

Policy Brief

# U.S. Outbound Investment into Chinese AI Companies

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## Executive Summary

Policymakers in the United States and abroad are increasingly concerned about the national security implications associated with outbound investment, and some in Washington are advocating for a potential outbound investment security review or regime to address the national security risks associated with outgoing U.S. capital. This policy brief analyzes data from Crunchbase on U.S. outbound investment into Chinese artificial intelligence companies between 2015 and 2021 to better understand the scope and nature of these transactions. This report aims to identify: 1) the main U.S. investors active in the Chinese AI market, and 2) the set of AI companies in China that benefitted from U.S. capital during this period. It also lays out potential implications and next steps for U.S. policy. Our key findings include the following:

- Chinese investors remain the dominant investors in Chinese AI companies. Between 2015 and 2021, at least 71 percent of the transaction value and 92 percent of the investment transactions with no U.S. participation came from Chinese investors alone.
- Based on available data in Crunchbase, between 2015 and 2021, 167 U.S. investors participated in 401 investment transactions—or 17 percent of 2,299 global investment transactions—into Chinese AI companies.
- Collectively, observed transactions involving U.S. investors totaled \$40.2 billion invested into 251 Chinese AI companies, which accounts for 37 percent of the \$110 billion raised by all Chinese AI companies. However, we do not know the exact portion of the \$40.2 billion that came from U.S. investors.
- Ninety-one percent of the observed U.S. investment transactions into Chinese AI companies during the covered time period came at venture capital (VC) investment stages, such as angel, seed, and pre-seed.

While Crunchbase data suggests that U.S. outbound investment into Chinese AI companies is limited, such financial activity, commercial linkages, and the tacit expertise that transfers from U.S.-based funders to target companies in China's booming AI ecosystem carry implications that extend beyond the business sector. Earlier stage VC investments in particular can provide intangible benefits beyond capital, including mentorship and coaching, name recognition, and networking opportunities. As such, U.S. outbound investment in Chinese technology, and particularly AI, merits additional attention and tracking.

The U.S. government is not currently in a position to effectively monitor, measure, or regulate outbound investment flows to Chinese AI companies. This, combined with the highly complex nature of these transactions, means policymakers should attain a full understanding of the nature and scope of U.S. financial and technological support to Chinese AI companies before proceeding to address any concerns, and doing so cautiously. To this end, we provide a set of recommendations:

- 1. Identify clear policy objectives for any potential outbound investment security review or regime.** There is a sufficient amount of U.S. outbound investment into Chinese AI companies to warrant further investigation with clearly scoped objectives.
- 2. Devise a pilot program for collecting data on U.S. outbound investment into China.** Revise disclosure requirements for U.S.-based funds, as well as disclosure requirements for U.S. firms investing in Chinese companies, particularly those in sectors deemed critical to national security.
- 3. The U.S. Department of Treasury, in conjunction with the interagency, should expand and revise the scope of the Non-SDN Chinese Military-Industrial Complex Companies List.** The expansion could include privately-held Chinese companies that can attract VC investments, as well as sectors critical to national security beyond defense/materiel and surveillance.
- 4. Create a mechanism to prevent U.S. investment into Chinese companies on the U.S. Department of Commerce's Entity List.** This could require divestiture from Chinese companies on the Entity List and restrict future investment in listed entities.

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## Introduction

Policymakers in the United States and abroad are increasingly concerned about the national security implications associated with foreign investment. There are several ongoing debates surrounding the rationale for a potential outbound investment security review or regime. Policymakers who have advocated for an outbound investment screening regime fear that U.S. capital is flowing into entities in China that are actively supporting the Chinese military (formally known as the People's Liberation Army, or PLA), some of which includes taxpayer dollars through the retirement and pension funds of public sector employees.<sup>1</sup> Others worry about safeguarding supply chains—especially in the wake of the COVID-19 pandemic, which saw a world forced to reckon with the fact that China dominated critical supply chains around personal protective equipment and other important materials.

Separately, others in the White House and in Congress are worried that the tacit knowledge associated with investment into Chinese high-tech firms in areas such as artificial intelligence poses national security concerns. In October 2022, new export control policies aimed at China's advanced node semiconductors and supercomputing inputs attempted to lay the groundwork for future U.S. policies aimed at slowing China's progress in AI.<sup>2</sup> Just a month earlier, National Security Advisor Jake Sullivan argued that AI is one of several “force multiplier” technologies, and as such, leadership in these fields is a national security imperative, and the United States must maintain as much of a lead as possible.<sup>3</sup>

This report analyzes Crunchbase data from 2015 to 2021 on U.S. outbound investment into Chinese AI companies to more effectively understand the scope and nature of these transactions. It seeks to identify the main U.S. investors active in the Chinese AI ecosystem and the set of Chinese AI companies that have benefitted from U.S. capital. We find that, although there are several gaps in our ability to track and monitor these investments, there is sufficient U.S. investment going into Chinese AI companies to warrant further and closer investigation. In addition, we discuss how such investments, and particularly the early-stage venture capital (VC) funding that accounts for the majority of U.S. investment transactions in Chinese AI companies, can provide additional benefits and support beyond pure capital. We reflect on the potential effect these investments might have in the broader scheme of U.S.-China technology competition. Based on these findings, we provide a set of recommendations focused on increasing transparency and bolstering pre-existing policy tools.

As U.S. policymakers deliberate ways to tackle the aforementioned concerns tied to U.S. investments in China, putting data behind the outbound investment screening conversations will be helpful to both map the range of potential policy responses and improve the accuracy and efficiency of these responses. First, however, it is important to acknowledge that putting a full stop to U.S. outbound investment in China would be neither practical nor beneficial for either side. China is the second-largest economy and second-largest destination of foreign investment, after the United States. In 2021, U.S. companies had an estimated \$118 billion in foreign direct investments (FDI) in China.<sup>4</sup> Second, while an outbound investment regime that limits the flow of U.S. capital and resources to China's technology sector may hinder or slow down China's progress in AI, it will not be able to fully stop it. As our data suggests, there is sufficient domestic support for AI development in China that, although restrictive U.S. policies may have some impact on China's AI development, these policies are unlikely to have a long-term crippling effect on the country's AI advancement.

There are also limits to what an outbound investment regime can do to answer questions of supply chain resilience and diversification, or deal with how capital that originates in the United States may end up buttressing the PLA.<sup>5</sup> Although some concerns around U.S. technology flowing to the PLA could potentially be remedied via an outbound investment regime, the process of identifying military end-users in China is difficult, thanks in part to Beijing's Military-Civil Fusion (MCF) strategy. As such, any outbound investment screening regime aimed at blocking U.S. capital from making its way into the Chinese military-industrial complex would be imperfect at best. China's whole-of-society approach to MCF does not mean that all entities in China are problematic. Rather, it suggests that an end-user approach to outbound investment may be less than effective.

Finally, the value of a carefully crafted outbound investment regime, especially when it comes to investment in emerging technologies such as AI, may in fact be less related to its ability to stop capital from flowing to China, and more to curtailing the influx of intangible or tacit expertise that transfers to China through these investment relationships. As such, we have included several case studies to show examples of the intangible benefits associated with early-stage VC investment. However, we note that examining these case studies requires significant time and resources, and in many instances, entities are not required to disclose certain information, making it harder to piece things together.

## ***Background on the Chinese AI Ecosystem***

Since 2015, China's leadership has prioritized the development of a strong indigenous AI ecosystem.<sup>6</sup> In a 2018 speech, Xi Jinping argued that accelerating the development of AI is an important strategic starting point for China to “gain the initiative in global scientific and technological competition.”<sup>7</sup> Toward this end, Beijing has adopted a whole-of-government approach that coordinates AI development efforts across government agencies. AI-relevant policymaking is led by two primary departments: the Ministry of Science and Technology (MOST) and the Ministry of Industry and Information Technology (MIIT). MOST is tasked with coordinating China's AI development strategies and research, whereas MIIT, through its network of industry alliances and think tanks, coordinates the testing and fielding of AI applications.<sup>8</sup>

One of the first major AI-specific policies, known as the 2017 “New-Generation AI Development Plan” (hereinafter referred to as the 2017 AI Plan; 新一代人工智能发展规划), laid out Beijing's strategic ambitions in AI development across all sectors—from national security and military operations, to economic and social development—and emphasized the role that AI would have in shaping international competition.<sup>9</sup> More specifically, the 2017 AI Plan lays out a three-stage progression for the future of China's AI industry:

- By 2020, China's AI industry will be “in line” with the most advanced countries, with a core AI industry gross output exceeding \$22.5 billion (RMB 150 billion) and AI-related industry gross output exceeding \$150.8 billion (RMB 1 trillion).
- By 2025, China's AI industry will reach a “world-leading” level in some AI fields, with a core AI industry gross output exceeding \$60.3 billion (RMB 400 billion) and AI-related industry gross output exceeding \$754 billion (RMB 5 trillion).
- By 2030, China will become the world's “primary” AI innovation center, with a core AI industry gross output exceeding \$150.8 billion (RMB 1 trillion) and AI-related industry gross output exceeding \$1.38 trillion (RMB 10 trillion).<sup>10</sup>

Whether or not China has succeeded in reaching its 2020 AI industry goals is difficult to ascertain; however, progress has certainly been made. Its government and state-

owned media reports often single out Beijing as a beacon of progress.\* In 2018, *Beijing Daily* reported that AI-related industry output in Beijing alone reached \$21.7 billion (RMB 150 billion), and in 2019, MOST stated that this number had grown to \$24.6 billion (RMB 170 billion).<sup>11</sup> As of September 2022, *Xinhua* asserts that Beijing's AI-related output value for 2022 is expected to reach \$32.9 billion (RMB 227 billion).<sup>12</sup>

Among other things, domestic and foreign investment is critical to meeting China's AI development and growth goals. The 2017 AI Plan called for the establishment of financial support mechanisms for fundamental and advanced AI research by using "angel investment, risk investment, start-up investment funds, financial market funding, and any other such channels to guide social capital to support AI development." It even emphasizes the role of foreign mergers and acquisitions, foreign investment, and collaboration with overseas enterprises to help support domestic AI firms.<sup>13</sup> More recently, China's National Development and Reform Commission (NDRC)—China's top economic regulator under the State Council—listed AI in its catalog of industries in which to encourage foreign investment.<sup>14</sup>

Private equity (PE) and VC investments play an important role in funding China's AI advancement. With extensive support from Chinese government actors as well as foreign capital and networks, including those from the United States, China's PE and VC market has grown to become the world's second largest, following that of the United States.<sup>15</sup> That said, China's VC growth is a recent phenomenon as its VC market only started in the early 2000s.<sup>16</sup> Still in its formative years, China's VC industry lacks conventional institutions such as well-established and long-standing innovation systems, legal infrastructure, a higher level of entrepreneurship, among other factors.<sup>17</sup>

China's government often steps in to reform the country's financial system and introduce other financial means to accelerate VC development.<sup>18</sup> One financial instrument includes Chinese government guidance funds (GGFs; 政府引导基金), which are modeled on the PE fund structure and have a dual mandate to achieve financial returns while furthering the state's industrial policy goals in strategic sectors like AI. The GGF mechanism faces a number of challenges, but overall, the mechanism

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\* Chinese official statistics and estimates should be taken with a grain of salt. While national-level statistics are usually accurate, local governments frequently inflate their economic numbers. And Chinese governments at all levels commonly target or estimate high levels of future growth that they subsequently prove unable to meet.



appears to function better than traditional policy mechanisms like subsidies and tax preferential treatments, for instance, by offering patient capital for tech startups to cross the “valley of death” to scale up and commercialize.<sup>19</sup> With this level of government financial support and facilitation, VC investment has become one of the more successful funding mechanisms in China.

In comparison, U.S. VC firms are world-renowned, massive, well-established, and have significantly more resources than most of their Chinese counterparts. Given that the Chinese VC industry is less mature, U.S. VC firms have been active participants in funding Chinese innovation, often with the tacit approval of the U.S. government if not outright encouragement, albeit the practice has indeed become more controversial over the past few years due to rising concerns over China’s MCF and human rights violations.<sup>20</sup>

### **Methodology**

This report relies on investment data from Crunchbase, one of the leading financial data providers.<sup>21</sup> Crunchbase, like other financial data providers, does not perfectly cover the entire investment market, but even imperfect coverage sheds new light on AI investment activity into China. We spot-checked Crunchbase data with data on “AI companies’ financing events” (人工智能全部公司及投融资事件信息表) acquired from Chinese-language financial data provider, ITJuzi, and found no meaningful transactions not already covered by Crunchbase.<sup>22</sup> See Appendix A for more details on the methodology.

To identify AI companies, we ran a regular expression-based search query against business descriptions of the target companies in Crunchbase. The results comprised companies whose descriptions include either terms associated with specific AI applications such as “machine learning,” “computer vision,” “TensorFlow,” or generic AI-related terms such as “artificial intelligence,” and “semiconductor.” Where Crunchbase’s company business descriptions are missing, we supplemented our keyword-based method using Crunchbase’s AI category.<sup>23</sup> This means AI companies in our analysis are limited to companies that CSET or Crunchbase has identified as AI companies. In other words, for example, not all “semiconductor” companies are classified as AI companies. Understanding that AI itself is not a sector, we used CSET’s “TINA” (Taxonomy of INtelligence Applications) classification to identify company sectors within AI.<sup>24</sup> More detailed information on this taxonomy can be found in Appendix B.

Focusing on U.S. outbound investment, we identified investors' country of origin based on their company headquarters. If investors are individuals rather than firms and their country of origin is unlisted, we extrapolate their country of origin based on the location of their affiliated primary organization, which serves as a proxy for their nationality. It is important to note that the location of an individual or a company's headquarters may not actually reflect the ultimate source of capital or the actual location of the investor. While our methodology may misplace firms like GSR Ventures—which, although headquartered in California, mainly operates in China—this approach still offers meaningful insights into corporate influence.<sup>25</sup>

Finally, we filled in transaction value gaps with estimated value. Financial data providers like Crunchbase only provide information on the total value that companies in a funding round raised where such information is disclosed. We produced the estimated totals using a multistage estimation process where we assigned each round the median amount for funding rounds of the same investment stage, target country, and year.\*

While the data used in this report is not without limitations, our analysis of U.S. investment in Chinese AI companies is an important step toward understanding this complex phenomenon and is a useful foundation to further explore intangible knowledge transfer aiding China's ability to leapfrog the United States in key strategic technologies such as AI.

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\* The estimated value amounts to \$33.6 billion, 25 percent of which comes from the investment transactions that involved U.S. participation. The estimated value skews toward the transactions that involved Chinese investors. In our dataset, a majority of undisclosed transaction value which we estimated for is associated with investment with Chinese participation.

# Assessment of U.S. Outbound Investment into Chinese AI Companies

## Investment in Chinese AI Companies: Understanding the Trends

With over 1,600 active AI companies by the end of 2021, the Chinese AI market is the world’s second largest, behind the United States. According to Crunchbase data, between 2015 and 2021, 1,239 Chinese AI companies raised \$110 billion across 2,299 investment transactions from 36 countries.\*

Table 1 provides more details on the different categories of investors into China’s AI sector and examples associated with each category. While keeping the limitations of Crunchbase data in mind, these categories nonetheless help us to better understand the various investors who have helped fuel China’s AI boom and locate areas where any potential U.S. policy may have an impact.

Table 1: Categories of Investors

Category	Example of Investment Transaction in Chinese AI Company
<b>U.S. participation:</b>	
Only U.S. investors	U.S.-based SOSV invested in Zeemo.ai.
Only U.S. and Chinese investors	U.S.-based Qualcomm Ventures and China-based Dark Horse Ventures invested in Bell.ai.

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\* Despite there being 1,600 active AI companies (according to Crunchbase) in China by the end of 2021, we only found 1,239 that received any investment during the time period between 2015 and 2021. It could be that some of the 1,600 active AI companies did not receive any investment funding during this time period.

U.S., Chinese, and other investors	U.S.-based Cisco, Singapore-based Capikris Foundation, and China-based Lenovo, Co-Stone Venture Capital, Green Pine Capital Partners, and China CITIC Bank invested in 4Paradigm.
U.S. and other non-Chinese foreign investors	U.S.-based GSR Ventures and South Korea-based Korea Investment Partners invested in Longmao Data.
<b>Non-U.S. participation:</b>	
Only Chinese investors	China-based Qiming Venture Partners invested in Bomming Vision.
Chinese and non-U.S. foreign investors	China-based Alibaba Group and Suning.com, and Singapore-based Temasek Holdings invested in SenseTime.
Other non-U.S. foreign investors	Germany-based Volkswagen Group invested in Mobvoi.

Source: CSET analysis of Crunchbase.

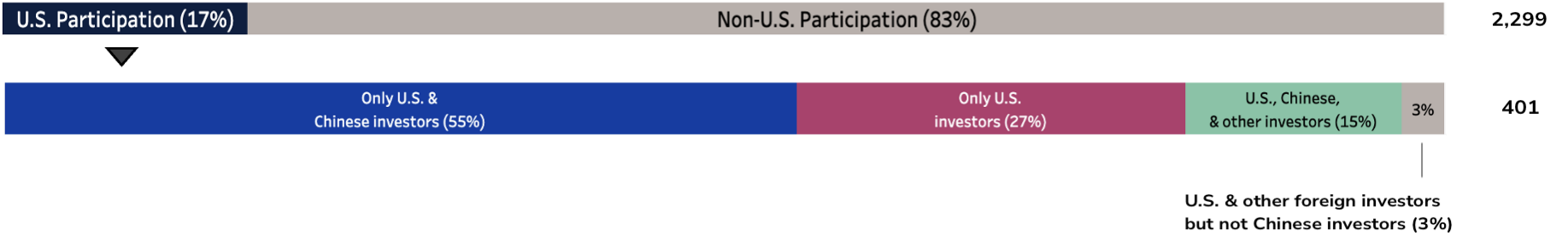
**Transactions with U.S. Investor Involvement**

Based on available data in Crunchbase, from 2015 to 2021, 167 U.S. investors participated in 401 investment transactions into Chinese AI companies, accounting for 17 percent of the observed transactions. Collectively, these transactions invested a total of \$40.2 billion into 251 Chinese AI companies, making up 37 percent of the total global funding raised by all Chinese AI companies in our dataset for this time period. However, we do not know what portion of the \$40.2 billion came directly and exclusively from U.S. investors. We attempted to address this issue by breaking down the 401 investment transactions by different groups of investors, as seen in Figure 1.

Of the 401 observed investment transactions with U.S. participation, 107 (27 percent) came exclusively from U.S. investors, amounting to \$7.45 billion (19 percent) of the total \$40.2 billion raised from transactions involving U.S. investors (See Appendix C, Table C1). This \$7.45 billion represents the lower bound of U.S. investment into Chinese AI companies during this time period. Some of the largest investments include Goldman Sachs' solo investment in 1KMXC, an AI-enabled robotics company, as well as an investment by three U.S.-based VC firms in Geek+, an autonomous mobile robot company.

Figure 1: Breakdown of Investment into Chinese AI Companies with U.S. Investor Participation, 2015-2021

AI Investment Transactions



AI Investment Transaction Value (Millions, USD)



Source: CSET analysis of Crunchbase.

As Figure 1 illustrates, U.S. investors do not typically act alone and are often involved in transactions that also include Chinese or other foreign investors. Such syndication deals—deals where two or more VC firms come together to take an equity stake in an investment—may help foreign investors from the United States or elsewhere obtain critical on-the-ground information from domestic Chinese investors, and in return help domestic investors become more skilled.<sup>26</sup> Other explanations for binding together include a potential increase in financial return, reduction in operation uncertainty, and less competition in bidding.<sup>27</sup> That said, while the number of investment transactions that brought together U.S. and Chinese investors accounts for more than half of the 401 transactions with U.S. participation, the value of these transactions comprises only 27 percent (\$10.8 billion) of the total amount raised.

In other instances, there are other foreign investors participating in the same transaction as U.S. and Chinese investors. Figure 1 shows that, although this category of investors sees less frequency in investment than the pair of U.S. and Chinese investors, the size of these investment transactions accounts for \$21.4 billion—or 53 percent of the total amount of capital raised in transactions with U.S. participation. This is not uncommon; more investors often means larger-value transactions, and more investors suggests that shares of capital are more distributed. However, since investors are not required to disclose their individual contribution, the share attributed to U.S. investors here is unclear.

Looking more closely at the data, we also identified three transactions where a U.S. company invested in a Chinese AI company alongside a Chinese company that is listed on the U.S. Department of Commerce’s Entity List. As Table 2 illustrates, in one of these cases, a U.S. company co-invested with iFlytek—a Chinese company already on the Entity List at the time of the investment. The other two examples involve a U.S. investor investing alongside SenseTime before it was added to the Entity List.

Table 2: Selected U.S. Joint Investment With Entity Listed Chinese Companies

<b>U.S. Investor</b>	<b>Chinese Co-Investor</b>	<b>Target Chinese AI Company</b>	<b>Announced Date of Investment</b>	<b>Date Co-Investor added to Entity List</b>
Silicon Valley Bank, MOMA (China) Co., Ltd.	SenseTime	51WORLD	December 2017	October 2019
Wanxiang America Healthcare Investments Group	SenseTime	Helian Health	June 2018	October 2019
GSR Ventures	iFlytek	AI Dexian Zhaopin Guan	November 2019	October 2019

Note: SenseTime was not on the Entity List at the time the investments were announced.

Source: CSET analysis of Crunchbase.

While U.S.-based investors by no means dominate the Chinese AI market, Crunchbase data does show such activity is prevalent, often intertwined with Chinese investors and other foreign actors looking for opportunities in China’s massive technology landscape. Considering the national security implications of U.S. outbound investment into one of China’s strategic priority sectors, additional information about these trends and further scrutiny of the actors and funds involved is warranted. However, given the current scale and scope of U.S. investment in Chinese AI companies, any proposal to regulate U.S. outbound investment to China is unlikely to significantly impact the overall development of the AI industry in China, as U.S. investor participation represents just a fraction of the overall capital flowing into China.

The following section will go further in examining investments into Chinese AI companies without involvement from U.S. entities. Other actors that are actively invested or interested in investing in Chinese AI companies may backfill in the event that U.S. investors are required or encouraged to divest or stop investing. As such, it is crucial to understand the scope and scale of such investment, a portion of which may be less affected by or perhaps even insulated from changes in U.S. policy.

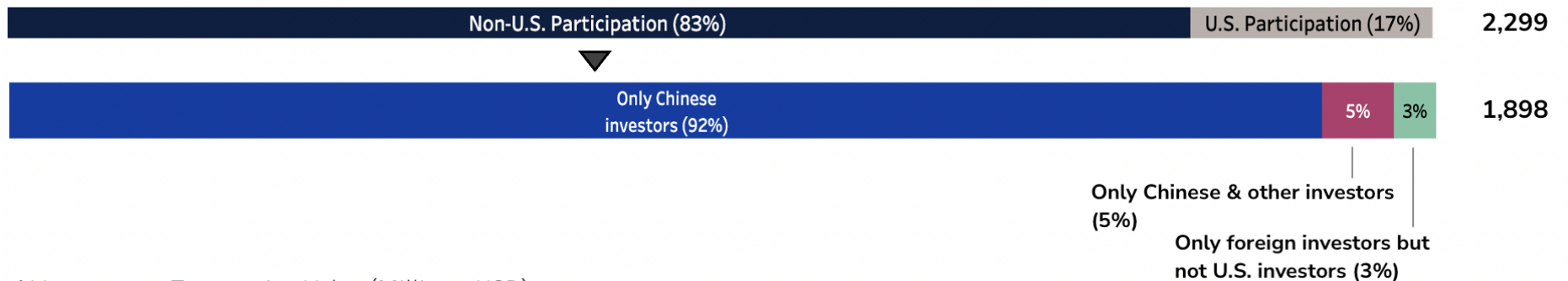


## Transactions without U.S. Investor Involvement

Between 2015 and 2021, 83 percent of the observed investment transactions (1,898 transactions) and 63 percent of transaction value (\$69.8 billion) raised by Chinese AI companies did not involve U.S. investors. As Figure 2 shows, 71 percent of this \$69.8 billion and 92 percent of the 1,898 investment transactions with no U.S. participation came from Chinese investors alone. Funds secured by Chinese AI companies from Chinese investors amounted to nearly \$50 billion across 1,749 investment transactions (See Appendix C, Table C2).

Figure 2: Breakdown of Chinese AI Investment Without U.S. Participation (Including Chinese and/or Foreign Investors), 2015-2021

AI Investment Transactions



AI Investment Transaction Value (Millions, USD)



Source: CSET analysis of Crunchbase.

Given that the majority of investment in Chinese AI companies comes from Chinese investors alone, regulating U.S. outbound investment into China's AI ecosystem will be unlikely to achieve desired objectives if those objectives are to halt China's AI progress. Moreover, Chinese AI companies are also capable of attracting investment from foreign investors other than the United States. For instance, Chinese investors co-investing with foreign investors other than U.S. investors, accounts for \$11 billion over 92 investment transactions (See Appendix C, Table C2). Foreign investors from countries such as Singapore, Taiwan, and South Korea, among others, have also put in about \$9 billion across 57 deals into China's AI ecosystem from 2015 to 2021.

### ***Types of Chinese AI target companies***

AI is a general-purpose technology that has a broad range of applications, spanning across different sectors. The Chinese companies in our dataset that received U.S. investment are developing applications in sectors such as business services and analytics, transportation, medicine and life science, security and biometrics, among others.<sup>28</sup> More specifically, as Table 3 shows, the majority of Chinese AI companies that we identified as recipients of U.S. investment focuses on general purpose AI-related tools and applications, transportation, and business uses such as business services and analytics and sales/retail/customer relations. Advances in AI are likely to impact many sectors of the economy and in doing so, spur innovation and enable other cutting-edge technologies, such as chips and semiconductors, and vice versa. Within the general-purpose category, eight AI companies focus on computing hardware that may be applied to different sectors, whereas two AI companies develop chips catered to specific uses, including in finance and transportation.<sup>29</sup>

Table 3: Distribution of Chinese AI Companies with U.S. Investor Participation by Application, 2015-2021

Application Area	Identified Chinese AI Companies with U.S. Investor Participation	
General purpose	53	21.1%
Business services and analytics	41	16.3%
Transportation	33	13.2%
Medicine and life sciences	19	7.6%
Security and biometrics	18	7.2%
Sales/retail/customer relations	17	6.8%
Finance	15	6.0%
Education	13	5.2%
Consumer goods	11	4.4%
Arts/sports/leisure/travel/lifestyle	11	4.4%
Process automation	10	4.0%
Diversified/NOS/Unclear	3	1.2%
Construction and field services	2	0.8%
Broadcasting and media production	2	0.8%
Agriculture	2	0.8%
Military/public safety/government	1	0.4%

Source: CSET analysis of Crunchbase.

Note: The application areas assigned in this report are based on previous CSET Taxonomy of INtelligence Applications (see Appendix B).

According to our data, only one Chinese AI company that received funding from U.S. investors is involved in developing AI applications for military or public safety uses. In this case, the classification adopted in Table 3 above could obfuscate the fact that AI algorithms and technologies developed in the commercial sector can, and in some cases, already are, modified for military or law enforcement use. For example, Chinese law enforcement and intelligence organizations have adapted SenseTime’s platform and core technologies for domestic surveillance and security purposes.<sup>30</sup> In addition, China’s MCF strategy has increasingly blurred the lines between the military and civilian sectors, especially in emerging technologies. A key aspect of MCF implementation is the two-way transformation of military and civilian science and technology achievements; therefore, Chinese leadership has emphasized the

advancement of dual-use technologies with simultaneous applications in both the military and civilian sectors.<sup>31</sup>

It is also worth noting that 22 of the 251 Chinese AI Companies (9 percent) that received U.S. investment are members of the Chinese government's AI innovation network, the Artificial Intelligence Industry Alliance (AIIA; 中国人工智能产业发展联盟). AIIA fosters collaborations among local governments, academic institutions, and companies, which are consistent with Chinese government goals, strategies, and policies.<sup>32</sup> For example, the CEO of Laiye—an AI automation company that received investment from U.S. investors including Cathay Innovation, Lightspeed Venture Partners, and Microsoft—is on the expert committee of AIIA Talent Development Center (中国人工智能产业发展联盟人才发展中心) launched with the intention of cultivating talent in support of the Chinese government's "Internet+ AI Action Plan."<sup>33</sup>

Similarly, Zhuiyi Technology, a natural language processing company that benefited from Chinese government funding, is the vice-chair of the AIIA's Digital Humans Working Committee (AIIA人工智能产业联盟数字人工作委员会副理事长单位) and is responsible for drafting the AIIA's Virtual Digital Human Guideline (中国人工智能产业发展联盟 (AIIA) 虚拟数字人规范).<sup>34</sup> A full list of companies in our dataset that are members of AIIA can be found in Appendix C, Table C3.

Although only a small subset of the AI companies that received U.S. funding have also benefited from funding and support of the Chinese government through this AIIA initiative, it serves to illustrate that it is often difficult to parse out Chinese government influence across the commercial and private AI sector in China. Furthermore, U.S. investors and funds may unknowingly be crossing paths with Chinese government presence in these companies and settings. Moreover, given this intricate relationship between the Chinese government and the commercial and private sector, it is possible that these AI companies might be more likely to respond to Chinese government policy priorities or pressures rather than market demands in which investors have the most interests.





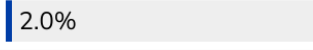
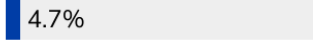
### ***Types of U.S. Outbound Investment into Chinese AI Companies***

The frequency and volume of U.S. investment in Chinese AI companies alone are not enough to assess the impact of U.S. involvement in or contributions to Chinese AI development. To further understand the nature of these investments, we examined the different types of deals U.S. investors are pursuing, differentiating between VC and PE funding rounds wherever possible. The two forms of investment belong to a much larger, complex part of the private equity industry.<sup>35</sup> VC financing focuses on funding

and mentoring early-stage companies with high growth potential, in exchange for a (often minority) stake of equity in target companies. Early-stage VC funds such as angel, pre-seed, seed, Series A, and Series B funding rounds typically involve earlier-stage target companies and smaller transaction values. In contrast, PE investments often target well-established companies with much larger stakes.

Table 4 shows that VC investment at all stages accounts for 91 percent of observed investment transactions involving U.S. investment in Chinese AI companies between 2015 and 2021. This trend is not unique to U.S. investors. Over the same period, Chinese AI companies have generally raised more VC funding rounds than PE financings (see Appendix C, Figure C4). This trend can partly be explained by the fact that China’s AI ecosystem is relatively new in comparison to that of the United States. As such, many Chinese AI companies may still be in the earlier stages of development and have yet to reach the mature stage that might attract PE investment.<sup>36</sup>

Table 4: Percentage of Chinese-Bound AI Investment Transactions and Value Involving U.S. Investors by Investment Stages, 2015-2021

Investment Stage	Transaction Value (Million USD)	Investment Transactions	
VC (Angel/seed/pre-seed)	\$950	103	 25.7%
VC (Early stage)	\$6,670	203	 50.6%
VC (Late stage)	\$14,348	58	 14.5%
Private Equity	\$8,400	10	 2.5%
Exit stage (IPO/M&A)	\$391	8	 2.0%
Unknown	\$9,475	19	 4.7%

Source: CSET analysis of Crunchbase.

Note: Private equity investment is a part of the broader private equity industry. M&A is mergers and acquisitions.

With the majority of U.S. investments into Chinese AI companies happening in earlier-stage VC rounds, we can assume that U.S. investors are helping to supply capital to Chinese companies at the stage where they are still tweaking their business models and refining their commercialization strategies. Given that a large share of U.S. investment in the Chinese AI market is VC investment, in particular at the earlier stages, the following section of this report investigates the implications associated

with this trend—for instance, the transfer of knowledge and other intangible benefits Chinese AI companies receive alongside the influx of capital.

Late-stage venture capital funds, in contrast, generally invest in Series C and later, often offering larger amounts of money before companies receive a prospective initial public offering (IPO). The amount of money raised in VC rounds is generally far less than the funds raised during the later stages, such as through PE and especially during the exit stage that may involve an IPO or mergers and acquisitions. For instance, as Table 4 shows, the funds raised in only 10 rounds of private equity funding are nearly equivalent to the money raised in more than three hundred transaction investments spanning the angel, seed, and pre-seed rounds and the early stage of VC funding.

## Understanding the Intangibles Attached to VC Investment

Investment from technologically advanced countries like the United States brings intangible benefits beyond pure capital, and investment in Chinese AI companies is no exception. A 2019 Chinese state-funded research paper notes that knowledge transfer in VC investment scenarios is inevitable, and that the “type of knowledge transferred from venture capitalists can help venture-backed firms acquire important information, such as that related to technological innovation, thus improving their technological innovation ability.”<sup>37</sup> Additional literature states that VC investors can “communicate valuable knowledge to an entrepreneur,” thus spurring innovation.<sup>38</sup> These intangible benefits come in various forms, including but not limited to:

- Mentoring and coaching from experts on international markets, managerial practices, efficiency and quality control practices, competitors, etc.
- Name recognition and seal of approval (if the investor is American or well-known).
- Networking opportunities via VC networks.<sup>39</sup>

This knowledge transfer is a two-way street. VC investment in China has provided U.S. investors with critical insight into China’s high-tech ecosystem. U.S. VC investors are also in the uniquely favorable position to act as knowledge intermediaries by transferring knowledge between their different portfolio companies, allowing one startup to learn from another via a connection back to the same investor.<sup>40</sup> More broadly, this two-way street has also facilitated further collaboration between U.S. and Chinese counterparts, resulting in greater innovative potential on both sides.

However, in the context of U.S.-China technology competition and broader PRC technology indigenization strategies, the transfer of this intangible knowledge could, in the long term, contribute to Beijing’s goals of catching up with and eventually leapfrogging the United States in key strategic technologies. At the same time, because this intangible knowledge, connections, and development opportunities are chiefly offered by U.S. investors, it can be seen as a potential chokepoint for Chinese AI and as such, an area where changes to U.S. policy could indeed have an impact on the speed and trajectory of China’s AI development.

This section describes potential instances of knowledge transfer associated with U.S. VC investments in Chinese AI companies. We discuss the role of U.S. VC in China’s AI



ecosystem via several case studies that illustrate these different transfer mechanisms. This discussion should be treated as a summary review of informative examples rather than an exhaustive account of this phenomena.

### **Top U.S. VC in China**

Table 5 shows the top 10 U.S. VC investors participating in investment transactions targeting Chinese AI companies from 2015 to 2021. According to our data, GGV Capital (formerly known as Granite Global Ventures) has been the most active overall in financing Chinese AI companies during this time period, with a total of 43 investment transactions. While GGV Capital is also active outside of China, its involvement in Chinese AI companies makes up 38 percent of its overall known AI investment transactions during this time period. In Table 5 below, we calculated the share of observed AI investment by the top 10 U.S. investors that went toward Chinese AI companies (based on what is available via Crunchbase) to estimate the role of Chinese AI companies in these firms' AI investment portfolios.

Table 5: Top 10 U.S. Investors Involved in Chinese AI Investment Transactions, 2015-2021

U.S. investors	Number of transactions in Chinese AI companies	Number of transactions in all AI companies globally	Percentage of investor's total AI investment activity in China
GGV Capital	43	112	38%
SOSV	38	284	13%
GSR Ventures	33	62	53%
BlueRun Ventures	20	24	83%
DCM Ventures	16	35	46%
Qualcomm Ventures	13	61	21%
Walden International	12	31	39%
Intel Capital	11	144	8%
HAX	11	84	13%
GL Ventures	11	12	92%

Source: CSET analysis of Crunchbase.

Note: "Number of transactions in all AI companies globally" refers to the total number of AI investments in Crunchbase that a company made globally (including China) between 2015-2021.

Some of the top U.S. VC investors on this list are more active in China than elsewhere in the world. For instance, 20 of BlueRun Ventures' 24 global AI investment transactions (83 percent) between 2015 and 2021 went to Chinese AI firms. GSR Ventures also appears to have a heavy investment footprint in China's AI ecosystem, with 33 of its 62 global AI investment transactions (53 percent) targeting Chinese AI companies.

GSR Ventures is an interesting example for understanding the limitations of Crunchbase data. Although Crunchbase claims that GSR Ventures is a U.S.-headquartered company, there are reasons to question this claim. In January 2015, the Committee on Foreign Investment in the United States (CFIUS) aimed to block a consortium of firms, including GO Scale Capital—managed by U.S.-based Oak Investment Partners and GSR Capital (which was formerly part of GSR Ventures)—from buying lighting company Lumileds out of concerns for the transfer of gallium nitride semiconductor technology to China. Dutch firm Phillips, the seller in question, eventually scrapped this deal.<sup>41</sup> Some U.S. reporting of the incident even referred to GSR Ventures as a Chinese firm.<sup>42</sup> According to the company's LinkedIn bio, as of 2016, GSR Ventures and GSR Capital, as well as GSR United Capital, are three “independent yet complementary teams,” suggesting a potential reorganization effort after the dropped deal.<sup>43</sup>

## **Mentorship and Coaching**

One of the primary intangible benefits that overseas industries get from U.S. investment is the opportunity for mentorship and coaching. The decades of expertise and experience of VC investors from leading U.S. companies is invaluable for younger firms, especially those in countries with burgeoning, yet relatively young, high-tech industries.

SOSV appears to have the largest global footprint in AI investment, participating in 284 investment transactions from 2015 to 2021, with 38 of the transactions (13 percent) targeting Chinese AI companies. In 2010, SOSV set up a subsidiary known as Chinaaccelerator—a program designed to assist small startups in entering China, as well as assisting Chinese startups in entering the global market. Chinaaccelerator claims to provide \$150,000 in funding in exchange for 6 percent of the target company's equity; one-on-one mentorship from three hundred mentors across China Southeast Asia, the United States, and Europe; a free co-working space at People Squared (with locations in Shanghai and Beijing); a robust alumni network; and other

perks. Startups in the program embark on a six-month-long journey divided into a three-month growth phase and three-month fundraising phase.<sup>44</sup>

In addition to Chinaaccelerator, SOSV oversees HAX, a similar accelerator program that provides early-stage startups with access to experts, investors, manufacturers, engineers, and other relevant stakeholders.<sup>45</sup> HAX has offices in San Francisco and Shenzhen, but according to the company's website, HAX itself is not a Chinese fund; rather, it is part of SOSV and merely maintains offices in Shenzhen.<sup>46</sup> Several companies in our dataset went through the HAX hardware accelerator program before securing financing. For instance, autonomous mobile robot startup Youibot participated in the HAX program in Shenzhen in 2018.<sup>47</sup>

Other accelerators attached to large U.S. firms have invested in and helped coach the Chinese AI companies that received U.S. investment in our dataset. For example, Clobotics—a computer-vision-based wind turbine blade inspection service, and Raven Tech—an AI software company, both participated in the Microsoft Accelerator program. For Clobotics, an initial investment from GGV Capital helped move the company to the head of the 2017 class of the Microsoft Accelerator program, according to Clobotics founder George Yan, who previously held the position of Head of Microsoft China for 16 years.<sup>48</sup>

In addition to participating in the Microsoft Accelerator program, Raven Tech also received backing from Y Combinator—an elite California-based accelerator with a very low 1.5-2 percent acceptance rate.<sup>49</sup> These opportunities and experiences likely made Raven Tech more attractive to other investors, and in 2017 the company was acquired by Baidu.<sup>50</sup>

Among other companies in our dataset, California-based VC firm Sequoia Capital made five investments into Chinese AI companies from 2015 to 2021. However, its China-based subsidiary was much more active during this time period, participating in 104 investment transactions that Chinese AI companies raised from 2015 to 2021. Sequoia Capital China has also established incubator programs in China, including the “Sequoia Digital Intelligent Industry Incubator Center.” Located within the Shanghai Zhangjiang Artificial Intelligence Island, this incubator was established in 2020 in cooperation with the local government in Shanghai.<sup>51</sup> At the opening ceremony for the new incubator, the deputy mayor of Shanghai said that Sequoia “provides important support for the growth and expansion of enterprises” in the area.<sup>52</sup> Although this incubator was set up by Sequoia Capital China, it is difficult to assess the incubator's or its parent company's relationship with its ultimate parent, U.S.-based Sequoia Capital. However, the brand recognition in itself is valuable.

In addition to funding portfolio companies, Sequoia Capital China has also played an active role in bolstering the VC ecosystem in China by teaming up with local partners to establish China-based VC firms. One prominent example is ZhenFund (真格基金)—a Beijing-based seed-stage venture fund founded in 2011 in collaboration with Sequoia Capital China and New Oriental Education & Technology Group.<sup>53</sup> ZhenFund has gone on to invest alongside prominent U.S. firms such as Sequoia Capital, Microsoft Ventures, GSR Ventures, and others. More information on the network-building aspect of VC investment can be found in the next section. Although beyond the scope of this paper, more information is needed to better understand the networks among U.S. and Chinese VC and PE firms.

Other U.S. VC firms have similar mentorship programs in China. For example, in 2020, GGV Capital held 19 “Master Classes” on topics such as finance, talent, strategy, organizational structure, sales, and more. The sessions brought in expertise from Alibaba, Huawei, Tsinghua University, and others.<sup>54</sup> GGV also claims to maintain relationships with local Chinese government offices and representatives in more than 20 cities to help connect portfolio companies with government departments.<sup>55</sup> In theory, pairings of FDI more generally and host country regulatory strategies can help the FDI-receiving nations expand their domestic markets and move up the value chain, which, in most cases, is a positive development.<sup>56</sup> However, given the critical nature of AI and the current state of U.S.-China competition in technology, we may be forced to rethink the cost-benefit analysis around FDI and VC investment more broadly.

### **Name Recognition and Building Strategic Networks**

Investments by VC investors often help extend the social capital of their portfolio companies via their network of contacts across industry. These connections can further help portfolio companies build their strategic networks with companies and investors working in adjacent or similar industries. Most importantly though, previous studies suggest that investments from big VC firms—especially those in the United States—may convey a credible signal of a firms’ quality to other parties.<sup>57</sup> In the context of U.S. VC investment into China’s AI ecosystem, this name recognition—alongside the strategic access that U.S. investors may grant to portfolio companies—may be a crucial indirect benefit that has contributed to the growth of China’s AI companies. In some cases, this may also lead to coattail investing—or copying the investment decisions of successful investors—where Chinese and other foreign firms follow in the footsteps of prominent U.S. firms.

Along these lines, Chinese media reports claim that Sequoia Capital assists portfolio company Infervision by recommending that the company participate in relevant government seminars and by helping to contact additional suitable investors.<sup>58</sup> As an example, in 2020, Sequoia Capital China and the China Development Research Foundation (CDRF; 中国发展研究基金会) jointly held a press conference on “Application Research of AI in the Field of Healthcare” at the Diaoyutai State Guest House in Beijing—a significant location usually reserved for diplomatic guests or government officials.<sup>59</sup> In attendance alongside Chinese government and Party officials were Sequoia Capital China leadership, as well as the CEOs of Infervision and Synyi—both Sequoia Capital China (and, in the case of Infervision, Sequoia Capital too) portfolio companies.<sup>60</sup> These high-level interactions—likely facilitated by Sequoia Capital—benefit portfolio companies by giving them access to government officials as well as a platform to promote their brand. In line with the previous section on mentorship and coaching, media reports also state that Sequoia Capital has helped Infervision with issues related to government resources, investor resources, leadership guidance, human resources, and public relations.<sup>61</sup>

The following two case studies, drawn from our dataset, provide examples of intangible benefits that come from corporate venture capital (CVC)—that is, a type of VC investment that comes directly from corporate funds.<sup>62</sup> Academic literature suggests that CVC investors often make strategic investments to strengthen the competitiveness of their parent companies, allowing them to tolerate the risk associated with early-stage investment in emerging technology, and focus on creating value, rather than solely on generating investment returns. CVCs may invest in startups to try and create synergies between their parent company and portfolio companies by sharing technology know-how and/or via business partnerships, thereby stimulating value creation for both the startup and the corporate parent.<sup>63</sup>

## **Intel Capital**

Intel’s investments in China have led to collaboration with, and likely knowledge transfer to, Chinese AI companies. According to our analysis of Crunchbase, between 2015 and 2021, Intel Capital—Intel’s own investment arm—participated in 11 transactions targeting Chinese AI companies. In some instances, Intel Capital obtained a seat on the board of the Chinese AI company in which they’ve invested. For example, Intel Capital’s investment in Horizon Robotics resulted in Intel’s Global Vice President, Daniel McNamara, joining the company’s board of directors.<sup>64</sup> Although a common practice in the VC industry, the expertise provided by companies like Intel could give

Chinese firms access to U.S. expertise—particularly through name recognition and networking access—that they might not be able to find elsewhere.

Horizon Robotics, often cited as a Chinese rival to Nvidia, specializes in AI chips for robots and autonomous vehicles. The company's Series A funding round in October 2017 was led by Intel Capital. In April 2022, Horizon Robotics announced a collaboration with Chinese electric car giant BYD to equip BYD vehicles with Horizon's latest generation automotive processor, Journey 5—a high-performance automotive processor designed for Level 4 autonomous driving.<sup>65</sup> In addition to BYD, Horizon has partnered with other Chinese and global companies working in the electric and new energy vehicle industry, including Audi, Bosch, Continental, and SAIC Motor.<sup>66</sup> In October 2022, Volkswagen announced intentions to take a 60 percent stake in a new joint venture with Horizon Robotics via its software unit, Cariad. The JV, based in China, will help Volkswagen “speed up customization of automated driving solutions in China.”<sup>67</sup> Just weeks after this announcement, Volkswagen also announced that it would no longer be investing in Pittsburgh-based Argo AI, stating that it would instead be concentrating its autonomous driving efforts on its existing partnerships with Bosch and Horizon Robotics.<sup>68</sup>

Despite Horizon Robotics touting its Intel support in its early days, the company now seems to be competing with Intel in developing auto-grade AI chips. In essence, Intel's support for Horizon Robotics may have helped the company better compete with Intel. In early 2022, Intel, via its Mobileye unit, revealed its EyeQ Ultra system-on-a-chip (SoC) designed to enable Level 4 autonomous driving.<sup>69</sup> Several industry analyses refer to Horizon as a rival to Intel/Mobileye, and some analysts believe that Horizon's Journey 5 chip may be a starting point for Horizon to overtake international rivals like Nvidia and Mobileye.<sup>70</sup> In May 2021, Chinese electric car firm Li Auto announced that it would be leaving Mobileye in favor of Horizon Robotics.<sup>71</sup>

In another instance, Intel Capital's investment in Eeasy Tech, a company focused on SoC design, resulted in the head of Intel Capital China, Wang Tianlin, joining the company's board.<sup>72</sup> Eeasy Tech was founded in the Zhuhai Hi-Tech Industrial Development Zone in 2016, and Intel's Series A investment coincided with investment from the Zhuhai Science & Technology Venture Capital—a firm held by the Zhuhai Provincial Government's State-owned Assets Supervision and Administration Commission (SASAC). In China, SASAC, at the national, provincial, and municipal levels, “performs investor's responsibilities, and supervises and manages the state-owned assets of enterprises under [its jurisdiction],” according to its official website.<sup>73</sup> This high-level interaction between Intel and the local government may have

presented an additional opportunity for knowledge transfer, presumably business and investment acumen, directly to the Chinese government.

In other situations, Intel Capital's investments in Chinese AI firms have led to the formation of strategic collaborations that could benefit the Chinese companies in a way that complements Chinese government strategies. Following Intel Capital's investments in Reconova Technologies, the Fujian-based company stated that Intel Capital's investment helps the company unlock its AI potential: "With AI becoming an important part of China's national strategy, there exists a huge opportunity. . . . The new investment from Intel Capital . . . will help us further expand our AI industry deployment, increase market share, and strengthen our industry leadership position."<sup>74</sup> According to Intel Capital leadership, the investment aimed to help Reconova develop "innovative visual perception technologies to accelerate AI application implementation and the upgrading of smart industries in China."<sup>75</sup>

Intel Capital's 2018 investment in Beijing-based HuiyiHuiying (now known as HY Medical) came after the two companies had previously established a joint AI laboratory. Following the 2018 corporate round investment, the two companies claimed they would be collaborating to develop an AI full-cycle breast health management cloud platform, and Huiyi Huiying stated that the investment from Intel Capital will help it enhance its research and development capabilities, broaden its market reach, and further grow its business.<sup>76</sup> Since then, Huiyi Huiying collaborated with Intel to optimize its algorithms that run on Intel's Xeon Scalable processors.<sup>77</sup>

HY Medical is not the only Intel Capital target company in China using this technology. Konfoong Biotech International also used the Intel Xeon Scalable processors to optimize algorithms related to tuberculosis screening.<sup>78</sup> As with many core processors, Intel's Xeon models are dual-use and have a range of potential military use-cases in addition to their commercial ones. Although these two instances involving medical and biotech technology seem outside the scope of national security concerns and play important roles in medical science, U.S. companies like Intel should take into account any potential diversion to a military end-use or end-user in China. The U.S. government has made it clear with recent export controls that cutting-edge chip exports to China are potentially problematic, and although Xeon processors are not the most cutting-edge chips on the market, they could eventually be subject to similar scrutiny.<sup>79</sup>

## **Qualcomm Ventures**

Similar to Intel Capital, Qualcomm Ventures' investments in China have created inroads to collaboration with, and knowledge transfer to, Chinese AI companies.



Launched in 2000 and headquartered in California, Qualcomm Ventures is the investment arm of U.S. information and communications technology giant Qualcomm. When founded, the company set out with an initial mission to “accelerate innovation by making investments that leverage smartphone technologies and lead to new, connected verticals and markets.”<sup>80</sup> Since then, the company has not only expanded its portfolio in terms of technology areas—moving into ride-sharing, smart hardware, and other sectors—but has also expanded its geographic footprint, setting up branches in China, India, Israel, and Brazil, among others.<sup>81</sup> Notably, the company’s China office was the first overseas branch it set up, just three years after Qualcomm Ventures was founded.<sup>82</sup>

Qualcomm Ventures has had an active presence in China since 2003. From 2015 to 2021, the company participated in 13 investment transactions raised by Chinese AI companies. Qualcomm Ventures’ parent company, Qualcomm Incorporated, made two additional investments during this time period. In July 2014, Qualcomm announced its \$150 million Strategic China Venture Fund to invest in Chinese startups across all stages, with Qualcomm Ventures advising and directing these investment activities. According to the official statement in July 2014, Qualcomm viewed China as a “strong player in the semiconductor industry” and wanted the company to continue investment in this area in China “to add to its strategic investments in Chinese companies.”<sup>83</sup> The company also noted that Chinese companies who receive investments from Qualcomm “can benefit from Qualcomm’s insights on mobile technologies and leverage Qualcomm relationships throughout the industry.”<sup>84</sup>

Qualcomm Ventures has made a handful of investments in the Chinese self-driving vehicle industry. In 2019 and 2021 respectively, the company made Series C and D investments in Zongmu—a tech firm working on self-driving vehicles. In August 2021, Qualcomm Ventures called its relationship with Zongmu a “strong strategic partnership . . . utilizing Qualcomm’s Snapdragon technology in its solutions.”<sup>85</sup> Although beyond the scope of this report, it is important to consider instances where U.S. firms may have leverage over Chinese ones. In the Zongmu case, the Snapdragon technology appears to be a critical gap that could not be filled as easily without U.S. contributions. Besides Zongmu, Qualcomm Ventures also invested in Haomo.AI, a Beijing-based startup working on self-driving vehicles. Haomo.AI was born out of China Great Wall Motor—China’s largest automotive manufacturer—and is still controlled by its Chairman, Wei Jianjun.<sup>86</sup>

Some of Qualcomm’s portfolio companies have established partnerships or collaborations with entities in China that may have national security implications for



the United States. In 2016, Qualcomm Incorporated reached into its Strategic China Venture Fund to make an investment in 7Invensun—a Beijing-based company working in the field of eye-tracking, eye-motion control, head-tracking, and facial identification technology.<sup>87</sup> In 2020, at a Qualcomm-hosted conference in Nanchang, 7Invensun said they planned to share their eye-tracking applications and explore further ways to improve their technology with other tech executives.<sup>88</sup> Through these types of events, Qualcomm is giving its portfolio companies opportunities to build their strategic networks.

Due to the sensitive nature of this technology, there is potential for 7Invensun's products to end up in the hands of China's security forces. As an example, in 2018, 7Invensun published two co-authored pieces with the Beijing Institute of Aerospace Intelligence and Information (北京航天情报与信息研究所), a subsidiary organization under the state-owned defense firm China Aerospace Science and Industry Corporation (CASIC; 中国航天科工集团).<sup>89</sup> One piece focused on the development of a driver-fatigue warning system, while the other looked at improving near-infrared cameras for facial recognition.<sup>90</sup> In addition, the 7Invensun website boasts two examples of the company's use cases that involve Chinese military actors.<sup>91</sup> One example mentions collaboration with the PLA's Air Force Aviation University (空军航空大学) that tracks eye movement during pilot training tasks, and the other highlights work with the China Academy of Launch Vehicle Technology (CALT; 中国运载火箭技术研究院) aimed at improving visual technology for astronauts.<sup>92</sup>

Along similar lines, Qualcomm Ventures and its parent company have also invested in SenseTime—a Chinese facial recognition company that has been sanctioned by the U.S. government due to its alleged participation in surveilling the Uyghur population in Xinjiang.

## Limitations

While the analysis in this report is illuminating, several limitations still exist. First, investment information found in the Crunchbase database is limited to publicly-announced transactions, and unknown or secret transactions are not captured.

Based on the information provided in Crunchbase, it is difficult to ascertain how much money a company receives from one specific investor in a funding round, since investment transactions are often represented as a lump sum of money without specific breakdowns of investor contributions. It is therefore difficult to determine how much money from U.S. sources is flowing to China from U.S.-based investors involved in such transactions. For example, in 2018, Chinese AI surveillance leader SenseTime raised \$620 million from seven investors, three based in the United States, two located in China, one headquartered in Singapore, and another in the United Kingdom. In this instance, we were unable to identify the exact amount each of the seven investors individually invested in the company.

Even in cases with one investor, it can still be difficult to assess the origin of capital due to the lack of transparency in investment data. PE/VC funds managed by general partners (GPs), such as U.S.-based Sequoia Capital, typically source capital from limited partners (LPs) whose background and degree of capital contribution are kept confidential, and funds are not required to disclose further information. This reality makes it difficult to track the original source of capital. In addition, the definition of a “U.S. investor” is not a straightforward one, as firms often have complicated and opaque ownership structures, and Crunchbase does not always provide reliable information on beneficial or ultimate ownership.<sup>93</sup> For instance, a U.S. VC firm could have capital coming from Chinese or other foreign LPs that they are not required to disclose.

Additionally, it is challenging to use Crunchbase data to determine whether a given investor has obtained a controlling interest through their investment. Similarly, it is difficult to effectively quantify the intangible two-way benefits that both the investors and the recipients receive during these deals. Beyond board seats, Crunchbase does not provide any information on what types of rights may be conveyed along with any given investment. As such, we are unable to effectively assess the degree of passiveness of the U.S. investment.

Lastly, syndication deals, as discussed earlier, often result in a network of co-investments where venture capital firms are interconnected.<sup>94</sup> Although beyond the scope of this report, our data suggests that U.S. VC firms like GGV Capital and GSR

Ventures are at the center of China's VC network and are highly connected to Chinese VC firms like Sequoia Capital China—the China-based subsidiary of U.S. firm Sequoia Capital. GGV Capital is the U.S. investor with the most unique partnerships with Chinese co-investors (67 partners), followed by GSR Ventures (50 partners). Between 2015 and 2021, GGV Capital most frequently co-invested with Sequoia Capital China in eight investment transactions raised by Chinese AI companies. Similarly, GSR Ventures jointly invested with Sequoia Capital China in six investment transactions, which is more often than it did with other Chinese VC firms. A network of U.S. and Chinese VC firms brings in a lot of expertise about the high-tech industry to portfolio companies. When VC firms are well-connected, they often share information and investment opportunities.<sup>95</sup> However, additional research is required to effectively understand what intangible assets this network of investors brings to Chinese firms.

## Next Steps

Although U.S. outbound investment into Chinese AI companies is limited, the highly-complex nature of such financial activity, commercial linkages, and the tacit expertise that transfers from U.S.-based funders to AI companies in China carries implications that warrant further investigation. As U.S. policymakers deliberate ways to tackle the concerns tied to U.S. investments in China, putting data behind the outbound investment review conversations will be critical to both mapping the range of potential policy responses and improving the accuracy and efficiency of those responses.

To address the aforementioned issues, we suggest the following as next steps for policymakers to consider.

- 1. Identify clear policy objectives for any potential outbound investment review regime.**

In the context of outbound investment to China, there are several issues at play. As previously mentioned, the debates span a variety of concerns, including but not limited to supply chain resilience, competition in innovation, military modernization, and more. These concerns, although all related to national security in their own right, bring with them different desired outcomes that will require unique policy approaches if the U.S. government wishes to address them effectively. As we have demonstrated in this brief, the existing U.S. outbound investment into Chinese AI companies and the intangible benefits that come with such financial transactions warrant further investigation; however, any investigation must begin with clearly scoped objectives in mind to avoid overreach that could have adverse effects.

The discussions around defining national security objectives in the context of export controls provide a helpful comparison for understanding the significance of this recommendation. Similar to an investment review regime, export controls are merely a means to an end and do not exist as a tool for their own sake. Without a clearly articulated vision for what their desired end should be, it can be difficult to use export controls effectively.<sup>96</sup>

In addition, the lack of a defined vision can result in policies that have adverse consequences for U.S. trade and company competitiveness. Companies will often over-comply with trade controls to avoid being tangled in complicated, ambiguous nets. If an outbound investment review regime is not scoped and clearly defined, it may force companies to be more risk-averse and even stop investing in China altogether, which would have significant negative implications for global trade flows and supply chains.

More recently, the Biden administration has made efforts to clarify some of the objectives surrounding the national security concerns associated with inbound investments. The September 2022 executive order (E.O. 14083) aims to clarify and define the criteria that the administration believes CFIUS should be considering in evaluating transactions.<sup>97</sup> A similar approach could be taken in the context of outbound investment.

What is our goal? Are we trying to prevent the Chinese military from reaching its 2049 modernization goals? Are we working to stymie Beijing's efforts to use technology to abuse human rights? Are we worried about China gaining a first-mover advantage in emerging technologies? However we choose to define national security will help to inform the type of outbound investment screening regime, as well as bolster its effectiveness.

**2. Devise a pilot program for collecting data on U.S. outbound investment into China. As part of this effort, the U.S. government should consider revising disclosure requirements for U.S.-based funds and disclosure requirements for U.S. firms investing in Chinese companies, particularly those in sectors deemed critical to national security.**

As a first step, the administration should develop a program for gathering data on U.S. outbound investment into sectors deemed critical to national security, as scoped by the previous recommendation. This data could then be used by the U.S. government and kept confidential to better shape any future outbound investment review regime while simultaneously protecting the competitiveness of U.S. firms.

While this policy brief provides some information about the scale and scope of these transactions, more information is needed. As noted earlier, a large portion of VC-related activity is either outside of the scope of or exempt from U.S. Securities and Exchange Commission disclosure requirements.<sup>98</sup> Many of the U.S. VC firms in our dataset operate funds that are registered or headquartered in the United States and receive funding from a number of LPs; however, current U.S. law does not require disclosure of the names of these LPs regardless of their location, so it can be difficult to ascertain the origins of money behind a fund.<sup>99</sup> While such opaqueness is not in and of itself a national security risk, imposing disclosure requirements is a first step to gaining more visibility into the potential risks associated with a given transaction. We understand that forcing U.S. companies to publicly disclose this information could be problematic; as such, we recommend that a first step could be imposing disclosure requirements that only go to relevant offices in the U.S. government.

Furthermore, an outbound investment screening regime that is too broad may create too much uncertainty for the business community and reduce U.S. companies' willingness and ability to maintain operations in China—or even base themselves in the United States—leading to additional supply chain issues at home and potentially decreasing the competitive edge of U.S. companies. As such, a data collection program such as a notification regime could provide necessary visibility into the types of transactions, as well as the actors in those transactions, that present potential risks to national security.<sup>100</sup>

The U.S. Department of Treasury previously proposed draft legislation on this issue—the “Sensitive Technologies Supply Chain Risk Management Act of 2022.” This draft lays out a pilot program that would require U.S. companies and individuals to submit notifications regarding certain outbound investments in China, Russia, and other “covered states” that involve sensitive technologies.\* Although this draft appears to have lost political momentum, the stated purpose of the program would have been to better inform the U.S. government's assessment of the national security concerns arising from the aforementioned transactions, and, based on those findings, identify what potential new authorities might be needed to address those risks.<sup>101</sup>

Others have proposed similar ideas for data collection. A September 2022 report from the Center for a New American Security (CNAS) and the Atlantic Council calls for a mandatory notification regime of certain U.S. investments in China.<sup>102</sup> The authors argue that a notification regime can inform the U.S. government of the proper scope of an outbound investment mechanism while simultaneously providing necessary information to support diplomatic outreach to allies to help understand the utility and need for such tools. The proposed regime would cover any transaction that involves the acquisition by a U.S. person, including any entity owned or controlled by a U.S. person, of an equity interest in a Chinese entity. This, as the authors note, would cover both “smart money”—a term they use to describe investments that convey an additional benefit beyond mere capital, as well as purely passive investment.<sup>103</sup> The idea of gathering data on the smart money aspect of U.S. outbound investment fits with our previous discussion of the intangible benefits that come with U.S. VC investments in China. Indeed, more information is required to better understand what types of knowledge, connections, know-how, and resources Chinese companies gain

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\* The term “Covered States” in this context applies to countries referenced in Section 126.1 of the International Traffic in Arms Regulations.

from U.S. investment beyond dollar amounts. That being said, we acknowledge the need to balance these data collection efforts with the fact that public disclosure of investment activities may hurt the competitiveness of U.S. companies; thus, it may be prudent to find ways to anonymize this data whenever and wherever possible.

In addition, the CNAS/Atlantic Council piece argues that, under the proposed notification regime, notification should be required for “covered investments made in any Chinese entity that produces, designs, tests, manufacturers, fabricates, or develops any item that would be controlled under U.S. export controls if originating in the United States.”<sup>104</sup> If the U.S. government has already decided to restrict the export of an item for national security or foreign policy reasons, it would make sense to ensure that U.S. dollars are not flowing into companies that make these items. First, however, we need to figure out where this is occurring.

### **3. The Department of Treasury, in conjunction with the interagency, should expand and revise the scope of the Non-SDN Chinese Military-Industrial Complex Companies (CMIC) List.**

Although the U.S. government currently does not have the capability to review U.S. investment into Chinese AI companies, it does already have in place a mechanism to prevent U.S. capital from flowing into certain swaths of Chinese companies. Under the Treasury Department, the CMIC List seeks to address the issue of securities investments in the United States that finance companies linked to China’s military-industrial complex. It gives the administration the ability to prohibit the purchase or sale of any publicly traded securities by entities that have been found to operate (currently or previously) in the defense and related materiel sector or China’s surveillance technology sector, in addition to those who are owned or controlled by an entity within those sectors.<sup>105</sup> The CMIC List could be used to block U.S. investment into specific Chinese AI companies that fall within its jurisdiction.

In essence, the CMIC List aims to prevent U.S. persons from buying or providing investment exposure to Chinese companies deemed by the U.S. government to be part of China’s military-industrial complex or complicit in surveillance regimes against minority populations in China.<sup>106</sup> As of December 2022, there are 68 entities on the CMIC List.<sup>107</sup>

The CMIC List should, at minimum, be expanded beyond publicly traded securities to include privately-held Chinese companies that can, and do, attract investment, including U.S. investment. This would also capture JVs and private-sector investments like VC investments.<sup>108</sup> This tool should then be used in cases of U.S. outbound

investment flowing to problematic actors in China, especially those working in the defense/military and surveillance industries, like iFlytek, which can be found in our dataset. This modified list could then be used in the most egregious cases, in conjunction with the aforementioned data collection regime, to gain a better perspective of the issues at play.

The CMIC List gives U.S. companies and persons 365 days to divest from an entity once it is added to the list. Once this period lapses, any purchase or sale of listed CMICs is prohibited absent authorization from Treasury’s Office of Foreign Assets Control (OFAC).<sup>109</sup> Chinese AI companies that appear in our dataset like Yitu Technology are on the CMIC List, but it is unclear how much this listing has actually affected Yitu, if at all.<sup>110</sup> According to our dataset, San Francisco-based VC firm GC Capital was a Series C investor in Yitu Technology in 2018.

Several gaps still exist. The CMIC List only prohibits the “purchase for value, or sale” of publicly traded securities. In other words, privately-held Chinese companies and non-state-owned enterprises (SOE) are not within the scope, despite some being on the list anyways. In addition, U.S. persons are still allowed to provide assistance and services that could allow Chinese firms to circumvent the essence of the CMIC List.

As of December 2022, the CMIC List already includes some privately-held Chinese firms, such as Yitu Limited (also known as Yitu Technology), Huawei, Inspur Group, Proven Glory Capital Limited, and more, despite its mandate. In other instances, the CMIC List contains wholly SOEs that are not traded on any stock market, such as China Aerospace Science and Technology Corporation, China General Nuclear Power Group, China National Offshore Oil Corporation, and others. In these cases, the CMIC List is acting merely as a blacklist.\*

To address these gaps, the administration should consider revising the CMIC List beyond its initial “defense materiel and surveillance” sectors. As of now, the CMIC List only includes Chinese entities that “operate or have operated in the defense and related materiel sector or the surveillance technology sector of the economy of the

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\* The U.S. government could consider moving some of the SOEs on the CMIC List—if not already listed—to the DOD’s Section 1260H list. However, the 1260H list is limited to Chinese military companies that are operating directly or indirectly in the United States, so some SOEs may not fall under this umbrella.



PRC.”<sup>111</sup> The scope could be revised to include other Chinese AI companies operating in sectors critical to national security, as determined by Congress or the administration.

#### **4. Create a mechanism to prevent U.S. investment into Chinese companies on the Entity List.**

Policymakers have expressed frustration with the limitations of the Entity List, especially as it relates to capital flows into listed entities. In November 2021, a group of U.S. senators wrote a letter criticizing the U.S. government for doing little to “impede the flow of U.S. exports and investment to Chinese AI companies with PLA ties.” In turn, the senators urged the Department of Commerce’s Bureau of Industry and Security (BIS) to “take all steps necessary to prevent key technologies from falling into the hands of the PLA,” including adding the companies listed in previous CSET reports to the Entity List.<sup>112</sup> In addition to U.S. VC firms, many U.S.-backed Chinese VC firms have invested in Chinese firms that have been blacklisted by the U.S. government. For instance, Chinese facial recognition firm Yitu Technology received investments from Sequoia Capital China, ZhenFund, and Hillhouse Capital.<sup>113</sup> These firms have also co-invested alongside U.S. Entity Listed Chinese firms like iFlytek; on multiple occasions, Hillhouse Capital has invested in Chinese AI companies in the same transaction as iFlytek.<sup>114</sup>

There is no element of the Entity List that requires any amount of divestiture from or limitations on investment into listed entities. As such, U.S. companies that may have previously invested in Chinese companies before they were added to the Entity List are not legally obligated to divest from the listed company or organization. For instance, according to our dataset, Qualcomm Ventures made a corporate round investment into SenseTime, a Chinese AI startup, in 2017, and invested again in 2018 in Series C. SenseTime was later added to the Entity List in October 2019 after BIS deemed it to be engaged in human rights violations and abuses against the Uyghur population in China’s Xinjiang Province.<sup>115</sup> Until December 2022, Qualcomm Ventures still listed SenseTime as part of its portfolio, although SenseTime’s presence on the Entity List does prevent Qualcomm from sharing any sensitive technology or information with the company.<sup>116</sup>

The Entity List, under BIS, is designed to restrict the export, reexport, and/or transfer of specified items to specific end-users. This restriction occurs by imposing license requirements on specific end-users—ranging from companies, government and private institutions, individuals, and research institutions—for which there is “reasonable cause to believe . . . that the entity has been involved, is involved, or poses a significant risk of becoming involved in activities that are contrary to the national security or foreign

policy interests of the United States.”<sup>117</sup> When an entity is added to the Entity List, U.S. exporters are required to obtain a license if they wish to export to that listed destination. In short, the Entity List deals with the flow of goods, not the flow of capital.

The Biden administration should consider adopting a general policy of cross-listing entities placed on the Entity List and those on an expanded CMIC List. This should, of course, only be done in instances where the underlying facts and risk assessment support a listing under each legal authority, as OFAC and BIS operate under different authorities.<sup>118</sup> In addition, the rationale for adding entities to both lists should be distinct to prevent jurisdictional overreach. Moving forward, a Chinese company could be added to the Entity List for risk of potential diversion to a military end-user in China, while simultaneously added to the CMIC List because of a connection to the Chinese defense sector. This ensures that both listings fall within the jurisdiction of their various agencies and regulations.

## Conclusion

Concerns surrounding the flow of capital between the United States and China will continue to grow over the next few years. The Biden administration is already working to outline its specific concerns related to Chinese investment in the United States, including matters related to supply chain resilience, leadership in emerging technologies, investments in key industries, and more.<sup>119</sup> In Congress, Senators Cornyn and Casey spent the better parts of 2021 and 2022 advocating for their “National Critical Capabilities Defense Act,” which aimed to establish an outbound investment screen for critical capabilities where the United States appears too reliant on China.<sup>120</sup> This report aims to identify the main U.S. investors active in the Chinese AI market, the set of AI companies in China that benefitted from U.S. capital, and the effect these investment activities and the intangible benefits that emanate from them might have in the broader scheme of U.S.-China technology competition.

The nature of U.S. outbound investment into Chinese AI companies is incredibly complex, and it will be critical for U.S. policymakers to temper expectations regarding the effectiveness of any outbound investment regulation related to emerging technologies. As this report shows, regulating U.S. outbound investment into China’s AI ecosystem will unlikely halt China’s AI progress. With AI in particular, the majority of financial backing comes from domestic Chinese entities. This means that, unlike export control maneuvers that rely on U.S. dominance in supply chain chokepoints, the U.S. has very little leverage over China in terms of funding AI development. The Chinese domestic market is so large that it has the potential to sustain itself in certain areas. Moreover, Chinese AI companies also attract investment from foreign investors other than the United States. Any unilateral U.S. action will be weaker without the help of U.S. allies.

As our data shows, although investors from other countries besides the United States and China occupy a smaller percentage of investment into China’s AI ecosystem, it will be vital to work with other countries to ensure that they understand the potential risks of investing in Chinese high-tech firms. It will also be essential to ensure that they do not backfill any gaps left by any U.S. firms that choose to invest elsewhere.

This report has just touched the surface of this issue. Although we are able to provide a baseline assessment of capital flows, several questions remain unanswered. Further study is required to better understand the specific intangible benefits of U.S. investment into Chinese tech companies beyond pure capital. This could include systematic studies on VC mentorship and coaching as well as accelerator and

incubator programs, beyond the case studies provided in this report. In addition, if the Biden administration revises any disclosure requirements or implements any data collection programs, there will be a massive need to study this data over the next three to five years.

Finally, it is unlikely the U.S. and Chinese capital markets will decouple entirely. Money will and must continue to flow between the United States and China, as a broader effort to separate these two economies, without well-scoped objectives, would have an immense blowback on the global economy. Therefore, if U.S. policymakers assume that trade and bilateral (and multilateral) investment will continue, they would do well to first refine their thinking about national security in the context of outbound investment and, more broadly, technology competition, and then use this contextualized definition to inform the design and implementation of an outbound investment screening regime.

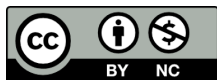
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## Appendix A: Methodology for Identifying AI Companies and Cross-border AI Investment

To identify AI companies, we ran a regular expression-based search query against the business descriptions of the target companies in Crunchbase. The results include companies whose descriptions include either terms associated with specific AI applications such as “machine learning,” “computer vision,” “TensorFlow,” or generic AI-related terms such as “artificial intelligence,” “semiconductor.”<sup>121</sup>

In addition, given that the company business description provided by Crunchbase appears limited in some cases, we supplement the AI company identification using the keyword-based method with Crunchbase AI tag. AI companies in our analysis include companies that CSET or Crunchbase has identified as AI companies.

To test for the degree of Crunchbase’s coverage, we randomly selected one hundred companies in ITjuzi data and spot-checked against Crunchbase. Sixty-four percent of the transactions are covered by Crunchbase overall, but when we checked for transactions used for analysis in this report, 74 percent of the transactions were covered by Crunchbase. Furthermore, when we validated the missing transactions (16 percent), we found that only two transactions involve U.S. investors, which means that 94 percent of the missing transactions skewed heavily on the transactions that involve domestic Chinese investors.

## Appendix B: Taxonomy of Primary Applications of AI

The following table is an adapted version of the TINA (Taxonomy of INtelligence Applications) coding guide used by CSET analysts to classify companies' primary applications of AI. The notes in the table are illustrative, not exhaustive.

Category		Notes
1	Medicine and life sciences	<p>Includes physiological monitoring, imaging and diagnostics, public health, and drug discovery.</p> <p>Companies whose products and services relate to the back-office business and logistical needs of healthcare providers—for example, medical billing and coding, or transcription of doctors' notes—are classified in category 11, not category 1.</p>
2	Agriculture	<p>Includes agricultural sensing and analytics as well as autonomous farm machinery.</p>
3	Transportation	<p>Includes autonomous vehicles, aerospace, avionics, and related components. This category also includes producers of AI-enabled unmanned aerial vehicles (UAV), drones, and mobile robots for the logistics and warehousing industries.</p>
4	Process automation	<p>Includes companies focused on automating production and processing of tangible goods, and on monitoring and maintenance of related equipment.</p>
5	Consumer goods	<p>Includes companies that design or produce consumer goods and devices.</p>

6	Utilities	Includes companies whose products serve utility producers (e.g., oil and gas companies or electric power producers) or utility consumers. This would include (for example) companies that produce software to help businesses understand and reduce their electricity or water consumption.
7	Construction and field services	Includes AI-enabled software and equipment for monitoring construction sites and civil infrastructure (e.g., power lines and pipelines) and planning construction projects.
8	Security and biometrics	Includes cybersecurity and authentication, including biometric authentication. Companies focused on facial recognition, gait recognition, voice printing, and similar biometric identity resolution techniques are classified in this category.
9	Finance	Includes investing, lending, insurance, cryptocurrency, credit rating, and personal finance. Companies focused on accounting are classified in category 11, not category 9.
10	Sales, retail, and customer relations	<p>Includes marketing, lead generation, customer service, and customer relationship management.</p> <p>This category generally includes sales and marketing tools even if the tools' intended users might otherwise be captured in another category. For example, an online insurance marketplace or a customer service platform for use by airlines would be properly classified in this category, not category 3.</p>
11	Business services and	Includes business analytics not captured in category 10, logistics and supply chain management, human



	analytics	<p>resources (including job search websites and recruiting platforms), enterprise reputation management, and accounting and legal services. “Business analytics” means “business intelligence” tools and similar analytic applications not generally visible to the user’s customers.</p> <p>This category also includes back-office tools even if the tools’ intended users might otherwise be captured in another category. For example, billing or human resources software with special features for universities or hospital systems are generally classified in this category, because accounting and human resources are relatively generic functions that exist in many different types of organizations.</p>
12	Broadcasting and media production	Includes AI-enabled platforms for recommending and disseminating digital media.
13	Arts, sports, leisure, travel, and lifestyle	Includes personal social media platforms.
14	Education	Includes AI-enabled instruction and assessment tools.
15	Military, public safety, and government	Includes companies whose products are designed specifically for use by governments and militaries or relate to services strongly associated with governments (e.g., traffic management).
16	General purpose	A catch-all category for companies whose goods and services are not developed specifically for one of the above categories, or seem useful for more than one of the above categories.

		<p>Generally, this category includes companies focused on computing hardware (chips, semiconductors, etc.), robotics, sensors, cloud computing, networking and Internet of Things, software development, tools for cleaning and structuring data, human-computer interface (including AR/VR), speech and text processing, and image and video processing—but only when not tailored to an application described in categories 1-15. For example, a company that produces sensors specifically for use in UAVs would be classified in category 3, not category 16.</p>
17	Diversified/NOS/Unclear	<p>Includes companies that cannot reasonably be placed in any other category, or that lack sufficient information to categorize.</p>

Source: "Tracking AI Investment: Initial Findings From the Private Markets," Center for Security and Emerging Technology, September 2020.

## Appendix C: Additional Figures and Tables

This appendix presents additional charts and tables of relevance to this topic.

Table C1: Breakdown of Investment into Chinese AI Companies with U.S. Investor Participation, 2015-2021

	<b>Investment Transactions</b>	<b>Transaction Value (Millions USD)</b>
Only U.S. investors	107	\$7,450
Only U.S. and Chinese investors	222	\$10,813
U.S., Chinese, and other investors	61	\$21,419
U.S. and other non-Chinese foreign investors	11	\$552
Total U.S. participation	401	\$40,234

Source: CSET analysis of Crunchbase.

Table C2: Breakdown of Investment into Chinese AI Companies with Non-U.S. Investor Participation, 2015-2021

	<b>Investment Transactions</b>	<b>Transaction Value (Millions USD)</b>
Only Chinese investors	1,749	\$49,715
Chinese and non-U.S. foreign investors	92	\$11,038
Other non-U.S. foreign investors	57	\$9,092
Total non-U.S. participation	1,898	\$69,845

Source: CSET analysis of Crunchbase.

Table C3: Target Company Membership in China's AIIA.

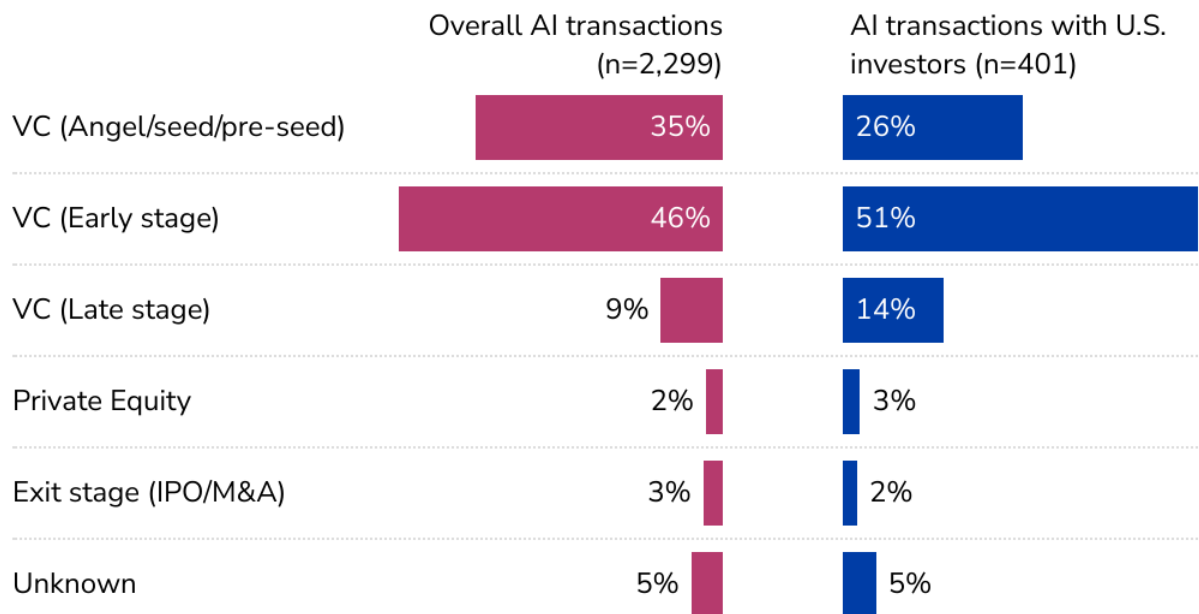
Full Name	Common Name	Chinese Common Name
Shanghai Tianshu Zhixin Semiconductor Co. Ltd.	Iluvatar CoreX	上海天数智芯半导体有限公司 (天数智芯)
Beijing Laiye Network Technology Co., Ltd.	Laiye	北京来也网络科技有限公司 (来也科技)
Xinjiang Aihua Yingtong Information Technology Co., Ltd.	AIWinn	新疆爱华盈通信息技术有限公司 (爱华盈通)
Wuhan Cobot Technology Co., Ltd.	COBOT	武汉库柏特科技有限公司 (库柏特)
Beijing Deepwise Bolian Technology Co., Ltd.	Deepwise	北京深睿博联科技有限责任公司 (深睿医疗)
Didi Chuxing Technology Co. Ltd.	DiDi	滴滴出行 (滴滴)
Liangfengtai (Shanghai) Information Technology Co., Ltd.	HiScene	亮风台 (上海) 信息科技有限公司 (亮风台)
Beijing Horizon Information Technology Co., Ltd.	Horizon Robotics	北京地平线信息技术有限公司 (地平线)

Beijing Infervision Medical Technology Co., Ltd.	Infervision	北京推想科技有限公司 (推想科技)
Beijing Kuaishou Technology Ltd.	Kuaishou	北京快手科技有限公司 (快手)
Shenzhen Leishen Intelligent System Co., Ltd.	Leishen Intelligent System	深圳市镭神智能系统有限公司 (镭神智能)
Hangzhou Lvwan Network Technology Co., Ltd.	Lvwan Technologies	杭州绿湾网络科技有限公司 (绿湾科技)
Beijing Yufanzhi Information Technology Co., Ltd.	Mobvoi (Chumenwenwen)	北京羽扇智信息科技有限公司 (出门问问)
Qianhai Enterprise Insurance Technology (Shenzhen) Co., Ltd.	Qibot	前海企保科技 (深圳) 有限公司 (企保科技)
Shanghai Qiniu Information Technologies Co., Ltd.	Qiniu Cloud	上海七牛信息技术有限公司 (七牛云)
Beijing Circulation Intelligent Technology Co., Ltd.	Recurrent AI	北京睿科伦智能科技有限公司 (循环智能)
Beijing Roobo Technology Co., Ltd.	Roobo	北京儒博科技有限公司 (儒博科技) <sup>122</sup>
SenseTime Group Inc.	SenseTime	北京市商汤科技开发有限公司 (商汤科技)

Terminus Technologies Group Co., Ltd.	Terminus Technologies	特斯联科技集团有限公司 (特斯联)
Beijing Unisound Information Technology Co., Ltd.	Unisound	北京云知声信息技术有限公司 (云知声)
Shanghai Yitu Network Technology Co., Ltd.	YITU Technology	上海依图网络科技有限公司 (依图科技)
Shenzhen Zhuiyi Technology Co., Ltd.	Zhuiyi	深圳追一科技有限公司 (追一科技)

Source: CSET AIIA Data, Crunchbase.<sup>123</sup>

Figure C4: Percentage of Chinese-bound AI transactions with U.S. investors by investment stages, 2015-2021



Source: CSET analysis of Crunchbase.

## Endnotes

<sup>1</sup> Congress.gov. “Text - H.R.1093 - 117th Congress (2021-2022): Stop Funding the PLA Act.” February 18, 2021, <https://www.congress.gov/bills/117/congress-house/bills/1093/text>; “Rubio Demands Biden Administration Protect Military Retirement Funds from China,” Marco Rubio, U.S. Senator for Florida, August 4, 2022, <https://www.rubio.senate.gov/public/index.cfm/2022/8/rubio-demands-biden-administration-protect-military-retirement-funds-from-china>.

<sup>2</sup> “Implementation of Additional Export Controls: Certain Advanced Computing and Semiconductor Manufacturing Items; Supercomputer and Semiconductor End Use; Entity List Modification,” Bureau of Industry and Security, U.S. Department of Commerce, October 13, 2022, <https://www.federalregister.gov/documents/2022/10/13/2022-21658/implementation-of-additional-export-controls-certain-advanced-computing-and-semiconductor>.

<sup>3</sup> “Remarks by National Security Advisor Jake Sullivan at the Special Competitive Studies Project Global Emerging Technologies Summit,” White House Briefing Room, September 16, 2022, <https://www.whitehouse.gov/briefing-room/speeches-remarks/2022/09/16/remarks-by-national-security-advisor-jake-sullivan-at-the-special-competitive-studies-project-global-emerging-technologies-summit/>.

<sup>4</sup> “FDI in Figures,” OECD, April 2022, <https://www.oecd.org/investment/investment-policy/FDI-in-Figures-April-2022.pdf>; “News Release: Direct Investment by Country and Industry, 2021,” Bureau of Economic Analysis, U.S. Department of Commerce, July 21, 2022, <https://www.oecd.org/investment/investment-policy/FDI-in-Figures-April-2022.pdf>; “Direct Investment by Country and Industry, 2021,” Bureau of Economic Analysis, July 2021, <https://www.bea.gov/sites/default/files/2022-07/dici0722.pdf>.

<sup>5</sup> Sarah Bauerle-Danzman and Emily Kilcrease, “Sand in the Silicon: Designing an Outbound Investment Controls Mechanism,” Atlantic Council and the Center for a New American Security, September 2022, <https://www.atlanticcouncil.org/in-depth-research-reports/issue-brief/sand-in-the-silicon-designing-an-outbound-investment-controls-mechanism/>.

<sup>6</sup> The “Internet +” Action Plan includes the first formal mention of AI and identifies 11 specific actions for technological transformation, PRC State Council, “State Council’s Guidelines on Positively Promoting ‘Internet +’ Action,” July 4, 2015.

<sup>7</sup> “Xi Jinping: Promote the healthy development of my country’s new generation of artificial intelligence” [习近平：推动我国新一代人工智能健康发展], Xinhua News, October 31, 2018, <https://perma.cc/PSC4-TVGG>; and Elsa Kania and Rogier Creemers, “Xi Jinping Calls for ‘Healthy Development’ of AI [Translation],” New America, November 5, 2018, <https://www.newamerica.org/cybersecurity-initiative/digichina/blog/xi-jinping-calls-for-healthy-development-of-ai-translation/>.

<sup>8</sup> Major Richard Uber, “China’s Artificial Intelligence Ecosystem,” National Intelligence University, 2021, [https://ni-u.edu/wp/wp-content/uploads/2021/08/Uber\\_Monograph\\_DNI2021\\_02261.pdf](https://ni-u.edu/wp/wp-content/uploads/2021/08/Uber_Monograph_DNI2021_02261.pdf).

<sup>9</sup> “Notice of the State Council on Issuing the New Generation Artificial Intelligence Development Plan” [国务院关于印发新一代人工智能发展规划的通知], PRC State Council, 2017, <https://perma.cc/B9ZR-5LQL>; and Graham Webster, Rogier Creemers, Paul Triolo, and Elsa Kania, “Full Translation: China’s ‘New Generation Artificial Intelligence Development Plan’ [2017],” New America, August 1, 2017, <https://www.newamerica.org/cybersecurity-initiative/digichina/blog/full-translation-chinas-new-generation-artificial-intelligence-development-plan-2017/>.

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<sup>90</sup> Liu Jinxing, Li Kemin, and Fu Yang, “Design scheme of an in-vehicle fatigued driving warning system” [一种车载疲劳驾驶预警系统设计方案], *Electroacoustic Technology* No. 9, 2018, <https://archive.ph/a1b6T>; Liu Jinxing, Fu Yang, Li Kemin, “Facial recognition near-infrared camera system based on USB3.0 transmission,” *Electroacoustic Technology*, August 2018, <https://archive.ph/PZiCi>.

<sup>91</sup> “Typical Uses” [典型案例], 7Invensun, <https://perma.cc/T53Y-XAGU>.

<sup>92</sup> The example on the 7Invensun website mentions the Aerospace First Academy (航天一院)—an alias for the China Academy of Launch Vehicle Technology (CALT), which is a subsidiary of state-owned China Aerospace Science and Technology Corporation (CASC). CALT has been one of the primary contributors to the development of China’s Long March family of rockets. For more information on CALT, see: Mark Stokes, Gabriel Alvarado, Emily Weinstein, and Ian Easton, “China’s Space and Counterspace



Capabilities and Activities,” U.S.-China Economic and Security Review Commission, March 30, 2020, [https://www.uscc.gov/sites/default/files/2020-05/China\\_Space\\_and\\_Counterspace\\_Activities.pdf](https://www.uscc.gov/sites/default/files/2020-05/China_Space_and_Counterspace_Activities.pdf).

<sup>93</sup> A “beneficial owner” refers to a person or entity who ultimately owns or controls an interest in a legal entity, such as a security, property, or interest in a trust. “Beneficial owner,” Legal Information Institute, Cornell University, [https://www.law.cornell.edu/wex/beneficial\\_owner](https://www.law.cornell.edu/wex/beneficial_owner).

<sup>94</sup> William D. Bygrave, “The structure of the investment networks of venture capital firms,” *Journal of Business Venturing*, Vol. 3 Issue 2, Spring 1988, <https://www.sciencedirect.com/science/article/abs/pii/0883902688900237>.

<sup>95</sup> Bygrave, “The structure of the investment networks of venture capital firms.” <https://www.sciencedirect.com/science/article/abs/pii/0883902688900237>.

<sup>96</sup> Kevin J. Wolf, Testimony before the U.S.-China Economic and Security Review Commission, Hearing on “U.S.-China Relations in 2021: Emerging Risks,” Panel III: “Assessing Export Controls and Foreign Investment Review,” September 8, 2021, [https://www.uscc.gov/sites/default/files/2021-08/Kevin\\_Wolf\\_Testimony.pdf](https://www.uscc.gov/sites/default/files/2021-08/Kevin_Wolf_Testimony.pdf); Tim Hwang and Emily S. Weinstein, “Decoupling in Strategic Technologies: From Satellites to Artificial Intelligence,” Center for Security and Emerging Technology, July 2022, <https://cset.georgetown.edu/publication/decoupling-in-strategic-technologies/>; and Bauerle-Danzman and Kilcrease, “Sand in the Silicon: Designing an Outbound Investment Controls Mechanism,” [https://www.atlanticcouncil.org/wp-content/uploads/2022/09/Sand\\_in\\_the\\_Silicon-Designing\\_an\\_Outbound\\_Investment\\_Controls\\_Mechanism..pdf](https://www.atlanticcouncil.org/wp-content/uploads/2022/09/Sand_in_the_Silicon-Designing_an_Outbound_Investment_Controls_Mechanism..pdf).

<sup>97</sup> “FACT SHEET: President Biden Signs Executive Order to Ensure Robust Reviews of Evolving National Security Risks by the Committee on Foreign Investment in the United States,” The White House, September 15, 2022, <https://www.whitehouse.gov/briefing-room/statements-releases/2022/09/15/fact-sheet-president-biden-signs-executive-order-to-ensure-robust-reviews-of-evolving-national-security-risks-by-the-committee-on-foreign-investment-in-the-united-states/>.

<sup>98</sup> “Modernizing the SEC’s Definition of Venture Capital Fund,” National Venture Capital Association (NVCA), February 2020, <https://www.sec.gov/spotlight/sbcfac/2020-02-04-presentation-vc-fund-definition.pdf>; and Stephen Matza, Kate Bridge, Maria LoPriato-Bergan, and Cole Sauers, “What is an Exempt Reporting Advisor?” AngelList, <https://learn.angellist.com/articles/exempt-reporting-advisor>; and Morgan Lewis, “Venture Capital and Private Equity Funds,” 2015, [https://www.morganlewis.com/-/media/files/special-topics/vcpefdeskbook/regulation/vcpefdeskbook\\_securitieslawoverview.pdf](https://www.morganlewis.com/-/media/files/special-topics/vcpefdeskbook/regulation/vcpefdeskbook_securitieslawoverview.pdf).

<sup>99</sup> “Private Equity: Fund formation and transactions in 42 jurisdictions worldwide,” *Getting the Deal Through*, 2009, <https://www.stblaw.com/docs/default-source/cold-fusion-existing-content/publications/pub849.pdf?sfvrsn=2>.

<sup>100</sup> Bauerle-Danzman and Kilcrease, “Sand in the Silicon: Designing an Outbound Investment Controls Mechanism.”

<sup>101</sup> “Christian C. Davis, Kevin J. Wolf, Joseph G. Fawkner, Clete R. Willems, Katherine P. Padgett, “U.S. Policy-makers Consider Alternatives for Outbound Investment Review,” Akin Gump Strauss Hauer & Feld LLP, May 5, 2022, <https://www.akingump.com/en/news-insights/us-policymakers-consider-alternatives-for-outbound-investment-review.html>; and Darshak Dholakia, Betsy Feuerstein, Hrishikesh Hari, Brooklynn Moore, Jeremy Zucker, “Proposed Outbound Investment Review Legislation Has Sweeping Extraterritorial Scope,” JDSupra, August 19, 2022, <https://www.jdsupra.com/legalnews/proposed-outbound-investment-review-5864076/>.

<sup>102</sup> Bauerle-Danzman and Kilcrease argue that these “certain investments” should include: “Investments made in any Chinese entity that produces, designs, tests, manufactures, fabricates, or develops any item or items that would be controlled under US export controls if originating in the United States.”

<sup>103</sup> Bauerle-Danzman and Kilcrease, “Sand in the Silicon: Designing an Outbound Investment Controls Mechanism.”

<sup>104</sup> Bauerle-Danzman and Kilcrease, “Sand in the Silicon: Designing an Outbound Investment Controls Mechanism.”

<sup>105</sup> “Executive Order Addressing the Threat from Securities Investments that Finance Certain Companies of the People’s Republic of China,” The White House, 2021, [https://home.treasury.gov/system/files/126/eo\\_cmhc.pdf](https://home.treasury.gov/system/files/126/eo_cmhc.pdf).

<sup>106</sup> Alison J. Stafford Powell and Alexandre Lamy, “US Government Issues Executive Order Amending Ban on US Persons Purchasing Securities of Certain Chinese Companies,” Sanctions & Export Controls Update, Baker McKenzie, June 10, 2021, <https://sanctionsnews.bakermckenzie.com/us-government-issues-executive-order-amending-ban-on-us-persons-purchasing-securities-of-certain-chinese-companies/>; and “International Trade Alert: Biden Administration Revamps Sanctions Program Targeting Publicly Traded Securities of Designated Chinese Military Companies,” Akin Gump Strauss Hauer & Feld LLP, June 7, 2021, <https://www.akingump.com/a/web/7yixJx7xPVzh7vTPwiWDYF/2LHFpt/biden-admin-revamps-sanctions-program.pdf>.

<sup>107</sup> “Consolidated Screening List Search,” International Trade Administration, U.S. Department of Commerce, <https://www.trade.gov/data-visualization/csl-search>.

<sup>108</sup> Bauerle-Danzman and Kilcrease, “Sand in the Silicon: Designing an Outbound Investment Controls Mechanism.”

<sup>109</sup> “International Trade Alert: Biden Administration Revamps Sanctions Program Targeting Publicly Traded Securities of Designated Chinese Military Companies,” Akin Gump Strauss Hauer & Feld LLP,

<https://www.akingump.com/en/news-insights/biden-administration-revamps-sanctions-program-targeting-publicly-traded-securities-of-designated-chinese-military-companies.html>; and “Frequently Asked Questions,” Chinese Military Companies Sanctions, U.S. Department of Treasury, <https://home.treasury.gov/policy-issues/financial-sanctions/faqs/added/2022-06-01>.

<sup>110</sup> Yitu is listed on the NS-CMIC List as “Yitu Limited.”

<sup>111</sup> “Executive Order Addressing the Threat from Securities Investments that Finance Certain Companies of the People’s Republic of China,” The White House, [https://home.treasury.gov/system/files/126/eo\\_cmhc.pdf](https://home.treasury.gov/system/files/126/eo_cmhc.pdf).

<sup>112</sup> “Cotton, Colleagues Call on Secretary Raimondo to Blacklist Companies that Provide AI Technology to the Chinese Military,” Tom Cotton, Senator for Arkansas, November 16, 2021, <https://www.cotton.senate.gov/news/press-releases/cotton-colleagues-call-on-secretary-raimondo-to-blacklist-companies-that-provide-ai-technology-to-the-chinese-military>.

<sup>113</sup> “Ji Yue explains Sequoia China’s AI layout in detail: nearly 30 companies have been invested in, and there are only two core standards” [计越详解红杉中国AI布局: 已投资近30家, 核心标准只有两个], Sequoia China, <https://perma.cc/26JT-2FCF>; and Reuters Staff, “U.S. adds eight Chinese firms to trade blacklist,” Reuters, October 8, 2019, <https://www.reuters.com/article/usa-trade-china-blacklist/u-s-adds-eight-chinese-firms-to-trade-blacklist-idINKBN1WN174>; and Winne Liu, “Hillhouse leads \$55m round for China AI developer Yitu,” Asian Venture Capital Journal, May 16, 2017, <https://www.avcj.com/avcj/news/3004936/hillhouse-leads-usd55m-round-for-china-ai-developer-yitu>.

<sup>114</sup> For example, according to Crunchbase, both Hillhouse Capital and iFlytek (out of 8 investors) invested in the Seed round for VirtAI Tech in 2020, and in 2021, both (out of 10 investors) invested in the Series C round for Guoyi Quantum.

<sup>115</sup> “Addition of Certain Entities to the Entity List,” A Rule by the Bureau of Industry and Security, U.S. Department of Commerce, October 9, 2019, <https://www.federalregister.gov/documents/2019/10/09/2019-22210/addition-of-certain-entities-to-the-entity-list>.

<sup>116</sup> “Our Portfolio,” Qualcomm Ventures, <https://www.qualcommventures.com/portfolio/>.

<sup>117</sup> Eric L. Hirschhorn, Brian J. Egan, and Edward J. Krauland, *U.S. Export Controls and Economic Sanctions*, Oxford University Press, 2022, DOI: 10.1093/oso/9780197582411.003.0001.

<sup>118</sup> Bauerle-Danzman and Kilcrease, “Sand in the Silicon: Designing an Outbound Investment Controls Mechanism.”

<sup>119</sup> “FACT SHEET: President Biden Signs Executive Order to Ensure Robust Reviews of Evolving National Security Risks by the Committee on Foreign Investment in the United States,” The White House. <https://www.whitehouse.gov/briefing-room/statements-releases/2022/09/15/fact-sheet-president-biden-signs-executive-order-to-ensure-robust-reviews-of-evolving-national-security-risks-by-the-committee-on-foreign-investment-in-the-united-states/>.

<sup>120</sup> “Supporters of Outbound Investment Legislation Urge Administration to Take Executive Action to Safeguard National Security, Protect Supply Chains,” U.S. Senator Bob Casey, September 27, 2022, <https://www.casey.senate.gov/news/releases/supporters-of-outbound-investment-legislation-urge-administration-to-take-executive-action-to-safeguard-national-security-protect-supply-chains>.

<sup>121</sup> For more details on the methodology, see <https://cset.georgetown.edu/wp-content/uploads/CSET-Tracking-AI-Investment.pdf>, 33.

<sup>122</sup> 北京儒博科技有限公司 (儒博科技) was rebranded to 北京如布科技有限公司 (如布科技), while the company’s English-language name remains the same; see: <https://www.jiemian.com/article/6431399.html>.

<sup>123</sup> For more details, see: <https://github.com/georgetown-cset/aiia>.