Private Equity Investment in Artificial Intelligence

Investment funds, venture capital (VC) firms and corporate investors are stepping up equity investments in artificial intelligence (AI) start-ups, reflecting a growing global interest in AI technologies and their commercial applications.

New analysis shows important increases in investments in AI start-ups

After five years of steady increases, private equity investment in AI has accelerated since 2016, with the amount of private equity invested doubling from 2016 to 2017 (Figure 1). In total, it is estimated that more than USD 50 billion was invested in AI start-ups during the period 2011 through to mid-2018. The surge in private investment suggests that investors are increasingly aware of the potential of AI, and are crafting their investment strategies accordingly.

A global trend led by the United States and China

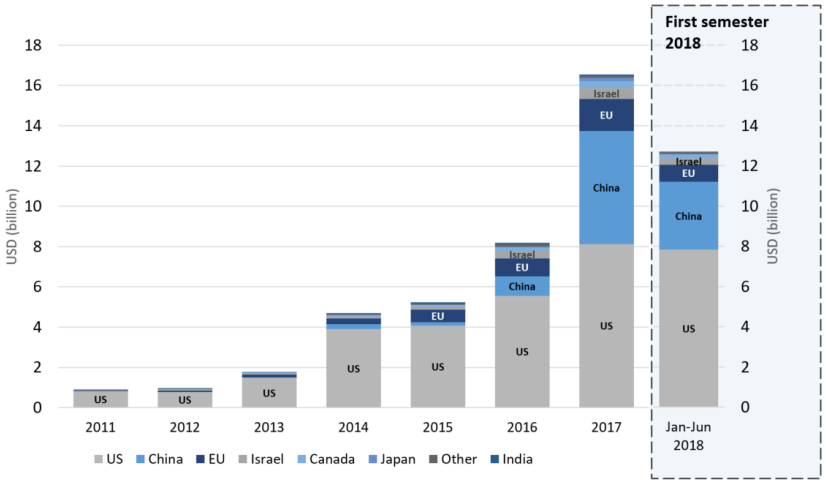
New analysis by the Organisation for Economic Co-operation and Development (OECD), using data from Crunchbase (see methodological box), found that AI start-ups have so far attracted around 12% of all worldwide private equity investments in the first half of 2018, a steep increase from just 3% in 2011.

Data suggest that start-ups operating in the United States (US) account for the majority of AI start-up equity investments worldwide, both in the number of investment transaction ("deals") and in US dollars invested, accounting for two-thirds of the total value of investment since 2011 (Figure 1). This is unsurprising, considering that the United States accounts for 70-80% of global VC investments across all technologies (Breschi, Lassebie, and Menon, 2018).

The People's Republic of China (hereafter "China") has seen a dramatic upsurge in AI start-up investment since 2016 and now appears to be the second player globally in terms of the value of AI equity investments received. From just 3% in 2015, Chinese companies attracted 36% of global AI private equity investment in 2017 and an annual average of 21% over the period from 2011 through mid-2018. This growth reflects the efforts of the Chinese government and the Chinese tech sector to lead in the field of AI.

Figure 1. Total estimated equity investments in AI start-ups, by start-up location

2011-17 and first semester 2018



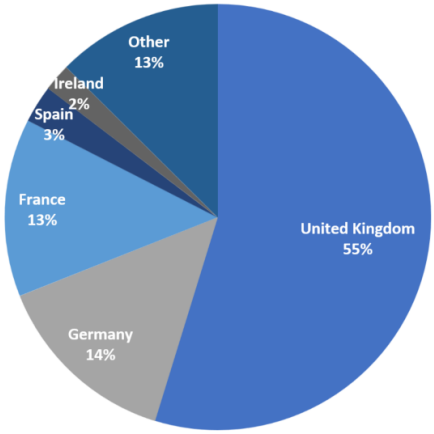
Source: OECD estimates, based on Crunchbase (July 2018), www.crunchbase.com.

The European Union (EU) accounted for 8% of global AI equity investment in 2017. This represents an important increase for the region as a whole, which accounted for just 1% of this investment in 2013. However, member states varied widely in terms of investment levels. United Kingdom start-ups received 55% of the EU total investment over the period 2011 to mid-2018, followed by German (14%) and French ventures (13%), implying that the remaining 25 countries shared less than 20% of all private AI equity investments received in the European Union and recorded in Crunchbase (Figure 2).

Beyond the United States, China and the European Union, which together attracted over 93% of global AI private equity investment from 2011 to mid-2018, start-ups in Israel (3%), and Canada (1.6%) also played a significant role. Most remarkably, Israel has seen investments in AI start-ups go from 5% of all equity invested in start-ups nationally in 2011, to 25% by mid-2018.

Figure 2. Private equity investments in AI start-ups based in the European Union, 2011 to mid-2018

Percentage of total amount invested in EU-based start-ups over period



Source: OECD estimates, based on Crunchbase (July 2018), www.crunchbase.com.

Data to 2017 show that the volume and size of AI deals is growing

The number of investment transactions also grew globally, from less than 200 investment deals in 2011 to over 1 400 in 2017. This corresponds to a 35% compound annual growth rate from 2011 to the first half of 2018 (Figure 3). Start-ups based in the United States attracted a significant portion of all investment deals, rising from 130 in 2011 to approximately 800 in 2017. The European Union has also seen an increase in the number of deals, from about 30 in 2011 to approximately 350 in 2017.

While China-based start-ups signed fewer deals than companies in the United States or the European Union, going from none in 2011 to approximately 60 in 2017, the high total value of investment in China means that the average value of these deals was considerably higher than in the European Union.

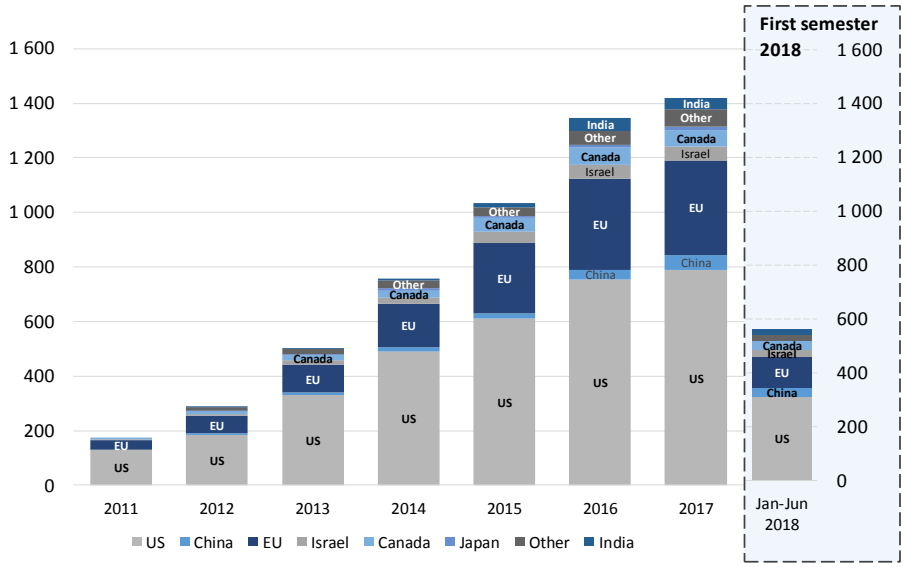
The large average size of investments in China is in line with a general trend, whereby deals are seeing an increase in per-investment value. In 2012 and 2013, close to nine out of ten reported AI investment deals were worth less than USD 10 million, while only one out of ten was between USD 10 and 100 million and there were no deals worth more than USD 100 million. By 2017, more than two deals out of ten were larger than USD 10 million and close to 3% were larger than USD 100 million. The trend accentuated in the first half of 2018, with 40% of reported deals worth more than USD 10 million and 4.4% worth over USD 100 million.

In terms of value, deals larger than USD 100 million represented 66% of the total amount invested in AI start-ups in the first half of 2018. These figures reflect the maturing of AI technologies and investor strategies, with larger investments focused on fewer AI companies. For example, the start-up that attracted the largest investment in 2017 (USD 3 billion) was the Chinese company Toutiao, an AI-powered content recommendation system based on data mining that suggests relevant, personalised information to users in China, through social network analysis.

Since 2016, Israel (Voyager Labs), Switzerland (Mindmaze), Canada (LeddarTech and Element AI) and the United Kingdom (Oaknorth and Benevolent AI) have all seen deals worth USD 100 million or more, highlighting dynamic AI activity beyond the United States and China.

Figure 3. Number of private equity investments in AI start-ups, by start-up location

2011-17 and first semester 2018



Source: OECD estimates, based on Crunchbase (July 2018), www.crunchbase.com.

Investment patterns vary across countries and regions

The total amount invested and the global number of deals has increased greatly since 2011, but wide variations in investment profiles emerge between countries and regions.

In particular, the profile of investments in Chinese start-ups appears very different from those of the rest of the world. Individual private equity investments in Chinese AI start-ups registered in Crunchbase were worth an average of USD 150 million in 2017 and in the first half of 2018, whereas the average investment size in 2017 in other countries was just one tenth of that amount.

Overall, three patterns can be observed:

- Chinese start-ups, with few but very large investments
- EU start-ups, with a steadily increasing number of smaller investments (USD 3.2 million on average per investment in 2016, USD 5.5 million in 2017 and USD 8.5 million in the first half of 2018)
- the United States, with a steadily increasing number of larger investments (USD 9.5 million on average per investment in 2016, USD 13.2 million in 2017, and USD 32 million in the first half of 2018).

These differences in investment profiles remain notable even when deals over USD 100 million are excluded from the sample. Similar patterns are seen in other technological areas; in 2017, Chinese start-ups across all industries raised USD 200 million on average per investment round, while start-ups in the United States and the European Union raised an average of USD 22 million and USD 10 million, respectively.

Autonomous-vehicles start-ups are receiving significant funding

Levels of private equity investment in AI vary widely by field of application. Autonomous vehicles (AVs) represent an increasing share of private equity investments in AI start-ups. Until 2015, AVs represented less than 5% of total investments in AI start-ups. By 2017, AVs represented 23% of the total, growing to 30% by mid-2018. The bulk of VC investment in AV start-ups went to US-based start-ups (80% in the period 2017 to mid-2018), followed by AV start-ups based in China (15%), Israel (3%) and the European Union (2%). The growth is due to a dramatic increase in the per-investment amount, with the actual number of investments remaining fairly constant (87 in 2016 and 95 in 2017). In the United States, the average amount per investment in this sector increased ten-fold from USD 20 million in 2016 to close to USD 200 million in the first half of 2018, in large part due to Softbank's USD 3.35 billion investment in Cruise Automation, a self-driving car company owned by General Motors that develops autopilot systems for existing cars. In 2017, Ford invested USD 1 billion in AV company Argo AI.

Want to know more?

Methodology of this study

This note describes estimates of private equity investments in AI start-ups based on Crunchbase (July 2018 version), a commercial database on innovative companies containing information on over 500 000 entities located in 199 countries. In this note, private equity investments are considered to be funds injected by specialised investors – generally private equity firms, VC firms or angel investors – into private companies with the aim of achieving high returns. Breschi, Lassébie and Menon (2018) provide a benchmarking of Crunchbase with other aggregate data sources and discuss possible caveats, including Crunchbase's reliance on self-reporting, delays in input of new deals in the database (implying numbers for the first half of 2018 are likely conservative), and representativeness for specific countries (notably Japan and Korea). It is also possible that start-ups increasingly self-categorise as AI start-ups because of investors' growing interest in AI.

In this note, AI start-ups are companies founded after the year 2000 and categorised in the "artificial intelligence" technological area of Crunchbase (2 436 companies), as well as companies that use AI keywords in the company's short description of its activity (an additional 689 companies). Three groups of keywords are considered to be AI-related: i) generic AI keywords (notably "artificial intelligence", "AI", "machine learning" and "machine intelligence"); ii) keywords pertaining to AI techniques (notably "neural network", "deep learning", and "reinforcement learning"); and iii) keywords referring to AI applications (notably "computer vision", "predictive analytics", "natural language processing", "autonomous vehicles", "intelligent systems" and "virtual assistant").

It should be noted that 26% of investment deals in AI start-ups in the database do not report the amount invested by VC firms. The analysis for this note estimates the amounts of these deals by using the average amount invested in smaller deals (considering only deals of less than USD 10 million) for the same period and the same country. The rationale for excluding larger deals is that their amounts are more likely to be known publicly and thus reported in Crunchbase. The estimated value of non-disclosed deals represents about 6% of the total value from 2011 to mid-2018, which may be conservative.

OECD work on AI

The OECD works to provide policymakers with evidence, analysis and guiding principles to foster trust in AI and to steer the development and adoption of this technology towards empowering people and spurring growth and innovation. Analytical and measurement work is underway to map AI developments, the economic and social impacts of AI technologies and applications, and their policy implications. This is complemented by the work of an AI Group of experts at the OECD (AIGO), created in June 2018, which brings together AI experts from all stakeholder groups to scope principles to foster trust in and adoption of AI. This ensemble of work aims at providing policy insights and guidance to ensure AI's beneficial use.

Source: See http://oe.cd/ai.

Further reading

Breschi, S., J. Lassébie and C. Menon (2018), "A portrait of innovative start-ups across countries", *OECD Science, Technology and Industry Working Papers*, 2018/02, OECD Publishing, Paris, http://dx.doi.org/10.1787/f9ff02f4-en.

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