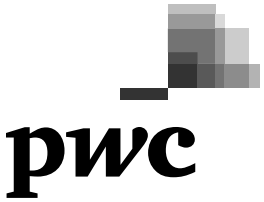
strategy&

October 2017

2017 Global Innovation 1000

Will Stronger Borders Weaken Innovation?



Introduction

Will Stronger Borders Weaken Innovation?

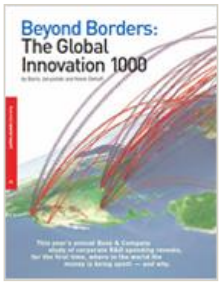
Innovation 1000 update

For the 13th year, Strategy& studied innovation trends and spending at the world's 1000 largest publicly listed corporate R&D spenders

2005:
Money isn't everything

2006:
Smart spenders

2007:
The customer connection



2008:
Beyond borders

2009:
Profits down, spending steady

2010:
How top innovators keep winning

2011:
Why culture is key

2012:
Making ideas work

2013:
Navigating the digital future

2014:
Proven paths to innovation success

2015:
Innovation's new world order

2016:
Software as a catalyst

2017:
Will Stronger Borders Weaken Innovation?

The study has become a recognized contributor in better understanding what drives success in R&D and innovation

- **The Global Innovation 1000 study has received significant media and academic attention**:
  - Called *"the most comprehensive assessment of the relationship between R&D investment and corporate performance"* by the *The Economist* in 2009
  - Given *"2006 Special Achievement Award for Advancing Innovation"* by **Innovate Forum**
  - Awarded Best of Visions award from **PDMA** in 2009
  - In 2011 and 2014, awarded Silver and Gold, respectively, for original research by the **American Society of Business Press Editors** (*"the Azbee"*)
  - Cited in more than 180 publications in 27 countries

Global Innovation 1000: Selected press coverage

Introduction

Will Stronger Borders Weaken Innovation?

Innovation 1000 update

Executive Summary – Will Stronger Borders Weaken Innovation?

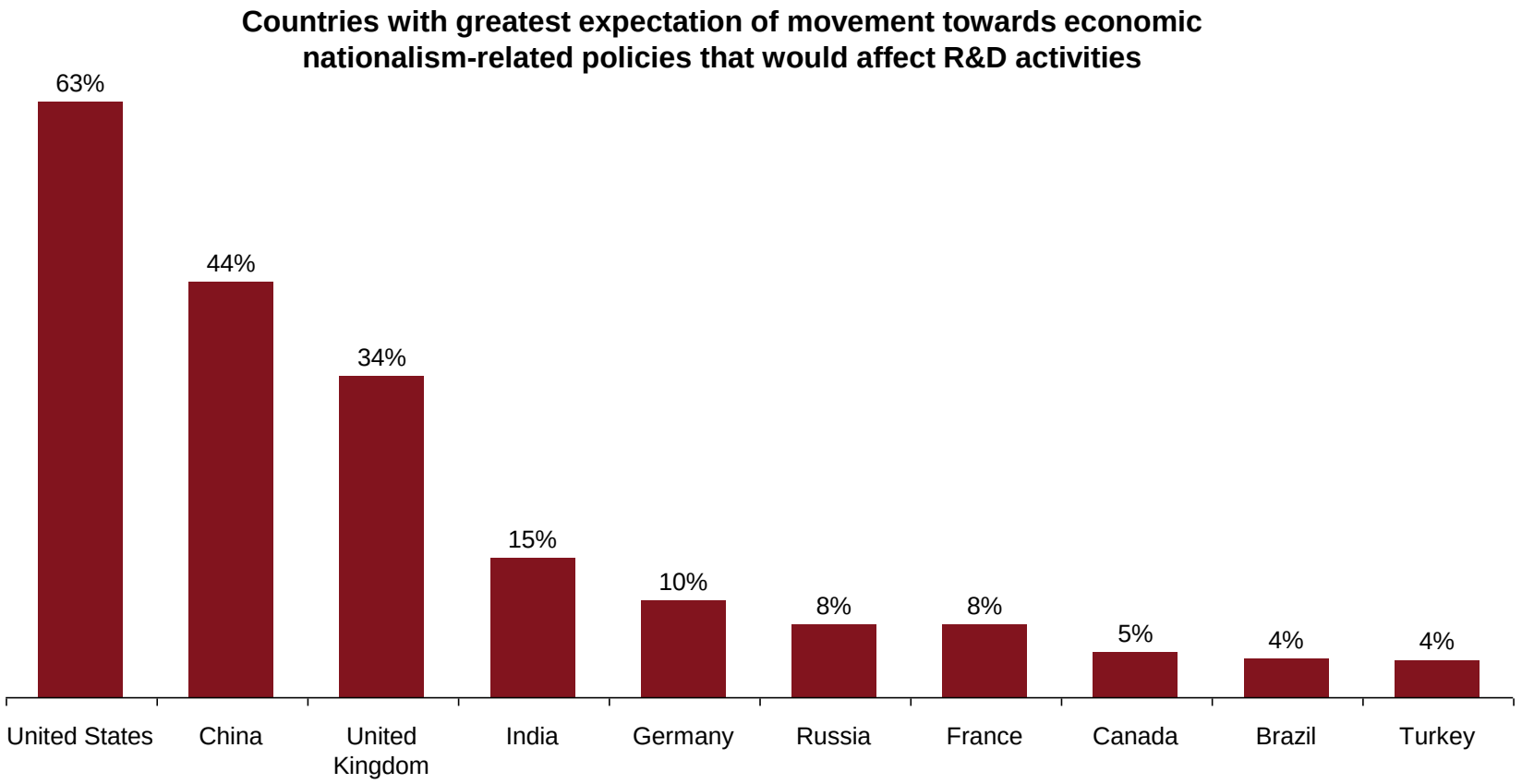
- Companies are concerned about the effects of economic nationalism and some are already seeing the effects on their businesses
- The **US, China, and the UK** are viewed as **having the greatest movement to economic nationalism** and are the same countries **whose R&D programs are most at risk**. Canada, Germany, and France will most likely gain from broad economic nationalism in R&D
  - **US's talent flow is most at risk** for disruption if policy in granting student and work visas becomes restrictive. Immigrants in the US hold a large share of jobs in the high-tech, science and engineering sectors as well as making up a large share of enrollment in engineering programs
  - **UK's talent flow** is also at risk in the same way the US's is. Weaker R&D programs in the UK could also have a ripple effect across the region
  - **China's corporate R&D** spending had experienced double-digit growth rates for many years, but in 2017 the country saw a 3.3% decline in corporate R&D spending for the first time. 81% of China's R&D spend in 2015 was performed by companies headquartered in other countries. The combination of these trends for China makes the country **vulnerable to potential disruptions of R&D investment coming from abroad**
- A little over **one half of companies expect a moderate to significant impact to their R&D** and innovation efforts and **almost half of the companies in North America** and **the rest of the world plan to make changes to their R&D programs** over the **next two years**
- **High performers are more likely to anticipate changes,** and they are also **more likely to take action. Middling** and **under performers were the most doubtful** that **economic nationalism would require changes** in their R&D efforts. Interestingly, under performers were most likely to take action that could be harmful to their overall R&D efforts
- Economic nationalism would result in the **replacement of today's integrated and interdependent network with more self-sufficient, fully-functioning R&D nodes**. Companies will need to look for ways to manage the higher costs they will incur with this model

Executive Summary – Update on Top 1000 companies

- In 2017 total **R&D spending** by the Global Innovation 1000 **increased 3.2% to $701.6B, exceeding $700B for the first time**
- **R&D intensity spiked to its all-time study high of 4.5%,** with revenue for the 1000 companies falling by 2.5% - driven by the 14.5% decline in Chemicals & Energy revenue
- **Software and internet industry continues to experience high year-over-year growth**, up 16.1% this year while Healthcare, the second fastest growth industry for R&D spending grew 5.9%
- **Healthcare companies are on track to become the biggest R&D spenders** by 2018
- **Computing and electronics, Healthcare, and Auto** contributed **61.3% of R&D spending in 2017**, almost the same as in 2016
- Regionally, **Japanese firms grew R&D spend for the first time in 5 years**, US continued its upward growth and China, who enjoyed years of double-digit R&D growth, saw a 3.3% decline in R&D spending for the first time in the study*
- **Amazon moved from number 3 in 2016 to become the largest R&D spender in 2017**. It is one of nine high-tech companies on the top 20 list, and one of 13 companies headquartered in the United States
- For the first time, **Alphabet surpassed Apple as the Most Innovative company and Alibaba joins the ranking** for the first time
- Companies selected by survey respondents as **the most innovative companies continue to outperform** the top 20 R&D spenders

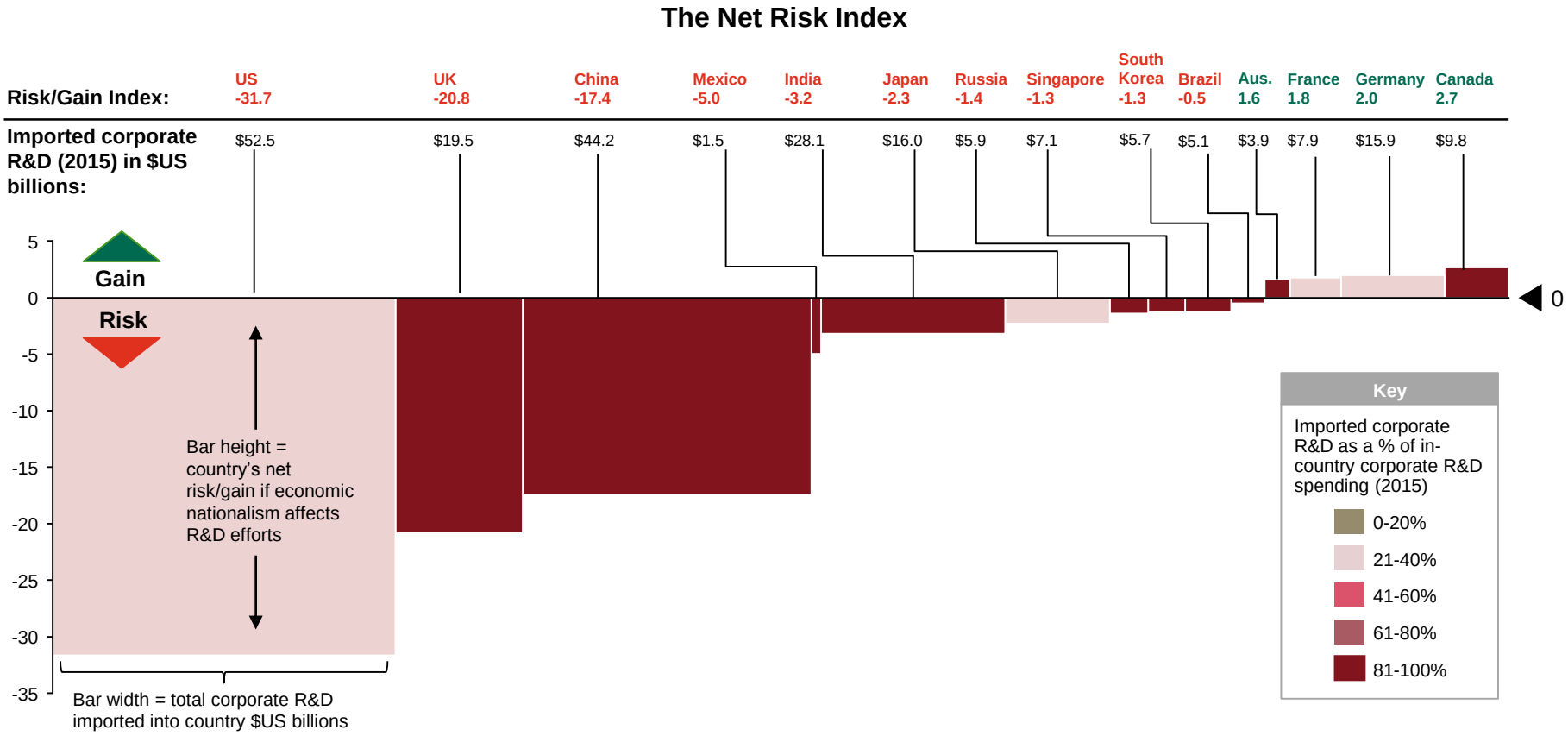
**Use of local currency would result in different YoY changes*

Companies viewed the US, China, and the UK as having the greatest movement towards economic nationalism-related policies that will affect R&D



Q21. Which three countries do you expect to have the greatest movement toward more economic nationalism–related policies that would affect corporate R&D activities?
N=562, N= total number of survey respondents
*China includes Hong Kong for all China data points

The US, UK, and China are most at risk while Canada, Germany, and France will most likely gain from broad economic nationalism in R&D



Q22. Which three countries do you believe will be the most put at economic risk if more economic nationalism-related policies affecting R&D efforts are widely adopted?
Q22a Which three countries do you believe will be the most helped economically if more economic nationalism-related policies affecting R&D efforts are widely adopted?
N=562
Source: 2017 and 2015 Global Innovation 1000 study

US, UK, and China are most at risk while Canada, Germany, and France will most likely gain (…continued)

United States

- The US's talent flow will be disrupted if there is a move towards restrictive policy in granting student and work visas
- Immigrants in the US hold a large share of jobs in the high-tech, science, and engineering sectors
- Enrollment in US engineering programs are predominantly made up of immigrants (81% electronical engineering and 79% computer science)*

United Kingdom

- Like the US, the UK's flows in talent is also vulnerable if there are barriers to recruiting engineers from other EU countries
- Britain is already experiencing an existing shortage of skilled workers
- Weaker R&D programs in the UK could have a ripple effect across the region

China

- Corporate R&D spending in China experienced double digit growth rates for many years, but in 2017 the country saw a 3.3% decline in R&D spending for the first time in the study
- 80% of R&D spending in China in 2015 was done by companies headquartered in other countries (mainly from the US)
- These trends for China makes the country vulnerable to potential disruptions of R&D investment coming from abroad

Top 3 countries to gain

Canada

- Canada is looking to attract international innovation talent to its university system as the US tightens visa and immigration programs
- Is an attractive alternative for multinationals like Microsoft who opened a new R&D center in downtown Vancouver in 2016 with 750 R&D positions

Germany

- Germany has repeatedly reiterated its pro-globalization policy stance
- The country was ranked as the second country that is most likely to gain from a move towards economic nationalism by survey respondents

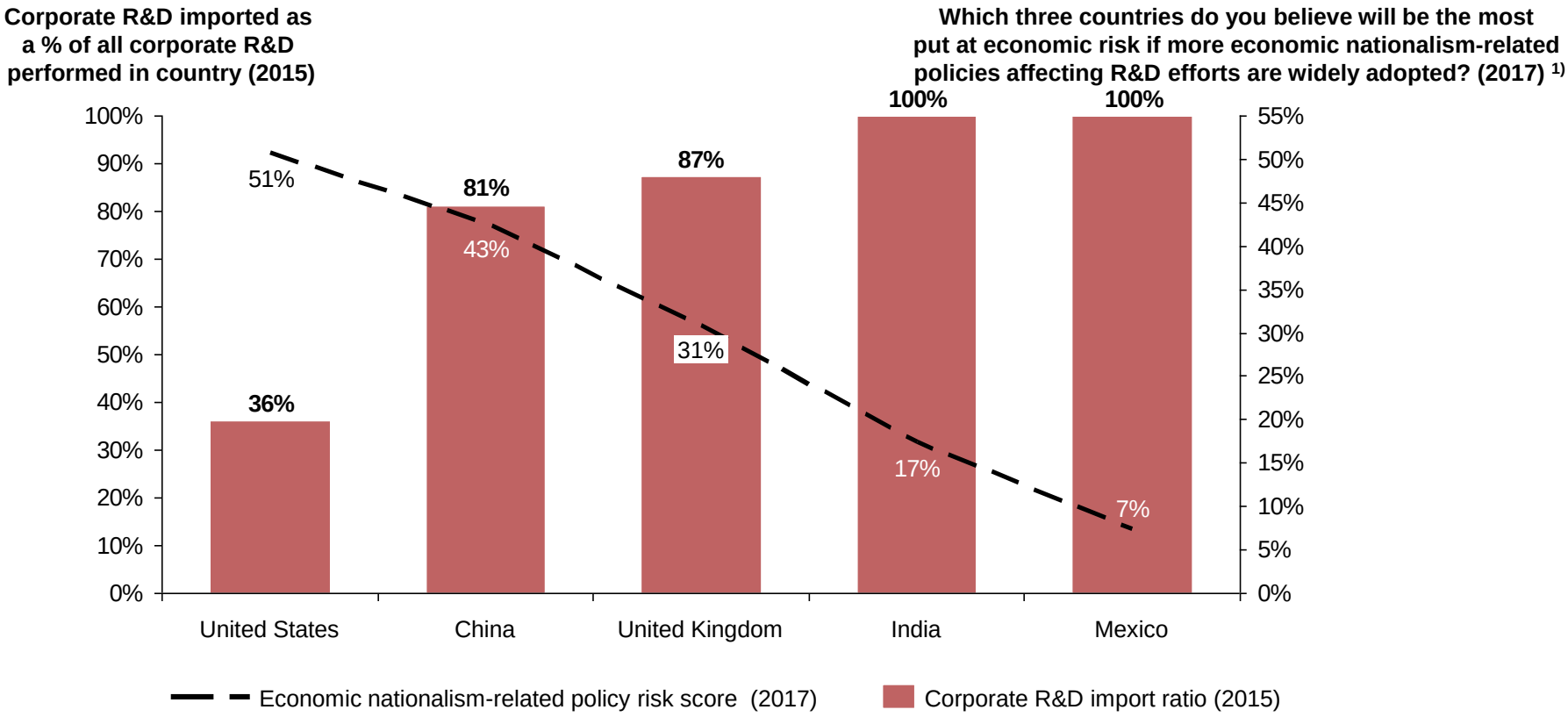
France

- Newly elected president Emmanuel Macron ran on a platform stressing the importance of innovation for the French economy
- France was ranked as the third country mostly likely to gain from broad economic nationalism by survey respondents

Source: 2017 Global Innovation 1000 study, National Foundation for American Policy

Executives may not be considering R&D flows in assessing who is most at risk from economic nationalism-related policies

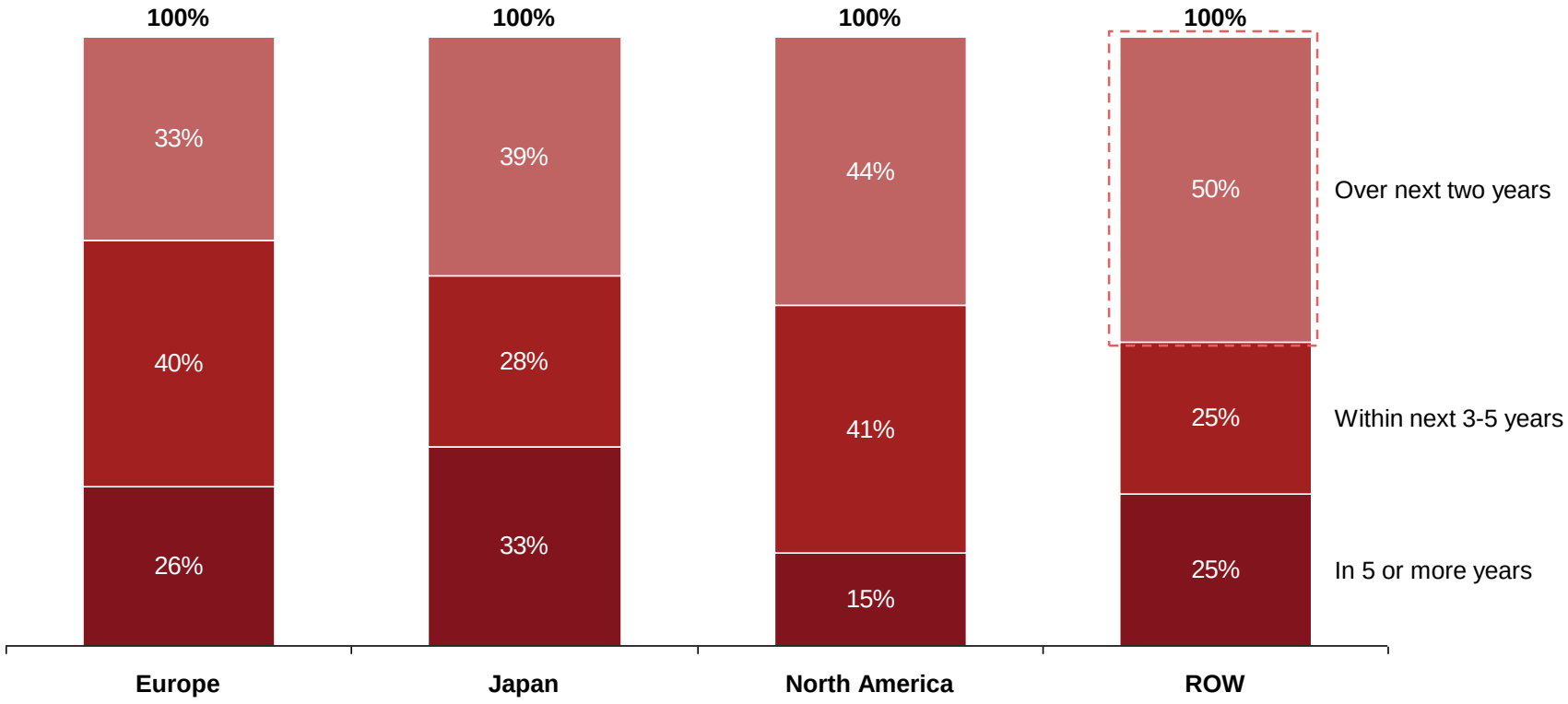
Economic nationalism-related policy risk score vs. corporate R&D import ratio



Source: 2015 and 2017 Global Innovation 1000 Studies
1) N=562

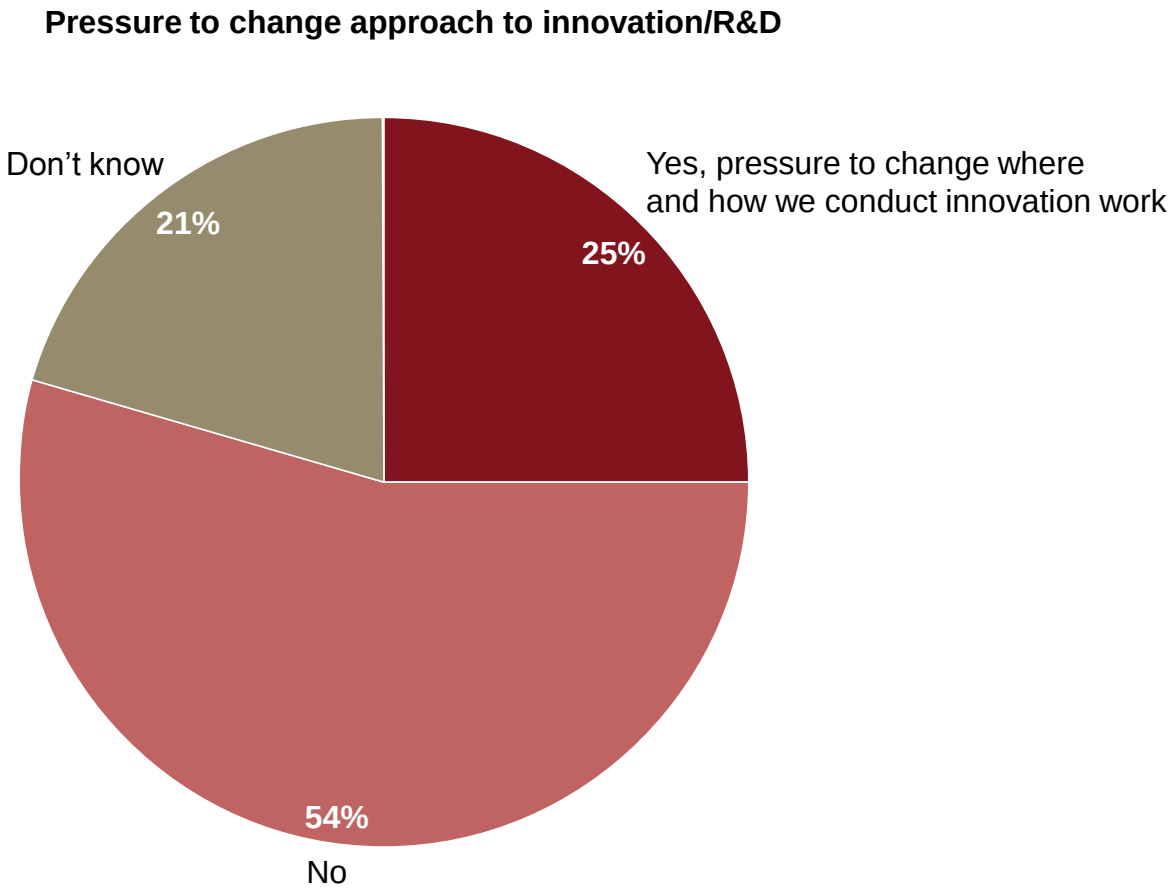
North America and the rest of the world companies believe their companies will make changes to R&D over the next two years

When companies are likely to changes its R&D efforts if there is a move towards economic nationalism



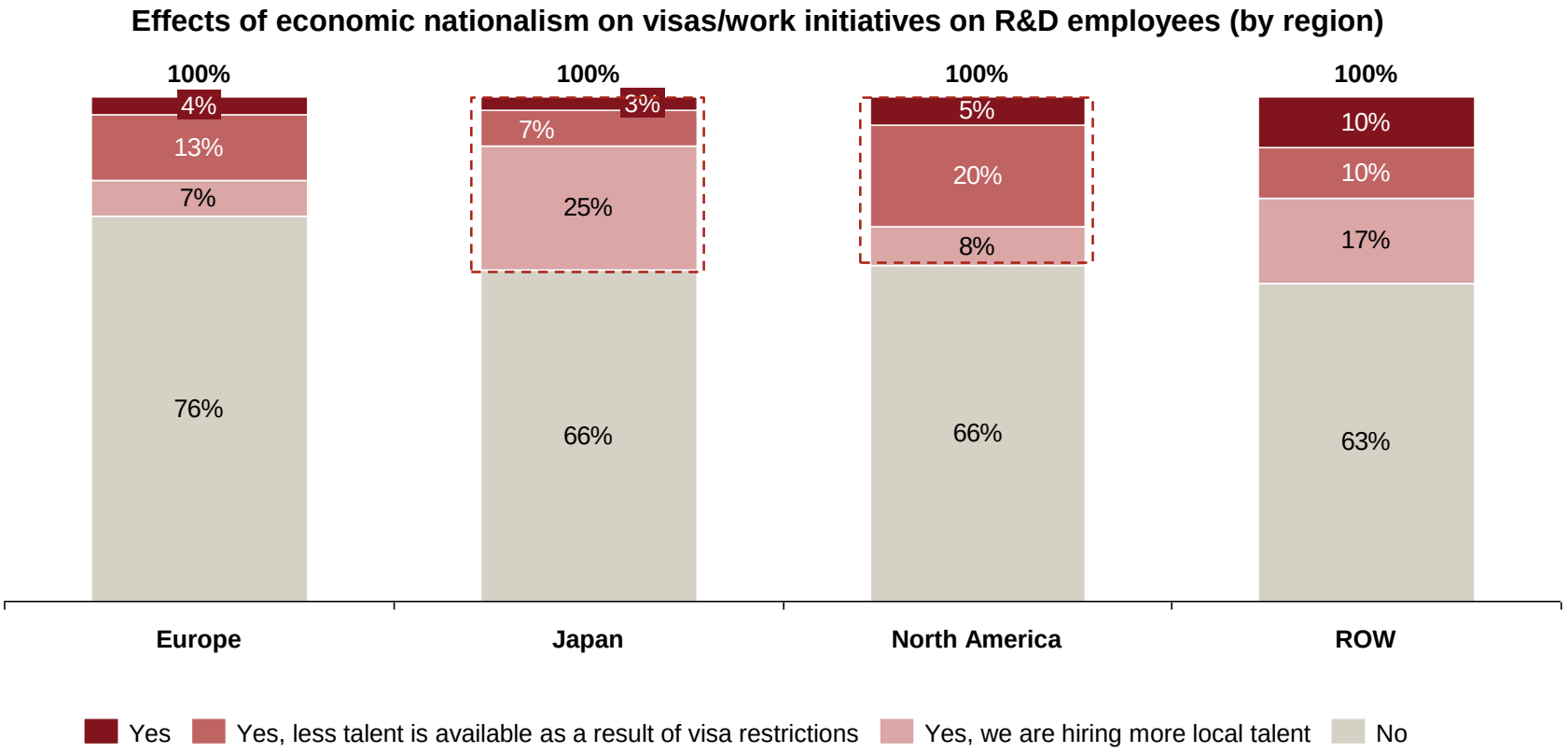
Q18. What changes would your company likely consider making to its R&D/innovation efforts if there is a move toward greater economic nationalism? And when?
N=379 (China region and Respondents with "No opinion" are not included)
Note: Due to rounding, not all columns will add up to 100%

One-fourth of companies have already experienced some pressure to change how or where they conduct innovation



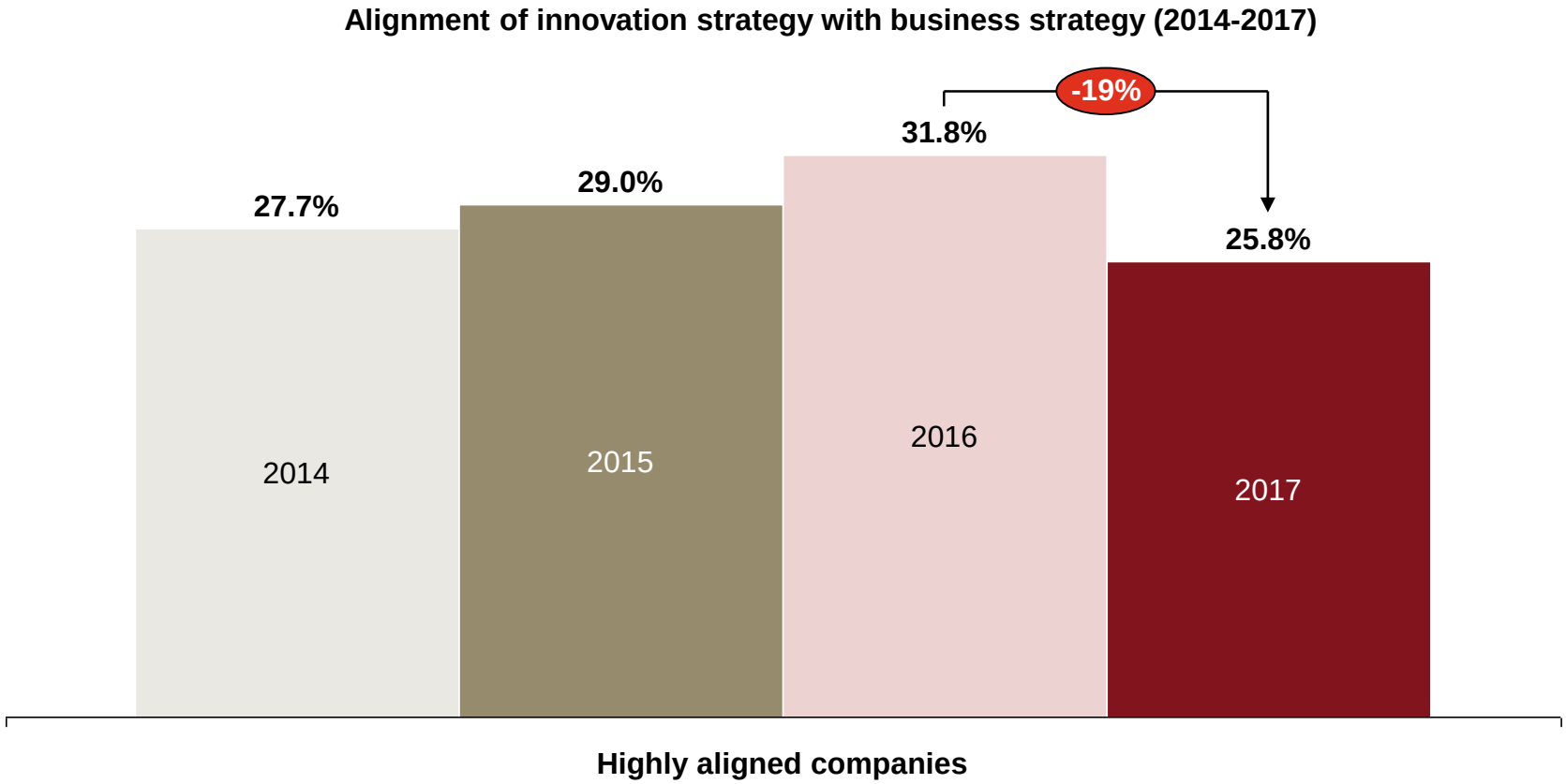
Q17. Has your company experienced pressure to change any element of its approach to innovation/R&D work as a result of economic nationalism in Your company's headquarters: and Any other country?
N=562

Japanese and North American companies are experiencing hiring challenges as a result of economic nationalism…



Q20. As a consequence of economic nationalism, has your company experienced any new or greater visa restrictions or work limitations on R&D employees?
N=557 (China region is not considered)

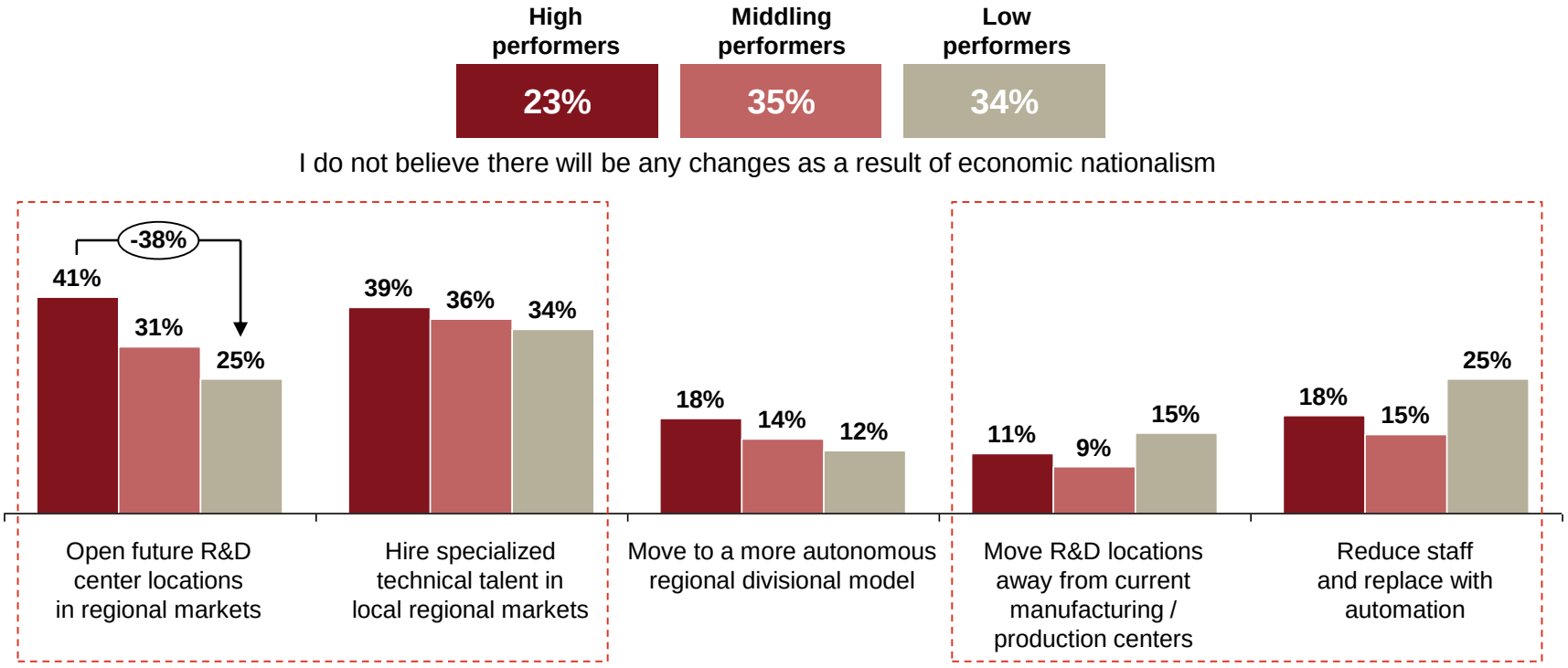
Uncertainty in economic policy could be the reason companies' high alignment between innovation strategy and business strategy dipped this year



Q10. How closely aligned is your company's innovation strategy (or approach to innovation) with its overall business strategy?
N=562

High performers are more likely to anticipate changes, and they are also more likely to take action while middling and low performers are more doubtful of changes

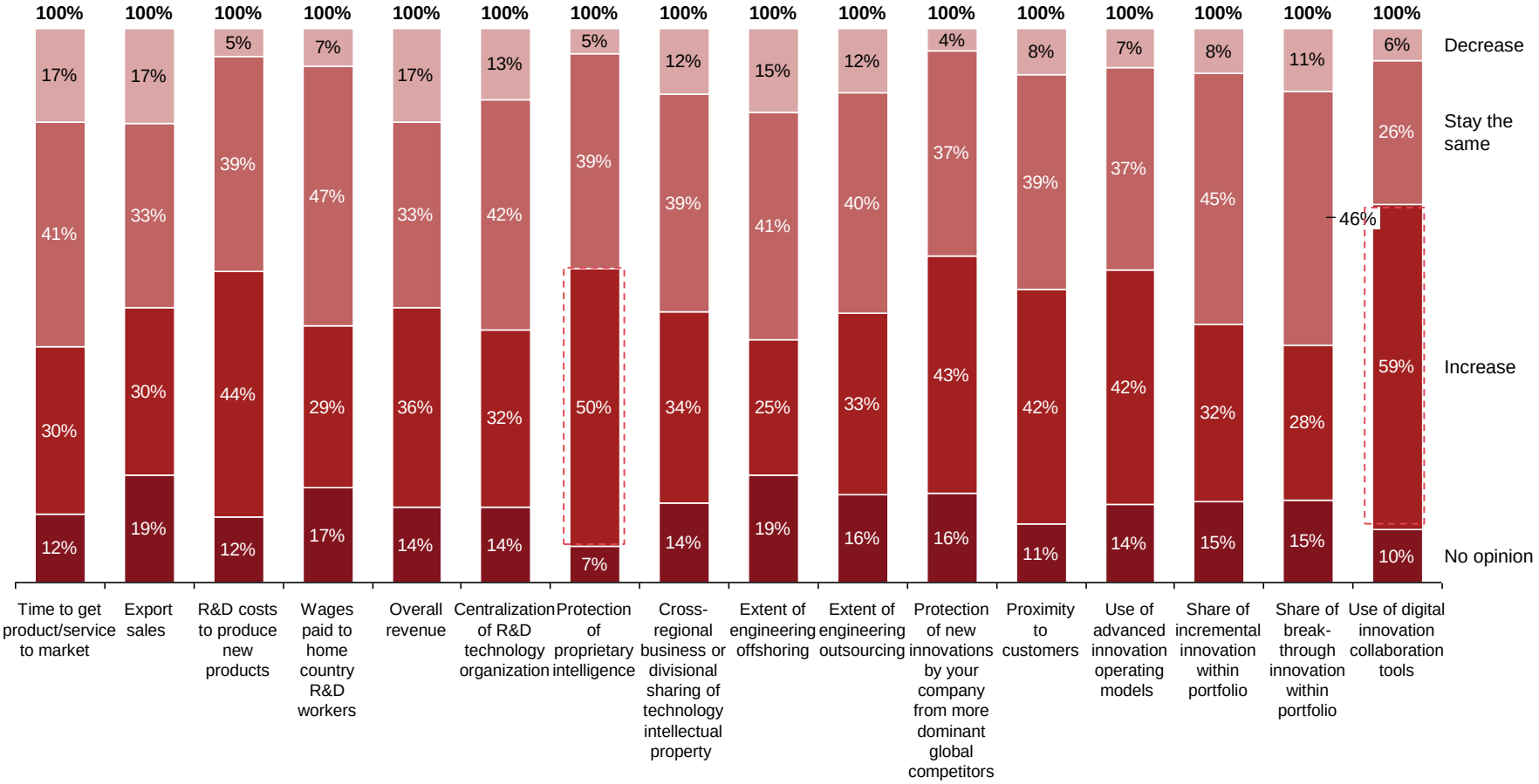
Likelihood of making a change in R&D/Innovation efforts if there is a move towards greater economic nationalism by perception of revenue growth



Q18. What changes would your company likely consider making to its R&D/innovation efforts if there is a move toward greater economic nationalism? And when?
Q11. How do you believe your company is performing relative to its key competitors?
N=562

As a result of economic nationalism, companies are going to be more digitally collaborative and protective of proprietary intelligence

Effects of economic nationalism on aspects of your innovation program

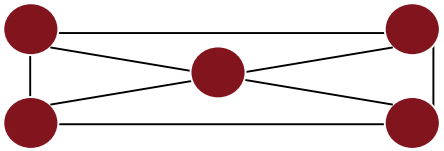


Q19. How do you expect the following aspects of your innovation program to change with increased economic nationalism ?
N=562, For “Protection of proprietary intelligence”, N=412 (As the question was not asked in Japanese survey)

Economic nationalism would result in the replacement of today's integrated and interdependent network with more self-sufficient R&D nodes

Integrated and interdependent network

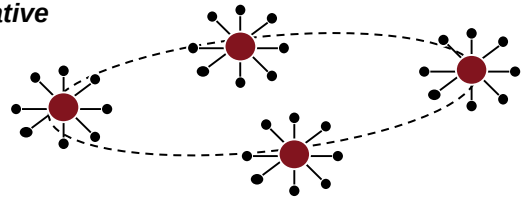
Illustrative



- The global innovation model involves the free flow of information, money, and talent across borders
- Today's global innovation model would need to evolve if there is a move towards economic nationalism
- In the 2015 Global Innovation 1000 study, we found that more and more companies look for talent outside their headquarters country and set up R&D centers close to their target markets
- The distributed elements of the global innovation model are connected by a strong central R&D organization while maintaining fluidity throughout the network

Self-sufficient, fully-functioning R&D nodes

Illustrative



- It is likely that today's global innovation model would be replaced with self-sufficient R&D nodes
- Companies will need to look for ways to manage the higher costs that will incur with this model
- Business leaders will need to consider these items in their contingency plans:
  - Potential realignment of business and innovation strategies and how a more autonomous and redundant R&D network would operate
  - How to staff and resource R&D centers
  - How to prepare R&D centers to be more self-sufficient
  - Consider whether or not there is access to the digital tools that are needed to maintain communication and efficiency

Introduction

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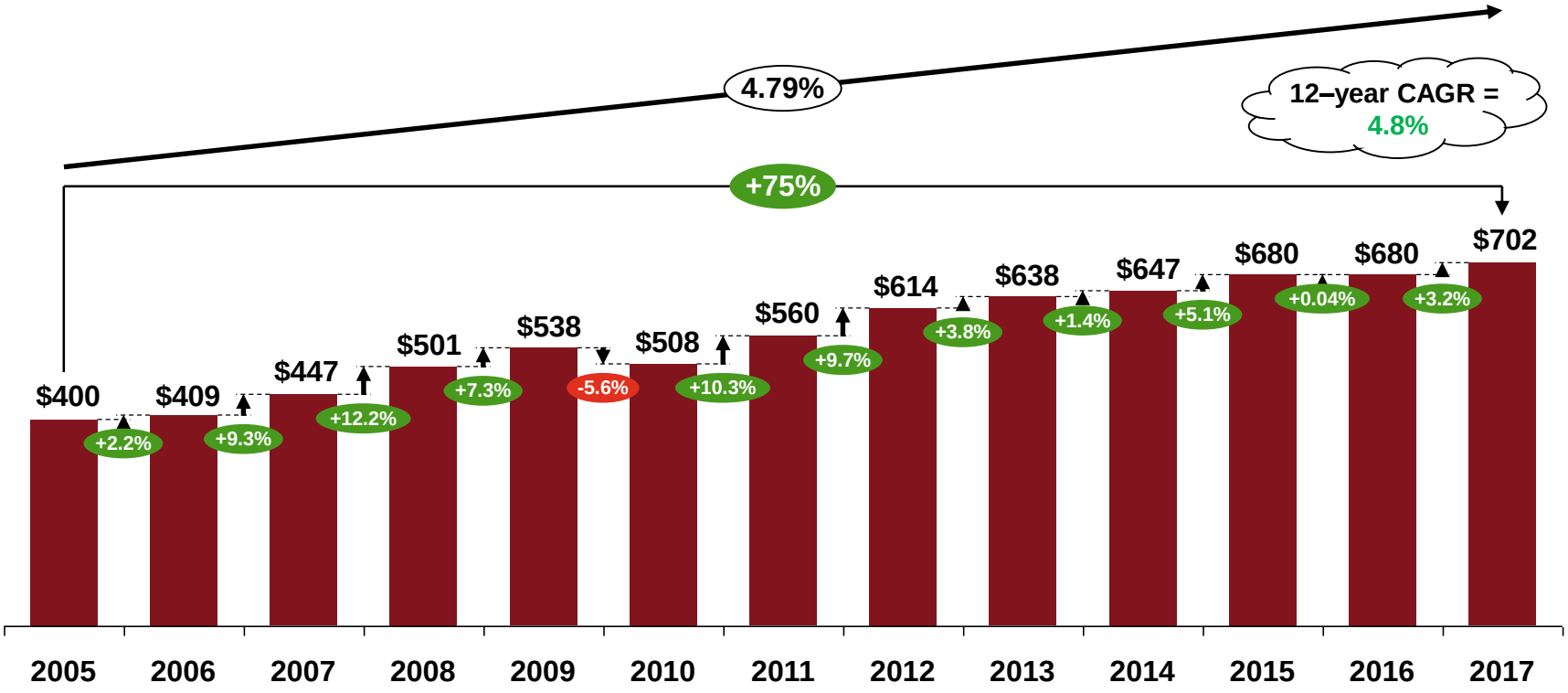
Innovation 1000 update

In 2017, R&D spending of the Top 1000 companies exceeded $700B for the first time

Global Innovation 1000 R&D Spending

2005–2017, $US Billion

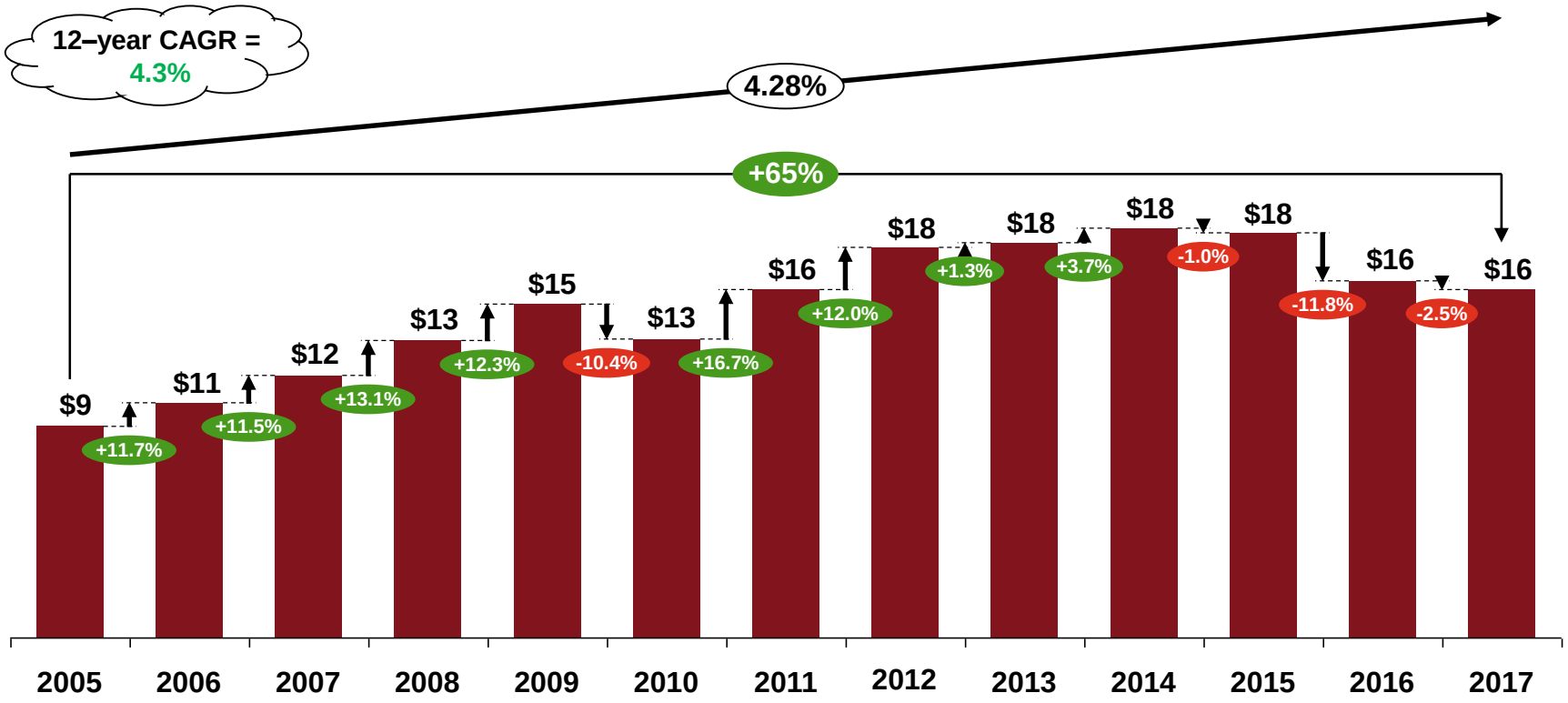


Source: Bloomberg data, Capital IQ data, 2017 Global Innovation 1000 Study

Total revenue for the Innovation 1000 fell by 2.5% from 2016 to 2017

Global Innovation 1000 Revenue

2005–2017, $US Trillion

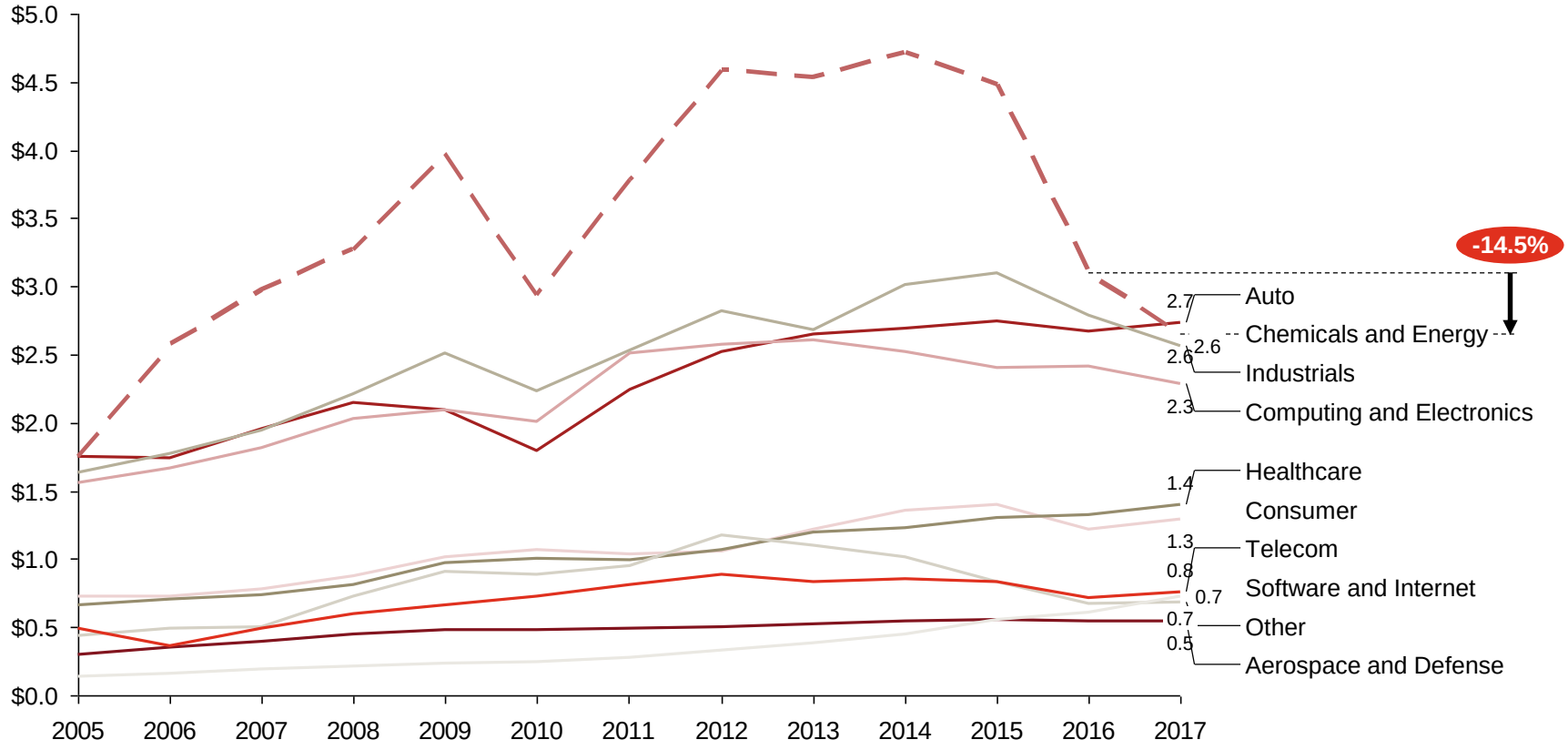


Source: Bloomberg data, Capital IQ data, 2017 Global Innovation 1000 Study

This was primarily due to falling revenue from the Chemicals & Energy industry

Revenue by Industry

2005–2017, $US Trillion

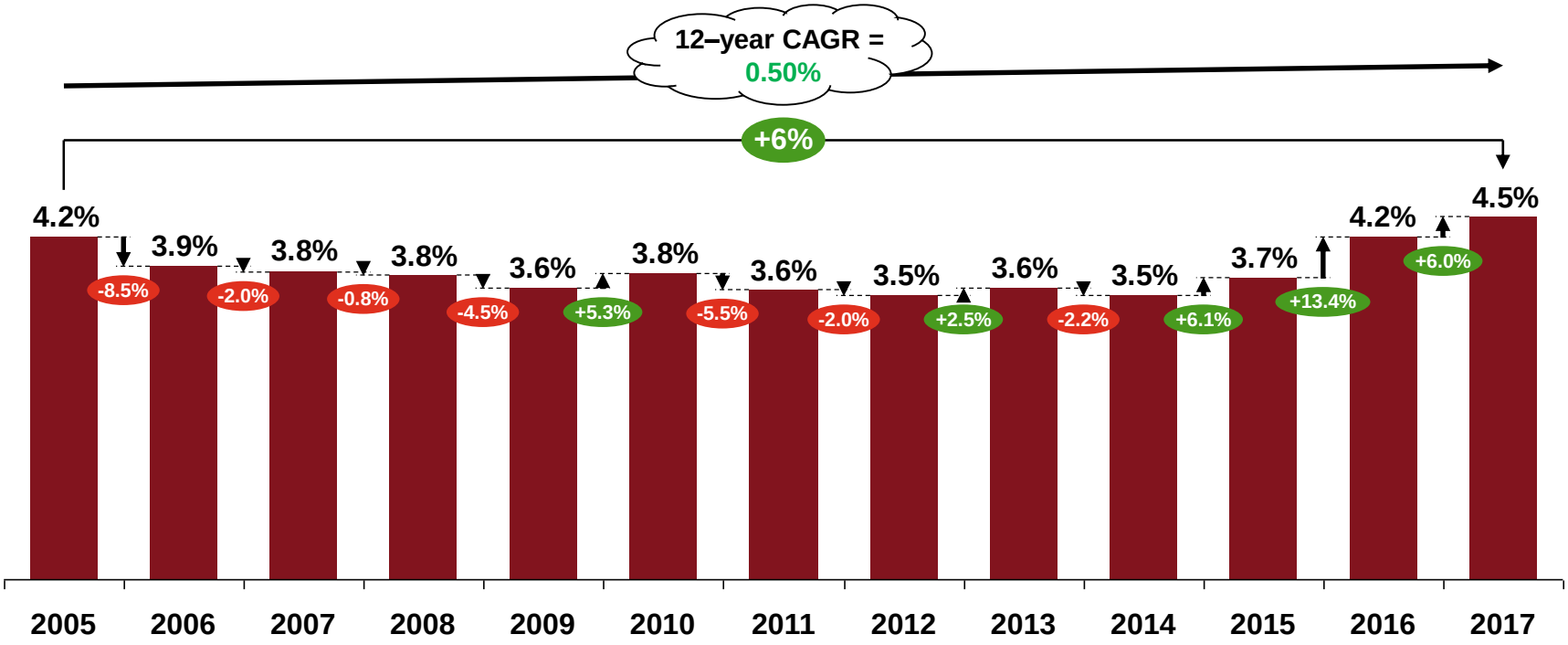


Source: Bloomberg data, Capital IQ data, 2017 Global Innovation 1000 Study

R&D intensity sees year-over-year growth of 6%, reaching an all-time study high of 4.5%

Global Innovation 1000 R&D Intensity

2005–2017

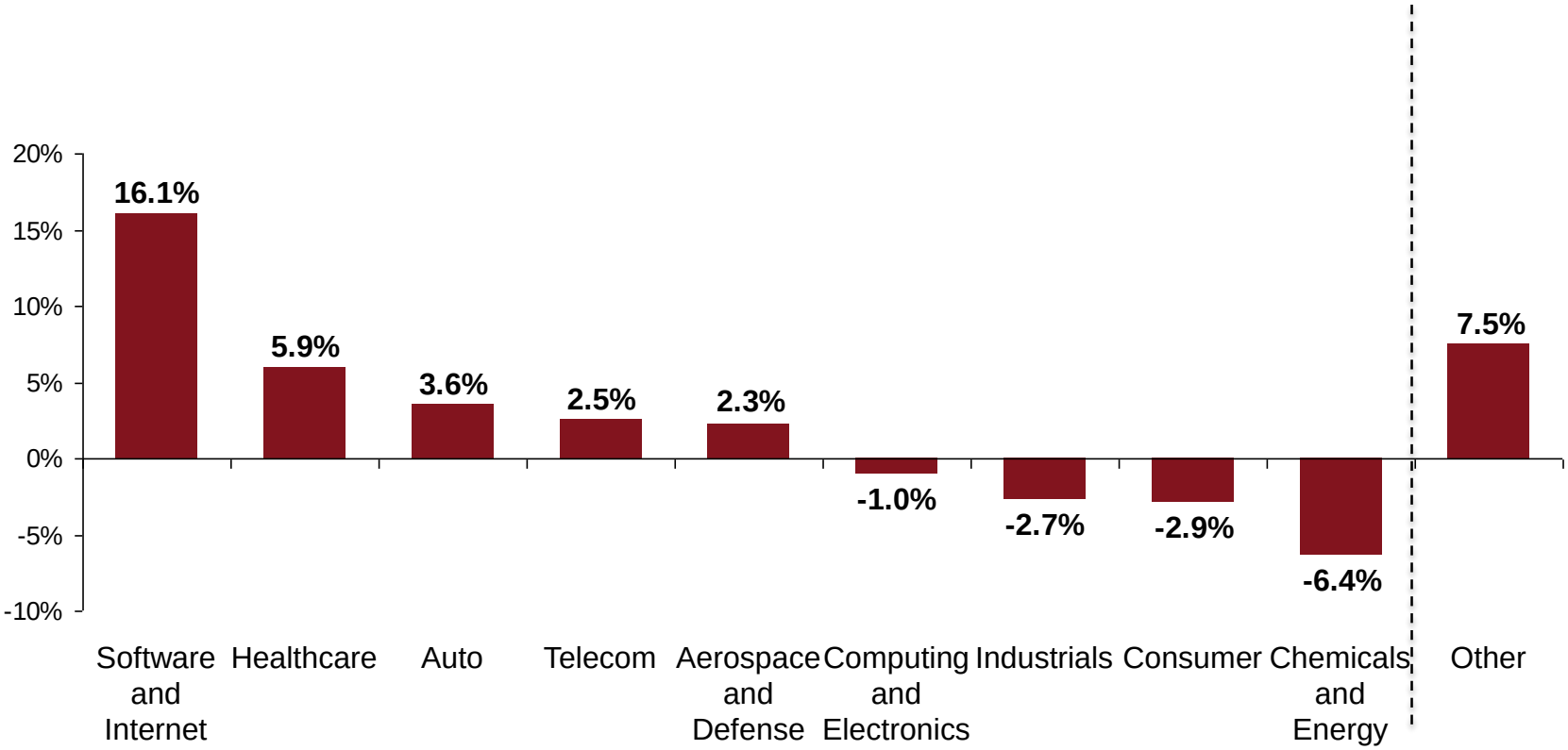


Source: Bloomberg data, Capital IQ data, 2017 Global Innovation 1000 Study

Software & Internet continues to experience significant year-over-year growth

Change in R&D Spending by Industry

2016–2017

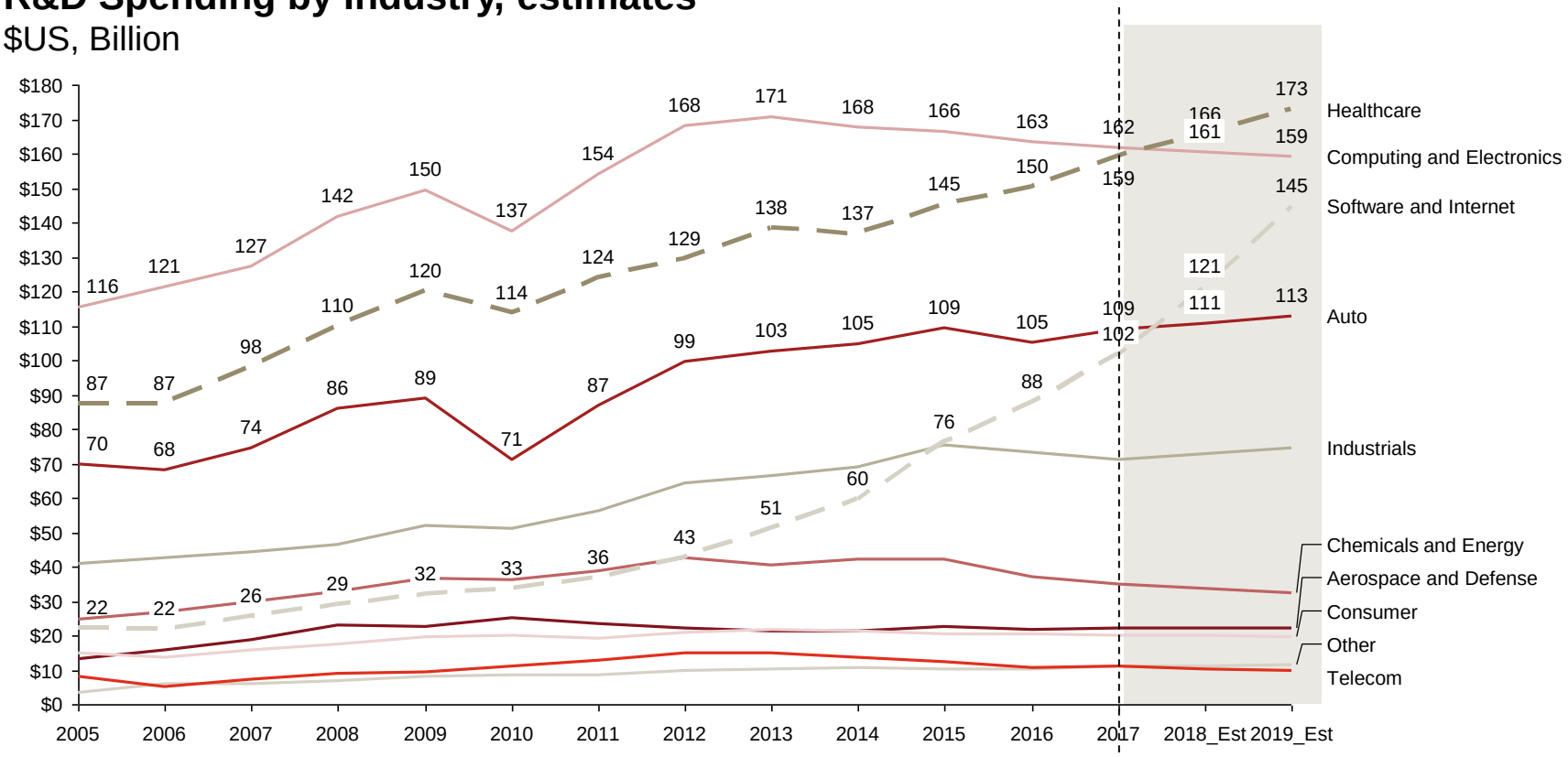


Source: Bloomberg data, Capital IQ data, 2017 Global Innovation 1000 Study

By 2018, Healthcare will surpass Computing & Electronics to become the top industry

R&D Spending by Industry, estimates

$US, Billion



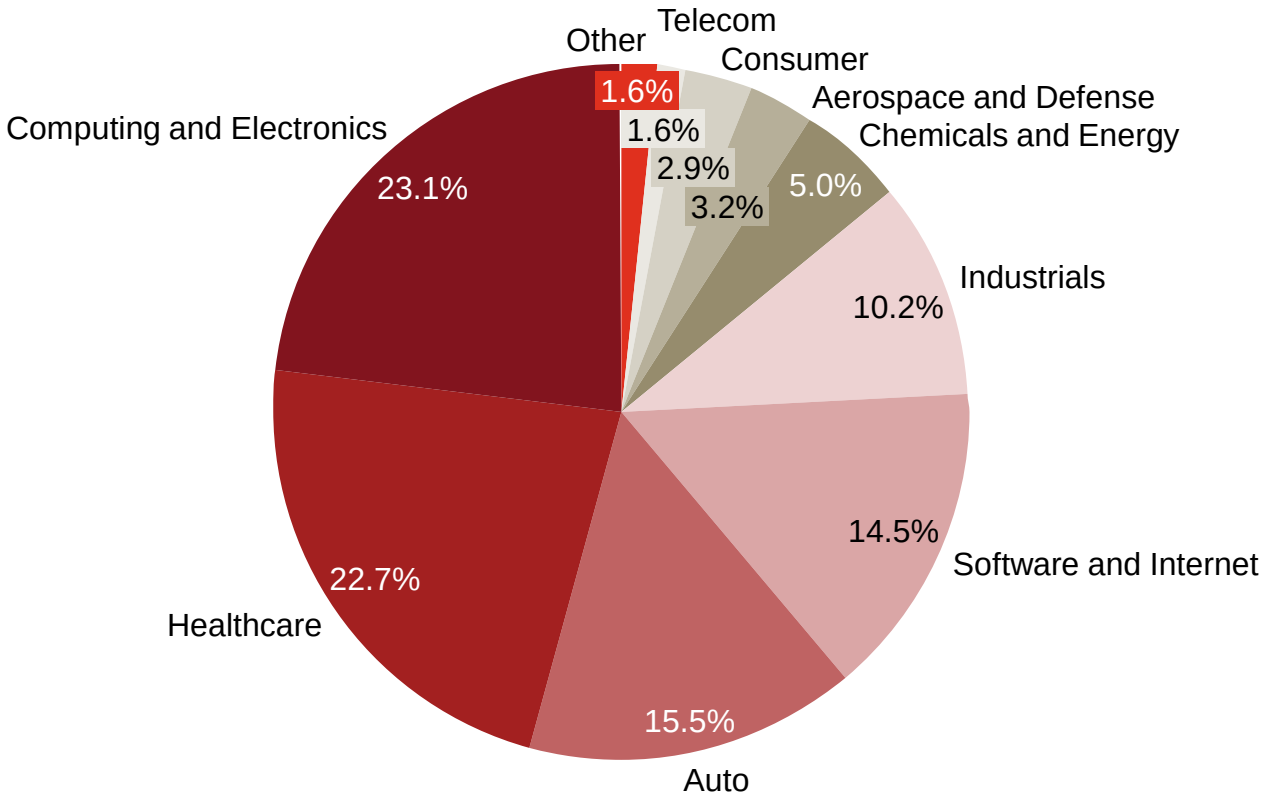
** CAGR Value is calculated for last 5 years span from 2012 to 2017*

Source: Bloomberg data, Capital IQ data, 2017 Global Innovation 1000 Study

Computing & Electronics, Healthcare, and Auto contributed 61.3% of R&D spending in 2017, almost the same as in 2016

2017 R&D Spending by Industry

Total = $701.6 Bn

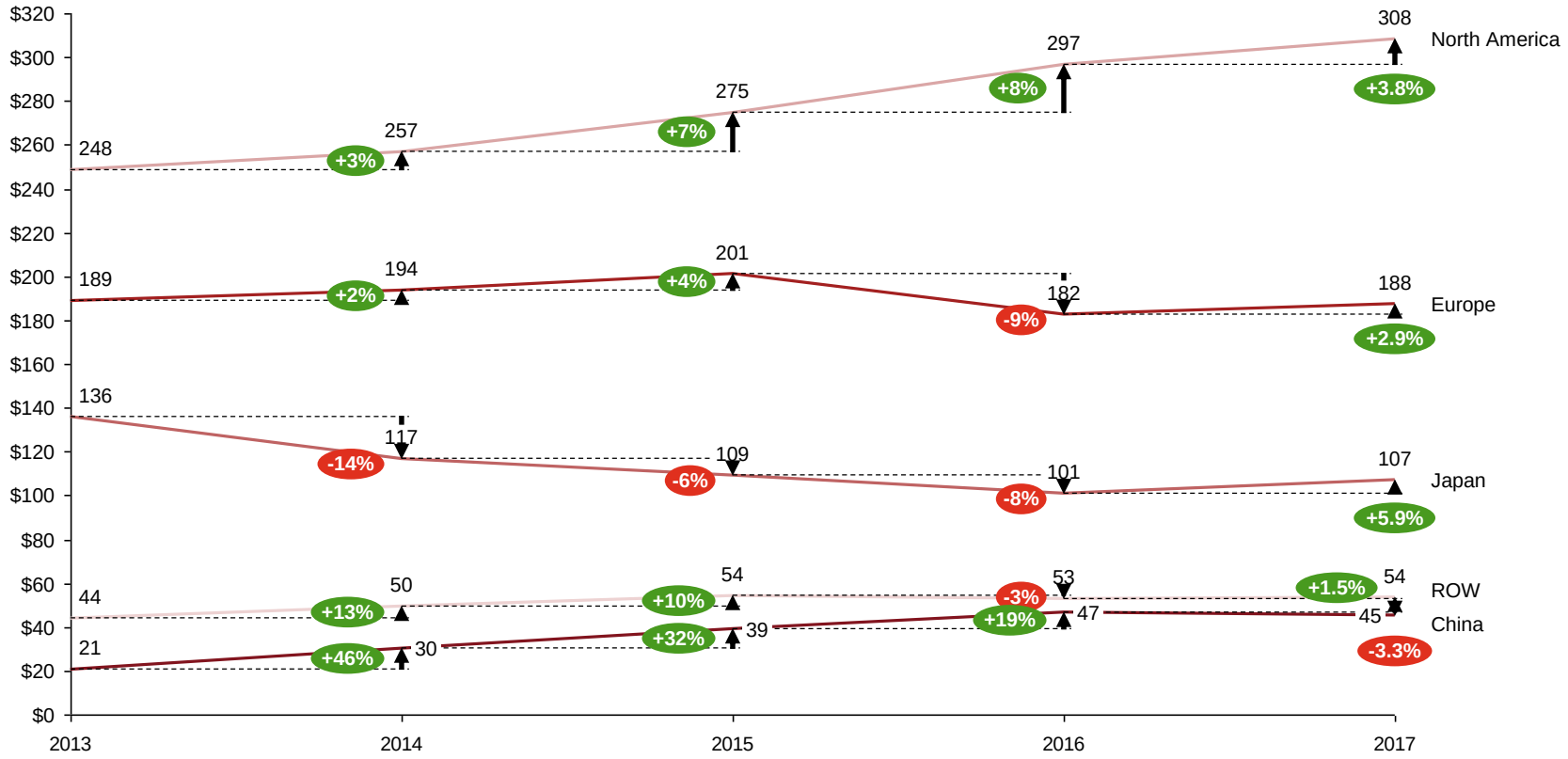


Source: Bloomberg data, Capital IQ data, 2017 Global Innovation 1000 Study

Japan sees real growth for the first time while China sees a decline in spending for the first time and North America continues to grow

R&D Spending by Region

2013–2017, $US Billion

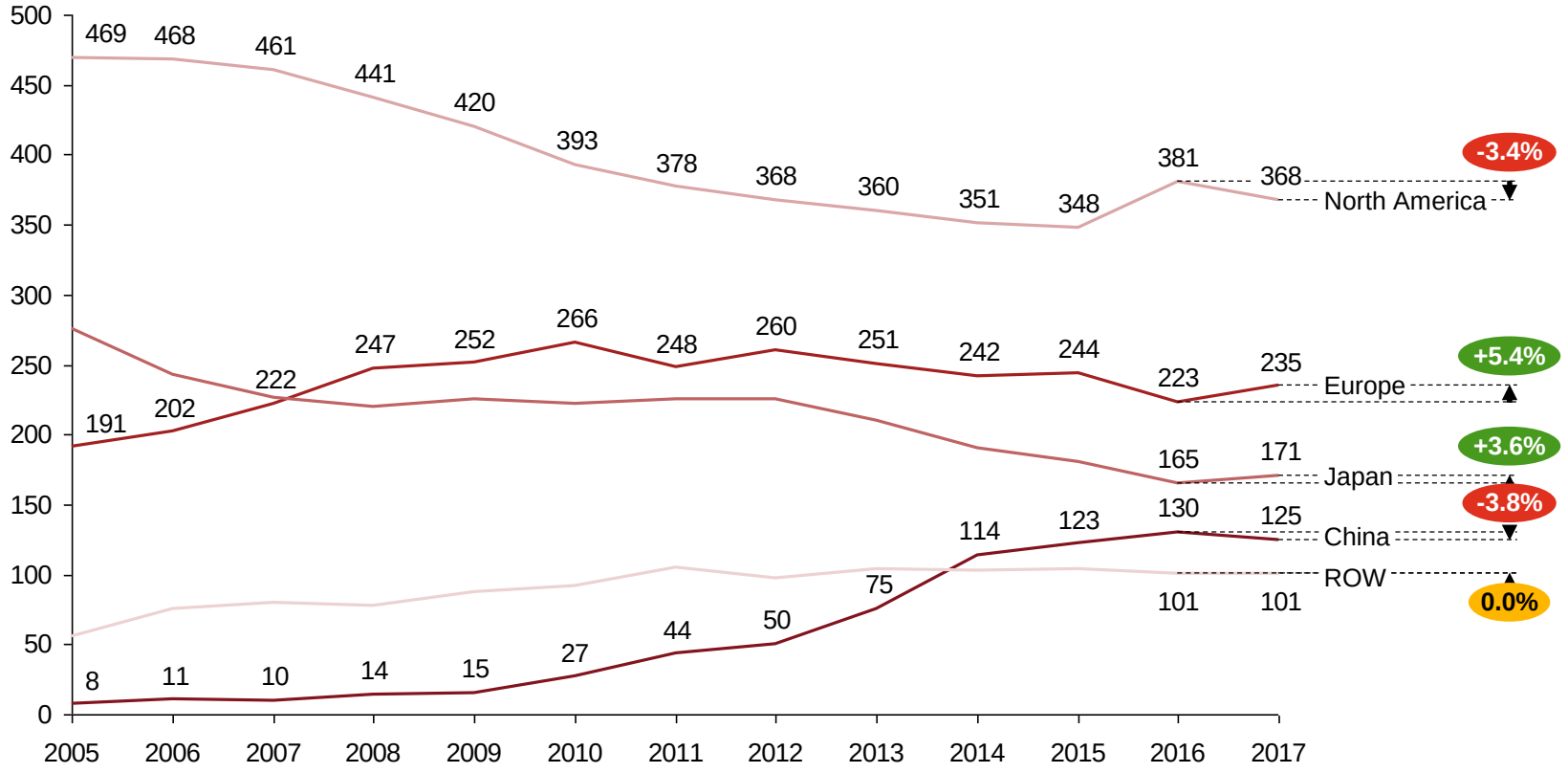


Notes: 1) Whenever China is called out in region data it always includes Hong Kong 2) *Use of local currency would result in different YoY changes
Source: Bloomberg data, Capital IQ data, 2017 Global Innovation 1000 Study

Europe and Japan increased the number of companies in the Top 1000 – for Japan, this is the first time in five years while China saw a decrease in number of companies for the first time

Number of Companies in the Top 1000 by Region

2005–2017



Source: Bloomberg data, Capital IQ data, 2017 Global Innovation 1000 Study

This is the first time the top spender is a high tech firm; Honda and Facebook join the Top 20 Spender ranking

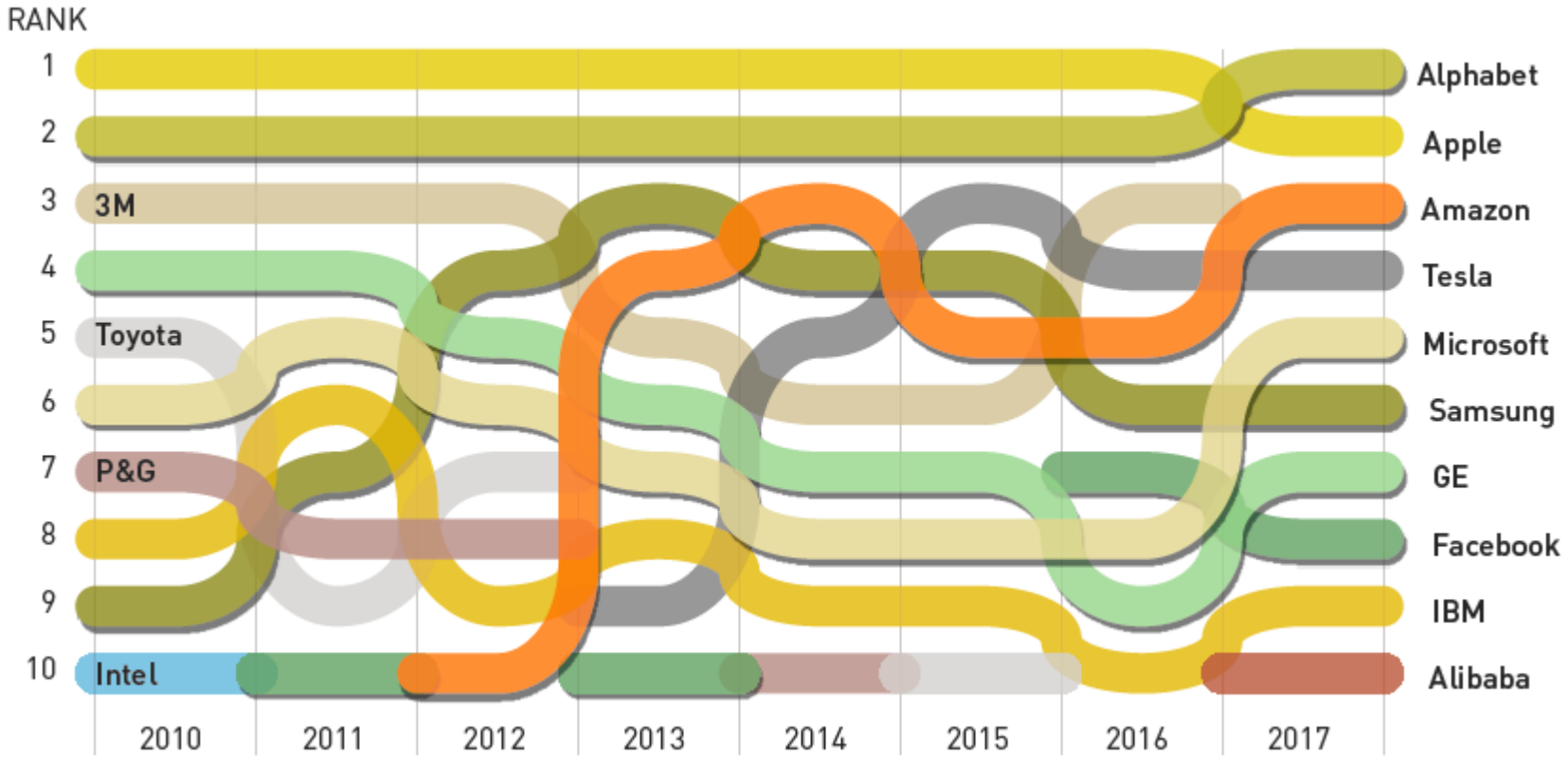
Top 20 R&D Spenders

Rank in 2017	Rank in 2016	Change	Company	Geography	Industry	R&D spending (US$ Billions)	Revenue (US$ Billions)	R&D Intensity
1	3	**+2**	Amazon.com, Inc.	North America	Software and Internet	16.1	136.0	11.8%
2	4	**+2**	Alphabet Inc.	North America	Software and Internet	13.9	90.3	15.5%
3	5	**+2**	Intel Corporation	North America	Computing and Electronics	12.7	59.4	21.5%
4	2	**-2**	Samsung Electronics Co., Ltd.	South Korea	Computing and Electronics	12.7	167.7	7.6%
5	1	**-4**	Volkswagen AG	Europe	Auto	12.1	229.4	5.3%
6	6	NA	Microsoft Corporation	North America	Software and Internet	12.0	85.3	14.1%
7	7	NA	Roche Holding AG	Europe	Health	11.4	51.8	21.9%
8	14	**+6**	Merck & Co., Inc.	North America	Health	10.1	39.8	25.4%
9	11	**+2**	Apple Inc.	North America	Computing and Electronics	10.0	215.6	4.7%
10	8	**-2**	Novartis AG	Europe	Health	9.6	49.4	19.4%
11	10	**-1**	Toyota Motor Corporation	Japan	Auto	9.3	247.5	3.8%
12	9	**-3**	Johnson & Johnson	North America	Health	9.1	71.9	12.7%
13	13	NA	General Motors Company	North America	Auto	8.1	166.4	4.9%
14	12	**-2**	Pfizer Inc.	North America	Health	7.9	52.8	14.9%
15	15	NA	Ford Motor Company	North America	Auto	7.3	151.8	4.8%
16	16	NA	Daimler AG	Europe	Auto	6.9	161.8	4.2%
17	20	**+3**	Oracle Corporation	North America	Software and Internet	6.8	37.7	18.1%
18	17	**-1**	Cisco Systems, Inc.	North America	Computing and Electronics	6.3	49.2	12.8%
19	23	**+4**	Honda Motor Co., Ltd. New	Japan	Auto	6.2	125.6	4.9%
20	27	**+7**	Facebook, Inc. New	North America	Software and Internet	5.9	27.6	21.4%
					Total	**194.5**	**2217.0**	**8.8%**

Companies in red have been among the top 20 R&D spenders every year since 2005
Source: Bloomberg data, Capital IQ data, 2017 Global Innovation 1000 study

For the first time, Alphabet surpasses Apple as the Most Innovative Company; Alibaba joins the ranking

10 Most Innovative Companies

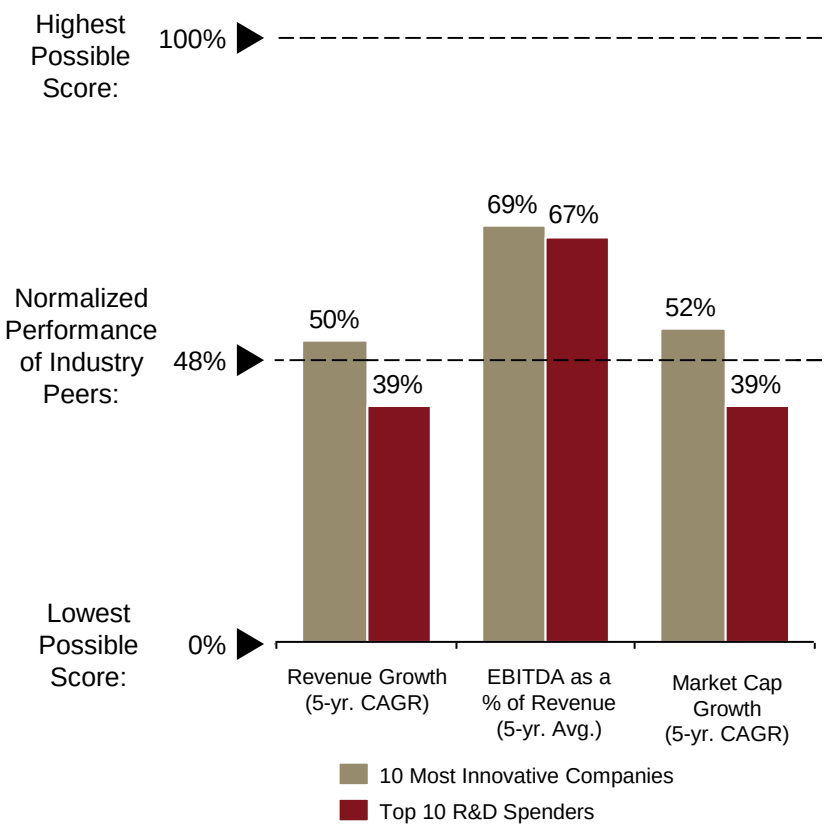


Source: Strategy& 2017 Global Innovation 1000 analysis
Q23. In your opinion, what are the three most innovative companies in the world? Please choose from the drop-down menu or choose “Other” to write in your recommendation.
N=562
*In 2015, Google announced a corporate restructuring forming an umbrella company called Alphabet

Once again, the 10 Most Innovative Companies outperform the Top 10 R&D Spenders on financial metrics

10 Most Innovative Companies vs. Top 10 R&D Spenders*

Rank	10 Most Innovative Companies	2017 R&D spend (US$ Bn)	R&D intensity	Top 10 R&D Spenders	2017 R&D spend (US$ Bn)	R&D intensity
1	Alphabet Inc.	13.9	15.5%	Amazon.com, Inc.	16.1	11.8%
2	Apple Inc.	10.0	4.7%	Alphabet Inc.	13.9	15.5%
3	Amazon.com, Inc.	16.1	11.8%	Intel Corporation	12.7	21.5%
4	Tesla, Inc.	0.8	11.9%	Samsung Electronics Co., Ltd.	12.7	7.6%
5	Microsoft Corporation	12.0	14.1%	Volkswagen Aktiengesellschaft	12.1	5.3%
6	Samsung Electronics Co., Ltd.	12.7	7.6%	Microsoft Corporation	12.0	14.1%
7	General Electric Company	4.8	4.0%	Roche Holding AG	11.4	21.9%
8	International Business Machines Corporation	5.8	7.2%	Merck & Co., Inc.	10.1	25.4%
9	Facebook, Inc.	5.9	21.4%	Apple Inc.	10.0	4.7%
10	Alibaba Group Holding Limited	2.5	10.8%	Novartis AG	9.6	19.4%



* Facebook and Alibaba do not have market cap data spanning back 5 years

Source: Bloomberg data, Capital IQ data, 2017 Global Innovation 1000 Study

For the complete study and more information on the annual Strategy& Global Innovation 1000 study

Please visit:
http://www.strategyand.pwc.com/innovation1000