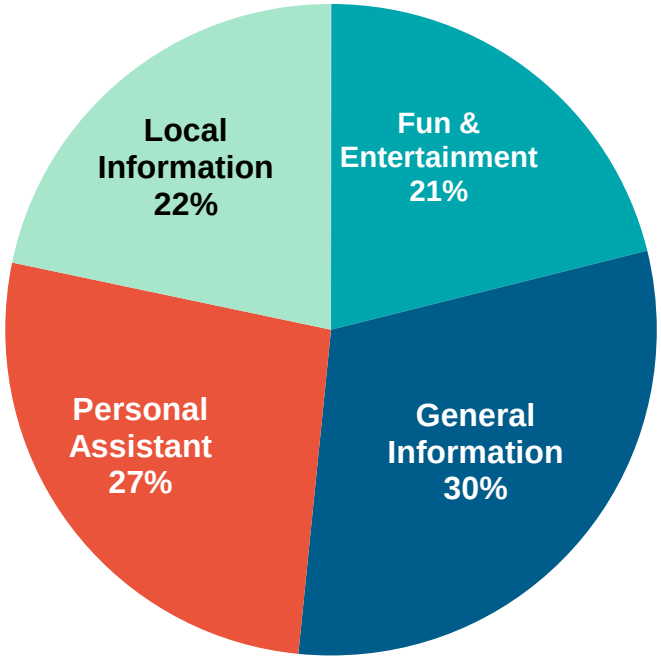


Source: Baidu
Note: (1) Data shown is growth of speech recognition at Baidu, as measured by the number of API calls to Baidu's speech recognition system across time, from multiple products. Most of these API calls were for Mandarin speech recognition. (2) Data shown is growth of TTS (text to speech) at Baidu, in terms of the total number of API calls to Baidu's TTS system across time, from multiple products. Most of these API calls were for Mandarin TTS.

Hound Voice Search & Assistant App = 6-8 Queries Across 4 Categories per User per Day

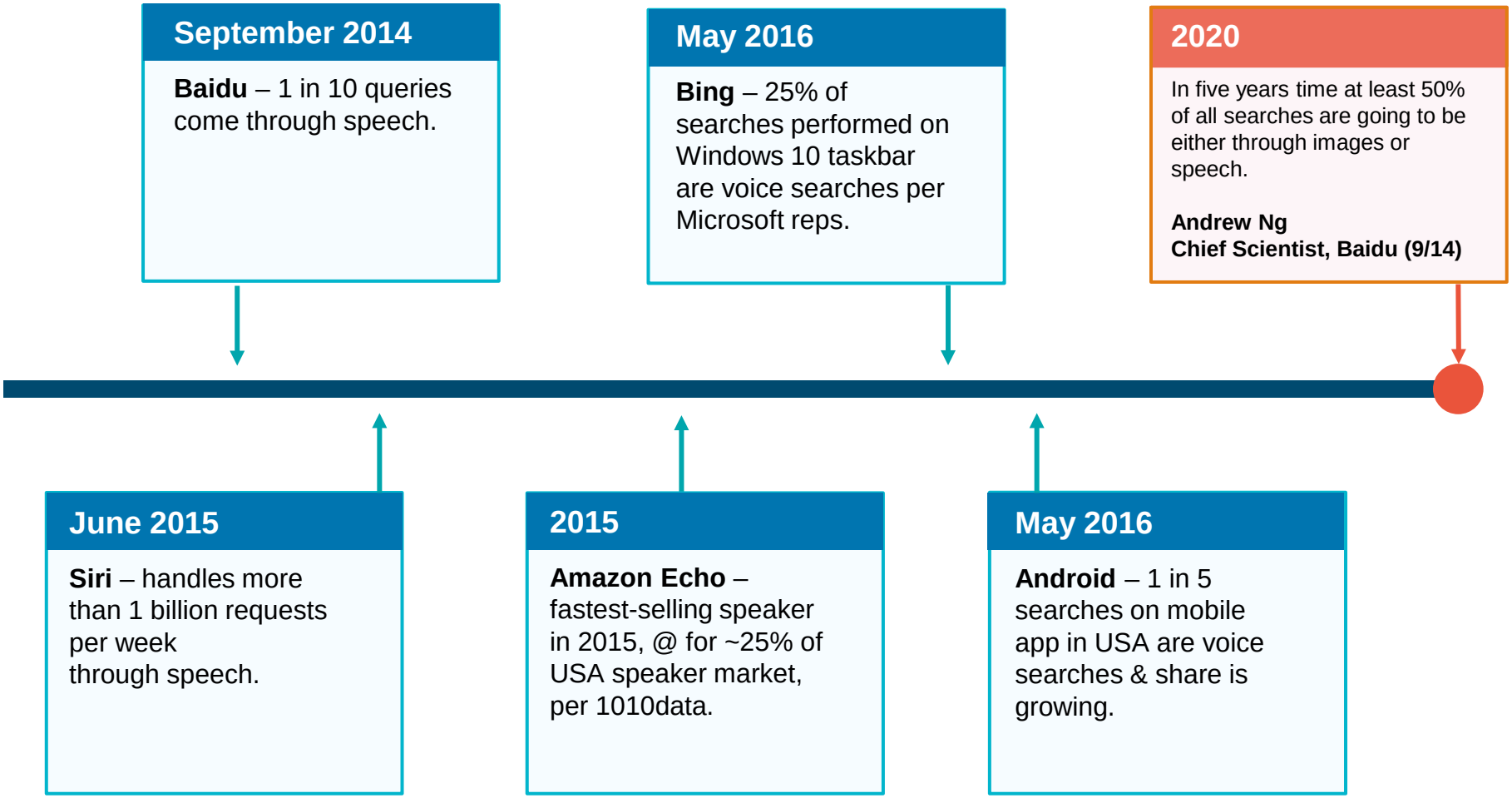
Seeing 6-8 queries per active user per day among 100+ domains across 4 categories... Users most care about speed / accuracy / ability to follow up / ability to understand complex queries...

Voice Query Breakdown – Observed Data on Hound App, USA, 2016



Source: SoundHound
Note: Based on most recent 30-days of user activity. Local information refers to queries about weather, restaurants, hotels, maps and navigation. Fun & entertainment refers to queries about music, movies, games, etc. General information refers to queries about facts, dictionary, sports, stocks, mortgages, nutrition, etc. Personal assistant refers to queries and commands about phone / communications, Uber and transportation, flight status, calendars, timers, alarms, etc.

Voice = Gaining Search Share...
USA Android @ 20%...Baidu @ 10%...Bing Taskbar @ 25%



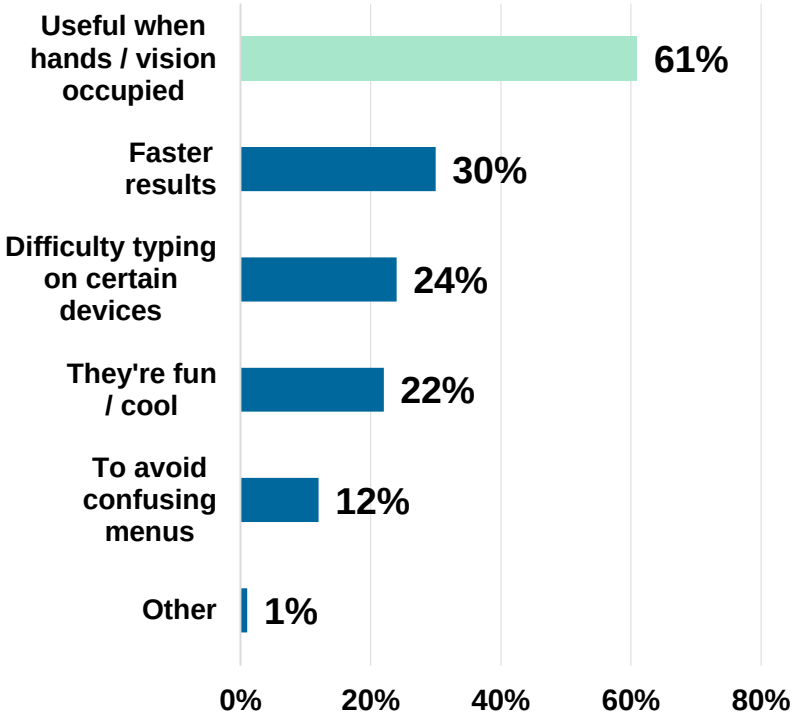
Source: Baidu World 2014, Gigaom, Gadgets 360, 1010data, MediaPost, SearchEngineLand, Google I/O 2016, ComScore, Recode, Fast Company

Voice as
Computing Interface...

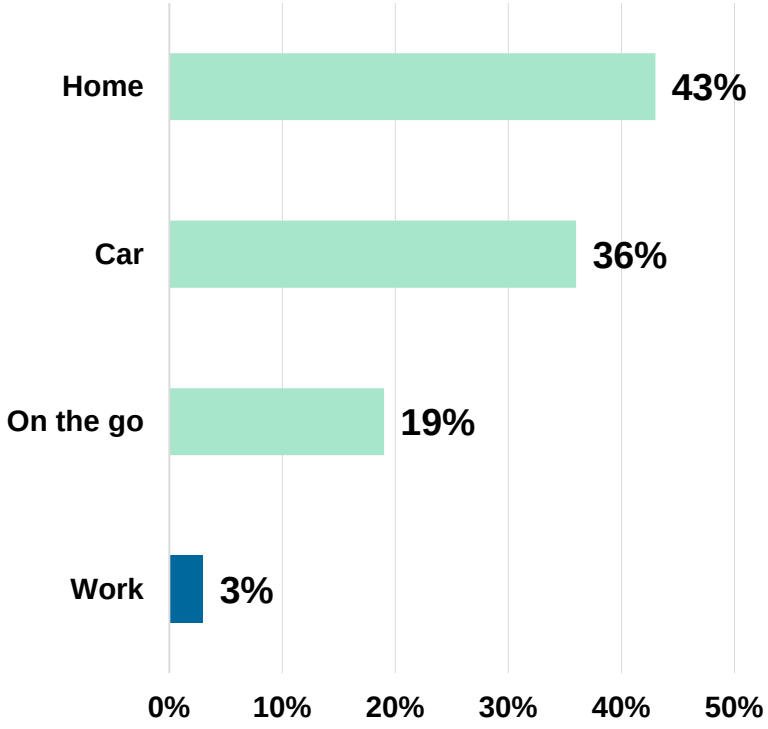
Hands & Vision-Free =
Expands Concept of 'Always On'

Hands & Vision-Free Interaction = Top Reason to Use Voice...@ Home / In Car / On Go

Primary Reasons for Using Voice, USA, 2016[1]



Primary Setting for Voice Usage, USA, 2016[2]



Source: MindMeld "Intelligent Voice Assistants Research Report – Q1 2016"
Note: Based on survey of n = 1,800 respondents who were smartphone users over the age of 18, half female half male, geographically distributed across the United States. (1) In response to the survey question stating "Why do you use voice/search commands? Check all that apply." (2) In response to the survey question stating "Where do you use voice features the most?"

Voice as
Computing Interface...

Platforms Being Built...
Third Party Developers
Moving Quickly

Amazon Alexa Voice Platform Goal = Voice-Enable Devices = Mics for Home / Car / Mobiles...

Alexa Voice Service – OEM / Developer Integrations (10+ integrations...)

Home
(Various OEMs)

Ring

Invoxia

Philips Hue

Ecobee

Scout Security

ToyMail

Luma

Car
(Ford Sync)

On Go
(Lexi app)

Alexa 'Skills' Kit Developers = ~950 Skills (5/16) vs. 14 Skills (9/15)

UBER · Capital One · Domino's · Pandora · Spotify · fitbit · Fidelity INVESTMENTS

Source: TechCrunch, Amazon Alexa, AFTVnews
Image: Geekwire.com, Heylexi.com
Note: Amazon launched the Alexa Skills Kit for third-party developers in 6/15.

...Amazon Alexa Voice Platform Goal = Faster / Easier Shopping on Amazon

Leveraging proliferation of microphones throughout house to reduce friction for making purchases...
3x faster to shop using microphone than to navigate menus in mobile apps...*

Amazon Echo

Amazon Echo Dot

Amazon Echo Tap

Amazon Prime
(~44MM USA Subscribers)

Evolution of Shopping with Echo

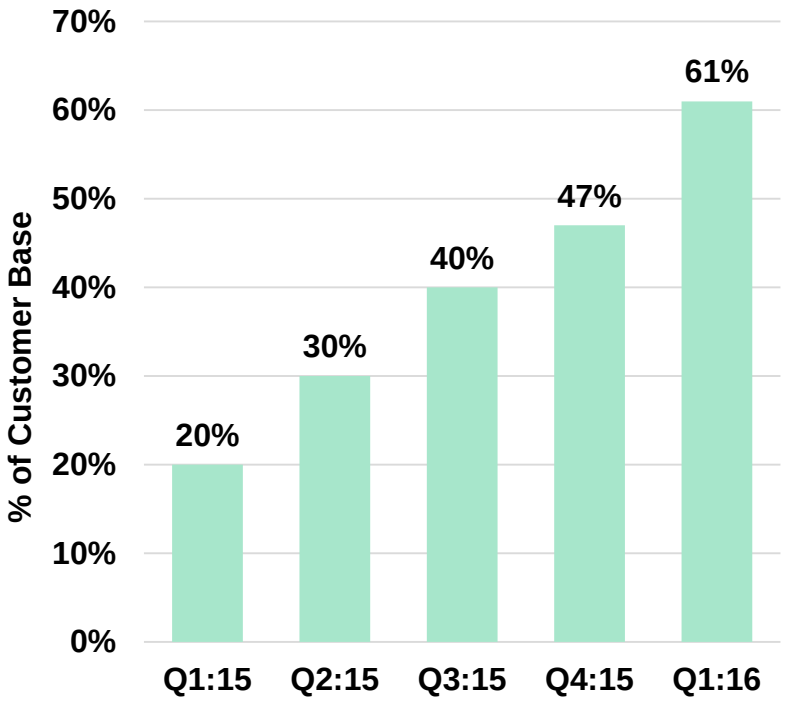
1. Shopping Lists **(2014)**
2. Reorder past purchases by voice **(2015)**
3. Order new items – assuming you are fine with Amazon selecting exact item **(2015)**

Source: Cowen & Company Internet Retail Tracker (3/16), Recode, MindMeld
Image: Amazon.com, Gadgets-and-tech.com, Tomaltman.com, Techtimes.com, Venturebeat.com
Note: *Per MindMeld study comparing voice-enabled commerce to mobile commerce for the following task, "show me men's black Adidas shoes for under $75" – takes ~7 seconds using voice compared to ~3x longer navigating menus in an app.

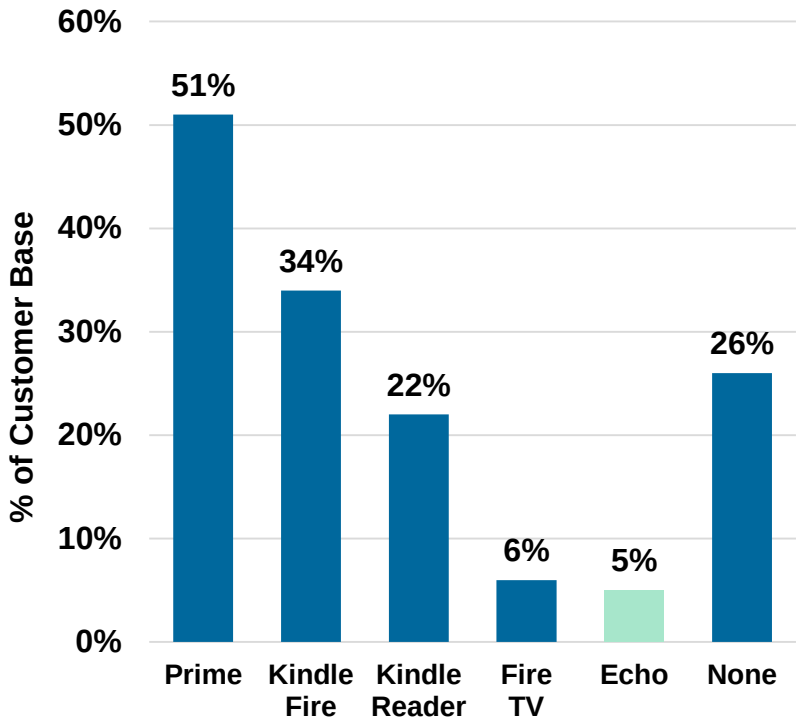
~5% of Amazon USA Customers Own an Echo vs. 2% Y/Y... ~4MM Units Sold Since Launch (11/14), per CIRP

~4MM Amazon Echo devices have been sold in USA as of 3/16, with ~1MM sold in Q1:16, per CIRP estimates

Amazon Customer Awareness of Amazon Echo, USA, Q1:15 – Q1:16



Amazon Customer Ownership of Amazon Devices, USA, Q1:16

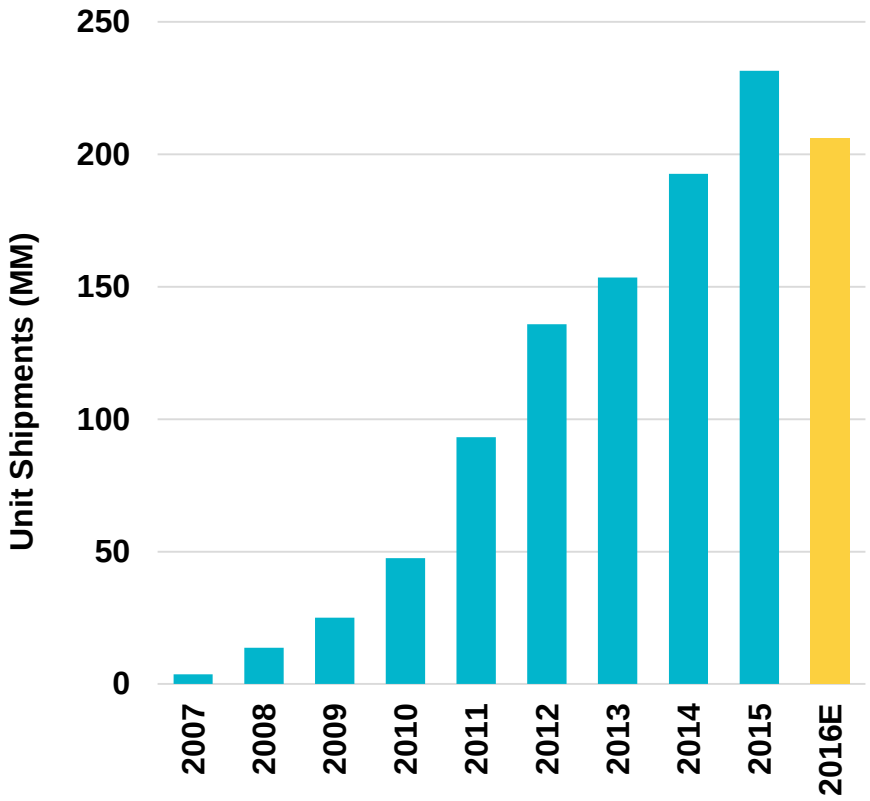


Source: Consumer Intelligence Research Partners (CIRP)
Note: Amazon Echo limited launch occurred in 11/14 and wide-release occurred in 6/15.

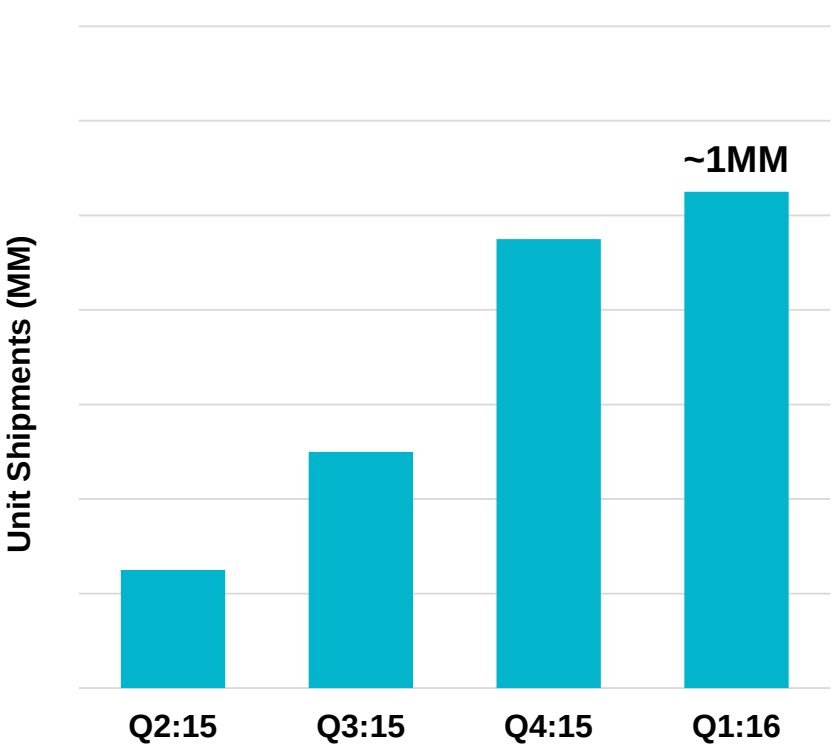
Computing Industry Inflection Points = Typically Only Obvious With Hindsight

iPhone Sales May Have Peaked in 2015...
While Amazon Echo Device Sales Beginning to Take Off?

iOS Smartphone Unit Shipments, Global, 2007 – 2016E



Estimated Amazon Echo Unit Shipments, USA, Q2:15 – Q1:16



Source: Morgan Stanley Research (5/16), Consumer Intelligence Research Partners (CIRP), KPCB estimates
Note: Apple unit shipments shown on a calendar-year basis. Amazon Echo limited launch occurred in 11/14 and wide-release launch occurred in 6/15.

Re-Imagining Transportation = Another New Paradigm in Human-Computer Interaction...

Cars

Is it a Car...Is it a Computer?...

Is it a Phone...Is it a Camera?

Is it a Car...Is it a Computer?

Source: Apple, Tesla

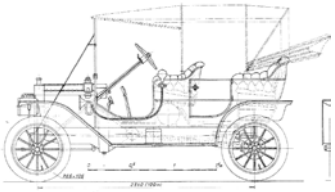
...One Can...
Lock / Monitor / Summon One's Tesla from One's Wrist

Source: Tesla, The Verge, Redmond Pie

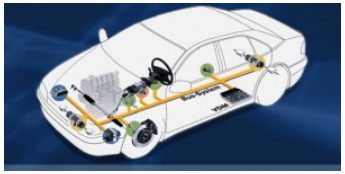
Car Industry Evolution =
Computerization Accelerating

Car Computing Evolution Since Pre-1980s = Mechanical / Electrical → Simple Processors → Computers

Pre-1980s
Analog / Mechanical
Used switches / wiring to route feature controls to driver

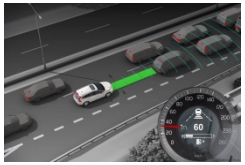


1980s (to Present)
CAN Bus
(Integrated Network)
New regulatory standards drove need to monitor emissions in real time, hence central computer



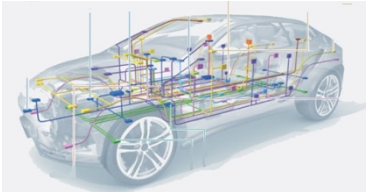
1990s (to Present)
OBD (On-Board Diagnostics) II
Monitor / report engine performance; Required in all USA cars post-1996

1990s-2010s
Feature-Built Computing + Early Connectivity
Automatic cruise control...
Infotainment...Telematics... GPS / Mapping...



OnStar

Today = Complex Computing
Up to 100 Electronic Control Units / car...
Multiple bus networks per car (CAN / LIN / FlexRay / MOST)...
Drive by Wire...



Today = Smart / Connected Cars
Embedded / tethered connectivity...
Big Tech = New Tier 1 auto supplier
(CarPlay / Android Auto)...

Tomorrow = Computers Go Mobile?...
Central hub / decentralized systems?
LIDAR...
Vehicle-to-Vehicle (V2V) / Vehicle-to-Infrastructure (V2I) / 5G...
Security software...

"The Box"
(Brooks & Bone)

Source: KPCB Green Investing Team, Darren Liccardo (DJI); Reilly Brennan (Stanford); Tom Denton, "Automobile Electrical and Electronics Systems, 3rd Edition," Oxford, UK: Tom Denton, 2004; Samuel DaCosta, Popular Mechanics, Techmor, US EPA, Elec-Intro.com, Autoweb, General Motors, Garmin, Evaluation Engineering, Digi-Key Electronics, Renesas, Jason Aldag and Jhaan Elker / Washington Post, James Brooks / Richard Bone, Shareable

Car Automation Accuracy / Safety Improvements = Accelerating... Early Innings of Level 2 / Level 3

NHTSA – Automated Driving System Classifications

	L0	L1	L2	L3	L4
	No Automation	**Function-Specific Automation**	**Combined Function Automation**	**Limited Self-Driving Automation**	**Full Self-Driving Automation**
Description	• Driver in complete and sole control of primary vehicle controls (brake, steering, throttle, motive power) at all times. Systems with warning technology (e.g. forward collision warning) do not imply automation	• Automation of one or more primary vehicle control functions, but no combination of systems working in unison	• Automation of at least two primary vehicle control systems working in unison	• Driver able to cede full control of all safety-critical functions under certain conditions. Driver is expected to be available for occasional control, but with sufficiently comfortable transition time	• Vehicle can perform all safety-critical driving and monitoring functions during an entire trip
Example	• N/A	• ABS • Cruise Control • Electronic Stability Control • Park Assist	• Tesla Autopilot • GM Super Cruise (2017)	• Google Car (manned prototype)	• Google Car
Time Frame	• Since cars invented (1760s)	• 1990s – Today	• 2010s	• 2010s	• ?

Source: National Highway Traffic Safety Administration, "Policy on Automated Vehicle Deployment" (5/2013), Tesla, General Motors, Google, media reports

Early Autonomous / ADAS Features Continue to Improve = Miles Driven Continue to Rise

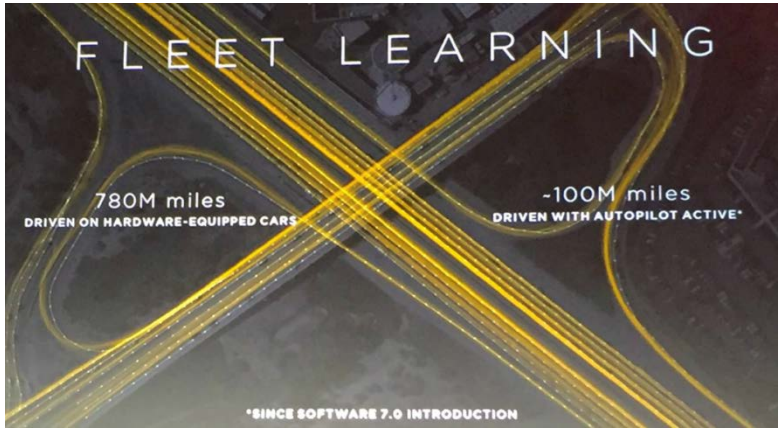
Google (Level 3 / 4 Autonomy)

Google Self-Driving Car Project

Where we are

We've self-driven more than 1.5 million miles and are currently out on the streets of Mountain View, CA, Austin, TX, Kirkland, WA and Metro Phoenix, AZ.

Tesla (Level 2 Autonomy)



Tesla customers have driven 100 million miles with Autopilot active

Source: Google, Tesla, Steve Jurvetson, EmTech Conference, The Verge

Primary Approaches to Autonomous Vehicle Rollouts = All New or Assimilation...Traditional OEMs Taking Combined Approach

All New = Top-Down, Fully Autonomous Vehicles

- Design & build vehicles from day one with goal of full autonomy
- Craft architectures / systems for end product needs and with full fleet in mind
- Adapt testing environments to needs (individual city testing)
- Solves potentially dangerous middle layer of semi-autonomy
- Need very specific environments and regulation to guide integration with current system
- Potentially difficult to scale
- Key Example: Google

Assimilation = Gradual Rollout / Mixed-Fleet Environments

- Roll out / upgrade autonomous features in current automotive context
- Solves issue of integrating autonomy into existing asset base
- Real-time, in-field updates & improvements (Tesla over-the-air software updates)...real-world learnings
- Semi-autonomous stages require potentially dangerous resumption of driver control
- OEM production cycles sometimes long, which could cause innovation to remain slow
- Key Example: TESLA

Source: Google, Tesla, Morgan Stanley Research, Reilly Brennan (Stanford)

Car Industry Evolution = Driven by Innovation...

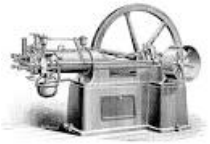
USA Led...USA Fell

Car Industry Evolution, 1760s – Today = Driven by Innovation + Globalization

Early Innovation (1760s-1900s) = European Inventions

1768 = *First Self-Propelled Road Vehicle (Cugnot, France)*

1876 = *First 4-stroke cycle engine (Otto, Germany)*



1886 = *First gas-powered, 'production' vehicle (Benz, Germany)*

1888 = *First four-wheeled electric car (Flocken, Germany)*

Streamlining (1910s-1970s) = American Leadership

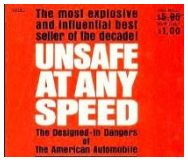
1910s = *Model T / Assembly Line (Ford)*

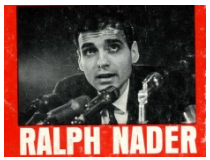
1920s-1930s =
Car as Status Symbol...
Roaring '20s / First Motels

1950s = Golden Age...
Interstate Highway Act (1956)...
8 of Top 10 in Fortune 500 in Cars or Oil (1960)

Modernization (1970s-2010s) = Going Global / Mass Market

1960s = *Ralph Nader / Auto Safety*





1970s = *Oil Crisis / Emissions Focus*

1980s = *Japanese Auto Takeover Begins...*

1990s – 2000s =
Industry Consolidation;
Asia Rising;
USA Hybrid Fail (Prius Rise)

DAIMLERCHRYSLER

HYUNDAI

KIA

SAIC MOTOR

Late 2000s = *Recession / Bankruptcies / Auto Bailouts*

Re-Imagining Cars (Today) = USA Rising Again?

DARPA Challenge (2004, 2005, 2007, 2012, 2013) =
Autonomy Inflection Point?

Today =

Ford GM TESLA

+

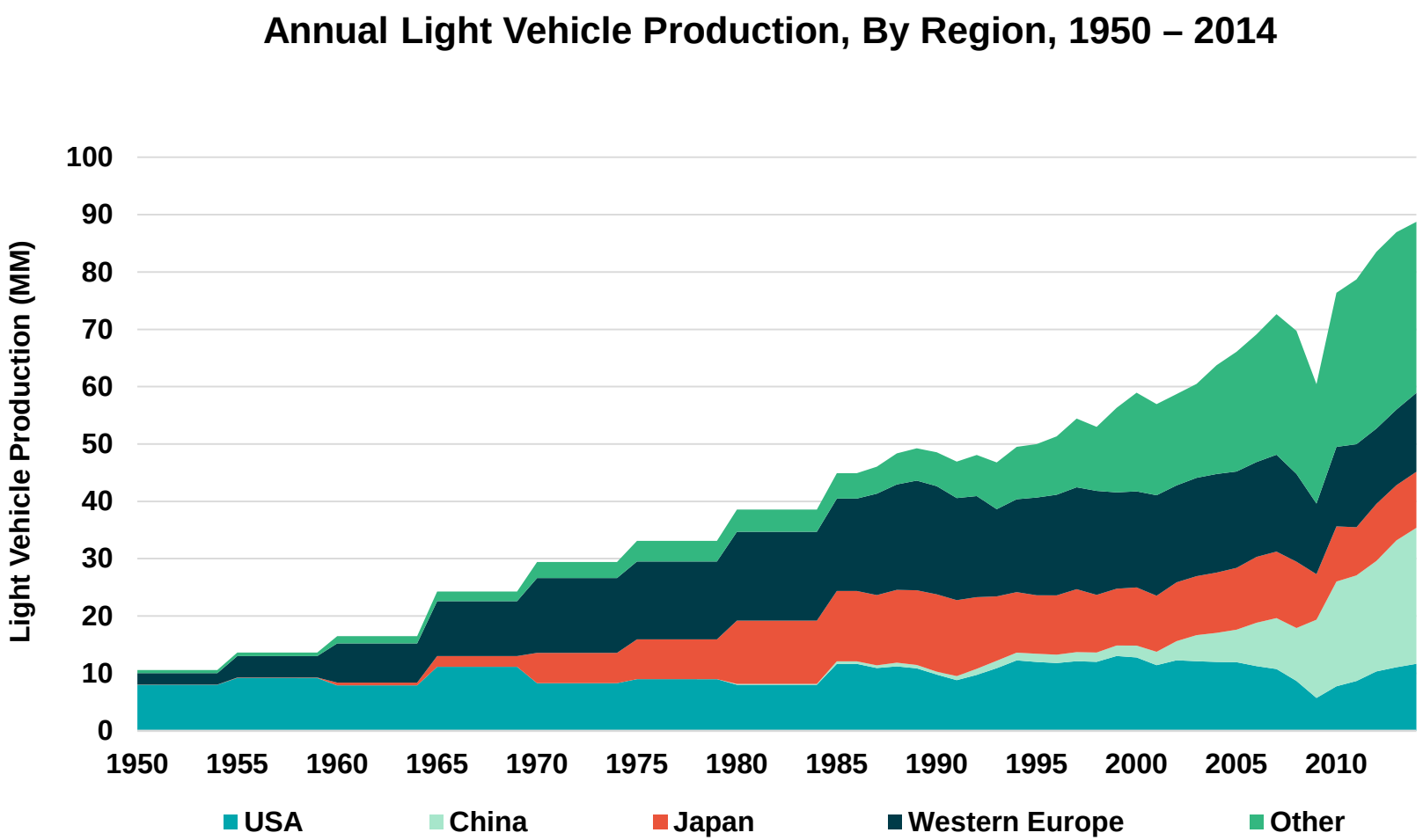
Google

+

UBER DiDi

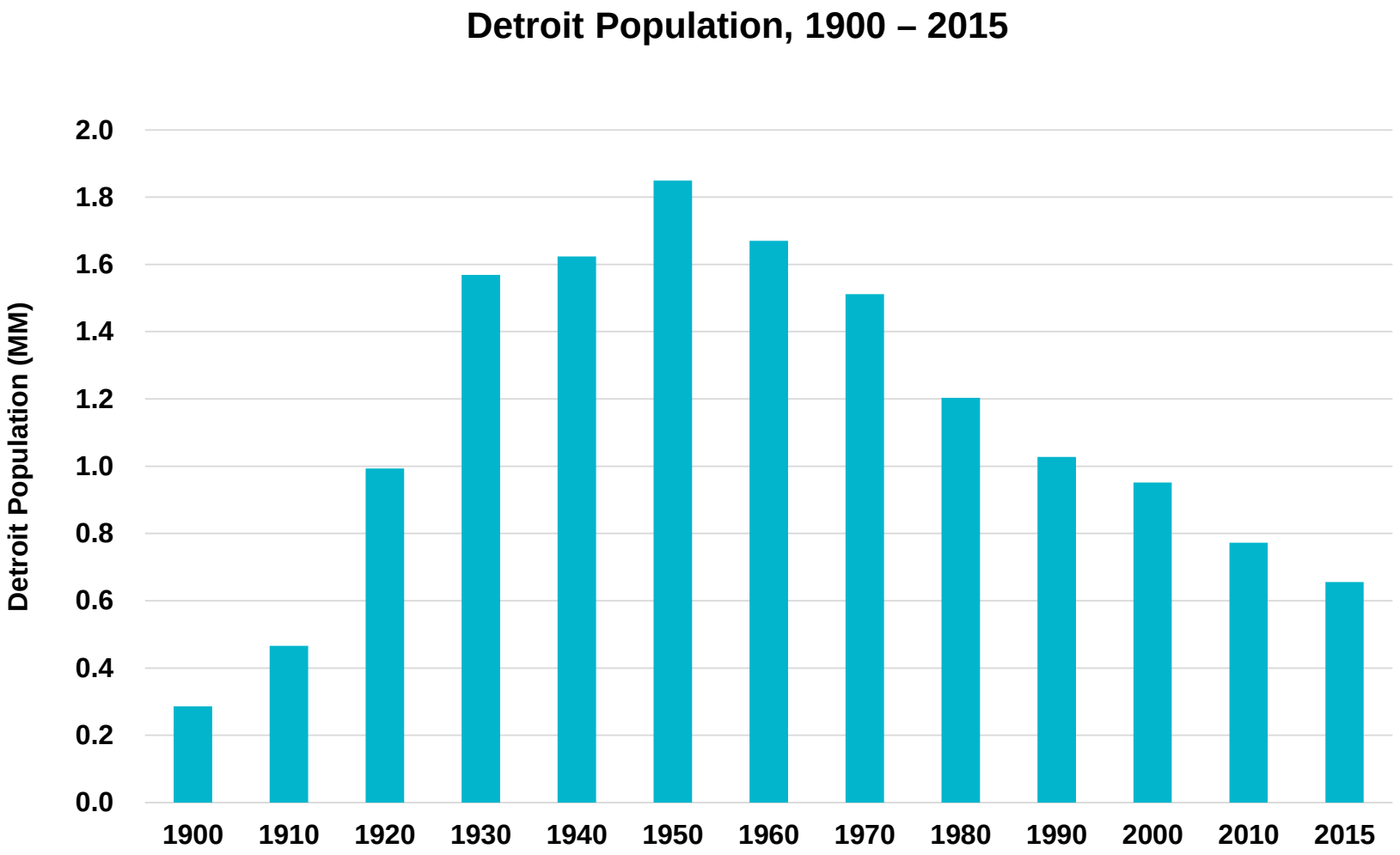
Source: KPCB Green Investing Team, Reilly Brennan (Stanford), Piero Scaruffi, Inventors.About.com, International Energy Agency, Joe DeSousa, Popular Science, Franz Haag, Harry Shipler / Utah State Historical Society, National Archives, texasescapes.com, Federal Highway Administration, Matthew Brown, Forbes, Grossman Publishers, NY Times, Energy Transition, UVA Miller Center for Public Affairs, The Detroit Bureau, SAIC Motor Corporation, Hyundai Motor Company, Kia Motors, Toyota Motor Corporation, DARPA, Chris Urmson / Carnegie Mellon,

Global Car Production Share = Rise & Decline of USA... Cars Produced in USA = 13% vs. 76% (1950)...



Source: Wards Automotive, Morgan Stanley Research
Note: Production measure represents all light vehicles manufactured within the given region (regardless of OEM home country). Light vehicles include passenger cars, sport utility vehicles and light trucks (e.g. pickups). Data from 1950-1985 only available every 5 years. Largest "Other" constituents are South Korea, India and Mexico.

Detroit Population Tells Tale of USA Car Production = Down 65% from 1950 Peak @ 1.8MM



Source: Southeast Michigan Council of Governments
Note: Represents mid-year population.

Car Industry =

Innovation Accelerating in USA

USA =
Potential to be Global Hub of Auto Industry Again?...

USA Has Many Key Components of Ecosystem

1) **Incumbents** – GM / Ford...Leading (2 of Top 10 Global) Auto Manufacturers

2) **Attackers** – Tesla... #1 Electric Vehicle Manufacturer

3) **Systems / Components** – *Processors / GPUs* (Nvidia...)...*Sensors / LIDAR / Radar* (Velodyne / Quanergy / Google...)...*Connectivity* (AT&T / Telogis / INRIX...)...*Mapping* (Google / Waze / Uber...)...*Operating Systems* (Google / Apple)...*Other* (Drivetrain / Power Electronics / Aerodynamics / Lightweighting / Etc...)

4) **Autonomous Vehicles** – Google / Tesla / Uber...Leadership in Development of Autonomous Vehicle Solutions

5) **Mobility & Fleet Innovation** – Uber / Lyft / Zendrive...Leadership in Ride Sharing Solutions / Infrastructure / Fleet Knowledge (Distribution via Mobile Devices / Recommended Traffic Flows)

6) **Education / University Innovation** – Stanford / Carnegie Mellon / Michigan / MIT / UC Berkeley...Leadership in STEM & Computer Science Education / Computer Vision / Robotics / Deep Learning / Automotive Engineering

Source: KPCB Green Investing Team, Reilly Brennan (Stanford)

...USA =
Potential to be Global Hub of Auto Industry Again?

USA Could Benefit from Creating Space in the Automotive Regulatory Framework to Foster Innovation

1) **Federally Provided Guidance to States to Embrace Autonomy –** Multiple legislative frameworks from individual states could impede autonomous innovation...

2) **Flexibility of Regulation –** Numerous approaches to solving autonomy challenge are likely to evolve simultaneously... regulation should not impede any single innovation approach...

3) **Individual Cities / States Championing Autonomy** – More testing locations / forward-leaning cities like Mountain View, CA / Austin, TX / Kirkland, WA / Metro Phoenix, AZ...

4) **Comprehensive Safety Frameworks –** Gov't should have power to allow autonomous systems that demonstrate quantifiable safety improvements over current driver-vehicle combination...

5) **Leaning Forward on Sharing (Car & Ride) –** Regulators should work with rather than against sharing companies to craft policy as consumer demand illustrates need / interest in sharing...

6) **Auto Cybersecurity** – Connected cars face increased risk of cyber attacks...manufacturers & suppliers should keep consumer security / privacy as a key priority...

7) **Next-Generation Franchise Laws –** Semi-autonomous & autonomous cars are likely to change process of buying / servicing given 'over the air' nature of software downloads...USA could consider the EU 'Block Exemption' as model & allow consumers to service vehicles at either manufacturer-affiliated or independent locations

Source: KPCB Green Investing Team, Reilly Brennan (Stanford), Google
Note: EU Block Exemption details per European Commission. Testing locations represent Google autonomous car testing cities.

Regulators = Typically Slow to Adapt to New Technologies

Back in the Day When Horseless Carriage (Car) Came Along...

Locomotive Act of 1865 – Red Flag Act
Law Enacted in UK...
Horseless Carriages (Cars) Had to be Preceded By Someone with Red Flag For Safety Purposes

Jitneys (1914)
Ride-Sharing, ~100 Years Ago...
150K Jitney Rides / Day (1915) in LA, yet Regulated Out of Existence by 1919...

157K Uber Rides / Day (2016) in LA...

Source: Encyclopaedia Brittanica, dailybritain.wordpress.com, Travis Kalanick (Uber) TED Talk (3/16), Michigan State University Library, William B. Friedricks, "Henry E. Huntington and the Creation of Southern California," Columbus, OH: Ohio State University Press, 1992

Global Perspective on Auto Industry Future – By Region, per Morgan Stanley Auto & Shared Mobility Research

N. America – Some home field advantage on tech innovation & early application of shared mobility, but culture of private ownership and litigious USA judicial system may slow progress.

China – Government focus on technology / environment, as well as quality of ride-sharing companies (esp. Didi), have driven strong early sharing adoption. Competing investment in public transit and impact of car ownership on social standing may impede full-scale adoption.

India – Offers all key ingredients (rapid urbanization, limited public infrastructure, large millennial population, internet inflection point) for shared mobility leadership. Current market structure is likely to change as shared mobility gains dominance, so future remains unclear.

Europe – Lack of homegrown tech champions coupled with power of OEMs (particularly Germans) and quality of European public transit may make adoption more difficult. High fuel costs and strong emissions standards may drive movement forward.

Japan – Social implications of an aging population and policy support (given importance of a strong automotive industry) represent key advantages, but OEM buy-in to new paradigm is crucial, and R&D investment in tech arena lags somewhat behind other geographies.

Korea – Strong technological culture, early political support and sharing-focused younger demographic leaves Korea relatively well positioned for move to shared mobility, though adoption remains in its infancy.

Source: 'Global Investment Implication of Auto 2.0,' Morgan Stanley Research, 4/19/16, led by Adam Jonas

Re-Imagining Transportation –

Mobility also Being Re-Imagined

Re-Imagining Automotive Industry = From Cars Produced to Miles Driven?

*We do believe the traditional ownership model is being disrupted...**We're going to see more change in the next five to ten years than we've seen in the last 50.***

- **MARY BARRA, GM CEO, 10/25/15**

*You could say there would be less vehicles sold, **but we're changing our business model to look at this as vehicle miles traveled...**I could argue that with autonomous vehicles, **the actual mileage on those vehicles will accumulate a lot more than a personally owned vehicle.***

- **MARK FIELDS, FORD CEO, 4/12/16**

Source: Mary Barra (General Motors), Mark Fields (Ford), Wall Street Journal

Car Ownership Costs (Money + Time) = High

Car Ownership Costs = High

$8,558 / Year, USA = Depreciation @ 44% / Fuel @ 15% / Finance + Fees @ 14% / Insurance @ 14% / Maintenance + Repair @ 9%

Commuting Time = Significant

4.3 Hours per Week per Worker, Average (13% of Work Week, USA)

Urban Auto Commuting Delays = Rising

42 Hours / Year / Urban Worker, USA (+2x in 30 Years), Equivalent to ~1.2 Extra Work Weeks / Year

Millennials = Driving Differently

Drivers License Usage Declining (Age 16-44) = @ 77% vs. 92% (1982, USA)

Millennial Willingness to Car Share = @ ~50% (Asia-Pacific) / @ ~20% (North America)

46% of Millennials Expect Vehicle Technology to do Everything a Smartphone Can...

Source: Ownership costs per AAA (4/16); Vehicle fees include license, taxes and registration. Commuting times per U.S. Census Bureau (2013) and include all transport options apart from walking and biking. Average USA work week per OECD Employment Outlook (7/15). Urban auto commuting delays per Texas A&M Transportation Institute / INRIX 2015 Mobility Scorecard (8/15); delays defined as extra time spent during the year traveling at congested rather than free-flow speeds by private vehicle drivers / passengers for 471 US urban areas. Driver's license rates per University of Michigan Transportation Research Institute / Federal Highway Administration (1/16). Car sharing statistics per Goldman Sachs Research (5/15). Millennial expectations per AutoTrader 2016 Cartech Impact Study (9/15, n=1,012).

Efficiency Gain Potential from Ride & Car Sharing = High

Cars = Underutilized Assets

USA = 2.2 Cars / Household, ~20% of Households Have 3+ Cars,

Cars Used ~4% of Time

Vehicle Miles Traveled (VMT) = High Per Capita

USA VMT Per Capita = 9K / +11x China (~850) / +48x India (~200)

Parking Infrastructure = Lots of It

~19MM Parking Spaces in Los Angeles County (2010), +12MM since 1950

14% of Incorporated Land in Los Angeles County Allocated to Parking

~4 Estimated Parking Spots / Person in USA

Energy Consumption by Light Vehicles = Significant

~500B Gallons of Fuel, Global (2014)...

Source: Car utilization / penetration, VMT and energy consumption per ""Global Investment Implications of Auto 2.0", Morgan Stanley Research (4/16); Los Angeles parking data per Mikhail Chester, Andrew Fraser, Juan Matute, Carolyn Flower and Ram Pendyala (2015) Parking Infrastructure: A Constraint on or Opportunity for Urban Redevelopment? A Study of Los Angeles Parking Supply and Growth, Journal of the American Planning Association, 81:4, 268-286; parking spots / person per Stefan Heck / Stanford Precourt Institute of Energy.

Uber Platform / Network = Why Millions of Riders Have Taken >1B Rides Since 2009

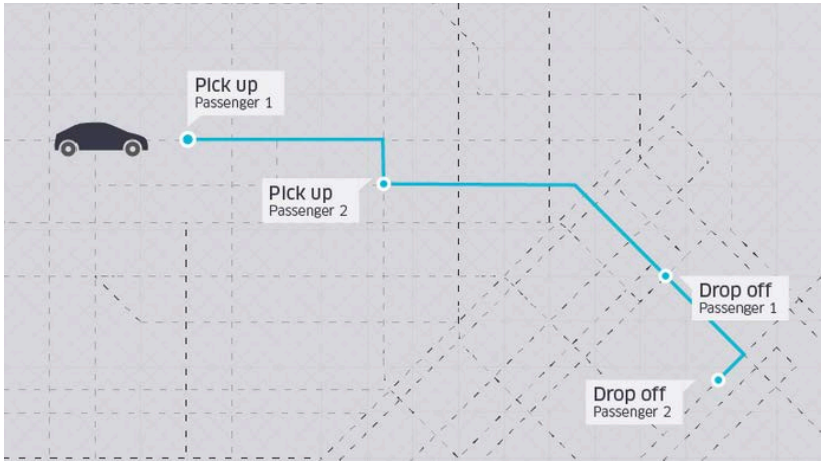
Top Reasons Riders Choose Uber

- 93% = Get to Destination Quickly
- 87% = Safety
- 84% = Too Much Alcohol to Drive
- 83% = Save Money
- 77% = Avoid Dealing with a Car
- 65% = Option During Public Transit ‘Off' Hours

Source: Berenson Strategy Group, Uber
Note: Survey conducted in 11/15 across 801 riders who had taken at least one trip in the past 3 months in 24 USA Uber markets.

Shared Private Rides Becoming Urban Mainstream = uberPOOL @ 20% of Global Uber Rides in <2 Years

uberPOOL



- **36** = Global UberPool Cities, +7x Y/Y
- **100MM** = UberPool Trips Since Launch (8/14)
- **40%** = UberPool as % of Total SF Rides
- **30MM** = China Rides / Month (in <1 Year)
- **>100K** = Riders / Week in 11 Global Cities
- **90MM** = Vehicle Miles Traveled saved vs. UberX*
- **1.8MM** = Gallons of Gas Saved vs. UberX*

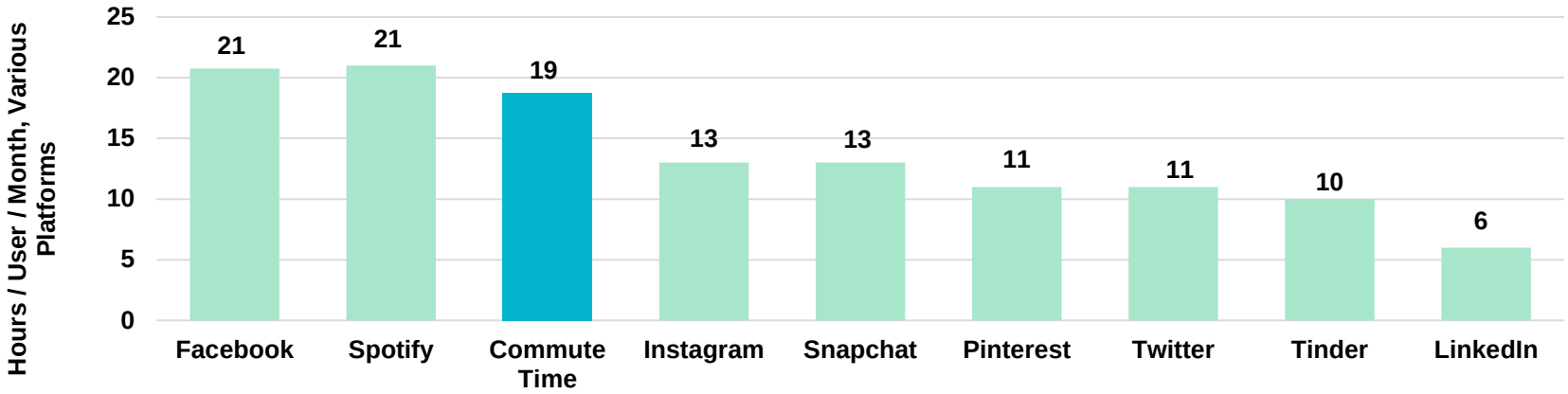
Source: Uber. UberPool announced in August 2014.
* Represents first 3 months of 2016.

Re-Imagining Most Important Seat in Car = Back Seat, Again?

Rolls Royce 10hp (1904) =
Designed for Rider

Mercedes-Benz F 015
'Luxury in Motion' Concept (2015) =
Déjà Vu?

Commute Time = Significant Engagement / Entertainment Opportunity?



Source: Time Spent data per Cowen & Co. Research + SurveyMonkey (n = 2,059, 6/15, minutes / day spent across all cohorts and extrapolated to hours / month), except for Spotify (per Company). Commute data per US Census Bureau as of 2013; includes all modes of transportation apart from walking / biking. Assumes 25.9 minute one-way commute, assumed to be 5 days per week in both commute directions and 4.35 average weeks / month. Images per RREC / SWNS.com, Mercedes-Benz, carbodydesign.com

Transportation Industry =
Strap In for Next Few Decades

Automotive Industry Golden Age, Take Two?

What if a Car:

- Is part of a network that provides a commuting service that comes to you?
- Is the most advanced computing device you use?
- In effect, is an on-demand cash generator, boosted by car / ride sharing?
- Gives you safe driving pay-backs from your insurer?
- Is safer, due to automation / reduced human error?
- Drives itself? Parks itself?
- Makes you want to commute?
- Makes you more productive?

CHINA =
INTERNET LEADER ON MANY METRICS

Hillhouse Capital*

Provided China Section of Internet Trends, 2016

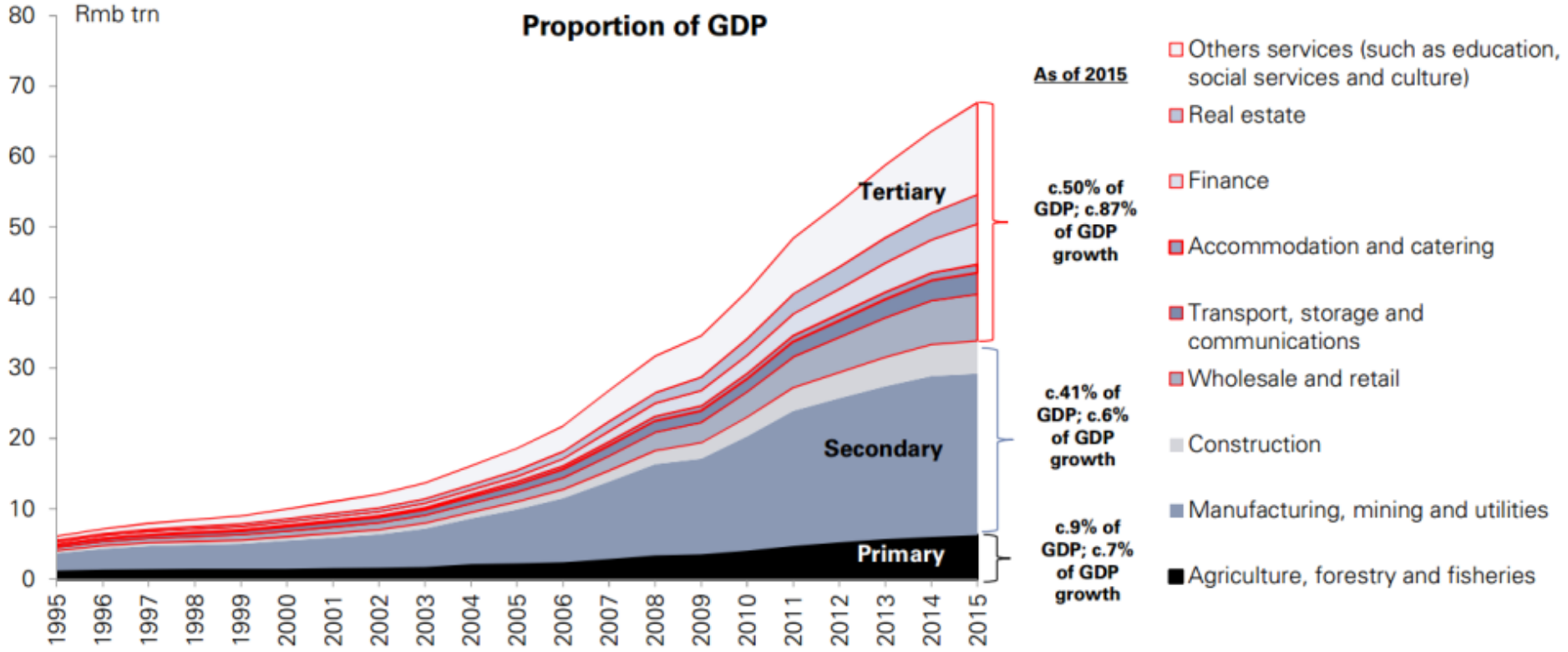
*Disclaimer – The information provided in the following slides is for informational and illustrative purposes only. No representation or warranty, express or implied, is given and no responsibility or liability is accepted by any person with respect to the accuracy, reliability, correctness or completeness of this Information or its contents or any oral or written communication in connection with it. A business relationship, arrangement, or contract by or among any of the businesses described herein may not exist at all and should not be implied or assumed from the information provided. The information provided herein by Hillhouse Capital does not constitute an offer to sell or a solicitation of an offer to buy, and may not be relied upon in connection with the purchase or sale of, any security or interest offered, sponsored, or managed by Hillhouse Capital or its affiliates.

China Macro =

Robust Service-Driven Job & Income Growth...
Despite Investment Slowdown

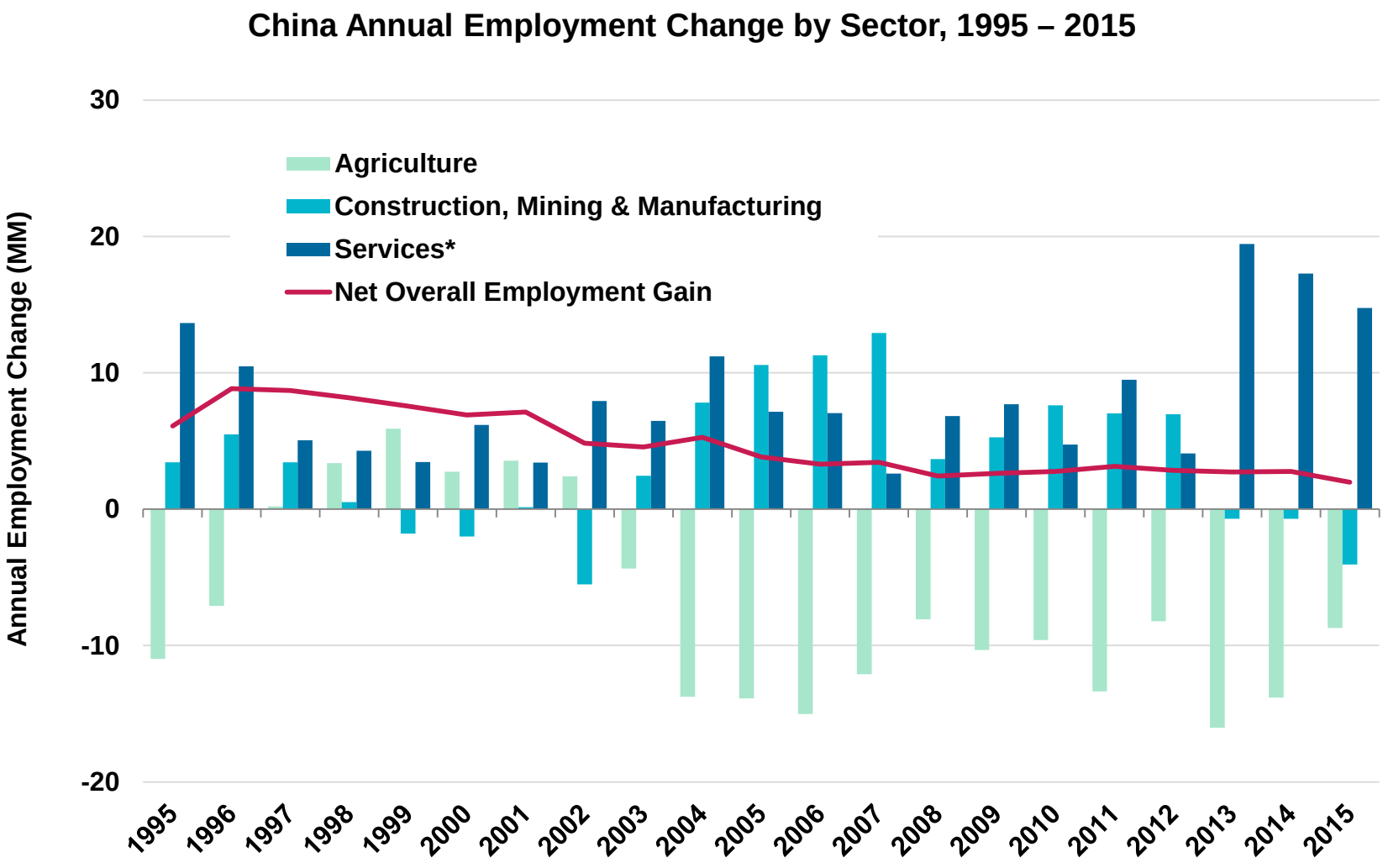
China Services Industries = 50%+ (& Rising) of China's GDP & ~87% of GDP Growth

China's GDP by Sector, 1995 – 2015



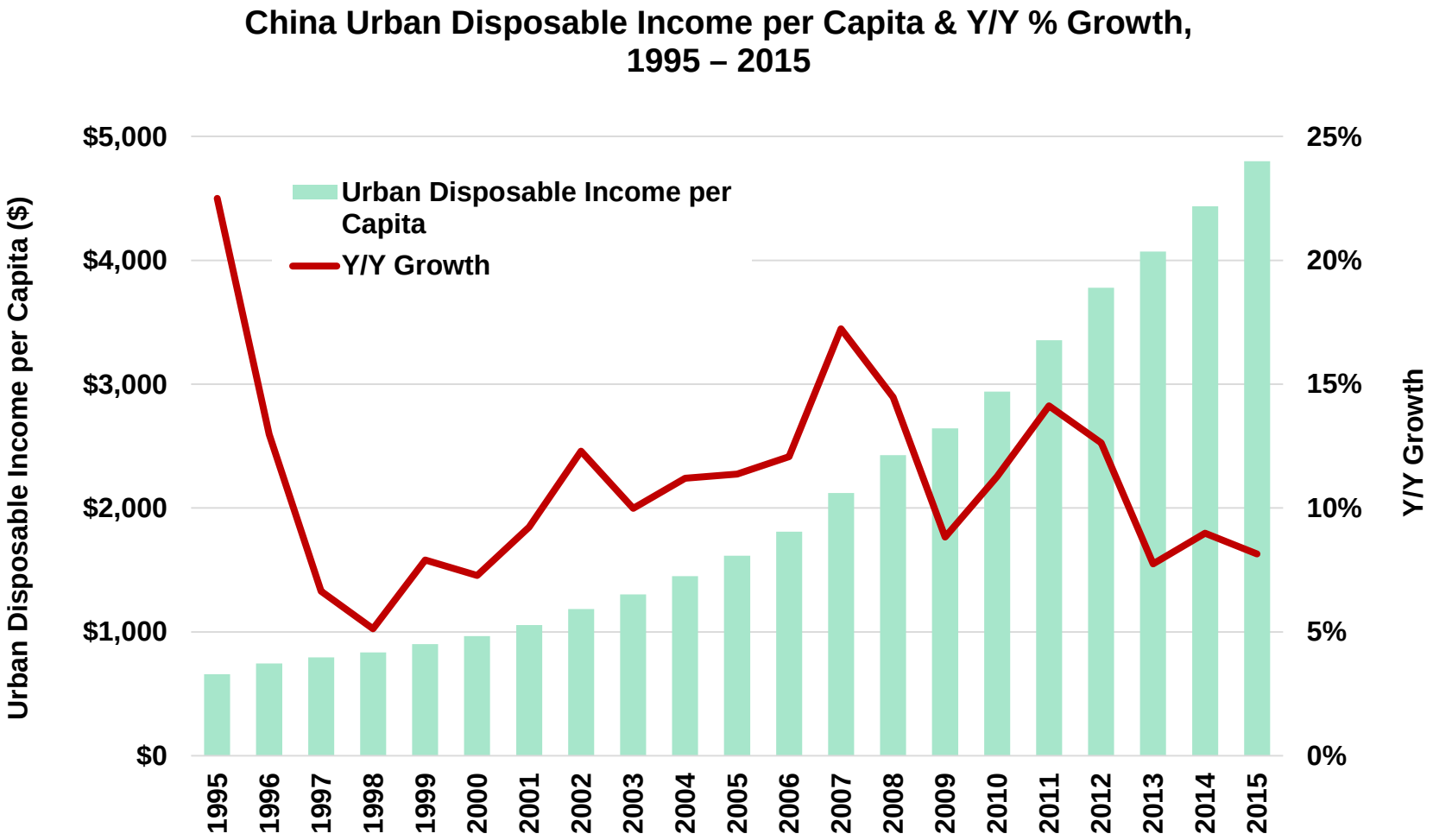
Source: National Bureau of Statistics of China, CEIC, Goldman Sachs Global Investment Research.

China Services* Industries Job Growth = Accelerating... Offsetting Job Losses from Construction / Manufacturing / Agriculture



Source: National Bureau of Statistics of China, Wind Information.
*Note: Services include wholesale, retail, transportation, storage, communication, accommodation, catering, finance, education, real estate and other services.

China Urban Disposable Income Per Capita = Continues to Grow @ Solid Rates



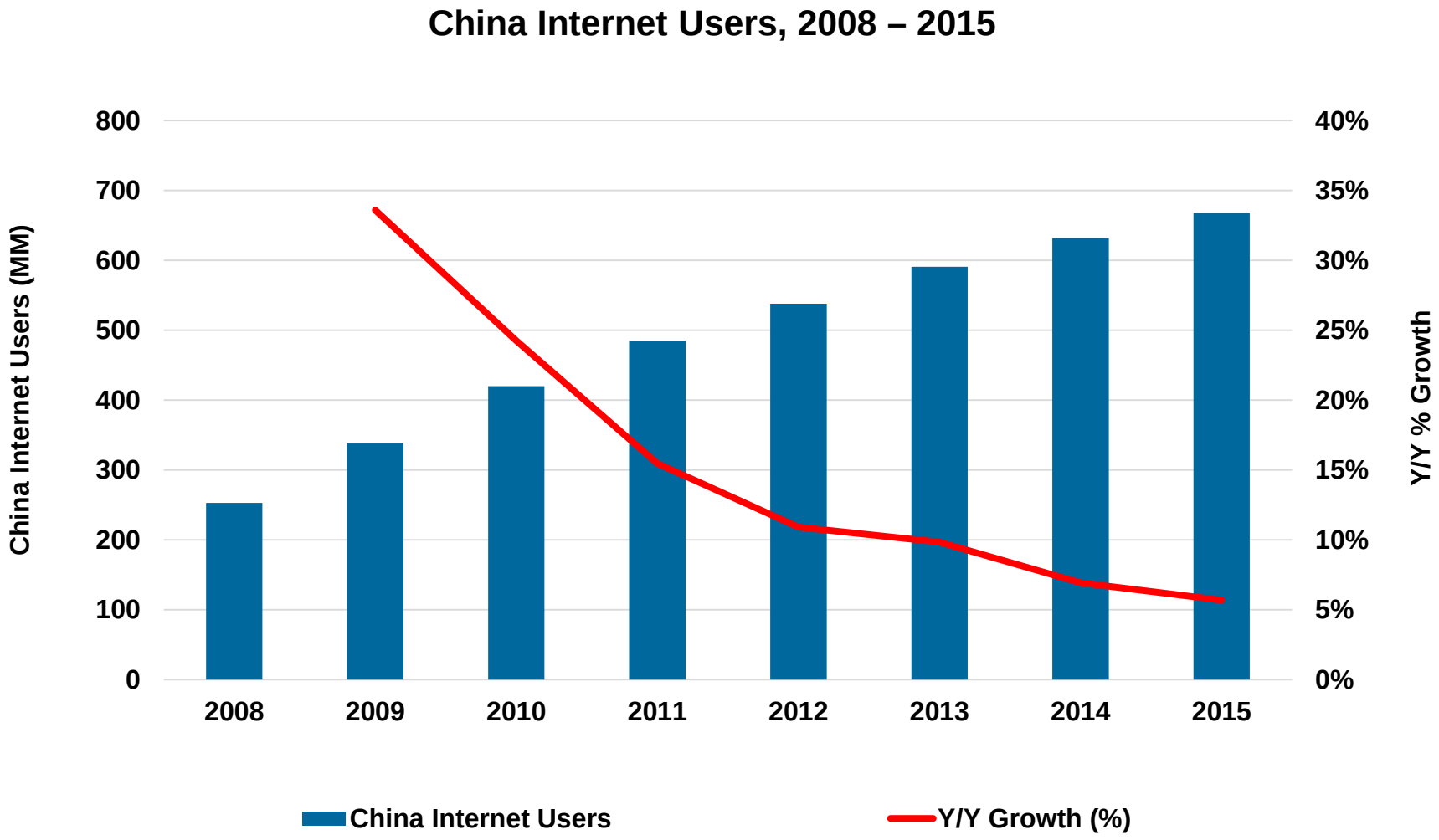
Source: CEIC, assume constant FX 1USD=6.5RMB.

China Internet @

668MM Users =

+6% vs. +7% Y/Y

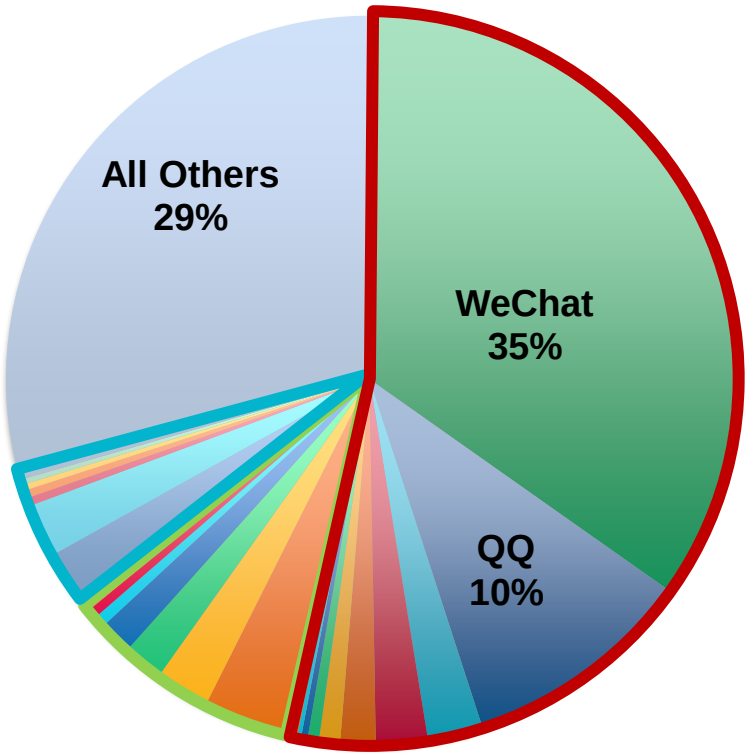
China Internet Users = 668MM, +6% vs. 7% Y/Y...@ 49% Penetration



Source: CNNIC. Internet user data is as of mid-year.

China Mobile Internet Usage Leaders...
Tencent + Alibaba + Baidu = 71% of Mobile Time Spent

Share of Mobile Time Spent, April 2016
Daily Mobile Time Spent = ~200 Minutes per User, Average



Tencent

- WeChat
- QQ
- QQ Browser
- Tencent Video
- Tencent News
- Tencent Games
- QQ Music
- JD.com
- QQ Reading

Alibaba

- UCWeb Browser
- Taobao
- Weibo
- YouKu Video
- Momo
- Shuqi Novel
- AliPay
- AutoNavi

Baidu

- Mobile Baidu
- iQiyi / PPS Video
- Baidu Browser
- Baidu Tieba
- 91 Desktop
- Baidu Maps

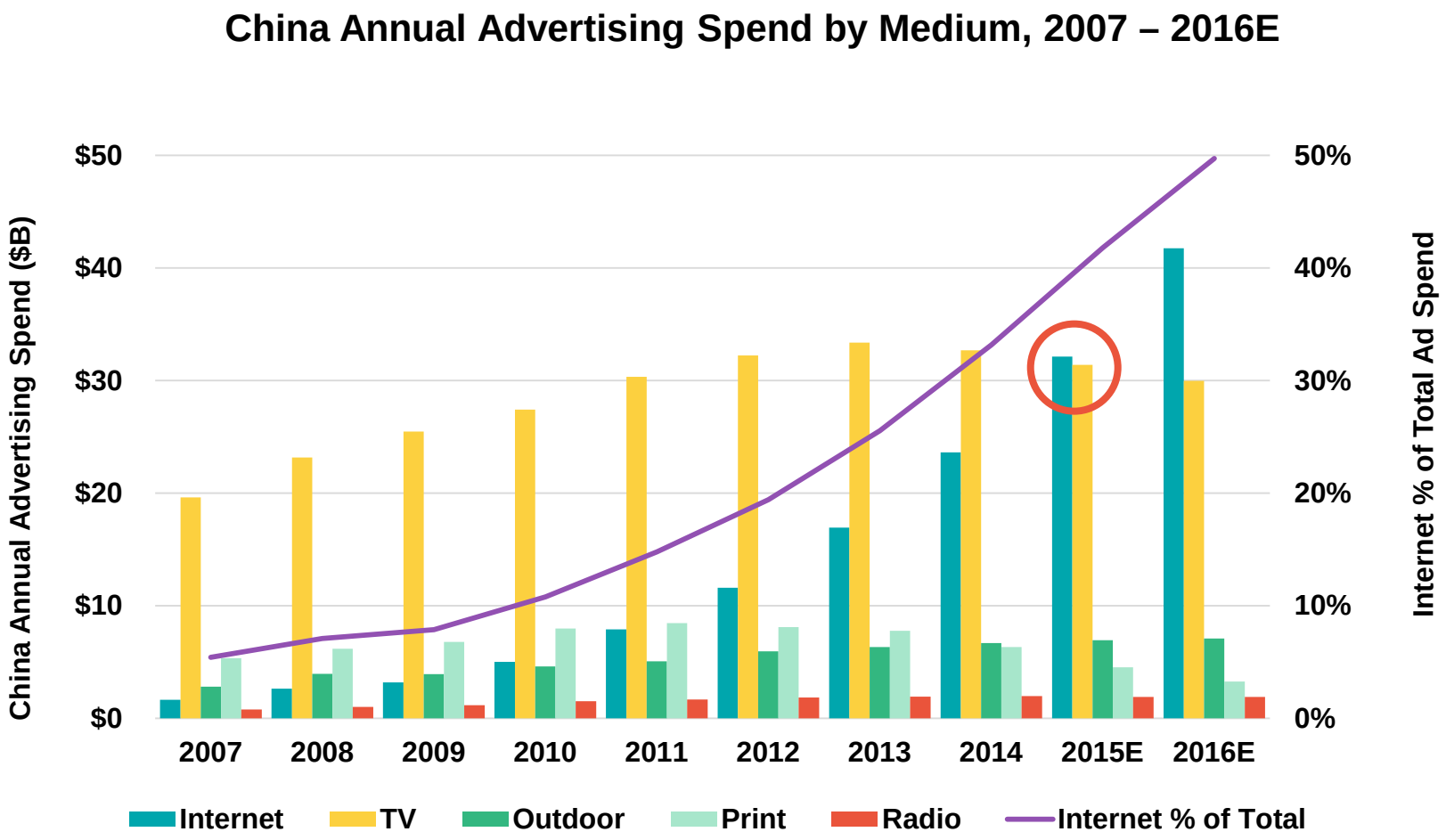
- All Other

Note: Grouping of apps include strategic investments made by Tencent, Alibaba and Baidu. Only apps in top 50 by time spent share are called out. Source: QuestMobile, Trustdata, and Hillhouse estimates.

China Internet Traction =

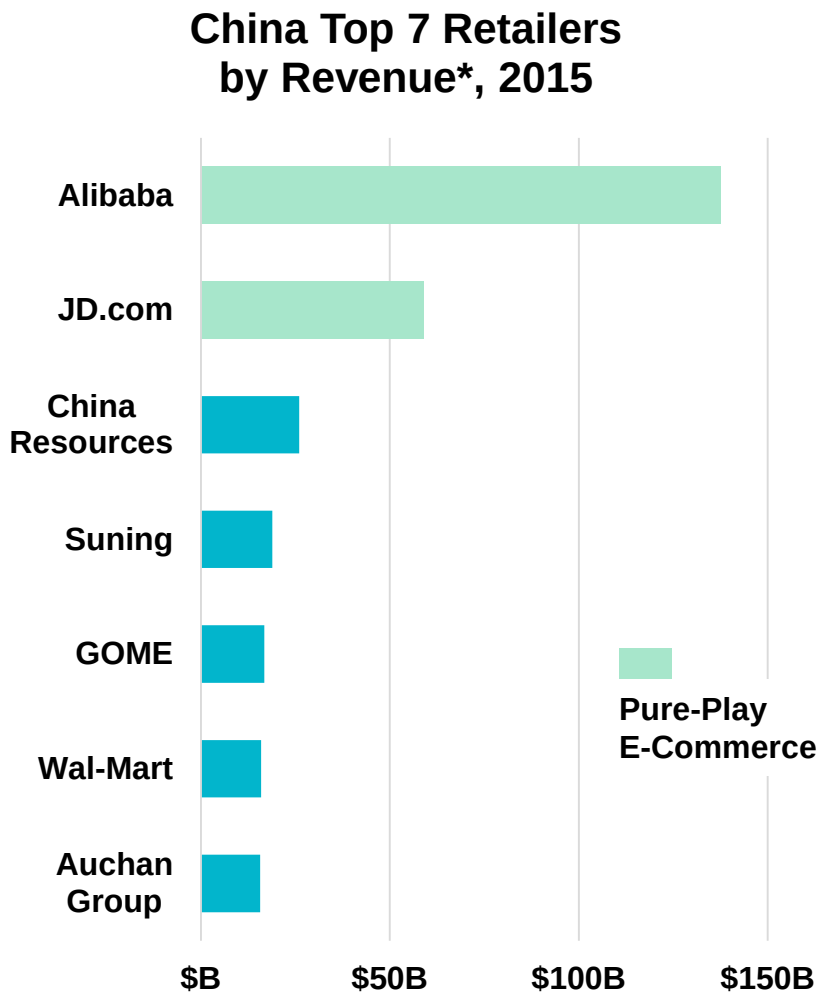
Advertising / Commerce / Travel / Financial Services Trends Often Compare Favorably to USA

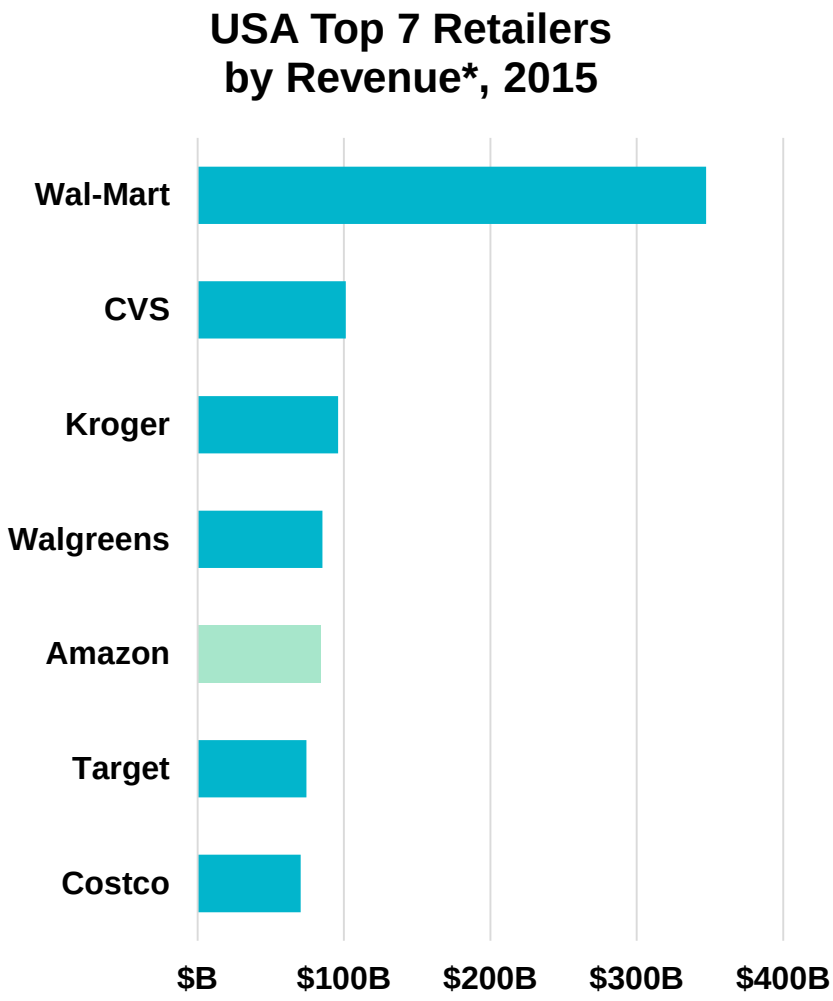
China Online Advertising > TV (2015)...
Online > 42% Total Ad Spend vs. 39% in USA



Source: GroupM China, April 2016 Forecast. Assume constant FX 1USD = 6.5RMB.
USA advertising share data excludes out-of-home, video game, and cinema.

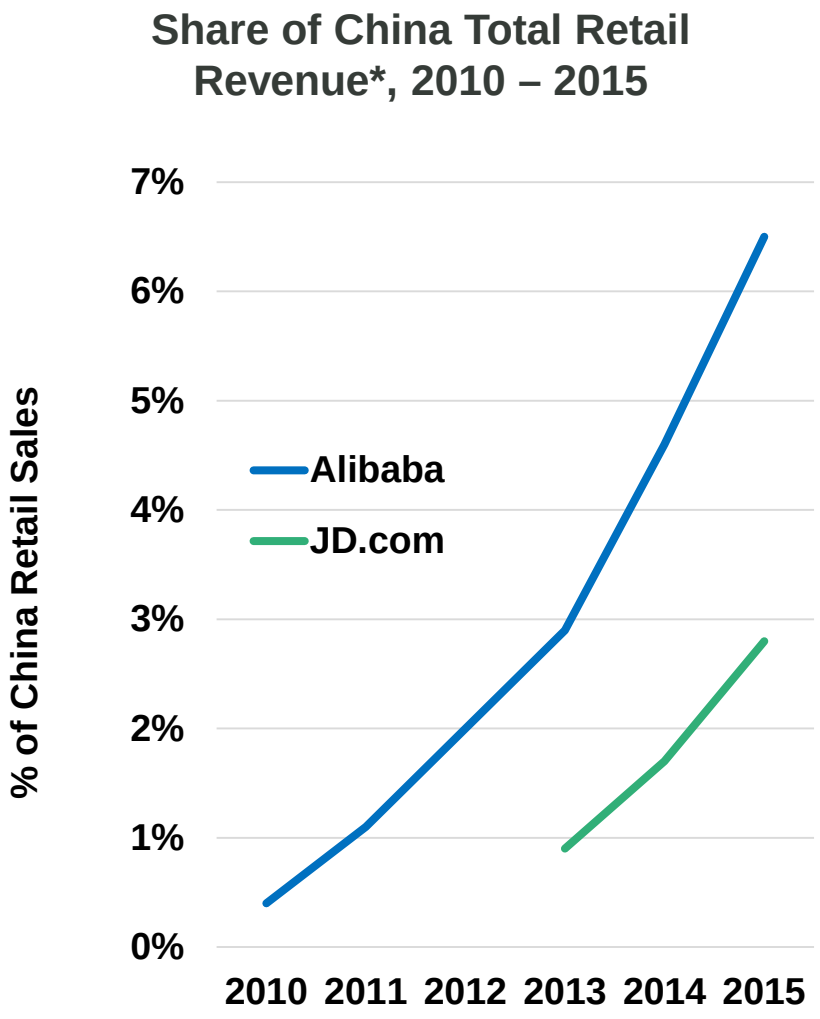
China E-Commerce Companies = Dominate Top Retailer Rankings vs. USA Peers...

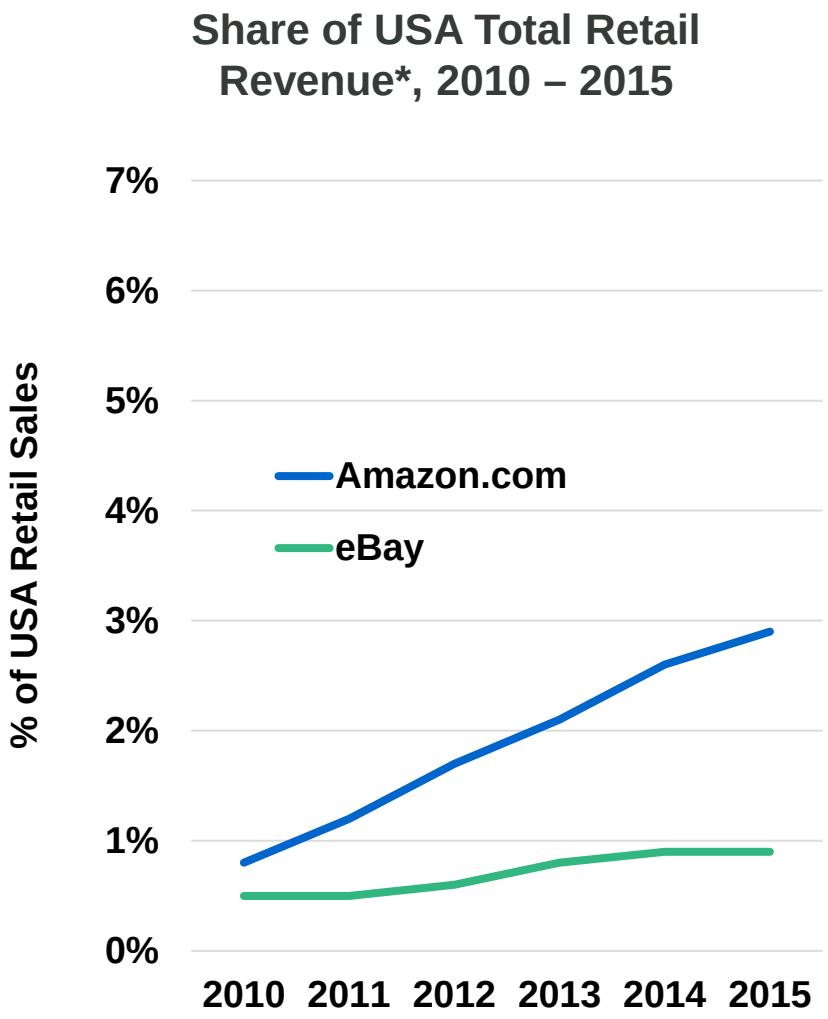




Source: Euromonitor. Note: *Revenue defined as retail value of goods excluding tax, and excluding certain transaction categories such as consumer-to-consumer, motor vehicles & auto parts, tickets, travel bookings, delivery foodservice, returns, and others, hence may differ from company disclosed total revenue or gross merchandise value figures.

...China E-Commerce Companies = Gaining Retail Share Faster than USA Peers...

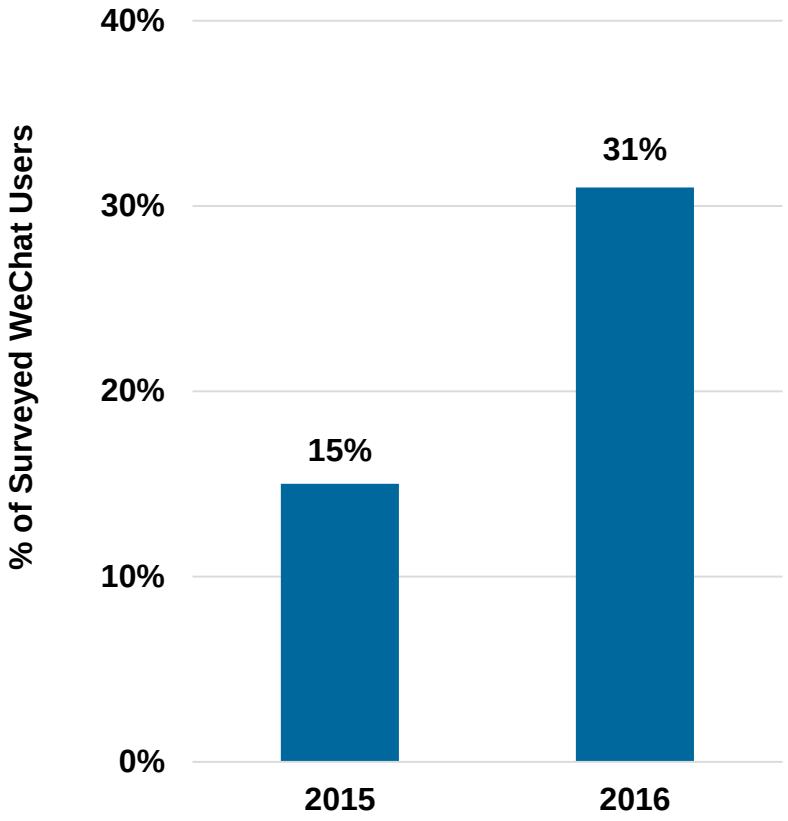




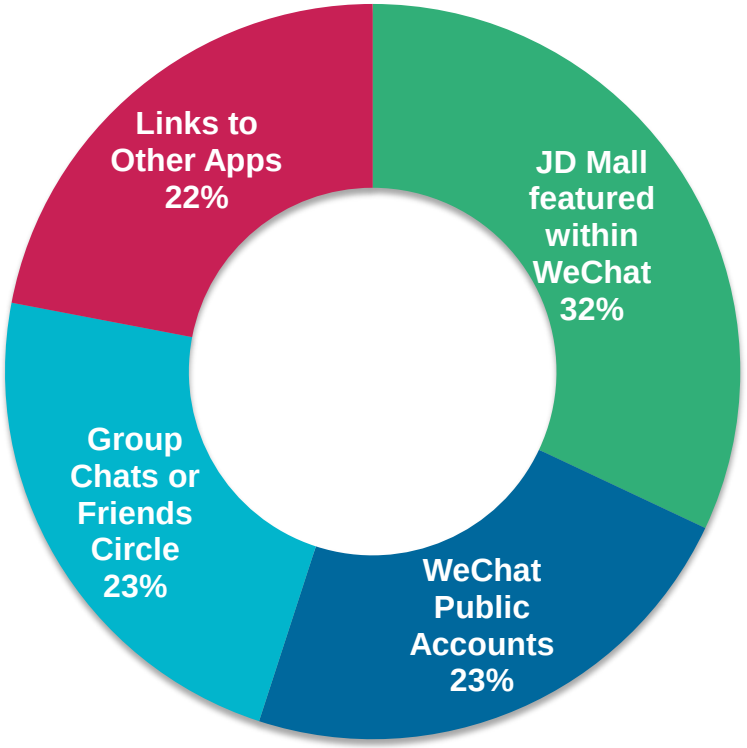
Source: Euromonitor. Note: *Revenue defined as retail value of goods excluding tax, and excluding certain transaction categories such as consumer-to-consumer, motor vehicles & auto parts, tickets, travel bookings, delivery foodservice, returns, and others, hence may differ from company disclosed total revenue or gross merchandise value figures.

...China E-Commerce = Becoming More Social...
31% of WeChat Users Purchase via WeChat, +2x Y/Y

% of WeChat Users Making E-Commerce Purchase Through WeChat



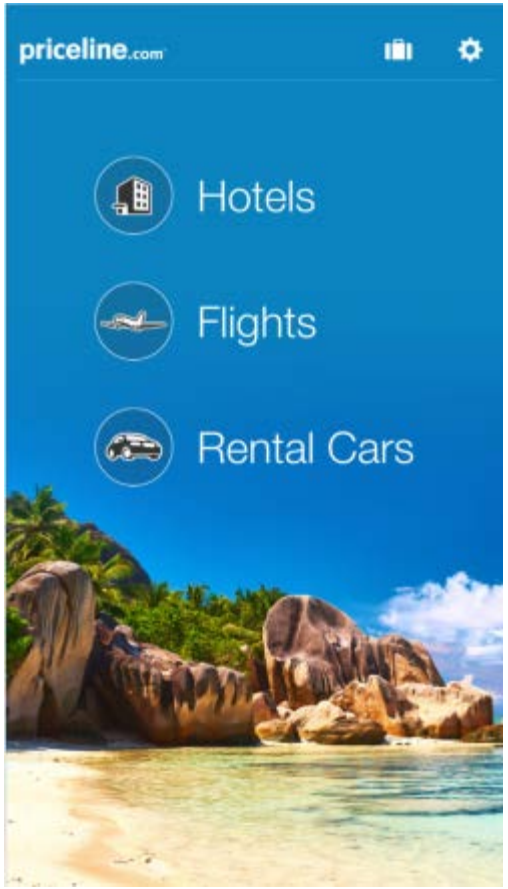
Channels Through Which Users Made E-Commerce Purchase



Source: McKinsey's 2016 China Digital Consumer Survey Report.

China Travel...Ctrip = Expansive One-Stop-Shop for Travelers...

Priceline App (USA)



Ctrip App (China)

Hotel

Transport

Tour

Attraction

Restaurant

Shopping / Currency Conversion

B&B, Hostel

Train / Bus / Ferry Ticket

Destination Guide

Portable Wi-Fi for Roaming

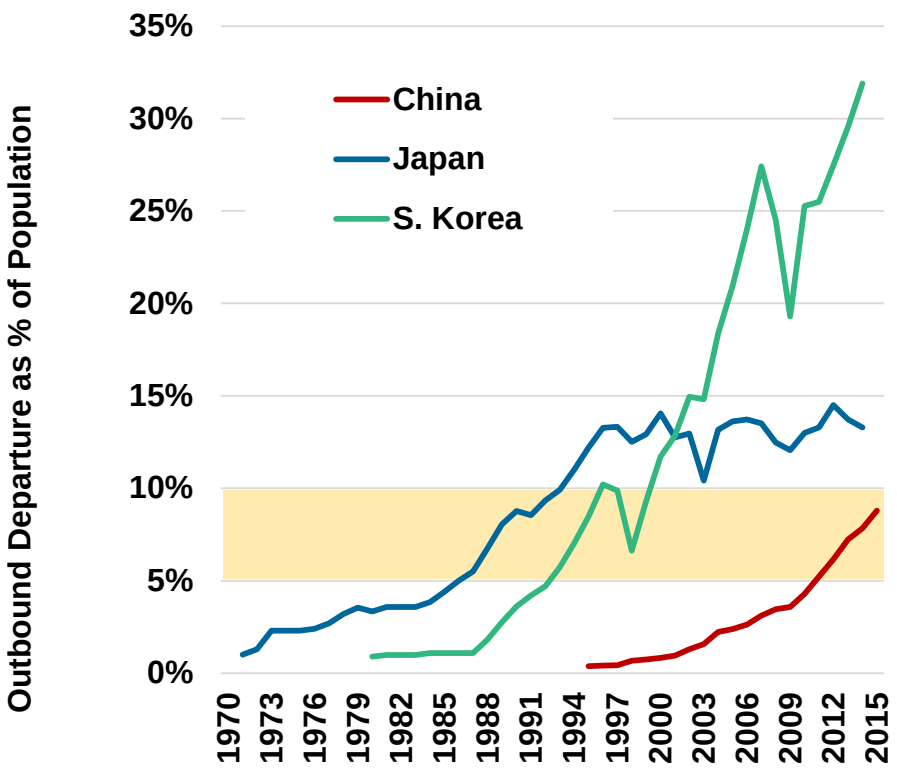
Travel Visa / Insurance

24/7 Customer Service

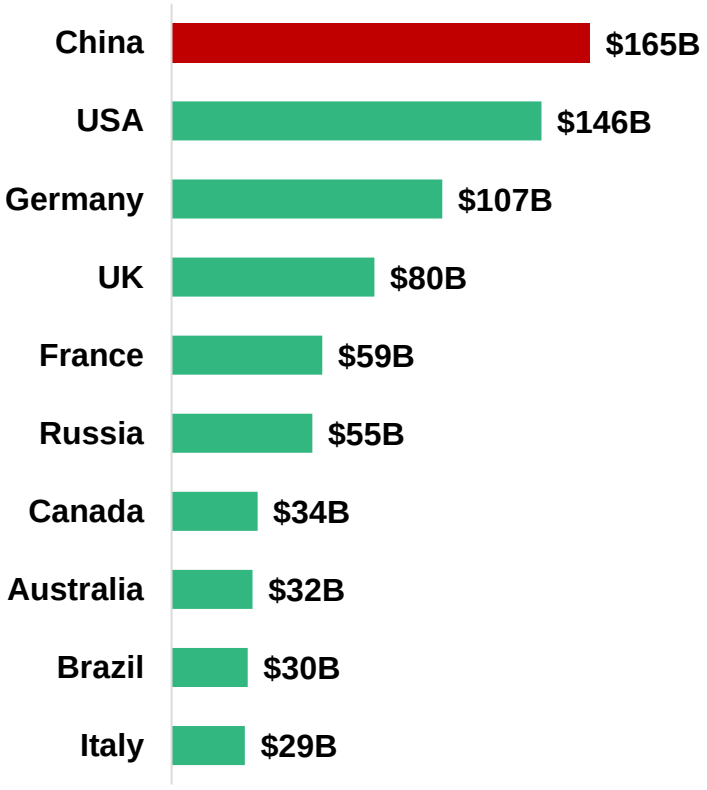
Source: Priceline, Ctrip.

...China Outbound Travel Penetration @ Inflection Point = Already World's Biggest Outbound Tourism Spender

Outbound Departures as % of Population, 1970 – 2015

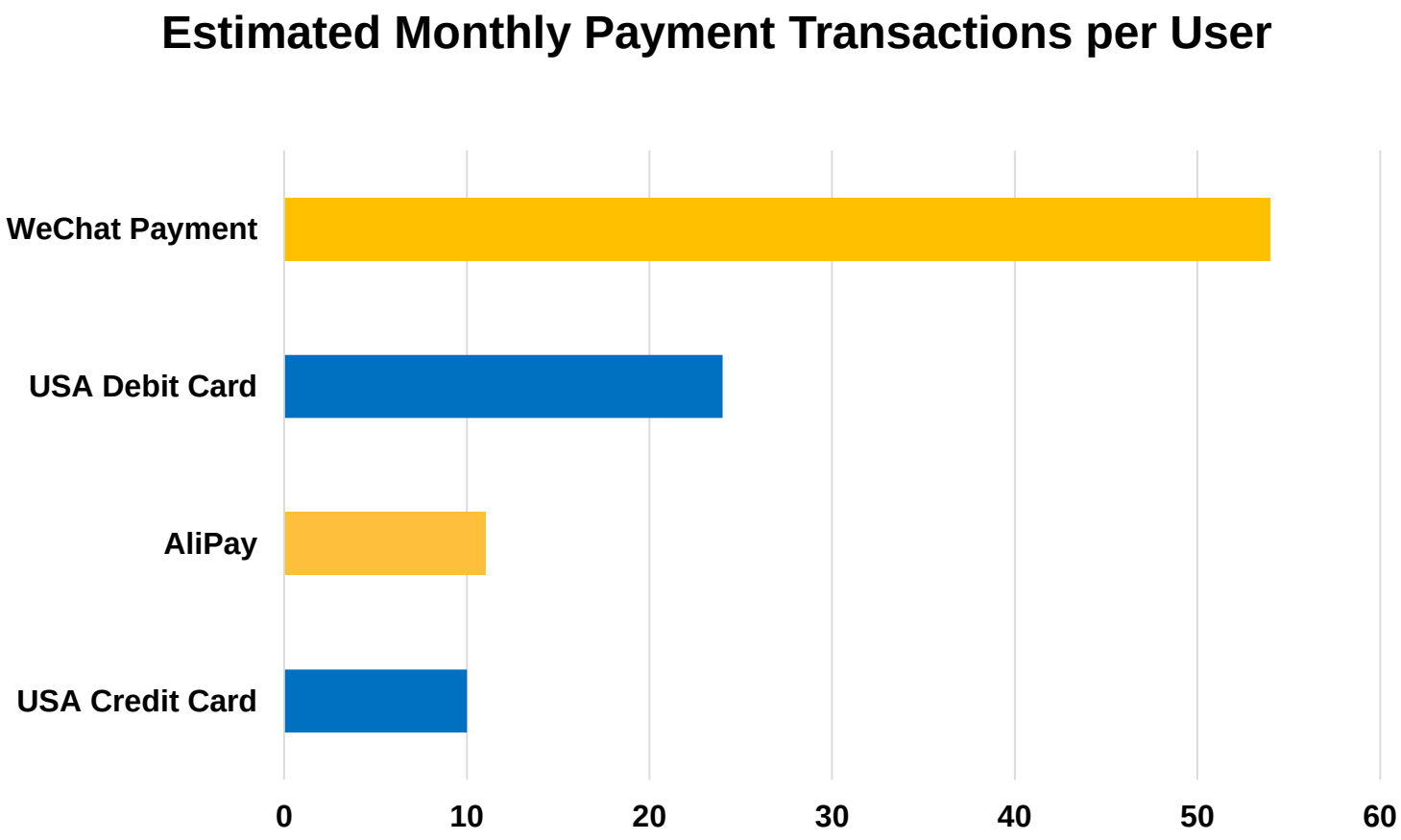


Top 10 Outbound Tourism Spending Country, 2014



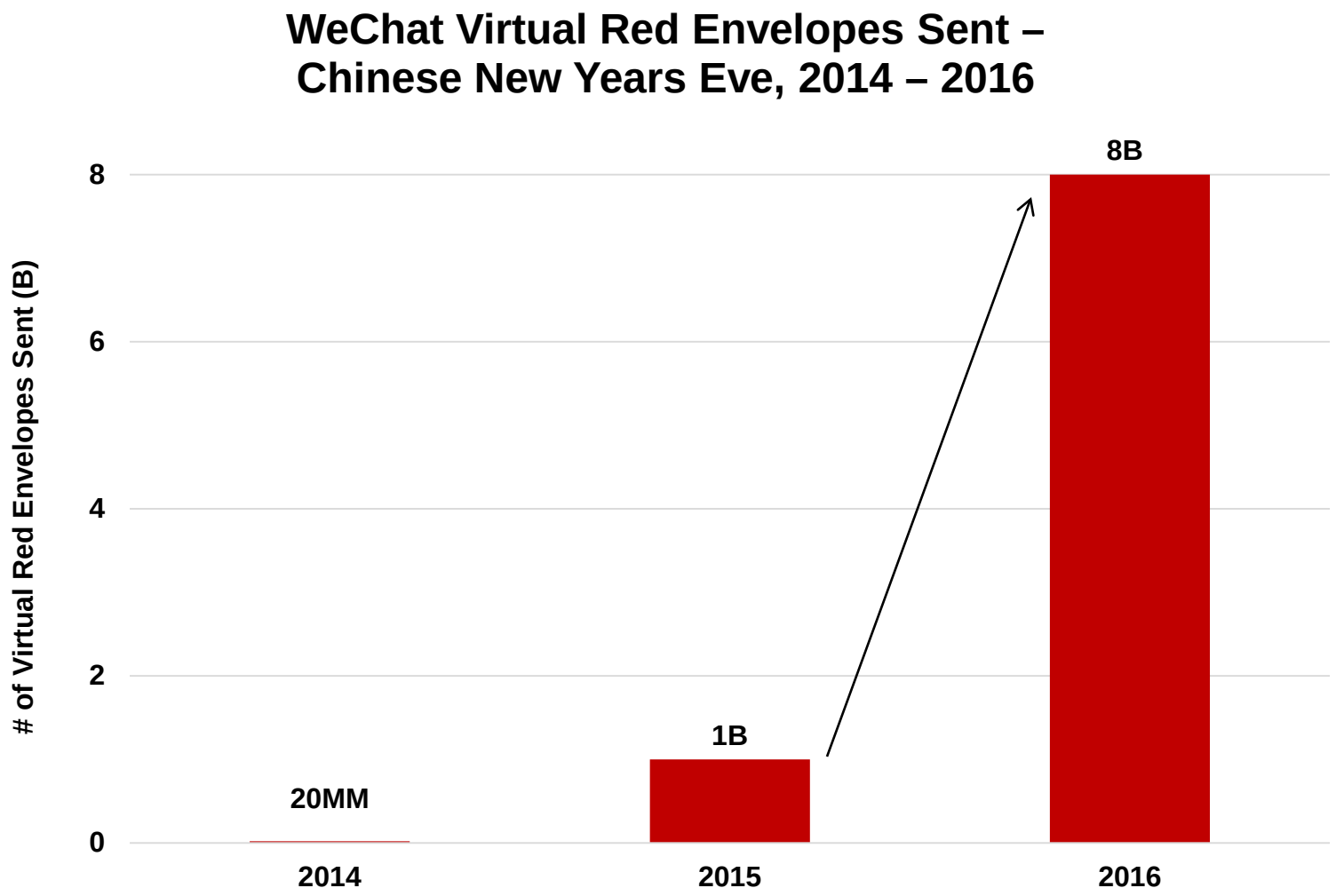
Source: CLSA, World Bank.

China Smartphone-Based Payment Solutions = High Engagement



Source: US debit and credit card data defined as number of payments (including online and offline) a month per active general-purpose card. Active cards are those used to make at least one purchase or bill payment in a month. Data per 2013 Federal Reserve Payments Study. AliPay / WeChat Pay stats per Hillhouse estimates. WeChat data includes peer-to-peer payments such as virtual Red Envelopes.

WeChat Chinese New Year Payments = 8B Virtual Red Envelopes Sent, + 8x Y/Y...

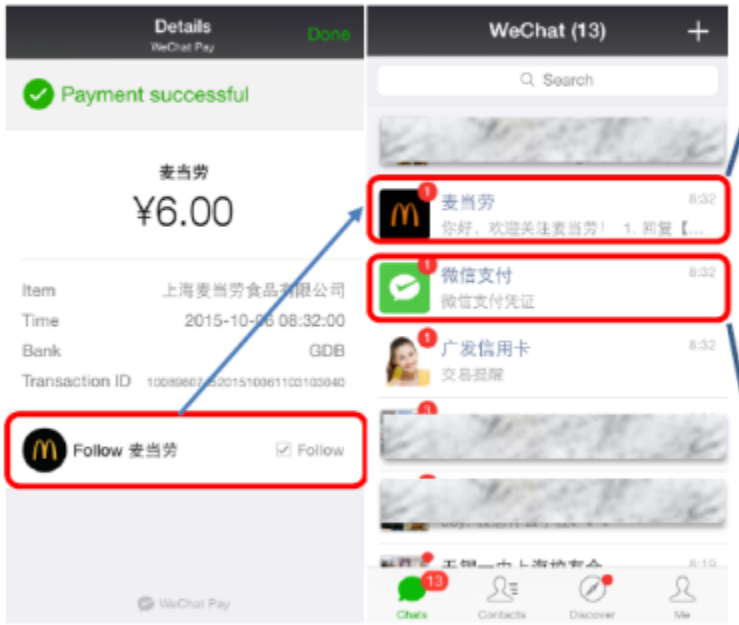


Source: Tencent.

...WeChat Payments = Can Drive Merchant Loyalty & CRM

An Example of Paying the Bill at McDonald's via Weixin Pay

"Weixin Pay + Public Accounts" is powerful

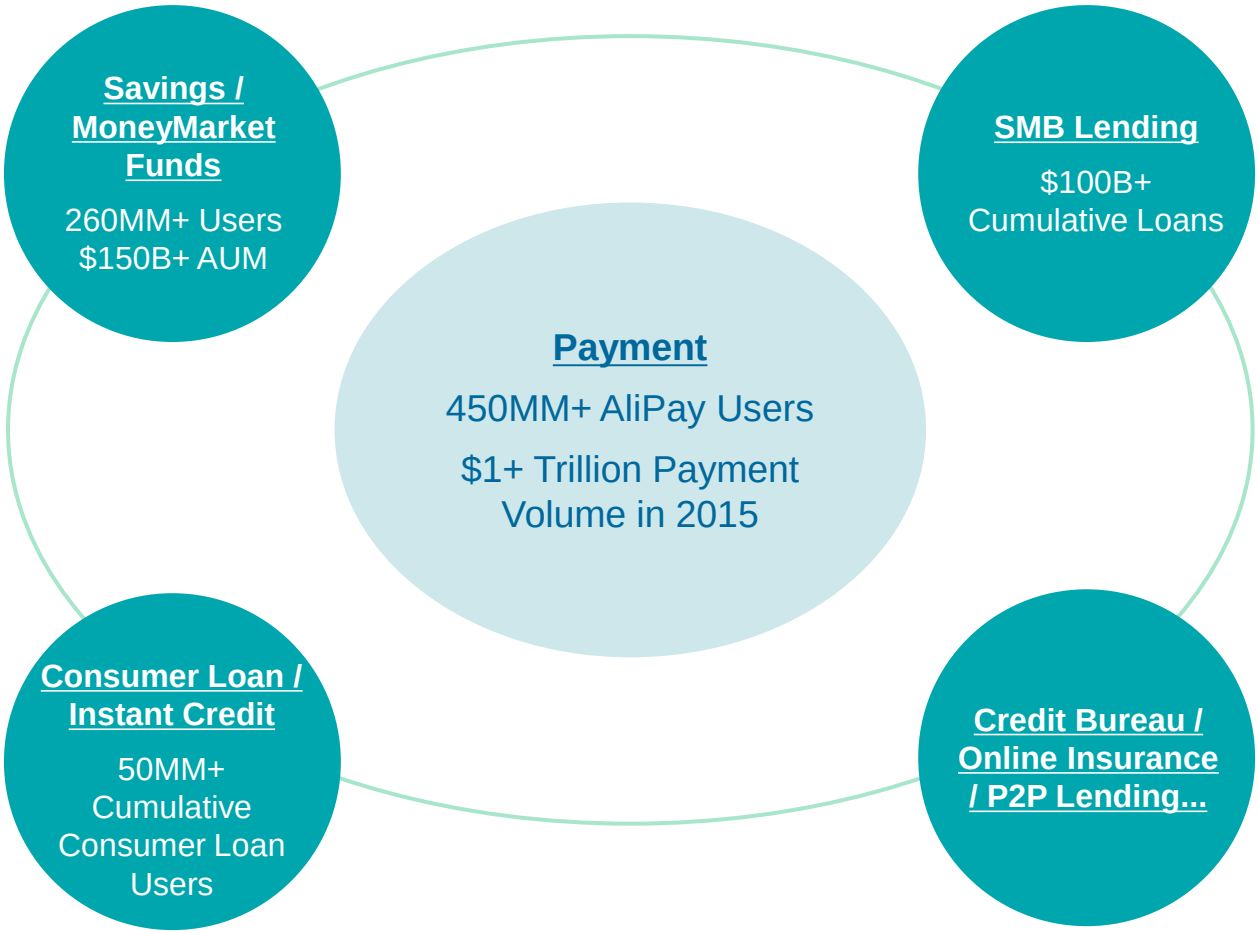


- After successful payment, consumers will follow McDonald's public account on Weixin by default.
- **Public Account enables merchants to reach existing customers for future marketing and CRM.**

- After successful payment, an e-receipt will also pop up automatically via the public account of Weixin Pay.
- **The public account allows consumers to review all historical transactions.**

Source: 86 Research.

Ant Financial (~$60B Valuation*) = Leveraging Alibaba AliPay Scale... Building China Financial Services One-Stop-Shop



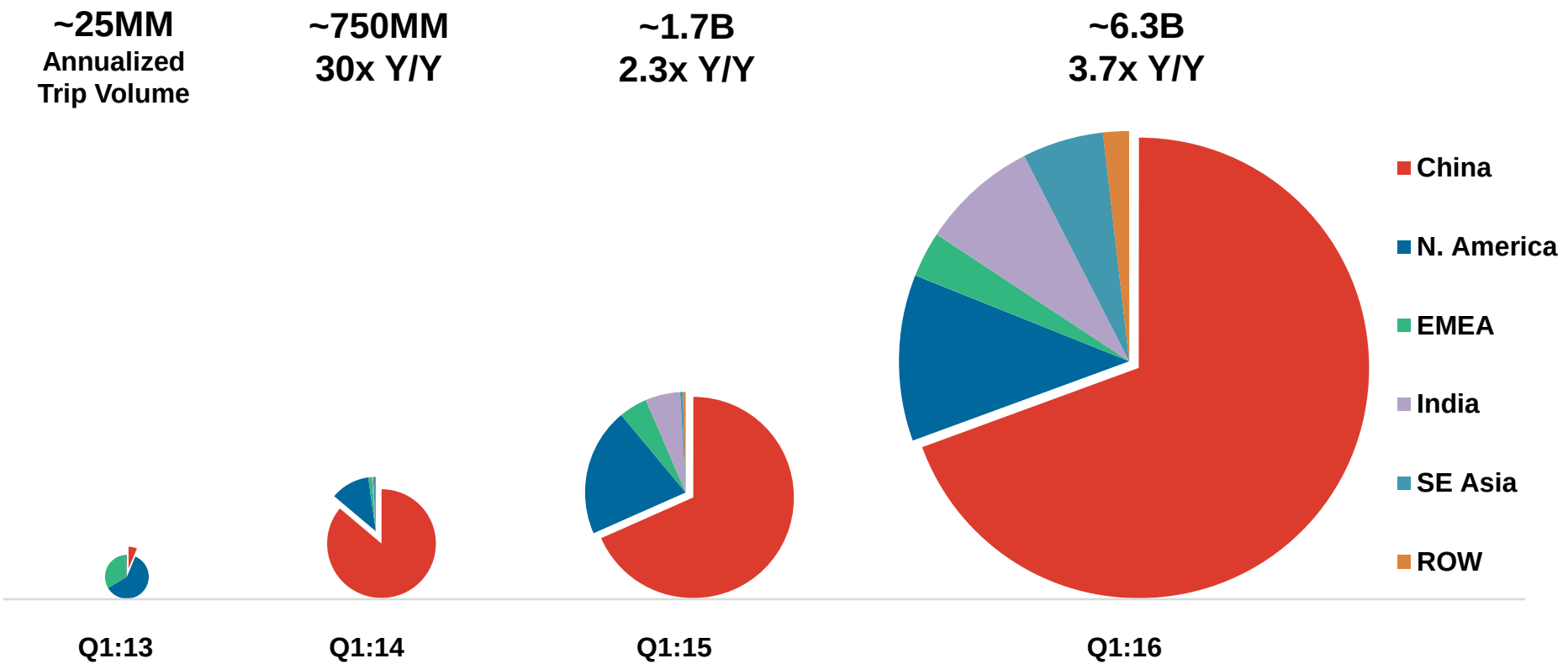
Source: Media reports, Ant Financial.
*Financing in 4/16

China Internet Emerging Momentum =

On-Demand

China On-Demand Transportation = Global Leader... 4B+ Annualized Trips (+4x Y/Y...~70% Global Share)

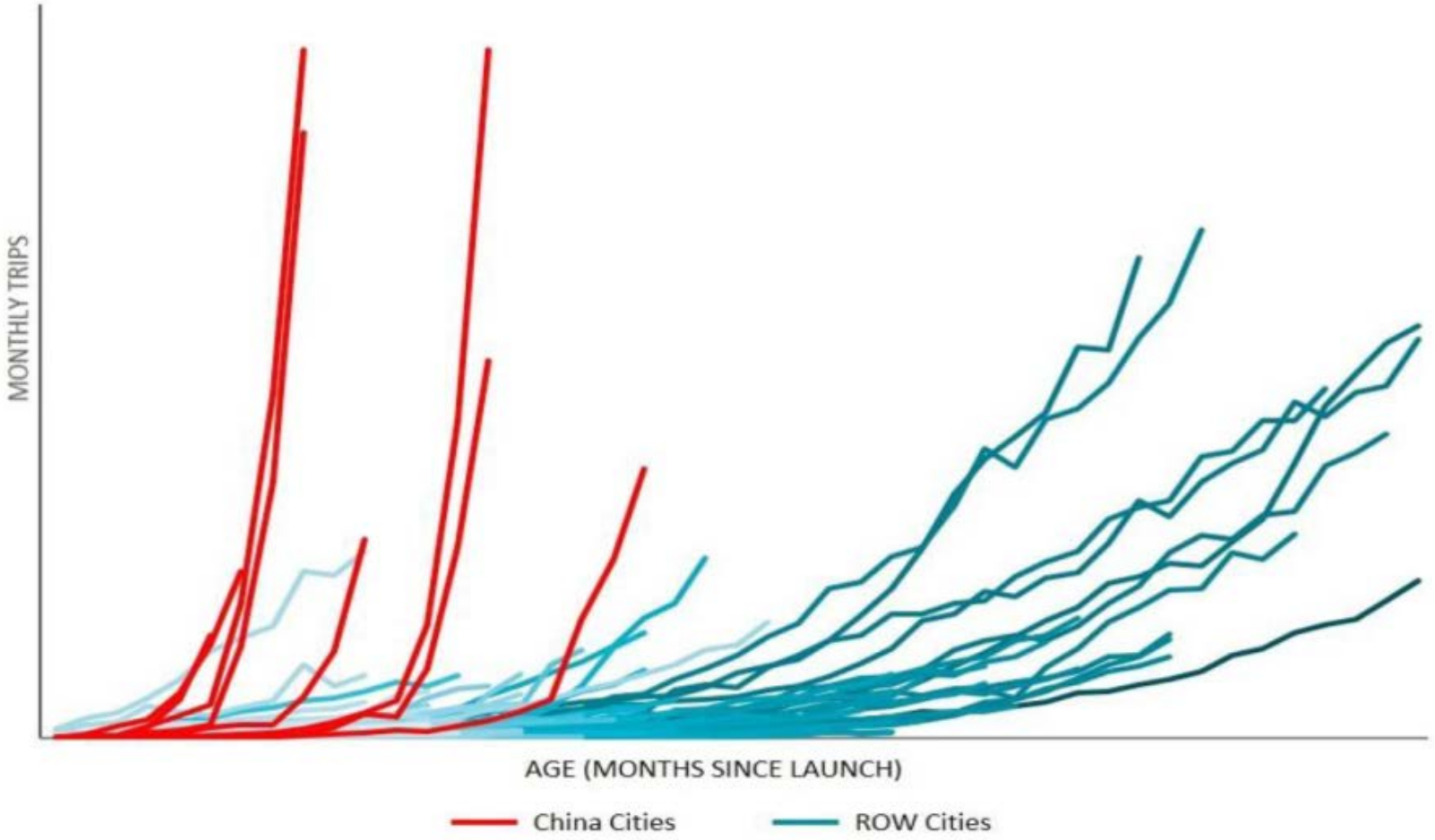
Annualized Global On-Demand Transportation Trip Volume by Region, Q1:13 – Q1:16



Source: Hillhouse Capital estimates, include on-demand taxi, private for-hire vehicles, as well as on-demand for-hire motorbike trips booked through smartphone apps.

China On-Demand Transportation...
China Cities = Fastest Global Growers

Monthly Trips Since Inception, Uber China vs. Rest of World



Source: Uber China chart per leaked CEO letter to investors in China in June 2015, third-party press releases.

PUBLIC / PRIVATE COMPANY DATA

Impact of Internet = Extraordinary & Broad
But, in Many Ways... It's Just Beginning

Internet-Related Dislocations = Long-Time in Making...Still Early Stage

Cord-Cutting Impacts Earnings for Traditional Media Companies...
E-Commerce Impacts Revenue Growth for Traditional Retailers

Media

Market Cap	2006	2016*
Viacom	$33B	$18B
Netflix	$1.4B	$44B

Revenue	2006	2015*
Viacom	$11B (+19% Y/Y)	$13B (-6% Y/Y)
Netflix	$1B (+46% Y/Y)	$7B (+23% Y/Y)

Retail

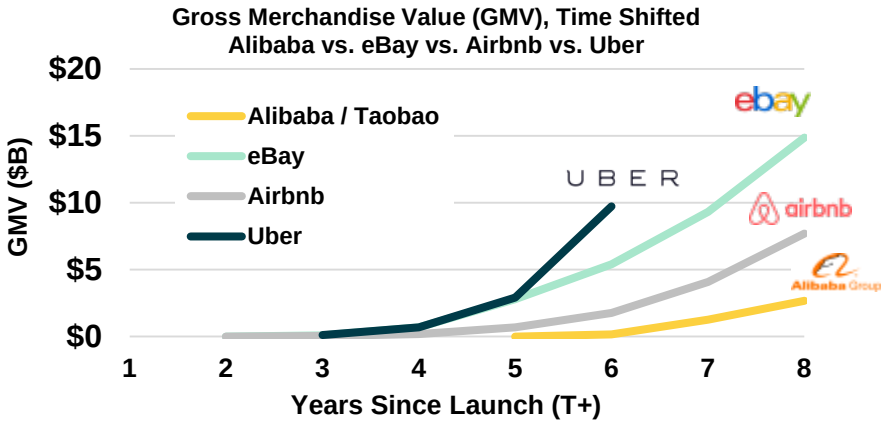
Market Cap	1997	2016*
Wal-Mart	$69B	$222B
Amazon.com	$400MM	$341B

Revenue	1997	2015*
Wal-Mart	$118B (+12% Y/Y)	$482B (-1% Y/Y)
Amazon.com	$148MM (+9.4x Y/Y)	$107B (+20% Y/Y)

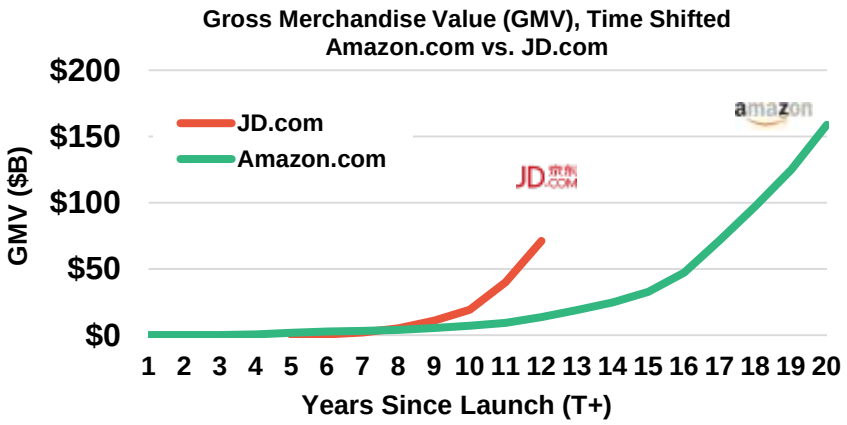
Source: CapIQ, Public Filings
* 2015 revenue for all companies reflects CY2015. Current market caps as of 5/31/16. Historical market caps for Wal-Mart / Amazon shown as of date of Amazon IPO (5/15/1997). Historical market caps for Viacom / Netflix shown as of date of CBS spinoff from Viacom (1/3/2006).

Current Generation of Internet Leaders = Growing Faster than Previous Generation

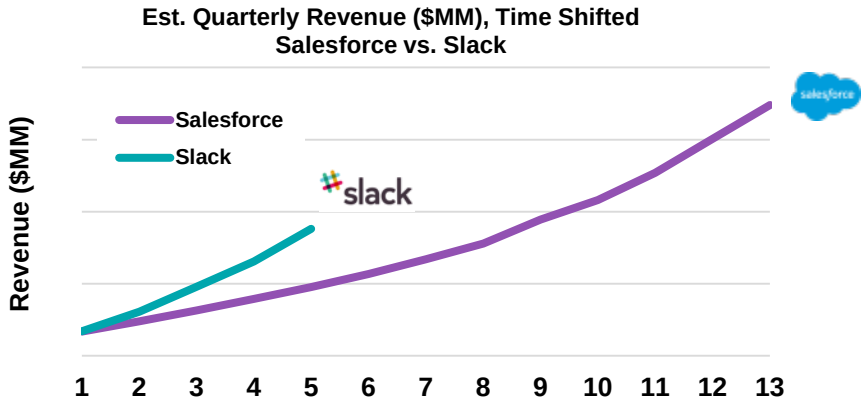
Marketplaces



Commerce



Enterprise



Marketplaces Source: Company data, Morgan Stanley Research. eBay founded in 1995. Amazon founded in 1995. Alibaba.com founded in 1999 as B2B portal connecting Chinese manufacturers and overseas buyers. Uber launched 2009, gave first ride in 2010. Airbnb founded in 2008..
Commerce Source: Publicly available company data, Morgan Stanley Research. JD.com launched B2C shipments in 2004, founded 1998 as an online magneto-optical store. Amazon founded in 1995.
Enterprise Source: Slack. Graph starting point based on similar est. revenue figures. Salesforce quarterly revenue approximated from publicly disclosed annual GAAP revenues.

Internet Leaders =
Getting Bigger...Staying Aggressive

Global Internet Market Leaders = Apple / Google / Amazon / Facebook / Tencent / Alibaba...Flush with Cash...Private Companies Well Represented

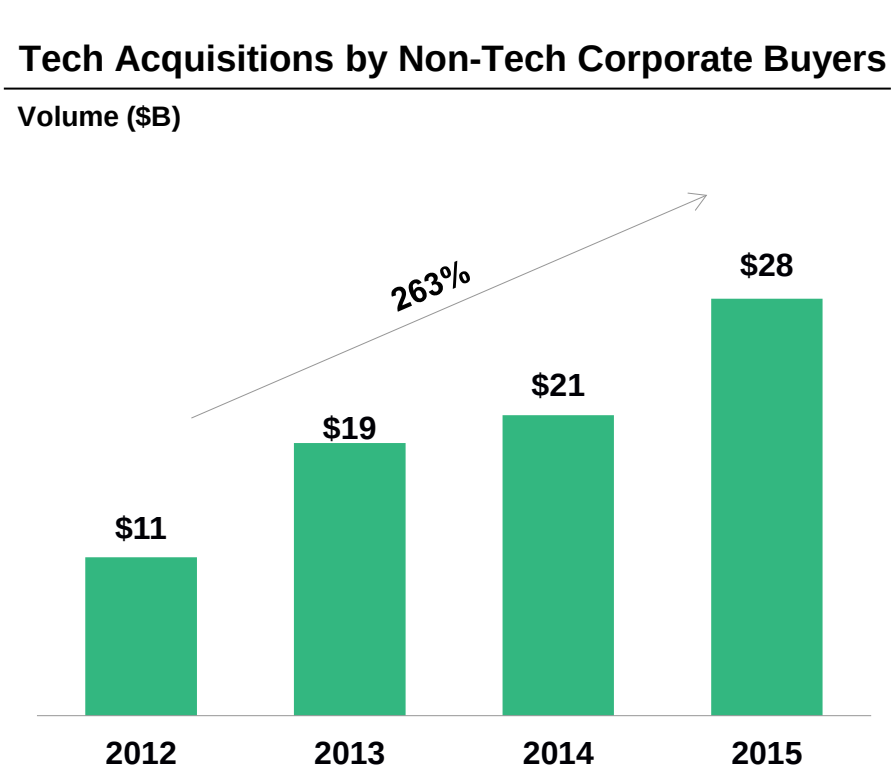
Rank	Company	Region	Current Market Value ($B)	Q1:16 Cash ($B)	2015 Revenue ($B)
1	Apple	USA	$547	$233	$235
2	Google / Alphabet	USA	510	79	75
3	Amazon	USA	341	16	107
4	Facebook	USA	340	21	18
5	Tencent	China	206	14	16
6	Alibaba	China	205	18	15
7	Priceline	USA	63	11	9
8	Uber	USA	63	--	--
9	Baidu	China	62	11	10
10	Ant Financial	China	60	--	--
11	Salesforce.com	USA	57	4	7
12	Xiaomi	China	46	--	--
13	Paypal	USA	46	6	9
14	Netflix	USA	44	2	7
15	Yahoo!	USA	36	10	5
16	JD.com	China	34	5	28
17	eBay	USA	28	11	9
18	Airbnb	USA	26	--	--
19	Yahoo! Japan	Japan	26	5	5
20	Didi Kuaidi	China	25	--	--
Total			$2,752	$447*	$554*

Source: CapIQ, CB Insights, Wall Street Journal, media reports. Market value data as of 5/31/16. * Includes only public companies.
Note: For public companies, colors denote current market value relative to Y/Y market value. Green = higher. Red = lower. Purple = newly public within last 12 months (applied here to both eBay and Paypal given Paypal spinoff on 7/20/15). Yellow = private companies, where market value represents latest publicly announced valuation. Ant Financial and Didi Kuaidi valuation per latest media reports as of 5/2016. Ant Financial treated separately from Alibaba as Alibaba retains no control of Ant and will receive a capped lump sum payment in the event of an Ant liquidity event. Cash includes cash and equivalents and short-term marketable securities plus long-term marketable securities where deemed liquid.

Traditional Industry Incumbents =
Active in Acquisitions / Investments

Incumbents = Increasingly Betting on Technology Companies to Fuel Growth... Non-Tech Acquisitions of Tech Companies +2.6x Since 2012

Tech Acquisitions by Non-Tech Corporate Buyers



Select Acquisitions by Non-Tech Incumbents

- **Auto Consortia** / Nokia Here
- **Avis** / Zipcar
- **AxelSpringer** / Business Insider
- **Disney** / Maker Studios, Playdom
- **Disney + Fox + NBCUniversal** / Hulu
- **First Data** / Perka, Clover
- **Ford** / Livio
- **General Motors** / Cruise Automation
- **Hudson Bay** / Gilt Groupe
- **Liberty Interactive** / Zulily
- **Monsanto** / Climate Corporation
- **Neiman Marcus** / Mytheresa.com
- **Nordstrom** / HauteLook
- **Northwestern Mutual** / Learnvest
- **Staples** / Runa
- **Target** / DermStore.com
- **Under Armour** / MapMyFitness, MyFitnessPal
- **Walmart** / Kosmix

Select Investments by Non-Tech Incumbents

- **American Express** / Concur
- **Citi** / Ayasdi, Betterment
- **Coca-Cola** / OneWeb
- **Ford** / Pivotal
- **Fox Sports** / DraftKings
- **General Motors** / Lyft
- **Goldman Sachs** / Dataminr, Kensho, Symphony
- **J.P. Morgan** / Prosper Marketplace
- **Lowes** / Porch
- **NBCUniversal** / BuzzFeed, Vox Media
- **Nikkei** / Evernote
- **Turner Sports** / FanDuel
- **USAA** / TRUECar
- **Visa** / Square
- **Whole Foods** / Instacart

@KPCB

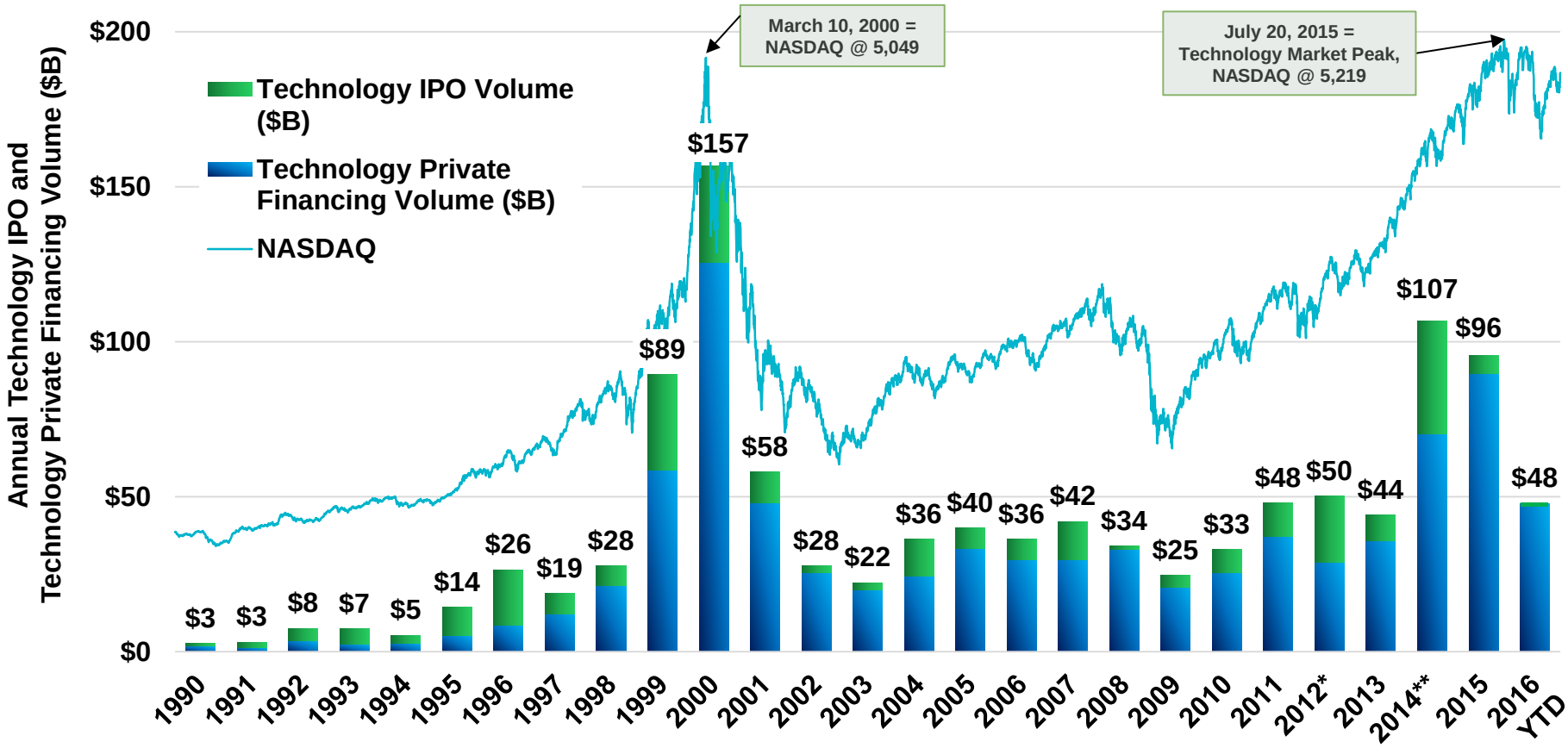
Source: Morgan Stanley, CapitalIQ, Thomson Reuters
Note: Includes technology targets >$100MM in value.

Global Technology Financings = Solid Trends in Private Financings... Only 2 Tech IPOs 2016YTD

Source: Morgan Stanley, Thomson Reuters
Note: YTD Tech IPOs include SecureWorks and Acacia Communications.

Global Technology Public + Private Financing Volume = Solid Relative to History

Global US-Listed Technology IPO Issuance and Global Technology Venture Capital Financing, 1990 – 2016YTD



VC Funding per Company ($MM)	$3	$3	$2	$5	$4	$4	$5	$5	$6	$8	$14	$18	$11	$8	$8	$9	$8	$9	$8	$9	$7	$7	$10	$8	$9	$13	$15	$16

*Facebook ($16B IPO) = 75% of 2012 IPO $ value. **Alibaba ($25B IPO) = 69% of 2014 IPO $ value.
Source: Thomson ONE, 2016YTD as of 5/26/16. VC Funding per Company ($MM) calculated as total venture financing per year divided by number of companies receiving venture financing. Morgan Stanley Equity Capital Markets, 2016YTD as of 5/26/16. All global U.S.-listed technology IPOs over $30MM, data per Dealogic, Bloomberg, & Capital IQ.

There are pockets of Internet company overvaluation but there are also pockets of undervaluation...

Very few companies will win – those that do – can win big...

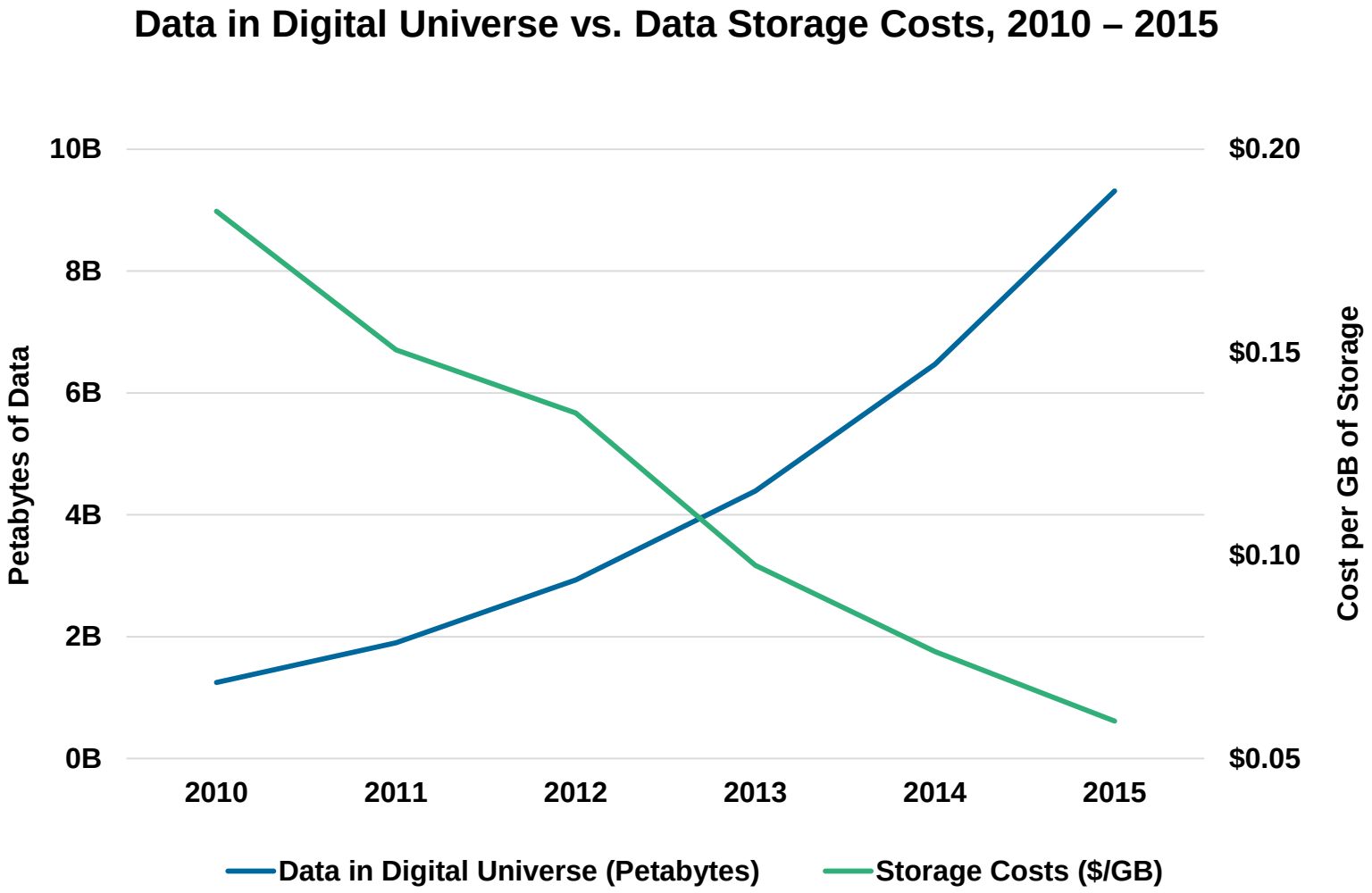
Over time, best rule of thumb for valuing companies = value is present value of future cash flows.

DATA AS A PLATFORM / DATA PRIVACY

CREATED BY KPCB PARTNERS TED SCHLEIN / ALEX KURLAND

Data as a Platform

Global Data Growth Rising Fast = +50% CAGR since 2010... Data Infrastructure Costs Falling Fast = -20% CAGR



Source: IDC, May 2016.

Data Generators = Increasing Rapidly

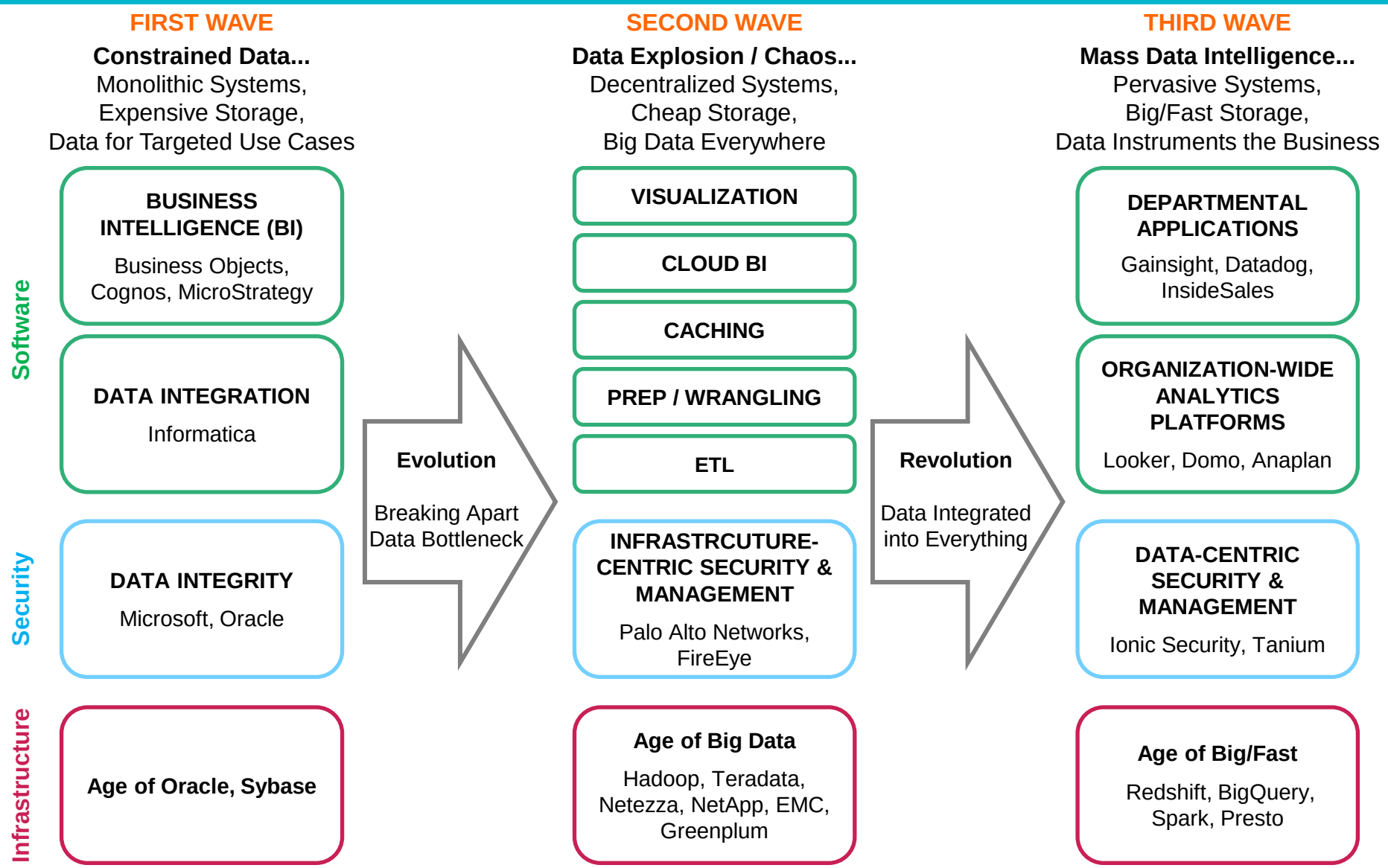
Source: Apple, DJI, Waze, Tesla, Microsoft, Ring, Fitbit, B & H Foto & Electronics.

Data = A New Growth Platform...
Powering New Services / Systems / Apps

The Network	Large investments in fiber optic & last-mile cables created connectivity that facilitated the early Internet growth
The Software	Optimizing the network with software became far more capital efficient than additional capex buildouts...ultimately resulting in the creation of *pervasive networks* (siloed data centers → AWS)...& then *pervasive software* (Siebel → Salesforce)
The Infrastructure	Emergence of pervasive software created the need to optimize the performance of the network & store extraordinary amounts of data at extremely low prices
The Data	Next Big Wave = Leveraging this unlimited connectivity & storage to collect / aggregate / correlate / interpret all of this data to improve people's lives & enable enterprises to operate more efficiently

Source: Adam Ghetti, Ionic Security; Ted Schlein, KPCB.

Evolution of the Data Platform, 1990 – 2016



Source: Looker, Ionic Security, KPCB.

Data is moving from something you use outside the workstream to becoming a part of the business app itself.

It's how the new knowledge worker is actually performing their job.

- **FRANK BIEN, CEO OF LOOKER, 2016**

Data as a Platform –

A Few Companies Utilizing Analytics to Improve Business Efficiency...

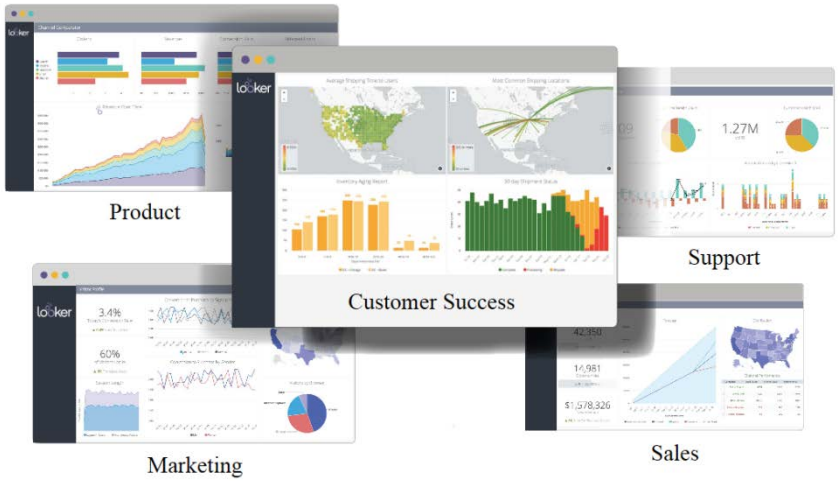
Data Analytics as a Platform = Looker

THEN

Complex Tools Operated by Data Analysts, Chaos of Data Silos Across the Company

NOW

Looker



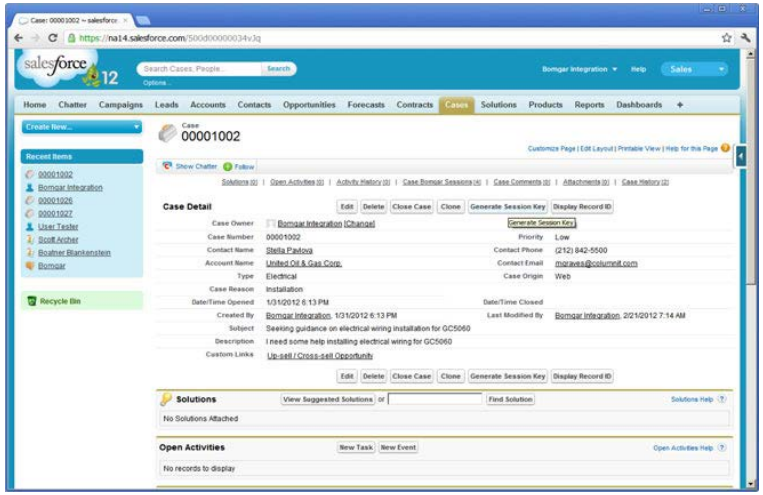
Data analytics platform built for both data analysts & non-technical business users that can scale throughout organizations

Source: Looker.

Customer Data & Relationship Intelligence as a Platform = SalesforceIQ

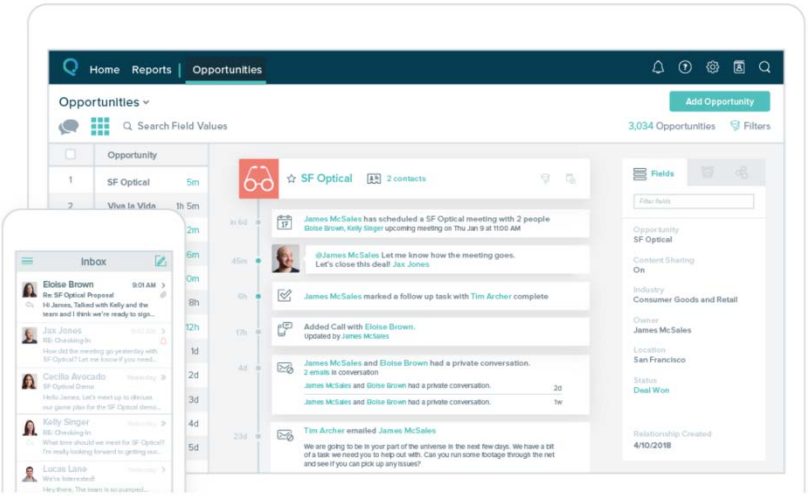
THEN

Difficult to Customize, Lack of Automated Customer Insights



NOW

SalesforceIQ



CRM solution that helps businesses build stronger customer relationships by analyzing data & patterns to identify opportunities.

Source: Bomgar Corporation, Salesforce.

Data Mapping as a Platform = Mapbox

THEN

Difficult & Expensive to Collect Data...
Limited In-App Digital Map Usage

NOW

Mapbox

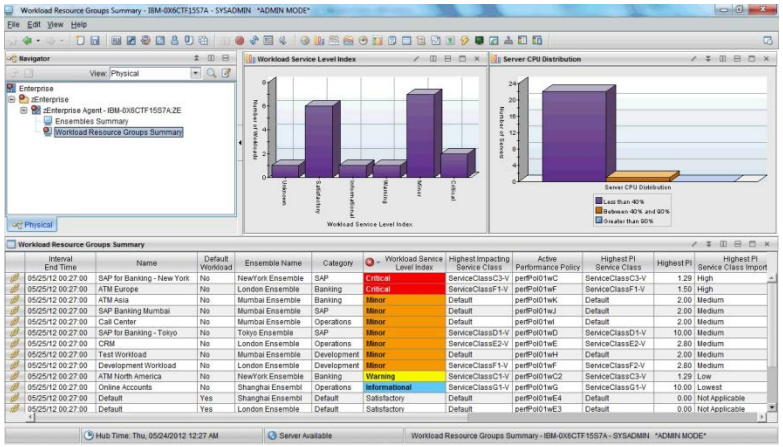
Worldwide maps crowdsourced by a community of smartphone users whose mobile navigation data facilitates real-time updates to the platform

Source: Forbes; Technical.ly; Philadelphia Police Department; Mapbox.

Cloud Data Monitoring as a Platform = Datadog

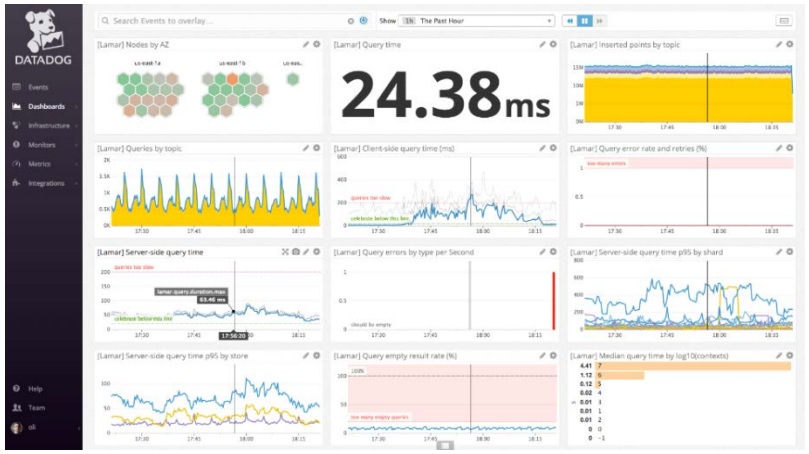
THEN

Expensive & Clunky Point Solutions, Lengthy Implementation Cycles, Only Used by System Administrators



NOW

Datadog



Cloud monitoring platform for both System Administrators & Developers that automatically integrates 100+ sources in real-time to represent hundreds of thousands of cloud instances

Source: IBM; Datadog.

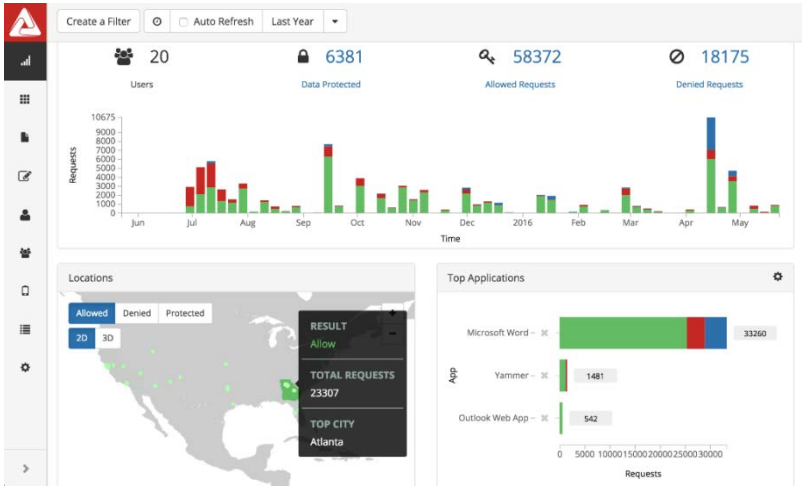
Data Security & Management as a Platform = Ionic Security

THEN

Securing Infrastructure to Keep Data Safe

NOW

Ionic Security



Distributed data protection & management platform that has processed tens of billions of API requests to enable customers to secure & control their data

Source: www.teach-ict.com; Ionic Security.

As Data Explodes...
Data Security Concerns Explode

Data Privacy Debate – Major Events, 2013 – 2016

Edward Snowden (Jun-13)

Former CIA contractor leaked classified information to media about internet & phone surveillance by USA intelligence.

Apple vs. FBI (Feb-16)

FBI claimed it needed Apple to provide access to an iPhone owned by a man who committed a mass shooting in San Bernardino, CA, so that the agency could recover information for its investigation. Request was denied by a federal judge in New York.

.

WhatsApp's Default End-to-End Encryption (Apr-16)

WhatsApp implements end-to-end encryption as default setting to protect communications of their 1B monthly active users worldwide.

Burr-Feinstein Anti-Encryption Bill (Apr-16)

Proposed law that would require technology companies & phone manufacturers to decrypt customer data at a court's request.

Microsoft Lawsuit (Apr 16)

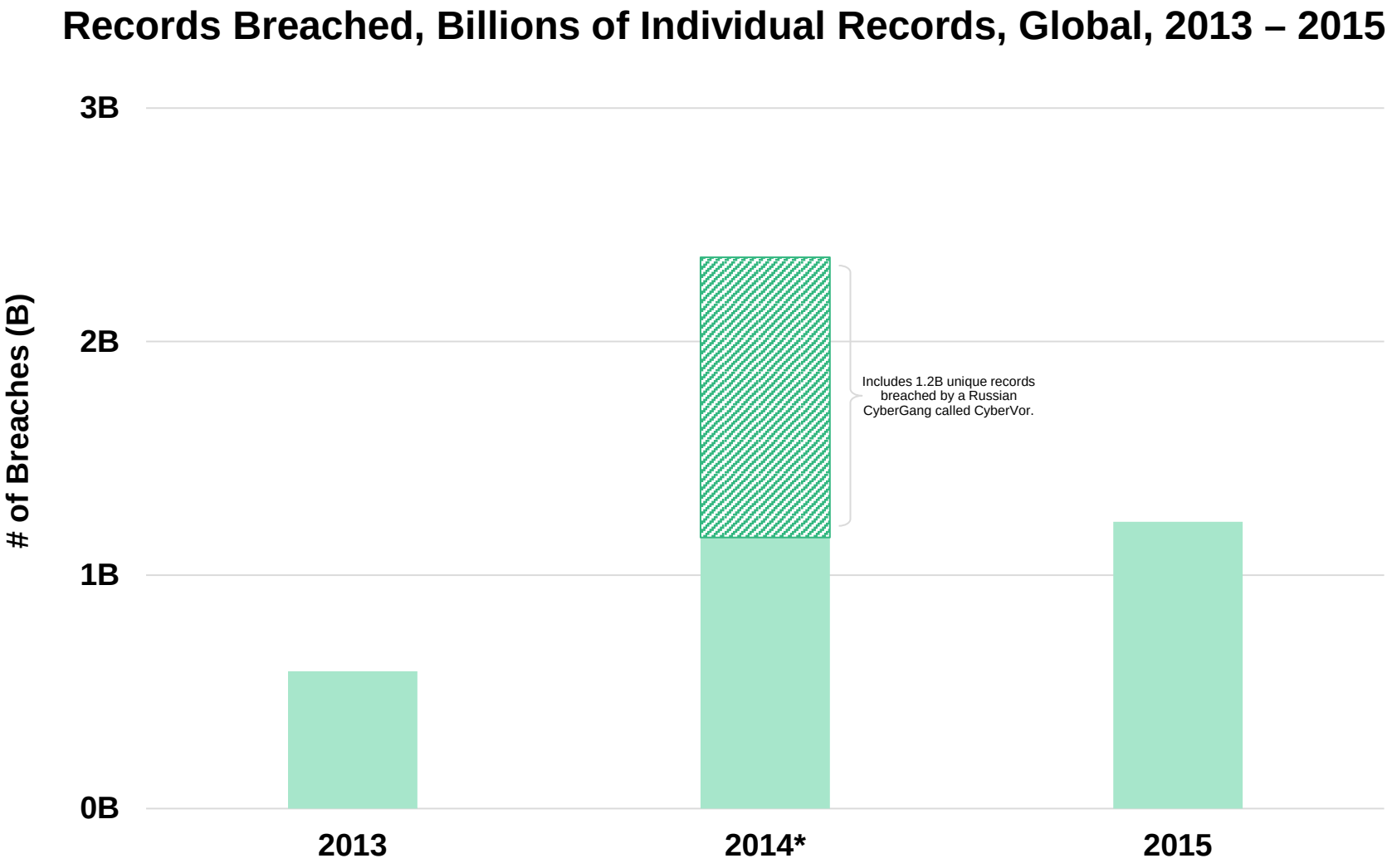
Files lawsuit for right to be able to tell customers when law enforcement officials request their emails & other data.

Apple Hires Data Security Expert (May-16)

Jon Callas, who co-founded several well-respected secure communications companies including PGP Corp, Silent Circle and Blackphone, rejoins Apple (he was also an employee in the 1990s and again between 2009 and 2011, when he designed an encryption system to protect data stored on a Macintosh computer).

Source: NY Times, CNBC, Reuters, Time, Washington Post, WhatsApp.

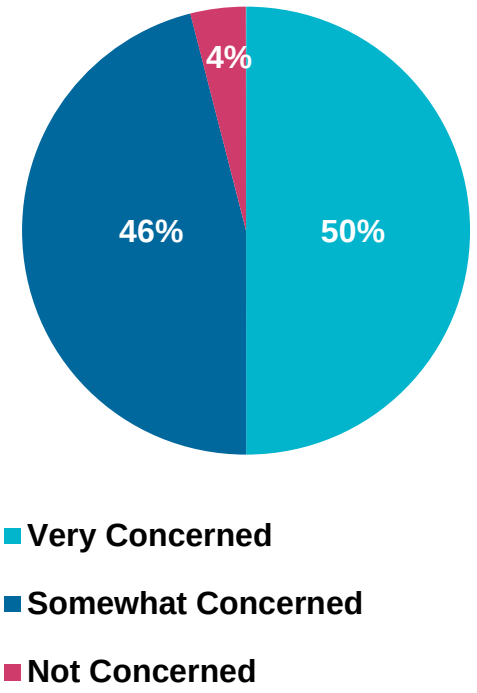
Cybercrime = Widespread Borderless Threat…
~4 Billion Data Records Breached Globally Since 2013



Source: Breach Level Index; IBM; Govtech
Note: *Includes 1.2B unique records breached by a Russian CyberGang called CyberVor.

Consumer Data Privacy Concerns Rising Rapidly

How Concerned are You About Data Privacy & How Companies Use Customer Data?



45%
Are more worried about their Online privacy than one year ago

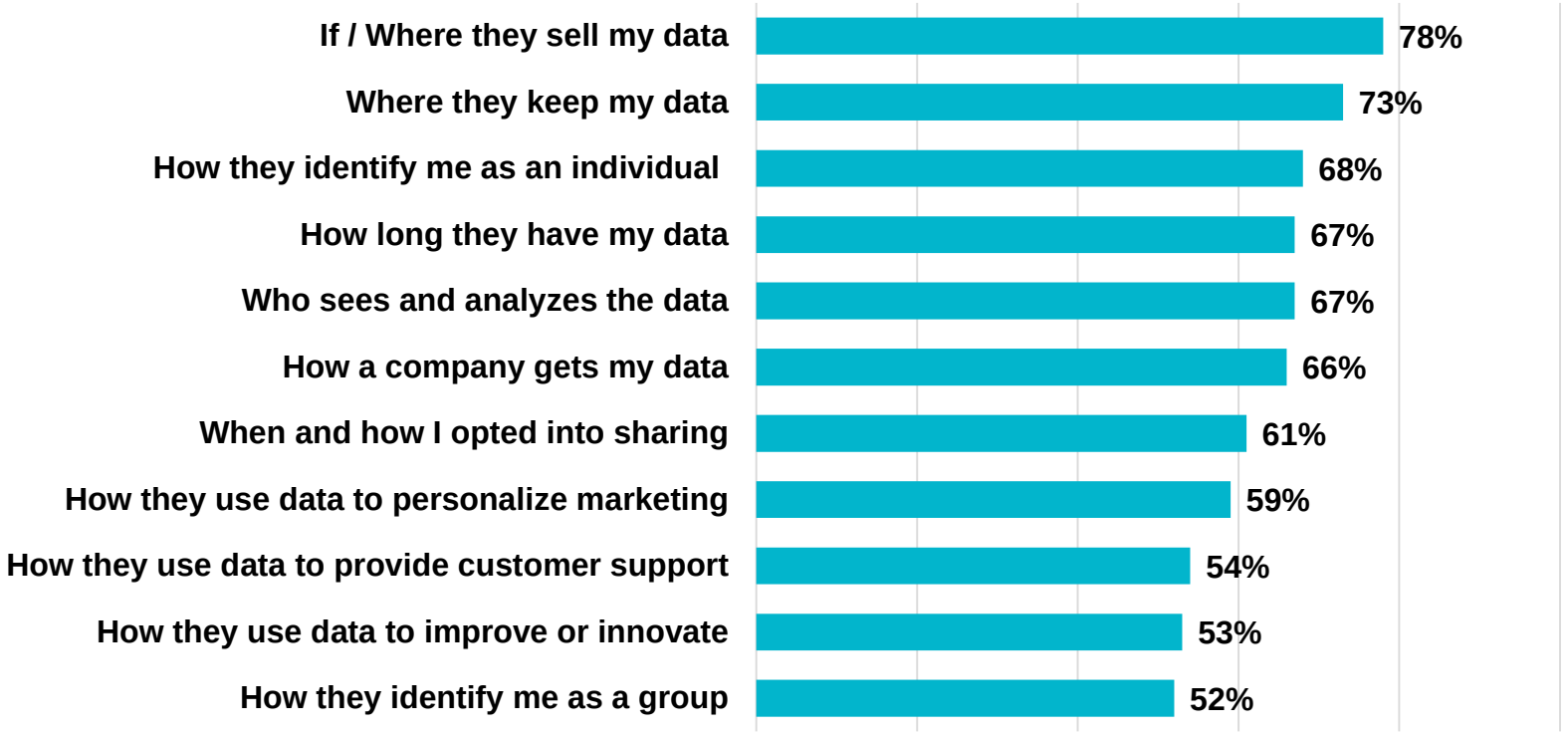
74%
Have limited their online activity in the last year due to privacy concerns

Source: Gigya "The 2015 State of Consumer Privacy & Personalization" report, US respondents, n = 2,000; TRUSTe / National Cyber Security Alliance Consumer Privacy Survey – US, 2016.

Consumers' Top Privacy Concerns = Data Selling / Storage / Access / Being Identified Individually...

Rate Level of Privacy Concerns Across Each of the Following Ways Companies Interact with Personal Data, n = 2,062

(These percentages reflect all respondents who rated their privacy concerns on a 1-5 scale, with 5 = Extremely Concerned, 4 = Very Concerned, etc.)



Source: Altimeter Group, "Consumer Perceptions in the Internet of Things", 2015. n = 2,062 respondents.

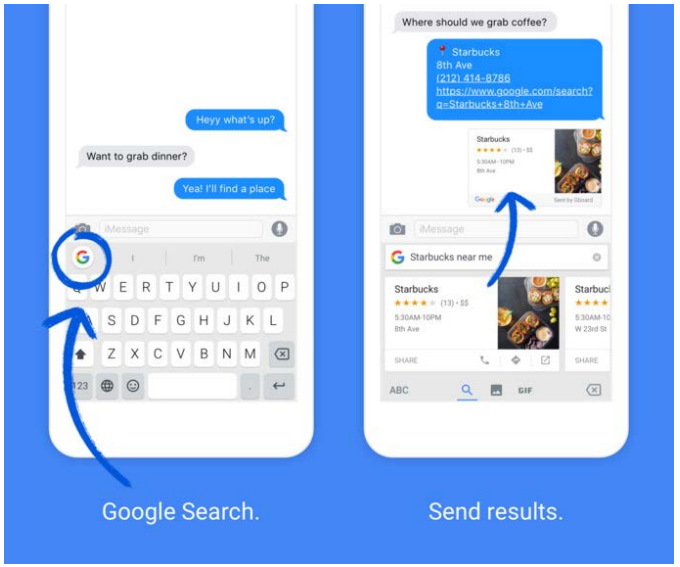
...Do People Care About Privacy...
Or Do They Care About *Who* Has Their Data?

Amazon Echo

The Echo's Alexa Voice Service listens to all speech in default mode

Google Gboard

Integrated keyboard for iOS devices that had an estimated 500K+ downloads within the first week of launch



Source: Amazon, Google, App Annie.
Today, data sent to Google is limited to search queries for processing, anonymous statistics to help diagnose problems when the app crashes and data about the most often used features. Privacy policies can change over time and it is possible Google may decide to track additional data with a user's consent.

In the tangible world, physical limitations prevent the broad abuse of the law...

Should the same laws automatically apply to the digital world where a few lines of code can unlock someone's entire life?

- **ADAM GHETTI, FOUNDER & CEO OF IONIC SECURITY, 2016**

Disclosure

This presentation has been compiled for informational purposes only and should not be construed as a solicitation or an offer to buy or sell securities in any entity.

The presentation relies on data and insights from a wide range of sources, including public and private companies, market research firms and government agencies. We cite specific sources where data are public; the presentation is also informed by non-public information and insights.

We publish the Internet Trends report on an annual basis, but on occasion will highlight new insights. We will post any updates, revisions, or clarifications on the KPCB website.

KPCB is a venture capital firm that owns significant equity positions in certain of the companies referenced in this presentation, including those at www.kpcb.com/companies.