

ASSESSING THE IMPACT OF BIG TECH ON VENTURE INVESTMENT

11TH JULY 2018



REPORT QUALIFICATIONS, ASSUMPTIONS AND LIMITING CONDITIONS

Oliver Wyman was commissioned by Facebook to investigate the dynamics of the technology venture investing market and review the potential impact of large technology firms.

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Introduction

The technology sector is the deepest and amongst the fastest growing segments of the venture investing market. The technology venture investing market has grown very rapidly, with total annual deal value in 2017 more than three times the size it was prior to the dot-com bubble crisis. While deal value growth has been robust, the market has recently experienced a decline in volume of deals.

These high-level trends have generated significant debate on the impact large technology players may or may not be having on the technology investing market. Against this backdrop, Facebook commissioned Oliver Wyman to investigate the dynamics of the technology venture investing market and review the potential impact of large technology firms on the health of the market.

Oliver Wyman's analysis (i) identifies key trends in the technology venture investing market; and (ii) qualifies the relationship between the activities of large technology companies (confined in this exercise to Facebook, Google, and Amazon – FGA) and key trends observed in the technology venture investing space overall focused on four key areas of concern. We opted to take a highly quantitative approach to the review, focusing on what could be learnt from available data as opposed to assessing the varying opinions that exist in the market.

We acknowledge there are a number of data sources covering the venture investing market that are not entirely consistent. This report focuses on global technology investing and the subsectors that make up that universe. In this context, we believe Crunchbase's data provides tangible advantages over other sources and have used this data as the primary source throughout the report. For more detail on how we have used the data please refer to p.28 of the report.

Key trends in the venture investing market

The global venture-investing market has seen broadly uninterrupted growth in total deal value since the dot-com crisis. The market is at record levels, with about \$150 billion of venture investment in 2017, compared to about \$55 billion prior to the dot-com crisis. Growth has come from both technology and other sectors, with technology experiencing marginally higher growth in recent years. As of 2017, technology accounted for an estimated 35% of global venture investing deal value. The observed growth is predominantly driven by an increase in larger and later-stage deals. While the technological costs of start-ups have declined, the costs associated with companies' go-to-market strategies continue to require ever-multiplying marketing budgets to cut through the noise and rise to the top amidst greater competition at the early stage from ease of entry. Human capital costs are additionally increasing, as growth in demand has outpaced the availability of employees with the appropriate skillset, which is largely constrained by more structural factors.

While the market has continued to enjoy strong growth in deal value, the number of technology deals in the past two years has contracted, with the decline particularly steep in early-stage funding. Despite the decline, the number of deals are still at 2013/2014 levels which were historically high at the time and the share of deals in the technology sector remains within the historically observed range.

A further segmentation of the technology sector reveals a high correlation among constituent subsectors during both up- and down-cycles. This allays concerns around the nature of this decline being tied to activities in specific subsectors of the market and instead supports the view that the recent decline in deal numbers was systemic across the technology sector. There is no evidence in the data to suggest that the decline in deal numbers is fuelled by systemic imbalances in the market, but rather points to an evolving market where fewer but larger funding rounds are completed. This is perhaps a symptom of the changing requirements of startups as they adapt to the evolving technological and commercial landscape.

In summary, while the market has seen shifts in region, sector, and investment round mix, overall deal value is at record levels and deal volume data remains within the range of volatility to be expected for an opportunistic sector such as venture investing.

Relationship between FGA activity and trends in the technology venture investing market

Whilst our analysis of market data does not find any evidence of negative trends outside of the range of historic shifts in the market, we also wanted to review specific hypotheses on how FGA activities might be affecting the market. We focused our analysis on four areas of potential concern:

Potential concern	Conclusions
1 FGA venture investment activities form a substantial part of the technology venture investing market	FGA venture investments are immaterial relative to total technology venture investments on an annual basis. In 2017, our analysis showed that FGA venture investments accounted for about 4 percent of total venture investment deal value and comprised just 1 percent of the total deal count that year.
2 FGA M&A activity is substantial and has an impact on the technology venture investing market	FGA M&A activity accounts for a small proportion of the overall technology venture investing market. When assessed at a sub-segment level, there was no indication to suggest that FGA M&A activity has had an impact on the investment levels seen. A breakdown of the growth experienced by subsectors with and without FGA acquisitions broadly shared the same characteristics.
3 Increasing FGA R&D investment is now at a scale that it is dampening activity in the technology venture investing market	While FGA R&D expenditure has grown rapidly in the past decade and is increasingly material relative to the size of the technology venture investing market, we found no evidence to suggest that FGA R&D expenditure has reduced the value of investment in the technology venture capital space. Venture capitalist (VC) interviews suggested the connectivity and infrastructure associated with FGA may in fact serve as a propagator of continued growth in the market.
4 FGA's presence in the technology sector dampens VC activity relative to other sectors	Our analysis suggests no negative impact of FGA presence on venture capital deal value in the technology sector. Venture capital investment activity shows an inverse correlation with sector maturity. Controlling for sector maturity, the technology sector in fact appears to attract excess venture capital investment relative to other similarly mature sectors.

1 | Key trends in the venture investing market

Venture investing has experienced strong growth in deal value since 2003, following a sharp decline in the aftermath of the dot-com crisis

Global venture-investing market

Total annual deal value (\$Billion), 1998–2017

Total annual deal value, \$Billion



The venture investing market has enjoyed uninterrupted growth in total deal value since 2003, with the exception of two inflection points in 2009 and 2012, which coincided with a weak macroeconomic environment and high levels of uncertainty following economic crises. This equates to an annualized growth rate of 19 percent per year for the period between 2003 and 2017. In contrast, global GDP has grown at a rate of some 5 percent annually for the corresponding period.

While the venture investing market has seen impressive levels of growth for a sustained period, it took more than a decade for the market to reach the deal value levels seen prior to the dot-com crisis, with 2014 being the first year the market experienced a greater value of deals than the previous record of \$55 billion in 2000.

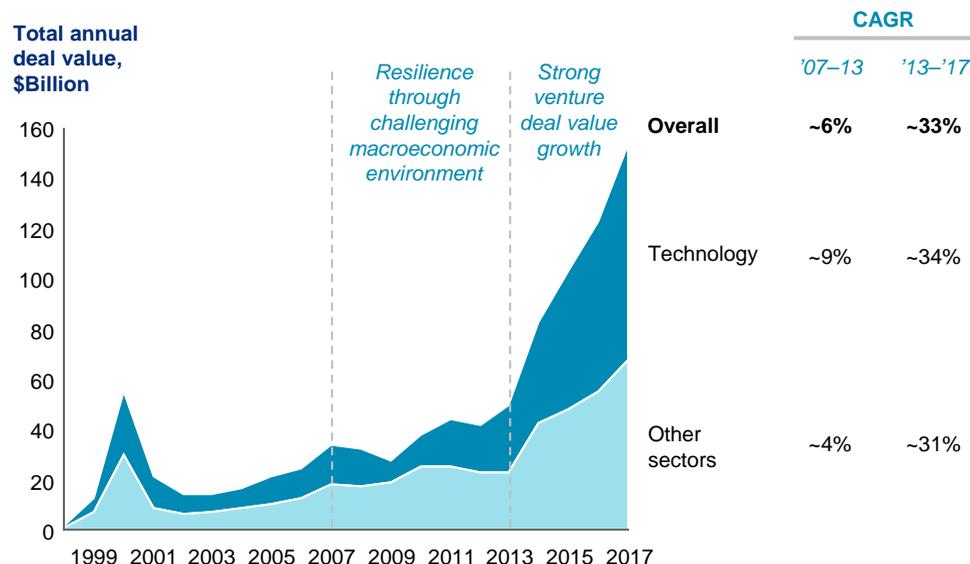
The market has seen particularly strong growth in the past five years, with an annualized growth rate of 33 percent since 2013. This is substantially higher than the annualized growth rate of 13 percent between 2003 and 2013. The year 2017 proved another record for the venture investing market, with more than \$150 billion of deals completed globally.

Source: Crunchbase (<http://www.crunchbase.com>), Oliver Wyman analysis

Technology has grown at a faster rate than other sectors in 7 out of the last 10 years

Technology venture investing vs. other sectors (globally)

Total annual deal value (\$Billion), 1998–2017



Technology and other sectors have experienced a strong growth trajectory with two distinct trends seen in the decade between 2007 and 2017.

Resilience through challenging macroeconomic environment

The first half of the period (2007–2013) saw a more moderate level of growth in the backdrop of tough macroeconomic conditions and economic uncertainty both in the US and in Europe.

Strong venture deal value growth

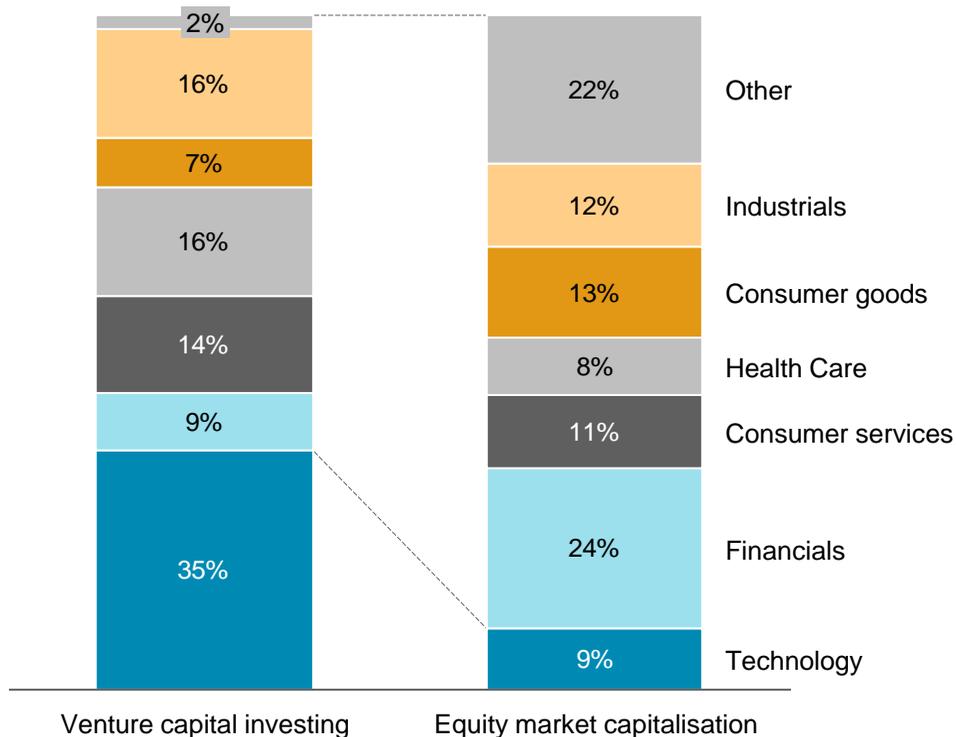
The second half of the period (2013–2017) saw a sharp rise in the value of deals conducted in the venture investing market as increased consumer demand for new products and services, demand for greater efficiency, and the lower cost of starting up (through innovations like Amazon Web Services) have propelled innovation in the market. Both technology and other sectors (e.g. healthcare, life sciences) experienced very strong growth in the past 5 years with growth in excess of 30% p.a. in deal value terms.

Source: Crunchbase (<http://www.crunchbase.com>), Oliver Wyman analysis

The technology sector attracts a significantly higher share of venture capital dealflow than its share of equity market capitalisation

Global venture-investing market: Sector shares

Average deal value and market capitalisation by sector, 2013-2017



Adjusting for double counting in terms of multiple sector allocation in the data (i.e. where a certain company is categorised under multiple sectors in the database), the technology sector has accounted for an estimated 35% of the total venture investing market in deal value terms. In comparison, the equity market capitalisation of technology companies however is only 9%.

This points to the technology sector's ability to attract significantly more venture capital investment relative to the global equity market capitalisation of publicly listed technology companies.

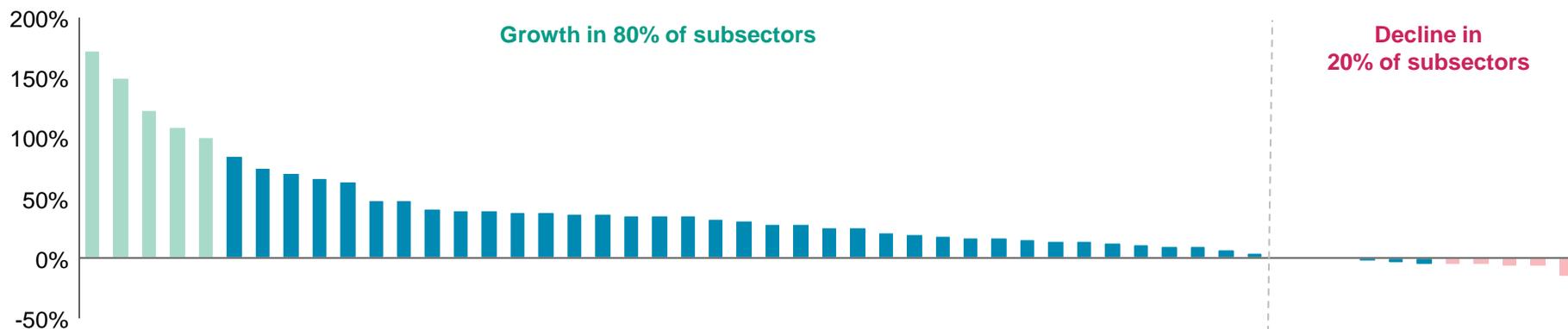
Note: To neutralise the impact of double counting, individual sector deal value was divided by the sum of deal flow in all sectors (which is larger than the aggregate deal value in a given year) so as to arrive at the sector share percentage figures seen on the chart.

Source: Crunchbase (<http://www.crunchbase.com>), Thomson Reuters Datastream, Oliver Wyman analysis

Annual deal value has grown in 80% of technology subsectors since 2013

Technology only investing: 2013–2017 growth

Annual deal value 2013-2017 CAGR by technology subsector (n=53)



Top 5 subsectors by change in annual deal value:

1. Electrical vehicles: ↑ 172%
2. Blockchain: ↑ 150%
3. Esports: ↑ 124%
4. Bitcoin: ↑ 110%
5. Robotics: ↑ 101%

Bottom 5 subsectors by change in annual deal value:

1. Nanotechnology: ↓ (16%)
2. CleanTech: ↓ (8%)
3. E-Learning: ↓ (7%)
4. Email: ↓ (6%)
5. Web: ↓ (6%)

Technology deal value growth has come from a broad base of subsectors with about 80% of subsectors having experienced growth in annual deal value since 2013.

While smaller, less mature subsectors have seen very strong deal value growth over the past few years, growth was not limited to small subsectors with nine of the ten largest subsectors in 2013 having also seen growth over the 2013-2017 period.

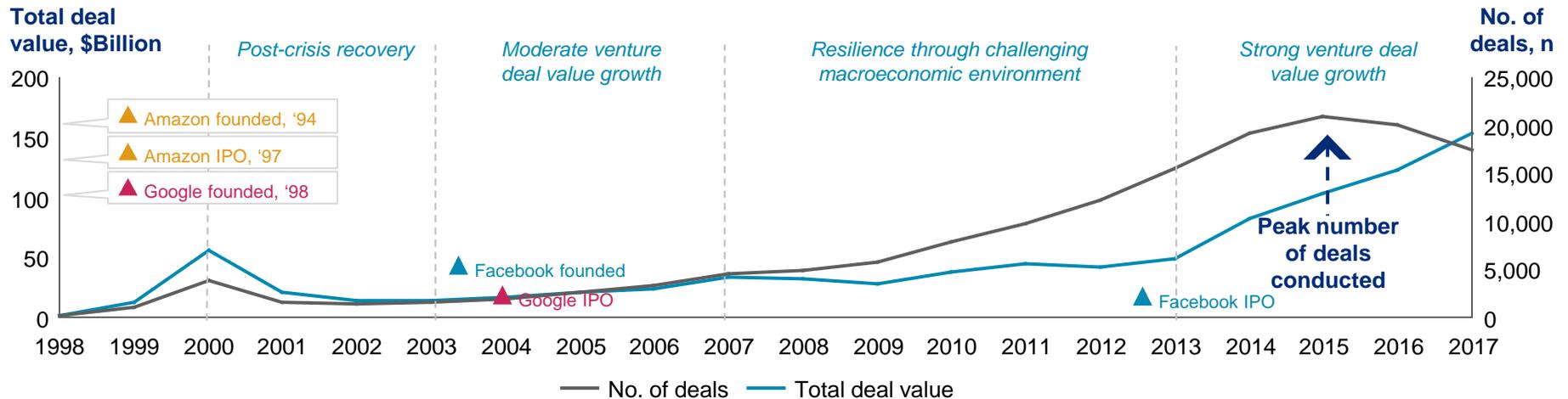
In line with our expectations for more mature subsectors, the continued growth in larger subsectors came primarily from growth in later-stage funding.

Note: Non-funding rounds include initial coin offerings, crowdfunding and undisclosed rounds.
Source: Crunchbase (<http://www.crunchbase.com>), Oliver Wyman analysis

The number of deals in the venture investing market have, however, declined since 2015 despite a continued rise in annual deal value

Global venture investing market

Total annual deal value (\$Billion) & no. of deals (n), 1998–2017



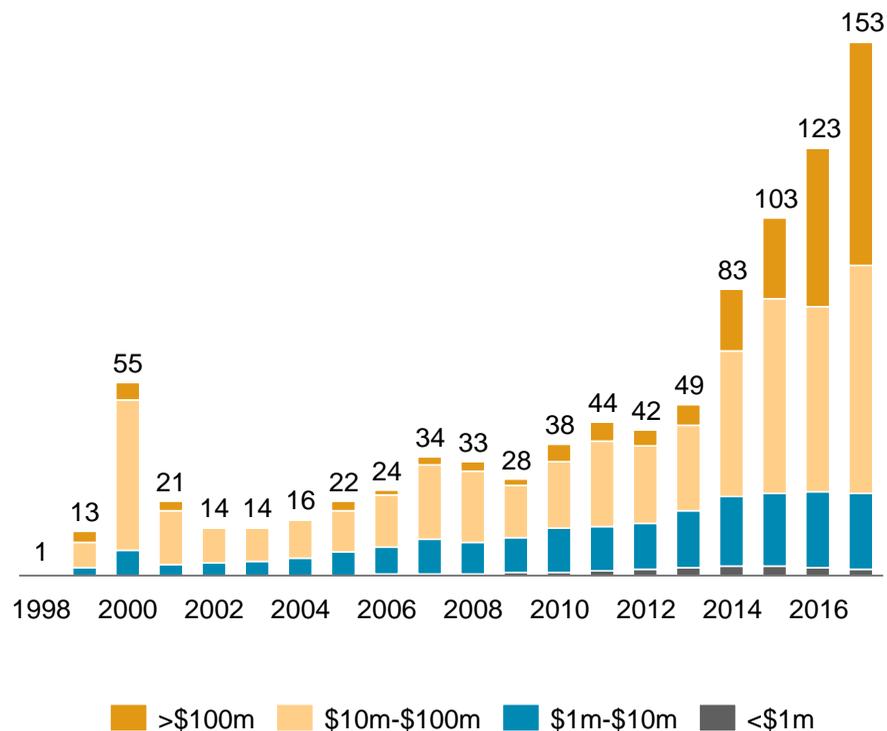
While the venture investing market has seen strong growth in deal value, it has experienced a decline in the number of deals conducted since 2015 from a peak of ~21,000 deals to ~17,500 deals in 2017. The decline in 2016 was the first time the market saw a lower number of deals completed since the dot-com crisis. The market grew at ~21% p.a. in number of deals for the period between 2007 and 2015 and declined at a rate of ~(-4%) p.a. from 2015 until 2017.

Prior to the dot-com bubble bursting, total deal value rose significantly faster than the number of deals, indicating that valuations were rapidly inflating. Conversely, after the financial crisis of 2008 and subsequent economic downturn, deal value growth was sluggish from 2009 to 2013, while the number of deals took a steadily upward trend across the same time period. The delta indicates a propagation of many, smaller ticket deals that lower the average deal value, implying an expansion in early stage investment. The opposite trend is true of post-2015, when number of deals began to decrease despite growth of deal value; correlating with the emergence of significantly more 'mega rounds' (deals of >\$100 million). This trend is exemplified by the relatively new corporate venture investor Softbank, which established its Vision Fund to the tune of \$100 billion. Industry perspectives have additionally suggested that another factor contributing to inflating deal size is an increase in funds 'driving away competition' by investing large sums in start ups to fund marketing efforts as these companies look to outperform the market and gain a disproportionate share of customers.

Source: Crunchbase (<http://www.crunchbase.com>), Oliver Wyman analysis

The share of larger-ticket funding rounds, particularly mega rounds (>\$100MM), has increased significantly in the past five years

Global venture investing market by deal size
Total annual deal value (\$Billion), 1998–2017



Increasing average deal size

Growing total deal value and a declining overall number of deals imply an increase in the average deal size. The increase in average deal size has been driven by a growing number of larger-ticket investments.

Despite declining technological costs, average deal values have grown as a result of soaring marketing budgets for startups' go-to-market strategies. Additionally, human capital costs are rising as innovation hits new levels and demand for talent increases. Industry perspectives also suggest that as funds increase in size the fund prerogative becomes to deploy larger amounts of capital per round, thus increasing deal size.

Growing number of mega rounds

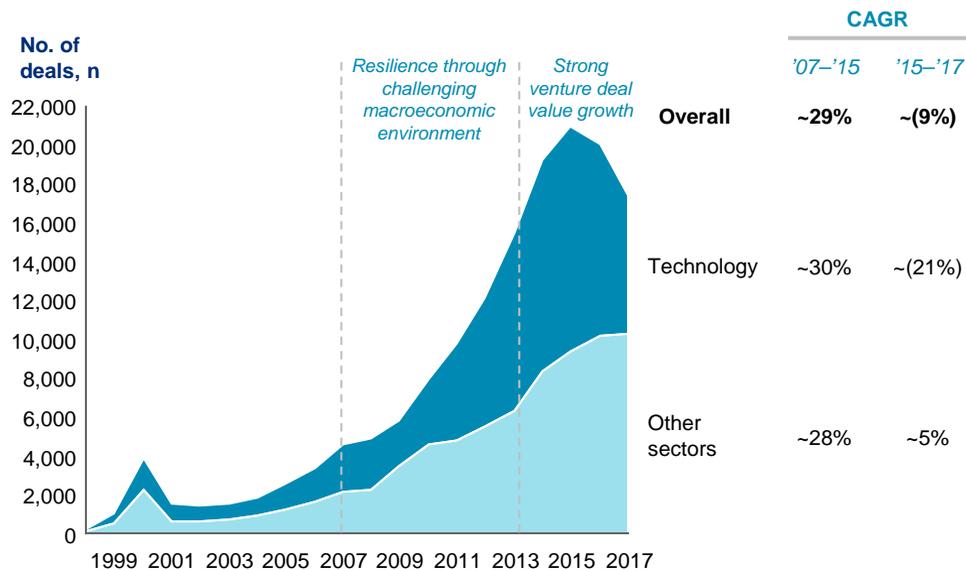
By 2017, mega rounds (deals of \$100+ million) contributed 42% of total deal value compared to 13% in 2011. The number of mega rounds still remains low relative to the rest of the market despite growing from 28 in 2011 to 172 in 2017. The size of mega rounds has increased as well. The 15 largest funding rounds of all time were all completed in 2016 and 2017 by companies such as Uber and Ant Financial

Note: Non-funding rounds include initial coin offerings, crowdfunding and undisclosed rounds.
Source: Crunchbase (<http://www.crunchbase.com>), Oliver Wyman analysis

The overall decline in the number of deals has been driven by the tech sector, but its share of deals as a proportion of the market remains within historical range

Global venture investing market: Technology vs. other sectors

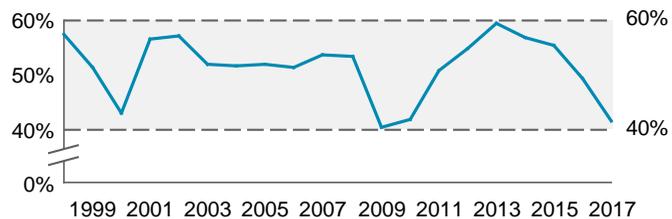
No. of deals (n), 1998–2017



Growth in the number of deals in the technology sector has recently started diverging from other sectors. The number of technology sector deals has declined by 21 percent a year between 2015 and 2017, while other sectors have grown 5 percent annually in the same period. This is in sharp contrast to the period between 2011 and 2015 when technology and other sectors grew annually at 24 percent and 18 percent, respectively.

The share of technology deals as a proportion of the market has declined as a result, however it still remains within the range of 40-60% observed historically. As highlighted on the previous pages, this decline in deal number has not impacted the market in terms of deal value growth which continues to grow at a healthy rate.

Share of tech deal as a proportion of the global venture investing market, %



Source: Crunchbase (<http://www.crunchbase.com>), Oliver Wyman analysis

The decline in deal numbers since 2015 was observed across a majority of subsectors suggesting this has been driven by broader macro forces

Global venture investing market: Technology

No. of deals (n), 2007–2017

Time period	2007–2011	2011–2015	2015–2017
Market growth CAGR	~22% p.a.	~24% p.a.	~(21%) p.a.
% of subsectors growing	96%	96%	19%
% of subsectors declining	4%	4%	81%

There is a notable alignment of technology subsectors with the overall technology sector growth or decline. In the periods 2007–2011 and 2011–2015, all but two sub-sectors grew in number of deals. The two subsectors that declined represented less than 1 percent of total deal volume in 2015.

Similarly in the period 2015–2017 when overall deal numbers began to decline, the subsectors were aligned, though less strongly, with about 81 percent of industries declining.

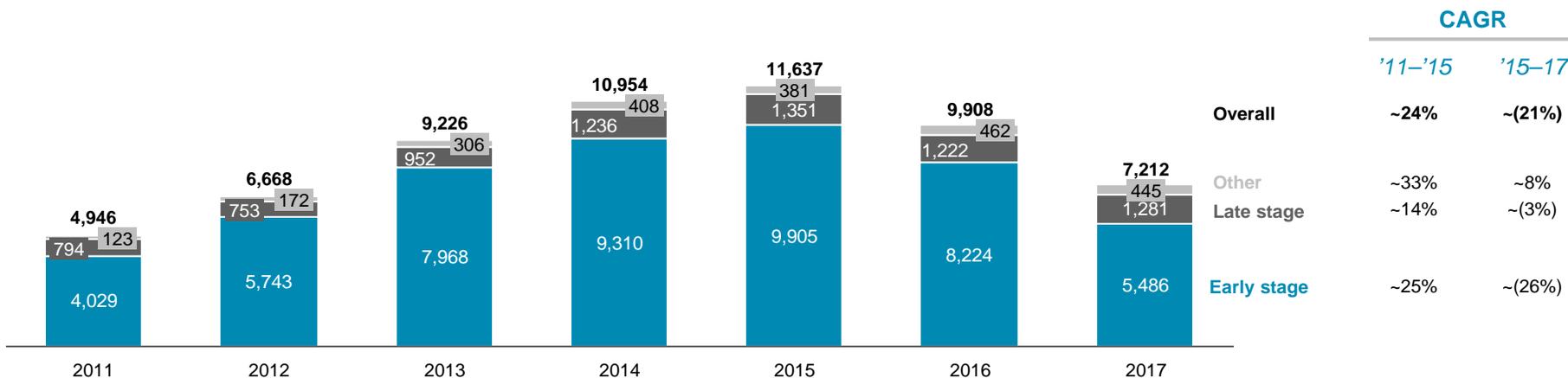
The proportion of subsectors correlating with the overall market trend and making up the bulk of deal value indicates that broader market forces are behind the performance of individual subsectors.

Source: Crunchbase (<http://www.crunchbase.com>), Oliver Wyman analysis

There has been a shift in funding round mix, away from early-stage Angel and Seed funding

Venture investing market: Technology

Number of deals split by investment round, 2011–2017



Early stage: Seed, Angel, and Series A; **Late stage:** Series B&C and secondary market transactions; **Other:** Initial coin offerings, crowdfunding and undisclosed rounds

Early stage investing (here defined as Angel, Seed, and Series A) displayed a greater level of volatility over the period between 2011 and 2017. Early stage grew rapidly from 2011–2015, seeing a CAGR of 25 percent. It, however, declined at a faster rate than late stage deals as well post-2015, with a CAGR of ~(26)% between 2015–2017. This large growth in early stage was buoyed by the emergence of accelerators that provided startups with the infrastructure and funding to grow. Market participants that we spoke with noted that the decline in 2016 and 2017 was due to several factors, including pullback among venture investors who grew cautious of the changing geo-political landscape and sharp declines in non-traditional investors conducting first-time investments in the market.

Late-stage investing followed a similar trend to that seen in early stage investing between the period 2011–2015, but grew at a lower rate. The market saw a lower level of decline over the 2015-2017 period with the number of deals rebounding in 2017 following a decline in 2016. This is due to late-stage funding being generally less reactive to changes in the market as venture investors continue to back ideas that they have supported.

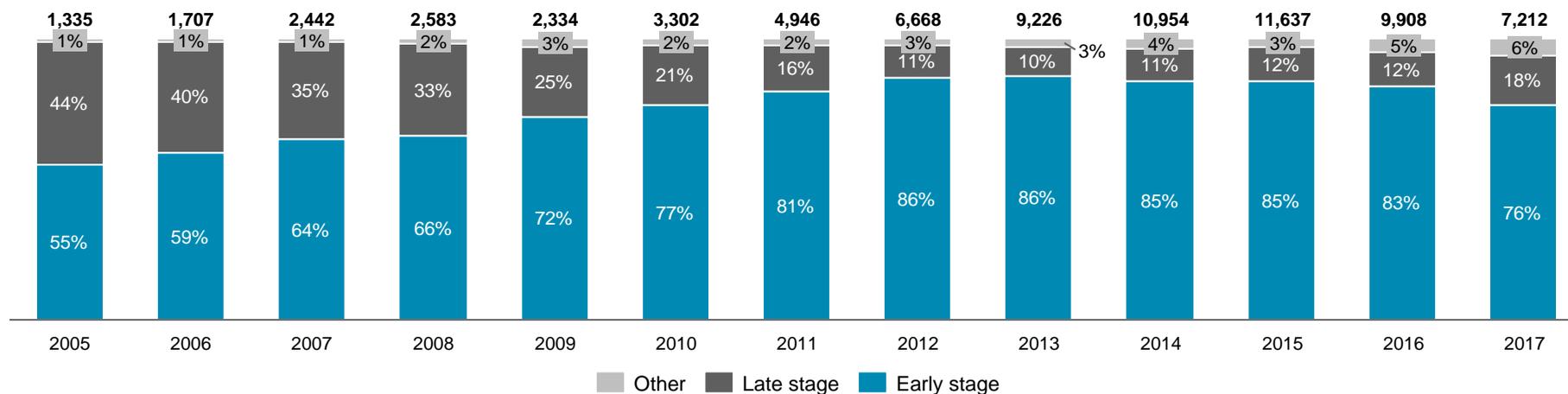
Note: Non-funding rounds include initial coin offerings, crowdfunding and undisclosed rounds

Source: Crunchbase (<http://www.crunchbase.com>), Oliver Wyman analysis

While there has been a shift towards later-stage funding, this seems to be consistent with the longer-term cycle

Venture investing market: Technology

Number of deals split by investment round (in % terms), 1998–2017



Early stage: Seed, Angel, and Series A; **Late stage:** Series B&C and secondary market transactions; **Other:** Initial coin offerings, crowdfunding and undisclosed rounds

Early-stage investing as a proportion of the market has increased substantially since 2005, with about 86 percent of the deals conducted in the market channeled to early stage startups in 2012. As mentioned earlier, this sharp growth in investment rounds was buoyed by the emergence of Amazon Web Services and other technologies that dramatically reduced startup costs for software and mobile businesses, as well as the emergence of large and well organized accelerators in the ecosystem. The recent pullback in the market particularly among early-stage investors has, however, seen it decline back to about 76 percent of total deals conducted in 2017. The number of early stage deals as a proportion of total deals conducted however remains in line with the longer term historical trend

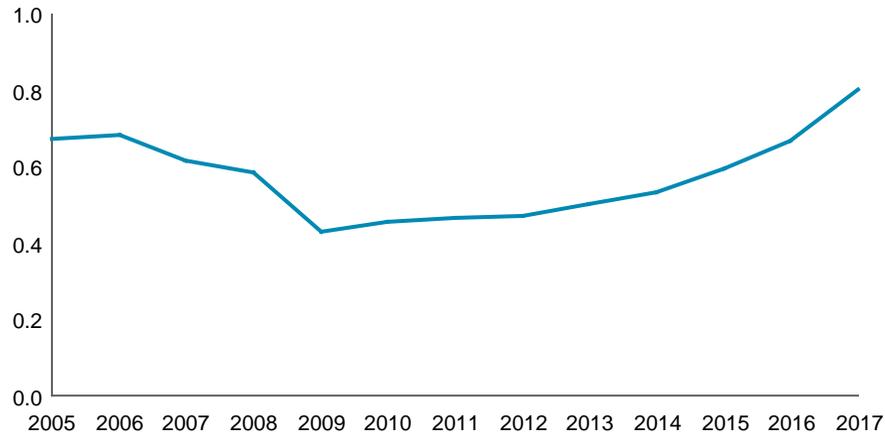
Note: Non-funding rounds include initial coin offerings, crowdfunding and undisclosed rounds

Source: Crunchbase (<http://www.crunchbase.com>), Oliver Wyman analysis

The average funding round size has increased; following dips around 2008, early stage investing has recovered in round size

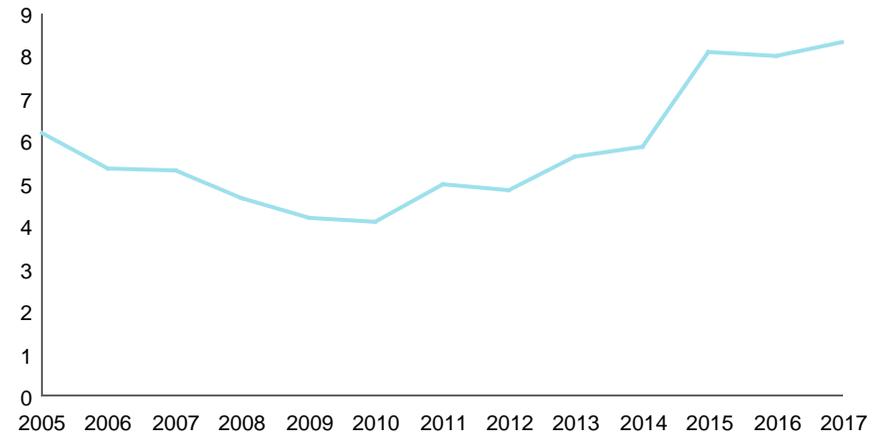
Angel & Seed: Technology

Average funding round size, \$Million, 1998–2017



Series A: Technology

Average funding round size, \$Million, 1998–2017



Both Angel and Seed funding and Series A rounds have seen similar broadly similar trends in average funding round size. The decline in average funding round size between 2005 and 2009 was driven by improving technology that substantially lowered startup costs. The drop was particularly sharp among software and mobile startups vs. startups in other sectors.

Angel & Seed: The increase, milder between 2009–2012 and steeper thereafter, has been driven by the changing mix of startups as they move away from mobile apps into other subsectors that require a larger amount of Angel or Seed funding. It should be noted, however, that the average funding round size was the same in 2016 as that in 2005–2006, with 2017 being the first year where the amount crept above \$700,000.

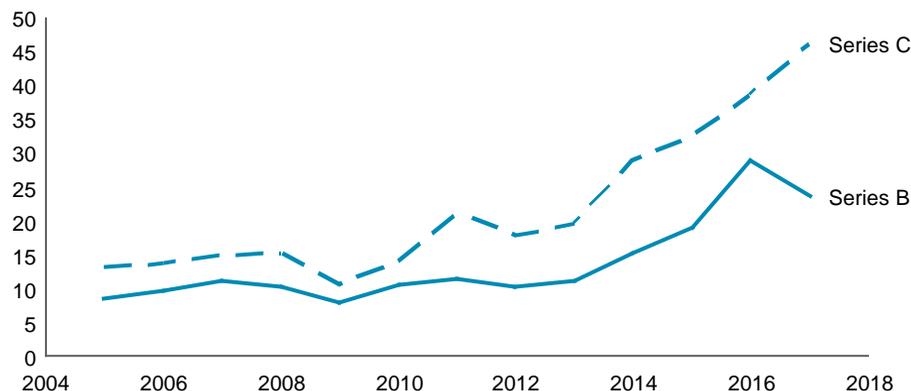
Series A: The rise in average funding round size for Series A has been steeper. This is in large part driven by the increasing costs associated with talent acquisition, as well as the increase in marketing budgets required for companies to cut through the noise and grow the customer base.

Note: Non-funding rounds include initial coin offerings, crowdfunding and undisclosed rounds
Source: Crunchbase (<http://www.crunchbase.com>), Oliver Wyman analysis

The average secondary-market funding round size rose sharply in 2017

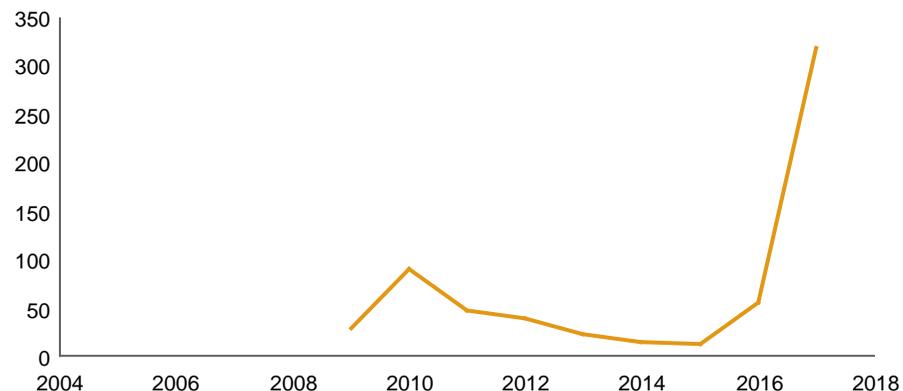
Series B & C: Technology

Average funding round size, \$Million, 1998–2017



Secondary market: Technology

Average funding round size, \$Million, 2009–2017



All stages have seen an increase in average funding size over the past few years though there is a particularly sharp rise in the average funding round size in the secondary market since 2016 and 2017. This has been driven to a large extent by the growth in mega rounds (>\$100 million). In 2013, there were some 20 mega rounds in technology, rising to 77 in 2015 and to a record 107 in 2017. The number of mega rounds increased at a rate of 36 percent a year between 2011 and 2017, with many of these occurring in the secondary markets.

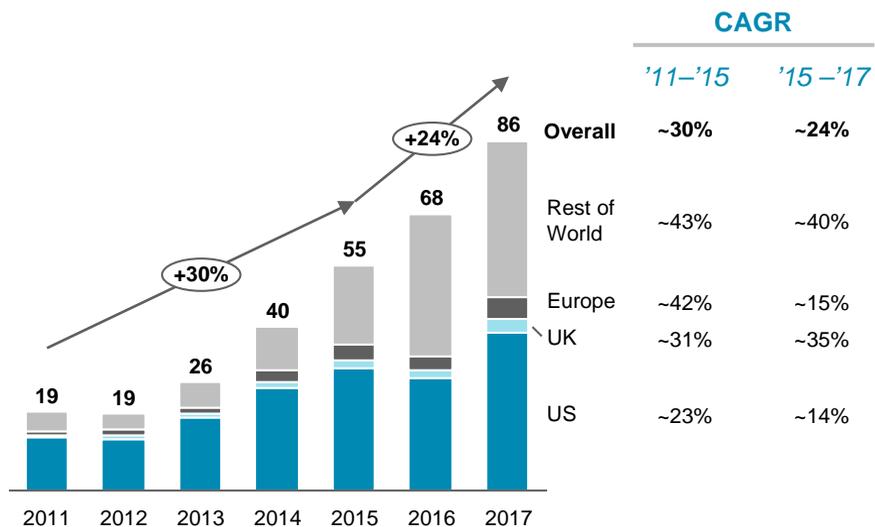
Notable mega rounds in 2017 include a \$780 million investment in Delivery Hero, led by Naspers and a \$600 million investment in Lyft, led by KKR. Corporate VCs such as Softbank have also been active in large rounds, with investments in Brain Corp, and Nvidia.

There was also a sharp increase in the number of rounds that raised between \$10 million to \$50 million in 2017 vs. previous years, which is in line with a shift in funding round mix towards later stages. The growth in later stage average round sizes has similar underlying factors as those seen in Series A funding with human capital costs and ever-growing marketing requirements leading to this sharp rise in recent years.

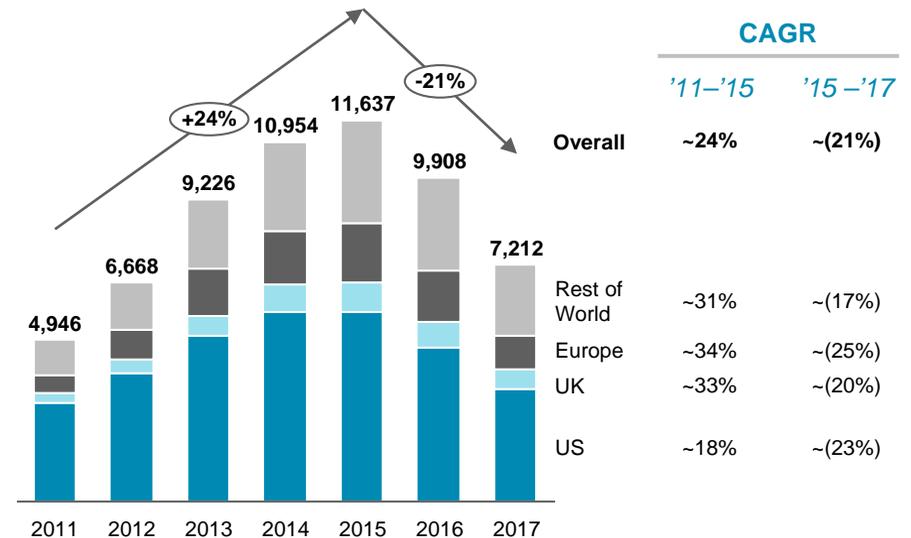
Note: Non-funding rounds include initial coin offerings, crowdfunding and undisclosed rounds
Source: Crunchbase (<http://www.crunchbase.com>), Oliver Wyman analysis

Every region has seen continued growth in deal value while deal numbers contracted

Venture investing market: Technology
Deal value split by region, 2011–2017



Venture investing market: Technology
No. of deals split by region, 2011–2017



From a regional perspective, the data suggests a more uniform picture with all regions seeing growth in deal value and contraction in the overall number of deals since 2015. In the past two years, growth in deal value has slowed and the number of deals declined. The slow-down was led by Europe and the US, with the UK and the rest of the world seeing a slightly lower impact.

Over a longer period, there is a noticeable shift in the proportion of deals and deal value away from the US as the US experienced slower growth in deal numbers and deal value pre-2015 and a stronger slow-down post-2015. The US today accounts for about 45 percent of the global technology venture-investing market vs. 79 percent in 2003 and 68 percent in 2011.

Source: Crunchbase (<http://www.crunchbase.com>), Oliver Wyman analysis

2 | FGA activity and trends in the technology venture investing market

We assessed FGA's impact on the technology venture investing market by testing four specific areas of concern

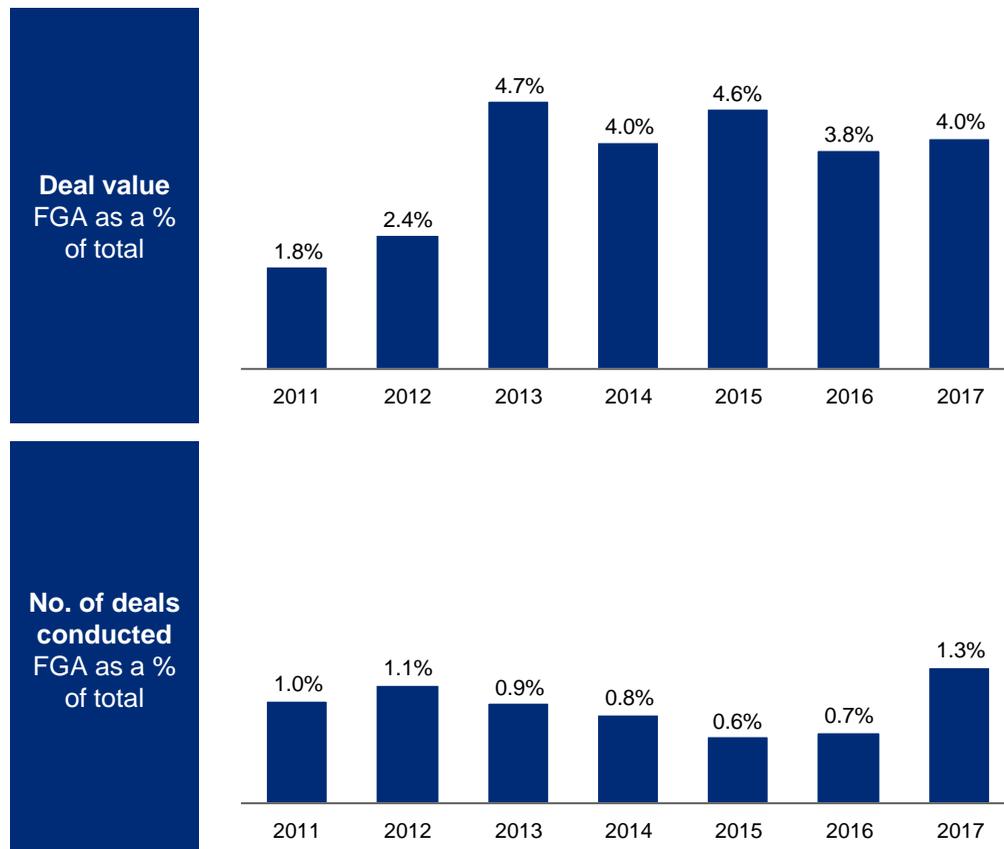
Potential concern	Overview of approach	Summary of findings
1 FGA venture investment activities form a substantial part of the technology venture investing market	<ul style="list-style-type: none"> Comparison of the venture investments conducted by FGA as a % of the technology venture investing market between 2007 and 2017 	<ul style="list-style-type: none"> FGA venture investments are immaterial relative to total technology venture investments on an annual basis In 2017, our analysis showed that FGA venture investments accounted for about 4 percent of total venture investment deal value and comprised just 1 percent of the total deal count that year
2 FGA M&A activity has an impact on the technology venture investing market	<ul style="list-style-type: none"> Comparison of growth rates in subsectors in which FGA conducted an acquisition vs. subsectors in which there was no acquisition 	<ul style="list-style-type: none"> FGA M&A activity accounts for a small proportion of the overall technology venture investing market When assessed at a sub-segment level, there was no indication to suggest that FGA M&A activity has had an impact on the investment levels seen A breakdown of the growth experienced by subsectors with and without FGA acquisitions broadly shared the same characteristics.
3 Increasing FGA R&D investment is now at a scale that it is dampening activity in the technology venture investing market	<ul style="list-style-type: none"> Comparison of the R&D investments conducted by FGA as a % of the technology venture investing market between 2007 and 2017 	<ul style="list-style-type: none"> While FGA R&D expenditure has grown rapidly in the past decade and is increasingly material relative to the size of the technology venture investing market, we found no evidence to suggest that FGA R&D expenditure has reduced the value of investment in the technology venture capital space Venture capitalist interviews suggested the connectivity and infrastructure associated with FGA may in fact serve as a propagator of continued growth in the market
4 FGA's presence in the technology sector dampens VC activity relative to other sectors	<ul style="list-style-type: none"> Comparison of deal value in the technology sector to other sectors, controlling for sectors' maturity levels 	<ul style="list-style-type: none"> Our analysis suggests no negative impact of FGA presence on venture capital deal value in the technology sector Venture capital investment activity shows an inverse correlation with sector maturity Controlling for sector maturity, the technology sector in fact appears to attract excess venture capital investment relative to other similarly mature sectors.

1 Impact from FGA venture investments

FGA venture investments form a very small proportion of overall technology venture investing, both from a deal value and numbers perspective

FGA investments as a % of the technology venture investing market

Deal value and number of deals conducted (%), 2011–2017



Over the past five years, FGA venture investments account for a small proportion of venture capital investments, with deal value never exceeding 5 percent.

The same is true when viewed from a number of deals perspective (FGA transactions accounted for about 1 percent of deals conducted since 2011).

The deal value percentages are higher than the deal number percentages due to several larger deals that FGA have participated in over the past few years (e.g. Google Ventures investment in Uber).

Note: Data presented here includes investments made by Facebook, Google and Amazon corporates as well as Alphabet (Google's parent company), GV (venture investment arm of Alphabet) and venture stage investments made by Gradient Ventures and CapitalG (growth equity investment arm of Alphabet – Google's parent company). Data presented only reflects Angel, Seed and Series A, B and C funding rounds and secondary market transactions; we have also included funding rounds where the series is listed as unknown in Crunchbase.

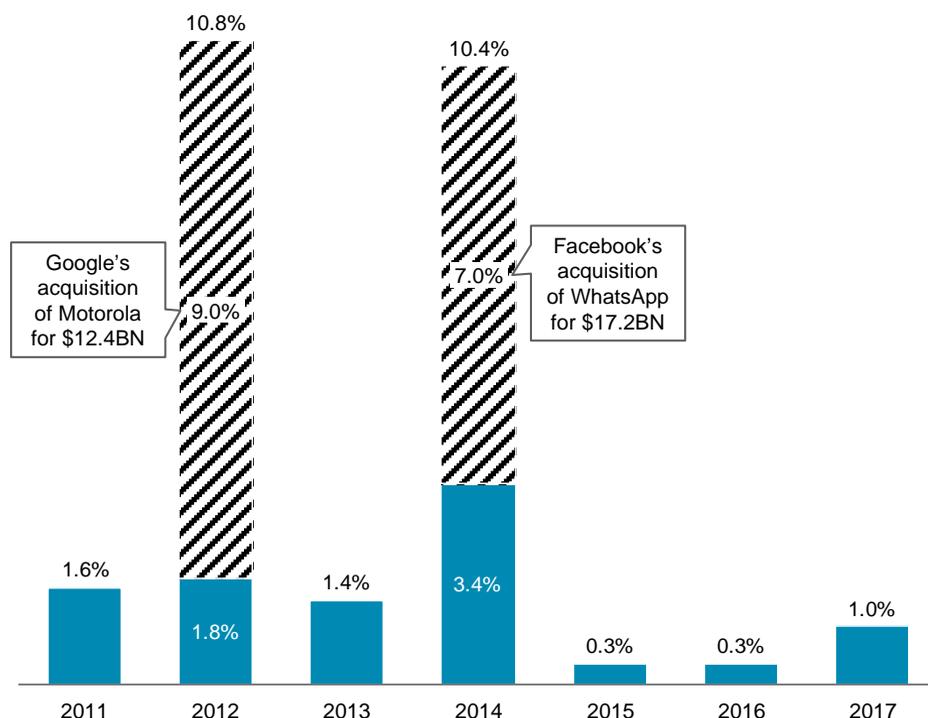
Source: Crunchbase (<http://www.crunchbase.com>), Oliver Wyman analysis

2 Impact from FGA M&A

FGA M&A activity represents only a very small proportion of overall technology M&A

FGA acquisitions as a % of technology M&A deal value

Deal value (%), 2011–2017



FGA acquisitions have represented only a small proportion of global technology M&A, with typical FGA deal values below four percent of the total. Only in 2012 and 2014 has FGA deal value accounted for a higher share which was driven by two mega-deals (\$10BN+) – Google's acquisition of Motorola and Facebook's acquisition of WhatsApp.

While usually small in relative terms, FGA on average dedicate ~\$2BN to acquisitions with appetite for larger deals where strategically attractive. FGA activity provides an additional exit option for early stage investors in the sector. Facebook's \$2BN acquisition of Oculus in 2014, for instance, provided a fast and lucrative exit opportunity for its venture capital backers such as Andreessen Horowitz.

Note: Deal value excludes Amazon's 2017 acquisition of Whole Foods.

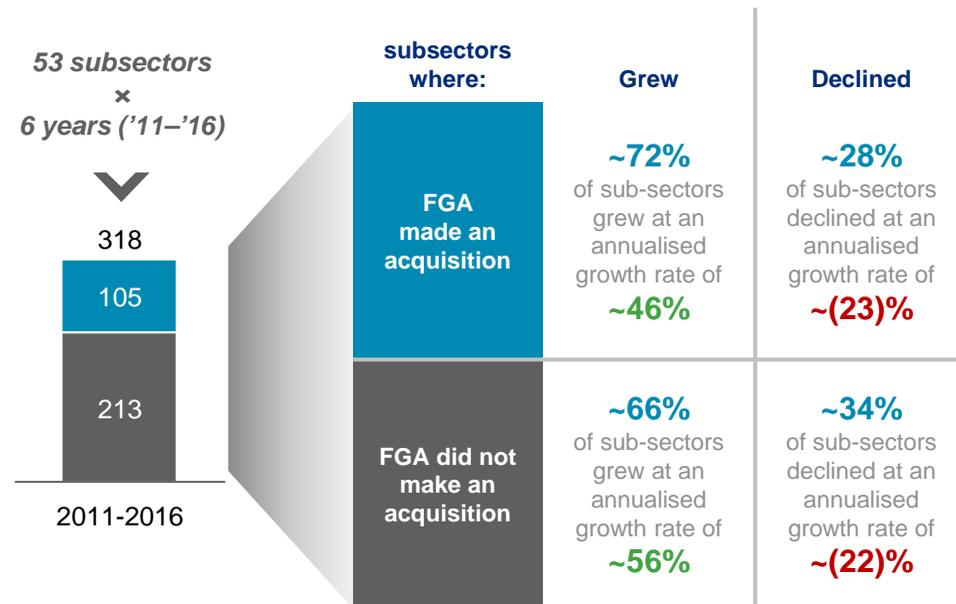
Source: Facebook, Google and Amazon annual reports, Thomson Reuters Eikon, Oliver Wyman analysis

2 Impact from FGA M&A

There's no evidence to suggest FGA M&A has a material impact on subsector growth rates

Comparison of subsectors which experienced an increase in growth

Subsectors in which FGA had an acquisition vs. subsectors in which FGA had no acquisition



Our investigation into the market highlighted investor concern that specific subsectors may be impacted by FGA acquisitions. To investigate, we assessed the growth rate in specific subsectors where FGA made an acquisition and compared it with subsectors where they did not make an acquisition, contrasting it with growth rates in the year following the acquisition vs. the year of acquisition to ascertain if FGA acquisitions could be linked with a noticeable increase or decrease in subsector-specific funding.

We found that about 66 percent of sectors where there was no acquisition by FGA experienced growth in the following year while 72% of sectors in which there was one or more acquisitions by FGA experienced growth.

There was not a material enough difference in the magnitude of growth rates to suggest that FGA acquisitions had an impact on growth rates of specific subsectors.

As such we find no evidence to suggest that FGA M&A has an impact on different subsectors growth rates. While there may be specific examples of subsectors seeing an increase in funding (such as VR following Facebook's acquisition of Oculus), the data suggests it is not reflective of a market-wide phenomenon impacting all sectors where FGA have conducted acquisitions.

Note: In order to measure the potential influence of FGA acquisitions on investment in a specific sector, we have measured the change in number of investment deals one (calendar) year after FGA made an acquisition within the subsector. Each data point represents an individual sector in a specific year between 2011 and 2016, i.e. 53 subsectors over 6 years

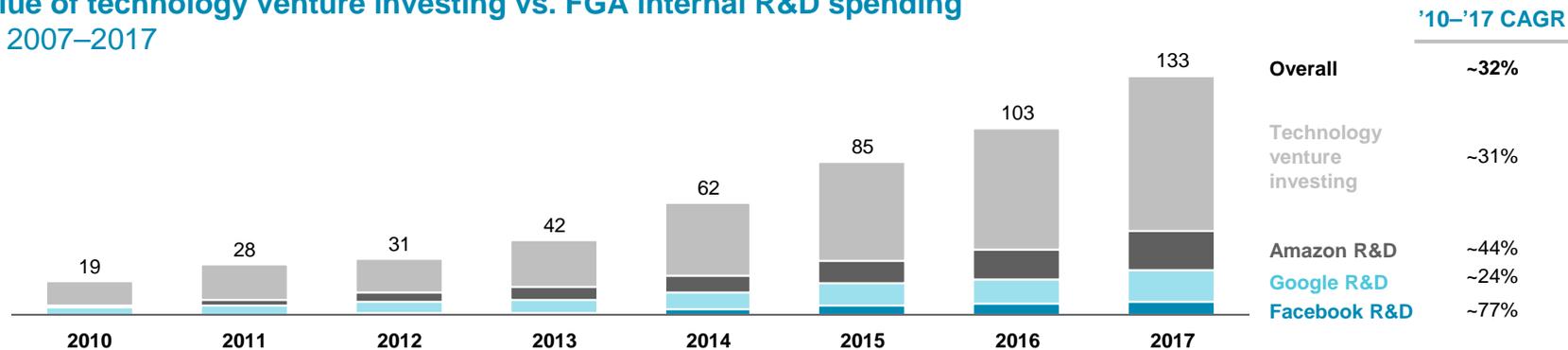
Source: Crunchbase (<http://www.crunchbase.com>), Oliver Wyman analysis

3 Impact from FGA internal investments

Internal FGA R&D investment is approximately half the size of total technology venture investing in 2017

Deal value of technology venture investing vs. FGA internal R&D spending

\$Billion, 2007–2017



As a % of venture investing in technology + FGA R&D spend

FGA % 30% 31% 39% 36% 35% 35% 35% 35%

Internal investment into research and development (R&D) by the large tech players Facebook, Google, and Amazon has grown significantly, driven by high employee headcount growth. Google headcount has grown on average between 15 percent and 25 percent annually, while Facebook's headcount has grown as much as 73 percent (between 2011 and 2012). This suggests that the large tech players are increasingly looking to hire rather than buy.

From 2010 to 2017, overall R&D spending grew at a CAGR of about 35 percent. Within this, Facebook grew at a CAGR of 77 percent, Google at 24 percent, and Amazon at 44 percent. As of 2017, Facebook had cumulatively invested some \$25 billion in R&D from 2010 to 2017, with Google and Amazon investing about \$75 billion each over the same period. Technology VC investing, on the other hand, has grown at a rate of 31 percent CAGR, with two periods in 2009 and later in 2012 where VC total deal value declined, accounting for the spike in FGA investing as a relative proportion at 39 percent in 2012. Funds continued to flow to internal R&D within the large tech players, which saw no decline throughout the periods of market uncertainty. After 2012, the growth has been largely equivalent; 2014–2016 CAGRs for FGA investment growth and technology venture investing growth stood at 29 percent; as such, FGA has maintained a level of roughly 35% of the total technology landscape (venture investing in technology + FGA R&D spend) in its internal R&D investing.

Investment in R&D as a proportion of revenue has remained broadly constant for Google (13% to 14% in 2007 to 2013, with a slight uptick from 2014 to 2017). Facebook, however, has seen investment as a % of revenue climb from 7 percent in 2010 to 27 percent in 2015, then normalize to about 20 percent afterwards.

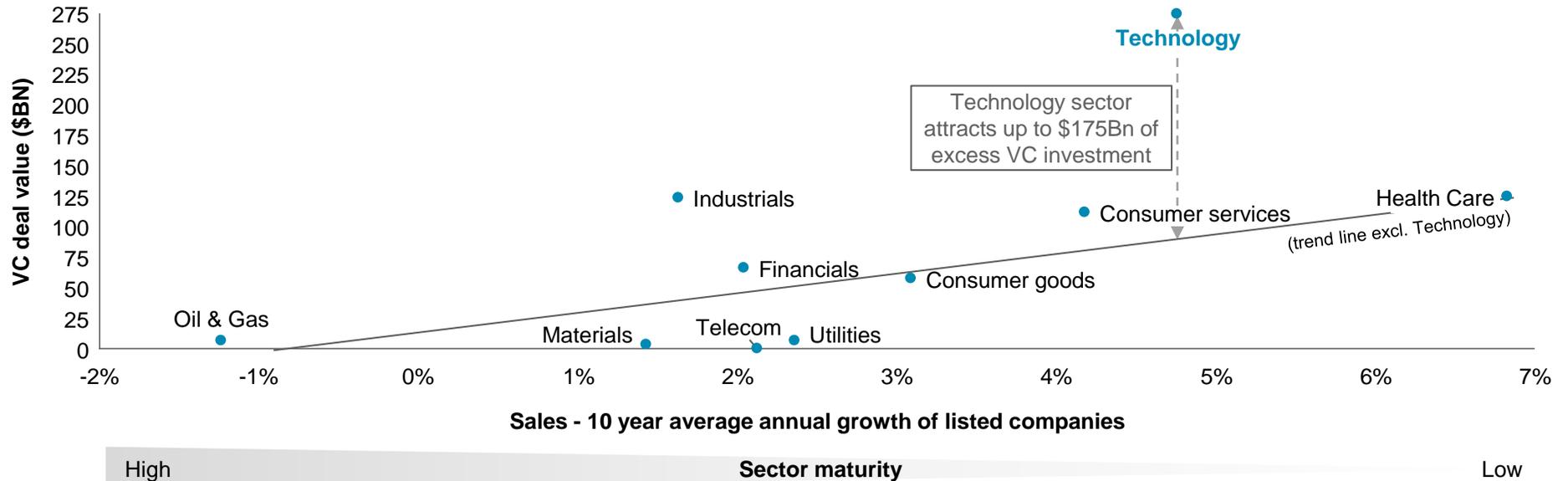
Note: Facebook information unavailable before 2010 due to lack of public data (IPO 2012)

Source: Crunchbase (<http://www.crunchbase.com>), Facebook, Google, and Amazon annual reports, Oliver Wyman analysis

4 Impact from FGA presence in technology sector

There is no evidence to suggest that FGA activity has a negative effect on venture capital investment in the technology sector

Venture capital investment in the last five years vs. sales growth over the past ten years



The technology sector attracts 35% of global venture capital investments, yet it makes up less than 10% of global equity market capitalisation.

Whilst this analysis suggests that the technology sector receives at least its fair share of VC investment, it doesn't normalise for sector maturity. One might naturally expect less mature sectors to attract more venture capital investment. Indeed, using sales growth as a proxy for maturity, we find an inverse correlation between sector maturity and venture capital investment.

However, even after accounting for its relative immaturity, the technology sector attracts a disproportional amount of investment activity relative to other sectors, suggesting there is no negative impact from FGA activity.

Source: Crunchbase (<http://www.crunchbase.com>), Thomson Reuters Datastream, Oliver Wyman analysis

Appendix

Use of data in this report

Use of data in this report

Primary data source of the venture investing market

This work is based on data from Crunchbase as our primary source. While there are a variety of information sources available, we chose Crunchbase's data, as it provided tangible advantages over other sources, including:

- High level of granularity available (including technology subsectors, region/country, stage type, and time series)
- Good coverage of early-stage deals relative to other sources
- Global coverage vs. some other industry sources with a regional focus
- Historic data available from the early 2000s up to and including 2017
- Flexibility to define data sets to assist in a focused analyses of technology subsectors within the broader venture investing market

Defining data subsets

Crunchbase does not have a mutually exclusive industry sector and subsector categorisation. Instead it has roughly 300 industry categories and investments can be assigned to multiple categories. In defining the "Technology" sector within the Crunchbase venture investing market data, we reviewed each of the category fields contained in the data set to determine whether to include or exclude that category from our technology sector definition. We considered 53 of these to fall within the technology sector for the purposes of this analysis. Companies that did not fall in one of these subsectors were assigned to "other". This necessarily creates the broadest definition of what constitutes a technology startup and one that is suitable for the exercise of understanding trends in the broader technology venture investing market.

When analyzing investments across sectors (e.g. p9 & 26) we used the same approach to allocate investments to other sectors. This results in potential duplication of investments to sectors, but we normalize for this by dividing by total investment including duplication and only review relative share of investment by sector.

When analyzing investments by technology subsector (e.g. p10, 14, 24) we also allocate investments to all technology subsectors identified in the Crunchbase data. For example, the data for an early-stage investment in a drone technology startup specializing in autonomous navigation, would be included (inter alia) within both the "drone" and "augmented reality" subsectors. This creates potential duplication of investments by subsector, but the analysis focuses only on relative growth by subsector and not absolute size. For the purposes of this report, we have considered venture investing to include the following funding round types: Angel, Seed, Series A,B & C, initial coin offering, product crowdfunding and secondary market transactions.

Other data sources used

Oliver Wyman also relied on Thomson Reuters Datastream and Eikon for data relating to industry / subsector growth rates and M&A transaction statistics respectively.

Source: Crunchbase (<http://www.crunchbase.com>), Thomson Reuters Datastream and Eikon, Oliver Wyman

