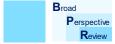


2024-E-5



Perspective Broad-Perspective Review Series

Environment for Startups in Japan and Initiatives in the Regional Japan

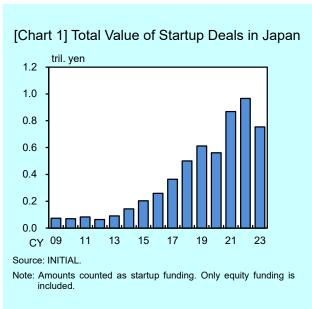
Research and Statistics Department ITAI Yusuke, MAENO Ryota, MIYOSHI Akira Kyoto Branch NISHINO Asuka

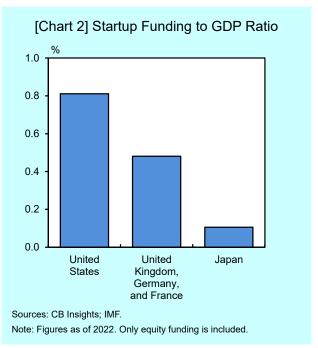
June 2024

The importance of startups is attracting renewed attention in discussions about improving productivity and stimulating innovation in Japan. Although most startups are still located in Tokyo, there have been positive changes in recent years, such as an increasing trend in startup funding in regions outside of Tokyo. However, the amount of funding raised by startups in Japan is still small compared to that in the United States and Europe. In addition, various issues regarding startups have been raised, including a lack of diversity in the investor base and a shortage of personnel at the executive level. This article provides an overview on recent positive trends among startups in Japan and challenges for future development. It also introduces the current situation and initiatives for development of startups in regional Japan.

Introduction

Startup funding in Japan has increased over the past decade (Chart 1). However, it remains on a much smaller scale than in the United States and Europe (Chart 2). The importance of startups, and moves toward increasing the number and size of startups, are attracting renewed attention in the discussion about improving productivity and stimulating innovation that creates new products and services in Japan. At the conference held at the Bank of Japan in November 2023, "Changes in the Global Economic Landscape and Japan's Economy," for example, there were views that pointed to the importance of developing startups.²





Although many Japanese startups are located in Tokyo, the creation and growth of startups in the regions, i.e., outside of Tokyo, is considered important not only for revitalizing these areas, but also for improving productivity and stimulating innovation in Japan as a whole.

This article provides an overview of the trends behind the increase in the amount of funding, focusing on investors who are key players in supporting the creation and growth of startups, and then presents an overview on issues for further developing startups.³ In addition, this article also reviews the current situation and initiatives in regional Japan.

Although the term "startup" does not necessarily have a clear definition, with a range of usages across the literature, this article assumes that it refers to "emerging companies that create new businesses and innovations based on advanced technologies and business models, aiming to grow rapidly in a short period by investments from investors including venture capital firms (VCs) and angel investors."

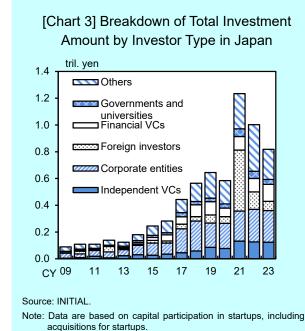
Recent Trends in Startups in Japan and Challenges

Developments surrounding Investors

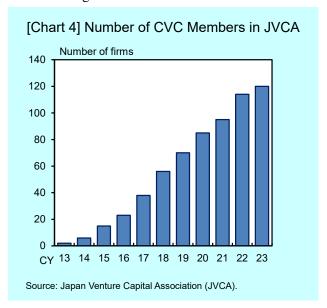
This section provides an overview on the investment trends in startups, categorized by type of investor.

Startups grow by utilizing external funding, including equity financing by selling shares of the firm to investors, debt financing through loans from financial institutions, and subsidies from governments and municipalities. In many cases, equity financing from VCs is said to be the primary method of fundraising.

Looking at trends in startup investment amounts by type of investor, they have been on an uptrend over the past decade, especially in investments from independent venture capital firms (independent VCs; venture capital firms that invest with funding from multiple external investors, including institutional investors, pension funds, and foreign investors), corporate entities (business corporations and corporate venture capitals),⁴ and financial institutions (Chart 3).⁵



Startup investments by corporate entities have been increasing, including those by corporate venture capitals (CVCs; departments or investment subsidiaries that invest in startups) which have been established increasingly commonly in recent years (Chart 4). By investing in startups, business corporations are said to seek not only financial returns but also strategic returns (such as acquiring new business ideas and technologies and strengthening existing businesses).⁶ It has been noted that investments from corporate entities have increased due to better financial results and a growing focus on open innovation (Chart 5). 7 Increased investment from business corporations is likely to have allowed startups to expand their businesses by giving them access to their distribution channels, facilities, and technologies.8



[Chart 5] Interview Responses by Firms about the Background to Investment Expansion by Business Corporations

Large firms are increasingly interested in startup investment as their strong performance expands their investment capacity (VC).

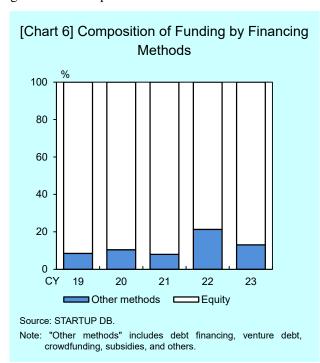
An increasing number of business corporations are seeking further growth by promoting open innovation through investment in startups (CVC).

We established a CVC in order to broaden the scope of our investment beyond technologies that are currently seen as directly applicable to our business to technologies that may become applicable depending on future developments, such as AI (business corporation).

Note: The industry of the interviewee is shown in parentheses.

Investments in startups by venture capital firms under financial institutions (financial VCs) have also increased as various financial institutions have established venture capital firms. Financial VCs are said to play a role in increasing lending opportunities

to startups from their parent financial institutions,⁹ and they likely have contributed to the increase in loan amounts from financial institutions to startups and the growth of venture debt, such as loans with equity warrants, which have characteristics of both equity and debt (Chart 6).¹⁰ By securing funding through debt and venture debt financing, startups can operate their businesses while avoiding the disadvantages of equity financing for existing shareholders, including the founder(s) of the firm, such as a decrease in the shareholding ratio. Therefore, an environment in which startups can choose their fundraising methods from not only equity financing but also debt and venture debt financing is likely to have a positive effect on the growth of startups.

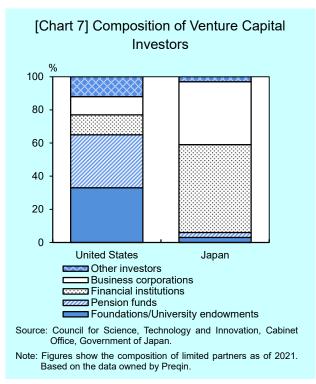


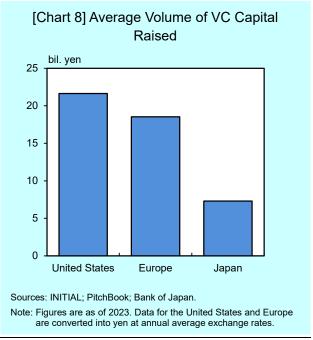
Challenges for Further Developing Startups

As discussed above, the raised funds for startups in Japan have increased over the past decade amid the increase in the amount of startup investment from various investors. That being said, the scale of startup fundraising remains small compared to that in the United States and Europe. For the further development of startups in Japan, several challenges have been identified, including some related to fundraising.

Challenges highlighted in startup investment in Japan include a lack of diversity in the investor base and the relatively small amount of investment from large investors. The main investors in venture capital funds in Japan are financial institutions and business corporations. Compared to the United States, the amount of investment from pension funds and institutional investors, which have relatively long-term

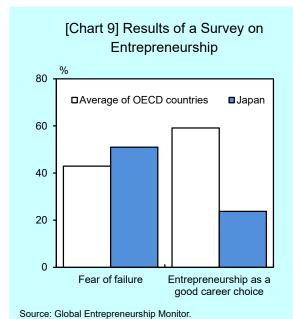
investment horizons and substantial assets under management, is limited in Japan (Chart 7).^{11,12} Under these circumstances, it has been pointed out that the size of startup funds in Japan is smaller than in the United States and Europe (Chart 8), and that the amount of investment remains small, especially at the stage where startups grow significantly.¹³ To address these issues, the startup industry in Japan is working on the development of standards to clarify the risk-return relationship of investment in venture capital funds, with the aim of increasing investment from pension funds and institutional investors. Going forward, whether the investment amounts from large investors will increase warrants close attention.





Startup investment by business corporations requires the accumulation of the knowledge and skills to achieve both financial and strategic returns, and it has been pointed out that merger and acquisitions (M&As) targeting startups by business corporations are less common in Japan compared to major developed countries. M&As are considered important not only for diversifying exit strategies for startups, which are said to be too focused on initial public offerings (IPOs), but also for promoting the circulation of personnel and funds, and for advancing open innovation. Is It is hoped that such M&As will become more common in Japan.

Moreover, along with improving the fundraising environment mentioned above, expanding the pool of personnel capable of managing startups is also essential. The fact that the number of startups in Japan is low is sometimes attributed to Japanese values and cultural factors. 16 Also, creating an environment where entrepreneurs can restart their businesses -- even if they fail -- is noted to be crucial to increasing the number of startups in Japan. 17 Indeed, the results of a survey conducted in Japan on how people feel about starting a new business show that only a small number of Japanese people consider it a good career choice, suggesting a limited pool of personnel who could become leading figures in startups (Chart 9).¹⁸ In this situation, there have been teaching initiatives on entrepreneurship, and such initiatives are hoped to contribute to a positive change in mindset.

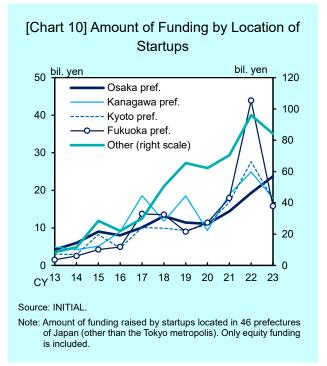


Note: "Fear of failure" shows the share of respondents who agreed that they saw good opportunities but would not start a business for fear it might fail. "Entrepreneurship as a good career choice" shows the share of respondents who agreed with the statement that, in their countries, most people considered starting a business a desirable career choice. Figures are as of 2022. Figures for "Average of OECD countries" are simple averages of the OECD countries that are subject to the survey and for which data are available.

In addition, it is important that there is an increase in the number of startups that aim for significant growth. Recently, the Japanese government and local authorities have been increasing public procurement from startups so that these startups can build up performance which could lead to subsequent business expansion. There have also been efforts to support Japanese startups in their expansion into foreign markets, ¹⁹ and these measures are expected to encourage startups to further develop.

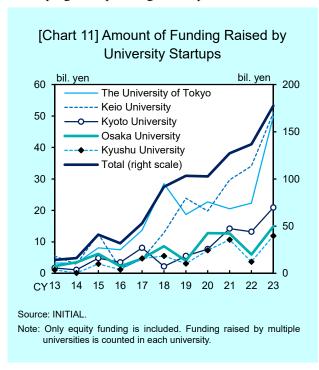
Current Situation and Initiatives for Development of Startups in Regional Japan

While most startups are located in Tokyo, recently, there have been signs of startup development spreading in regional Japan as well. In fact, in many prefectures, the amount of funding for startups is on an increasing trend (Chart 10).



In each region, the growth of startups utilizing research achievements at local universities is attracting attention. ²⁰ In fact, the fundraising amounts for university startups have been increasing (Chart 11). ²¹ A shortage of management personnel and a lack of successful cases have been pointed out as challenges that are unique to regional Japan. However, it is hoped that successful precedents will be created, as combined support from industry, government, academia, and financial institutions are being expanded, such as efforts to make it easier for startups to attract personnel. In this regard, the box at the end of this report provides

an overview on the current situation of startups and startup development initiatives in Kyoto, where businesses utilizing deep tech in fields such as life sciences and alternative energy are growing, led by startups from Kyoto University. The progress in these initiatives are expected to contribute to further developing startups in regional Japan.



Concluding Remarks

The amount of startup funding in Japan has been increasing as support from various entities progresses.

There seem to be signs of startups developing outside of Tokyo as well.

As successful cases of startups accumulate, they may lead to the creation of an autonomous growth mechanism within the startup ecosystem. This is because successful entrepreneurs can support new entrepreneurs with funding and expertise, and as the network of such support expands, it can facilitate an accumulation of resources necessary for startup growth (such as personnel, funds, and facilities). A two-way interaction between successful cases of startups and the accumulation of resources may lead to a further increase in successful cases.²² In Silicon Valley, such a mechanism is said to be in place, making it a global center for startups.²³ In this respect, the situation for startups in Japan is considered to be at its initial stage for the autonomous mechanism to work effectively. Going forward, efforts to foster the development of startups are expected to further progress, including strengthening funding for startups, increasing the supply of personnel, and supporting business expansion, part of which is backed by the government's "Startup Development Five-year Plan."

Startups are expected to develop innovation, which is a source of competitiveness.²⁴ Meanwhile, they are also expected to invigorate the markets and enhance the productivity of existing firms by stimulating competition in the markets. ²⁵ As startups are developed more autonomously and their experiences accumulate, there will be more active development of innovation, thereby contributing to the improvement of productivity in Japan.

[Box] Startups in Kyoto: Current Situation and Initiatives

This box provides an overview on the current situation of startups and initiatives for startups developing in Kyoto, as an example in regional Japan. In Kyoto, the amount of funding for startups is on an increasing trend, as in Japan as a whole (Chart 10). Since 1950s, several emerging manufacturing firms in Kyoto have grown into global enterprises with their advanced technology. Recently, particular attention is being paid to the growth of startups that aim to break new business ground using deep tech based on their advanced technology and on research achievements at universities (top panel, Box Chart).

A shortage of people to manage businesses (e.g., CEOs and CFOs) is a particularly noted issue for further developing startups in Kyoto (middle panel, Box Chart). This issue is unique to regional Japan, and to address it, some regional financial institutions and universities are making efforts in initiatives such as introducing management personnel to startups and providing entrepreneurship development programs (bottom panel, Box Chart). For example, a Kyoto University affiliated VC operates a platform that introduces the university's "research seeds" -- in other words, research topics that are yet to be developed but have the potential for future use -- that are expected to be commercialized, to personnel who are registered as potential executives typically in the Tokyo metropolitan area. Some startups are, indeed, growing after being matched with personnel on this platform.

In Kyoto, several emerging manufacturing companies have grown into global companies since 1950s by being inspired and supported by successful entrepreneurs and by expanding overseas in the early stages of their businesses.²⁶ Recently the number of exemplar startups are beginning to grow and progress has also been made in many supporting programs run by various organizations. As more entrepreneurs follow in their footsteps, support frameworks are further strengthened, and resources, such as the number of experienced management personnel, increase, the number of successful startups in the region is also expected to rise.

[Box Chart] Interview Responses from Those Involved in the Startup Industry in Kyoto

1. Current situation and characteristics of startups in Kyoto

- -- Led by startups from Kyoto University, businesses using deep tech are beginning to grow in the life sciences, including regenerative medicine, and in alternative energy (regional financial institutions).
- -- Startups from Kyoto University that are breaking new business ground based on deep tech are attracting attention (regional financial institutions, local authorities).

2. Issues surrounding startups in Kyoto

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Human Resources	The biggest issue is that, "there are enough technical personnel, but few management personnel in Kyoto." People with management experience in the workplace such as trading companies and investment banks and with a capacity to take management responsibilities are concentrated in Tokyo (universities, startups, and business corporations) There are not enough personnel who can evaluate and support startups from both technological and business perspectives (universities, startups).
Capital	Deep tech investments take longer time than other tech investments to mature, so it is important to have a long-term perspective when providing financial support (universities).
Facilities	Startups can freely use only few R&D facilities, offices, and co-working spaces (regional financial institutions).
Precedent Instances	Since few startups in Kyoto have grown significantly in recent years, there are no exemplars for entrepreneurs. Also, there are not enough successful experiences for those who support startups, nor enough mentors with whom startups can consult (regional financial institutions) In Kyoto, a support framework based on the collaboration between industry, government, academia, and finance is beginning to come together. However, a lack of successful cases in recent years makes it difficult for entrepreneurs to have a positive outlook in concrete terms, and startups have difficulties to securing management personnel (startups).

3. Examples of local efforts to address human resourcing issues

- -- We operate a platform for matching the university's technology seeds with external management personnel, and some matched cases are attracting attention both domestically and internationally. There is also a growing trend toward collaboration with other universities that have similar support frameworks (universities).
- -- Some foreign VCs are matching Japan's technology seeds, including research achievements at regional universities, with foreign management personnel (VCs, business corporations).
- -- We introduce management personnel to startups (regional financial institutions).
- -- We operate entrepreneurship training programs in collaboration with entrepreneurs outside the region (regional financial institutions).

Note: The industry of the interviewee is shown in parentheses.

¹ Data from INITIAL are as of January 23, 2024. The same applies hereafter.

² In the summary discussion of the conference, participants discussed Japanese firms' responses to globalization and the government's policy responses. Regarding responses taken by Japanese firms, it was pointed out that (1) Japanese firms may not have fully enjoyed the benefits of globalization, (2) a decline in competitiveness of Japan's trade sector may have led to a deterioration in the terms of trade, pushing down household consumption, and (3) deflationary pressures such as low wages in China may be coming to an end. Participants discussed the background to the stagnation in the earning power of small and medium-sized enterprises (SMEs) and in product innovation, and expressed opinions pointing to the importance of R&D and startups. For more information, see the following.

Research and Statistics Department (2024), "Tōkyō daigaku kin'yū kyōiku kenkyū sentā/Nippon ginkō chōsa tōkei kyoku dai 10 kai kyōsai konfarensu: 'Kokusai keizai kankyō no henka to nihon keizai' no moyō [Summary of the 10th Joint Conference entitled 'Changes in the Global Economic Landscape and Japan's Economy,' co-hosted by the Center for Advanced Research in Finance at the University of Tokyo and the Research and Statistics Department of the Bank of Japan]" (available only in Japanese), Bank of Japan Research Paper.

³ For more information on the current situation and issues for startups in Japan, see also the following.

Matsui, Y. and Bunya, K. (2022), "Wagakuni benchā-bijinesu no genjō to kadai [Current Situation and Issues of Venture Businesses in Japan]" (available only in Japanese), Bank of Japan Review Series, No. 22-J-11.

- ⁴ In this article, "business corporations" does not include financial institutions nor startups.
- ⁵ According to interview responses by those involved in the startup industry, factors behind the recent decline in startup investment in Japan include the impact of adjustments in valuation triggered by rising interest rates in the United States and Europe, as well as moves to postpone fundraising due to differences between investors and startups in their views of startup valuations under such circumstances.
- ⁶ Kato (2022, pp. 104-108) points out that CVCs aim to recoup their invested funds as well as to obtain business synergies, such as the acquisition of new ideas and technologies from the startups in which they invest.

Kato, M. (2022), "Sutāto-appu no keizaigaku: Atarashii kigyō no tanjō to seichō purosesu wo manabu [Economics of Start-up: Understanding the Birth and Growth of New Firms]" (available only in Japanese), Yuhikaku.

- ⁷ The increase in investment by corporate entities may be due in part to the open innovation tax system that was introduced in April 2020 to promote open innovation. Under this tax system, if a domestic business corporation or its domestic CVC acquires a certain amount of newly issued shares of a startup or more, aiming for open innovation with the startup, 25 percent of the price of the acquired shares can be deducted from the income. In addition, in the case of M&As that contribute to the growth of a startup conducted in or after April 2023, the acquired issued shares are also subject to the above system, as enabled by the tax reform in fiscal 2023.
- ⁸ According to the "Benchā kigyō no keiei kankyō tō ni kansuru ankēto chōsa (2023 nendo) [Survey on the Startup Business Environment (fiscal 2023)]" in the "Benchā hakusho 2023 [Venture White Paper 2023]" (available only in Japanese) published by the Venture Enterprise Center, Japan, popular choices in a multiple-choice question about what respondents (from startups) expect from open innovation with large firms were "The firm's credibility will be improved by utilizing the

brands of large firms" and "The feasibility of business development will be increased by collaborating with large firms." Kato (2022, pp. 104-108) also points out that startups receiving CVC investments expect to acquire complementary assets, such as distribution channels which startups do not have, from the business corporations that provide the funds.

- ⁹ Kato (2022, pp. 104-108) points out that investments by financial VCs are known to have the objective of increasing lending opportunities for their parent companies (financial institutions).
- ¹⁰ "Other methods" also includes subsidies and crowdfunding. Takahashi (2023) points out that debt financing and venture debt financing may be on the rise. Note that in this article, we follow Takahashi (2023) and treat debt financing and venture debt financing separately.

Takahashi, F. (2023), "Kokunai sutāto-appu no dettosei shikin chōtatsu no genjō -- Omoni benchā-detto no hirogari to kadai ni tsuite [Current Situation of Debt Financing at Startups in Japan: Mainly on the Expansion and Issues of Venture Debt]" (available only in Japanese), Venture Enterprise Center, "Benchā hakusho 2023 [Venture White Paper 2023]," I-34-39.

¹¹ For more information on the funding environment for startups in the United States, see, for example, the following.

Kono, A. and Ohmura, N. (2023), "Wagakuni sutāto-appu kigyō no shikin chōtatsu dōkō ni tsuite [On the Funding Trends of Japanese Startups]" (available only in Japanese), The Finance, December 2023, No. 697, 50-51.

¹² Regarding the increase in investment in emerging companies by pension funds in the United States, Isova (1996) points out that while the Employee Retirement Income Security Act of 1974 (ERISA) requires pension funds to invest in appropriate volumes of risky assets, rapidly growing pension funds invested in emerging companies through venture capitals in the 1980s. As for the current situation, it is pointed out in "Sekai ni gosuru sutāto-appu ekoshisutemu no keisei ni tsuite [Creating a Globally Competitive Startup Ecosystem]" (available only in Japanese) published by the Expert Committee on Innovation Ecosystem, Council for Science, Technology and Innovation (CSTI), Cabinet Office, Government of Japan, that since VC investments require long-term investments, in other countries, institutional investors, such as pension funds, university endowments, and sovereign wealth funds (SWFs) -- which manage long-term and large-scale funds -- have become a source of long-term capital growth in those countries. It is also pointed out that institutional investors are a source of returns by earning long-term risk premiums while reducing risks through diversified investments, and long-term investment is driving the overall market growth; and that institutional investors capture the fruit of this growth, creating a virtuous cycle that drives

Isoya, A. (1996), "1980-nendai amerika no kin'yū kōzō -- shikin junkan no sokumen wo chūshin ni -- (ge) [Financial Structure in the United States in the 1980s: Focusing on Aspects of the Flow of Funds (2)]" (available only in Japanese), Shōken Keizai Kenkyū, No. 2 (July 1996), 71-79.

- ¹³ "Sutāto-appu ekoshisutemu no genjō to kadai [Current Situation and Issues of the Startup Ecosystem]" (document from the 4th Expert Committee meeting on Innovation Ecosystem, CSTI, Cabinet Office, Government of Japan, held in April 2022, available only in Japanese) points out that one of the issues of Japan's startup ecosystem is a lack of large-scale investments, which are essential for startups to expand into the global market.
- ¹⁴ For example, in "Reiwa 5 nendo nenji keizai zaisei hōkoku [Annual Report on the Japanese Economy and Public Finance 2023]" (available only in Japanese), Cabinet Office, Government of Japan, it is pointed out that the number of acquisitions of startups by business corporations is limited in

Japan compared to major countries. Kono and Ohmura (2023) also point to limited exit options and opportunities (i.e., there are fewer M&As and exit strategies are too focused on IPOs) as one of the issues concerning startup financing in Japan.

- ¹⁵ "Reiwa 5 nendo nenji keizai zaisei hōkoku [Annual Report on the Japanese Economy and Public Finance 2023]" (available only in Japanese), Cabinet Office, Government of Japan, argues that startup acquisitions by business corporations are important both as an exit strategy for startups and as a means of promoting open innovation in existing large firms, because they lead to the circulation of personnel and funds.
- ¹⁶ See, for example, the following paper for a discussion on the factors behind the low number of entrepreneurs starting new businesses in Japan.
- Yagi, T., Furukawa, K., and Nakajima, J., (2022), "Productivity Trends in Japan -- Reviewing Recent Facts and the Prospects for the Post-COVID-19 Era --," Bank of Japan Working Paper Series, No. 22-E-10.
- ¹⁷ In "Benchā kigyō no keiei kankyō tō ni kansuru ankēto chōsa (2023 nendo) [Survey on the Startup Business Environment (2023)]," the option "Fear of failure (e.g., difficulty in trying again after a failed startup)" received the largest number of responses as the most significant reason for the low number of startups in Japan. When asked about what is needed to increase the number of entrepreneurs in Japan, "re-challenge/safety net" and "mind, culture, and tendency" were chosen more than "financing" and "education." Kato (2022, pp. 246-247) also points to the importance of incentivizing entrepreneurs to start their own businesses, by creating an environment that allows for a quick restart of businesses by streamlining bankruptcy and dissolution processes, and by reducing the cultural and social pressure to avoid failure.
- ¹⁸ Chart 9 is based on the Global Entrepreneurship Monitor's Adult Population Survey. Survey respondents were individuals aged 18 to 64.
- ¹⁹ For example, the Japan External Trade Organization (JETRO) supports overseas expansions of Japanese startups by providing mentoring services, networking and PR support, assistance in formulating business strategies, and introductions to potential business partners.
- ²⁰ Kutsuna (2022) points out that region-based startups that are attracting attention are those utilizing the research achievements at local universities.

Kutsuna, K. (2022), "Kansai chiiki no sutāto-appu no genjō [Current Situation of Startups in the Kansai Region]" (available only in Japanese), Kokumin Keizai Zasshi, 226 (1), 1-10.

- ²¹ University startups include firms that were founded based on a university's research achievements, firms that conducted joint research or development with a university within one year of their establishment, and firms that have some sort of close connection to the university, as identified by the firm itself or a third party.
- 22 Stam and van de Ven (2021) note that they "find positive feedback effects of the prevalence of high-growth firms on most

of the subsequent values of the ecosystem elements, although not consistently in all the periods."

Stam, E. and van de Ven, A. (2021), "Entrepreneurial Ecosystem Elements," Small Business Economics, Vol. 56, pp. 809-832.

²³ Ioki (2019) points out that the Silicon Valley startup ecosystem has a mechanism in place to create startups on an ongoing basis, with serial entrepreneurs playing a mentoring role. Ioki, T. (2019), "Has the Startup Ecosystem in Japan Formed? Japan's Strengths and Weaknesses Compared to Major Countries," the Japan External Trade Organization (JETRO), 2019-10-15.

https://www.jetro.go.jp/en/jgc/reports/2021/542b3256055c112e.html, (referenced 2024-05-02).

²⁴ Washimi (2021) points out that the proportion of startups that have applied for a patent appears to be much higher than that of existing firms.

Washimi, K. (2021), "Venture Capital and Startup Innovation — Big Data Analysis of Patent Data —," Bank of Japan Research Paper.

- ²⁵ The Japanese government's "Grand Design and Action Plan for a New Form of Capitalism 2023 Revised Version" states that, with regard to promoting "Startup Development Five-year Plan" formulated in 2022, "startups exist to resolve social issues with a sense of urgency, through new technologies and ideas. At the same time, they also provide new stimulus to revitalize markets and improve the productivity of existing firms."
- ²⁶ For examples of support by experienced entrepreneurs for new entrepreneurs in Kyoto, and examples of how early overseas expansion in the early stages of a business led to its subsequent dramatic growth, see the following.

Kyoto Shimbun Shuppan Center (ed.) (2003), "Kyoto genki kigyō dokusō no kiseki: Sekai e habataku [Energetic Companies in Kyoto; The Path of Innovation: Expanding Overseas]" (available only in Japanese), Kyoto Shimbun Shuppan Center.

Suematsu, C. (2002), "Kyō-yōshiki keiei -- Mojūruka senryaku: 'Nettowāku gaibusei' Katsuyōno kakushin moderu [Kyoto-Style Management -- Modularization Strategy; An Innovative Model Utilizing 'Network Externalities']" (available only in Japanese), Nihon Keizai Shimbun Inc.

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