# Mizuho Economic Outlook & Analysis

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# *Challenges for Japanese companies to grow in the expanding "global technology frontier"*

**< Summary >**

◆ Over the past decade, the productivity of Japanese companies has deviated significantly below the productivity level of global frontier companies (referring to companies possessing global top-level productivity, hereafter, "GF Companies" ) Japanese companies may be missing the opportunity to grow amid the expanding technology frontier.

◆ Japanese companies have been slow in catching up with GF Companies. Japan also needs to promote policies for industry regeneration in a bid to maximizing the effects of R&D tax reductions and other measures.

◆ While policies to stimulate industry regeneration require prudent system design, now is the chance to push forward institutional reform in light of the current improvement of the labor market.

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## 1. Japanese companies are failing to maximize its opportunities in the expanding "global technology frontier"

Japan faces a broad array of challenges necessitating change and diverse countermeasures in order to improve productivity.

In view of these problems, we have analyzed productivity from a micro-level perspective. Specifically, using the data of listed companies in the OECD countries, we confirmed to what extent Japanese companies have been able to absorb global frontier technology and knowhow. We also investigated how efficiently these companies have allocated management resources among themselves and suggested several policy measures to deal with such issues.

Firstly, we looked at the level of Japanese companies' productivity relative to global frontier companies (referring to companies possessing global top-level productivity, hereafter, "GF Companies" ).

**Chart 1** shows our calculation on the deviation of productivity (TFP: Total Factor Productivity) of listed companies in Japan, the US, and the OECD countries (excluding Japan) from that of GF Companies. In this calculation, GF Companies are defined as companies whose levels of productivity (TFP) are ranked within the world's top 50 for every combination of "industry (middle classification) x year."[1] Companies which do not fall within the definition of GF Companies can still be regarded as top-tier companies in their own countries (referred to as national frontier companies) since they are listed companies in their respective markets.

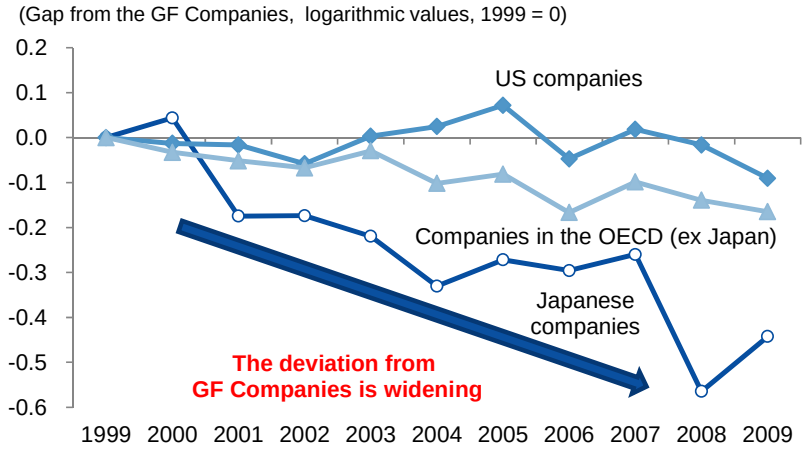
The estimation results revealed that the downward deviation of Japanese companies' productivity from the level of GF Companies is gradually expanding, while US companies are keeping pace with the rising productivity of the GF Companies. Companies in the OECD (excluding Japan) also showed a downward deviation but to a lesser extent than Japanese companies. Thus, the international comparison revealed that the rate of productivity growth among Japanese companies is considerably slower.

There are two factors that may explain why the productivity growth rate of Japanese companies is falling behind the GF Companies: namely, insufficient absorption of technology and knowhow from the GF Companies by the respective Japanese companies, and inefficient resource (employment and capital) allocation among Japanese companies. We have shed light upon these two factors and set forth potential policy measures to deal

[1] This definition follows the analysis conducted by Andrews et.al. (2015). The calculation method of productivity (TFP) is also mostly the same as Andrews et.al. (2015). In the calculation we used *OSIRIS*, a financial database of listed companies all over the world. Although Andrews et.al. (2015) employs *ORBIS*, which also includes the financial data of unlisted companies, we believe it is sufficient to limit the subject of analysis to listed companies in this paper, given our purpose of analysis, which is to study spillover from GF Companies to companies in Japan.

with them from the next section.

**Chart 1: Productivity (TFP) of listed companies (manufacturers) in Japan, the US, and OECD countries**




Notes: 1. Productivity (TFP) of the respective companies is calculated referring to Andrews et.al. (2015). (We have added external imputation for part of the missing values.)
2. The average number of each year's samples is 667 Japanese companies and 2,855 companies in the OECD countries (excluding Japan; 1,448 are US companies). The number of samples is smaller than the number of listed companies because some companies do not disclose the information necessary to calculate productivity (TFP). (Personnel expenses information is particularly missing for many companies.)
3. We set the sample period from 1999 to 2009 as it corresponds to the period when we were able to secure a certain number of samples.
Source: Made by MHRI based on Bureau van Dijk, *OSIRIS*, OECD and *STAN Database*.

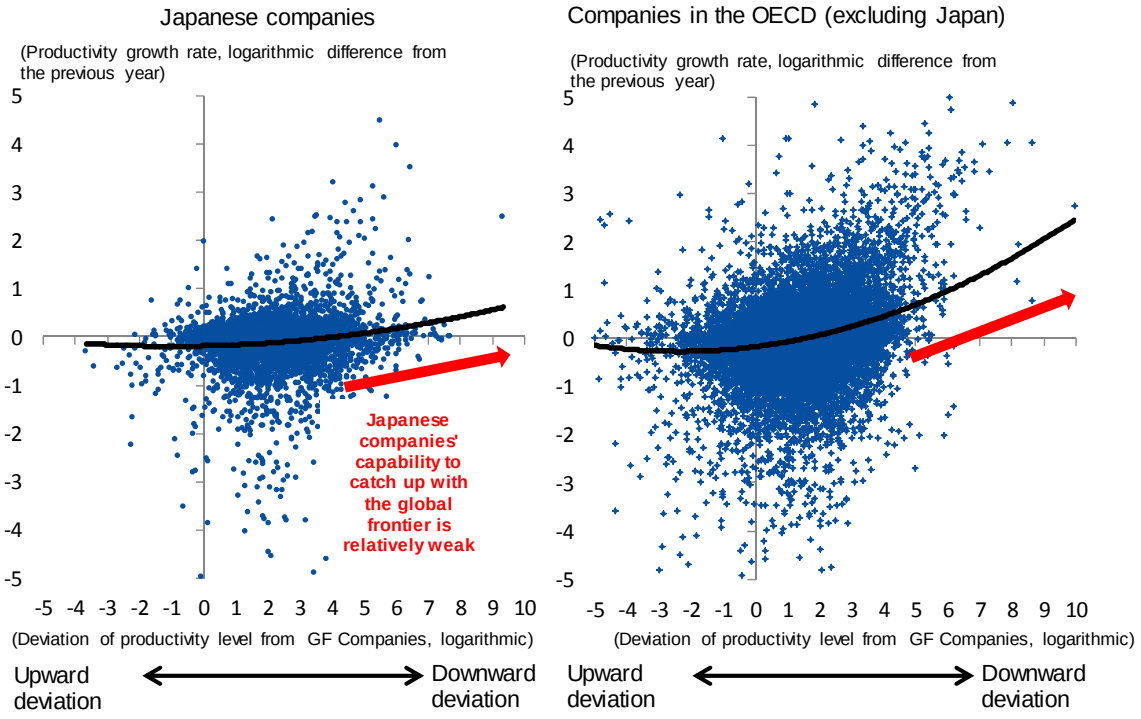
## 2. Strengthening the capability to catch up with the "global technology frontier" is required

Let us begin by confirming the facts to see whether Japanese companies' absorption of technology and knowhow from the GF Companies is genuinely insufficient.

**Chart 2** plots the respective situation of the individual companies in Japan (the left chart) and the OECD countries (excluding Japan, the right chart), with the horizontal axis depicting the deviation of productivity level from the GF Companies (the larger the positive figure, the more downward they deviate from the GF Companies, one-year lag) and the vertical axis showing productivity growth. If technology and knowhow of the GF Companies are spreading to other companies, the graph should be rising to the right, since the more the production level deviates downward (right side of the graph), the higher the effect of production growth through the absorption of frontier technology (upper side of the graph). In fact, companies in Japan (left chart) and the OECD countries

(right chart) show a rising movement to the right hand side of the chart, revealing that technology and knowhow of the GF Companies are spreading to other countries. However, note that the slope is shallower in Japan compared with the OECD countries. This suggests that the spread of technology and knowhow from the GF Companies (in other words, catching up with the GF Companies in terms of technology and knowhow) is weaker in Japan compared with other OECD countries.

**Chart 2: Deviation of productivity level from GF Companies and productivity growth rates (comparison of companies in Japan and the OECD countries)**




Notes: 1. The figures are calculated referring to Andrews et.al. (2015).
2. The chart is created with pool data from 2005 through 2009. The number of samples is 5,517 Japanese companies and 26,884 OECD companies (excluding Japan). The horizontal axis takes a one-year lag.
Source: Made by MHRI based on Bureau van Dijk, *OSIRIS*, OECD and *STAN Database*.

Then, why is the capability of Japanese companies to catch up with the GF Companies relatively weak? According to an OECD analysis conducted in 2015, conditions which may affect the catch-up process include the following: (1) the company possesses connections with GF Companies through trade transactions, international joint study (open innovation), or in-house direct investment, (2) the company possesses sufficient corporate size to cover the fixed costs required to enter into the above transactions (trade and joint study), and (3) the company invests in intangible assets in

such areas as R&D and human resource training related to development and management in order to build a corporate structure capable of absorbing and exercising technologies and skills.

Of the above conditions, many point out that Japanese companies fall significantly behind other countries in the areas of international joint study and intangible asset investment. A look at the ratio of intangible asset investment to GDP,[2] revealed that Japan came in at a relatively low level of 9.8% compared with other developed countries (US: 15.2%, France: 13.5%, UK: 12.8%).[3] Moreover, while the problem is not inherent to individual Japanese companies, the low level of inward foreign direct investment in Japan in general (Japan: about 4% of GDP; overall OECD countries: about 30%[4]) may be serving as an impediment to Japanese companies' opportunity to study from the GF Companies.

To deal with this situation, the typical policy response may be to promote intangible asset investment by stepping up R&D tax reduction measures. Nevertheless, we need to pay attention to the fact that although an R&D tax reduction can directly boost R&D investment, it does not necessarily result in productivity gains. In particular, it is often said that Japan's R&D efforts produce poor results relative to the amount invested (in other words, Japan's R&D investment is marked by low efficiency). Hence, it is difficult to achieve the policy goal of catching up with the GF Companies by enhancing R&D tax reduction measures alone.

While this point is revisited in Section 3, let us turn to the idea that in order to connect R&D tax reduction measures with productivity improvement, it is necessary to implement such measures together with a policy to promote the exit of low productivity companies from the market (Acemoglu et.al. [2013]). Given the limited availability of resources, including personnel capable of achieving high quality R&D, it would be difficult for Japanese companies as a whole to produce good R&D results unless such R&D resources are transferred from low productivity companies to companies with high productivity. In order to take advantage of R&D tax reduction measures, it would also be necessary to pay attention to the complementary nature of such policies when combined with policies to stimulate the regeneration of industry.

## 3. Inefficient resource allocation among companies should also be addressed

Next, we examined the possibility of inefficiency in resource (employment and

[2] Strictly speaking, the figure represents the ratio against added value in the corporate sector.

[3] From OECD, *Science, Technology and Industry Scoreboard 2013*. Data are as of 2010 in principle. (Data of Japan are as of 2008.)

[4] Data are taken from UNCTAD, *UNCTAD STAT* and calculated based on the stock of direct investment at the end of 2014.

capital) allocation among companies. The condition where asset allocation among companies is efficient means that companies with low productivity exit the market driven by the proper functioning of the selection mechanism in the market, and production resources (labor and capital) employed by such companies are instead reallocated to companies with high productivity in search of higher wages and profits. Although efficient asset allocation cannot always be realized, it is desirable to take advantage of the market mechanism to make asset allocation as efficient as possible.[5]

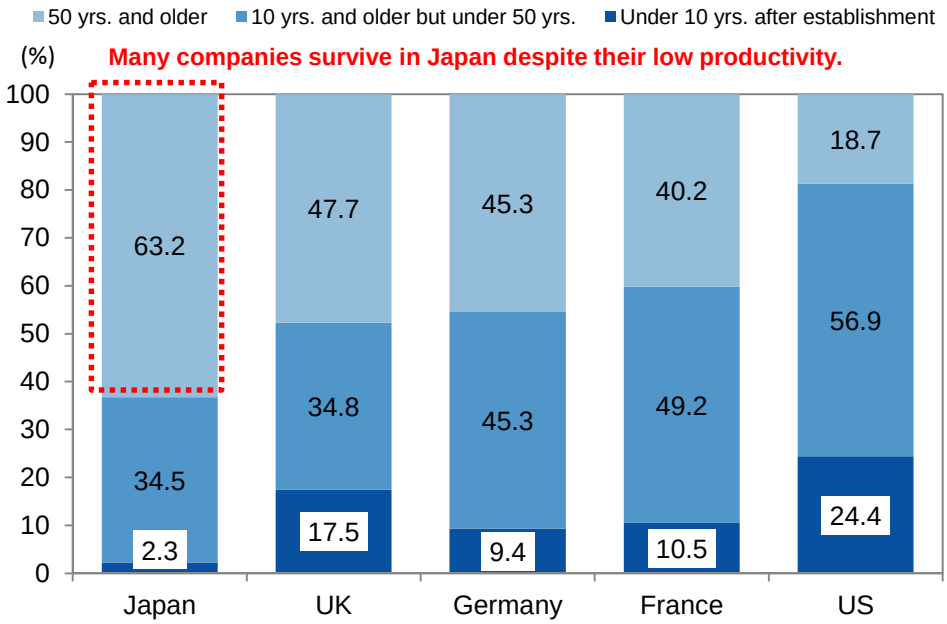
In the case where many companies survive in the market despite their low productivity, it is highly likely that the selection mechanism in the market is not functioning properly. As we look at the international comparison of the age structure of companies with low productivity (companies whose level of TFP falls below their respective industry average), it becomes apparent that in Japan the ratio of old companies (companies in existence for 50 years or longer since its establishment) is significantly higher than in other major countries (**Chart 3**), suggesting the malfunctioning of the selection mechanism in the market.

Major policy measures to improve the efficiency of resource allocation among companies would include measures such as the following: the reduction of administrative costs to start up new businesses (registration cost of incorporation, etc.), the relaxation of labor regulations, the reduction of bankruptcy costs, and the improvement of access to venture capital. According to Andrews et.al. (2015), of the above measures, Japan has room for improvement particularly in the relaxation of labor regulations and better access to venture capital.

However, note that careful system design is necessary in the deregulation of the labor market,. For example, if the protection of fixed-term employment is eased while the rules on dismissal of indefinite-term employment remain strong, companies may become incentivized to replace indefinite-term employment with fixed-term employment. As fixed-term employees have fewer opportunities to receive in-house vocational training compared with indefinite-term employees, this may in turn serve as impediments to productivity improvement. Furthermore, since labor deregulation usually brings about considerable pain, the timing of implementation is also important. In this sense, now may be the chance to promote such labor reform given that the labor market has improved to the extent that Japan currently faces a shortage of labor.

[5] It should be noted that it is also important to execute complementary system reform in addition to making the market mechanism function properly.

**Chart 3: International comparison of the age structure of companies with low productivity (manufacturing)**




Notes: 1. The figures are calculated referring to Andrews et.al. (2015). Companies with low productivity are defined as companies whose level of productivity (TFP) falls below their respective industry average.
2. The chart is created with pool data from 1986 through 2011. The number of samples is 5,836 companies in Japan, 1,857 in the UK, 278 in Germany, 863 in France, and 13,456 in the United States. Source:
Made by MHRI based on Bureau van Dijk, *OSIRIS*, OECD and *STAN Database*.

## Reference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