# Mizuho Economic Outlook & Analysis

**December 20, 2016**

# *Recording of R&D set to bring greater strength to capital investment as a component of GDP*

**< Summary >**

◆ GDP statistics were revised for the first time in 16 years to adapt to the new international standard. The most significant revision is the treatment of research and development (R&D) as private capital investment. The revision significantly pushed up the economic growth rate since the introduction of "Abenomics."

◆ Japanese corporations - mainly large corporations - are more aggressive about R&D than their counterparts in other countries, and have higher interest in R&D spending. Driven by R&D, capital investment as a component of GDP going forward is likely to show greater strength than under the old standard.

◆ However, as R&D tends to depend more on internal funds than investment in tangible fixed assets, it is prone to be led by large corporations. In order to broaden the base of R&D, the support by lending mechanisms and preferential tax treatment is indispensable.

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## 1. Change in treatment of R&D spending in GDP due to Japan's revision of SNA to adapt to the latest international standard

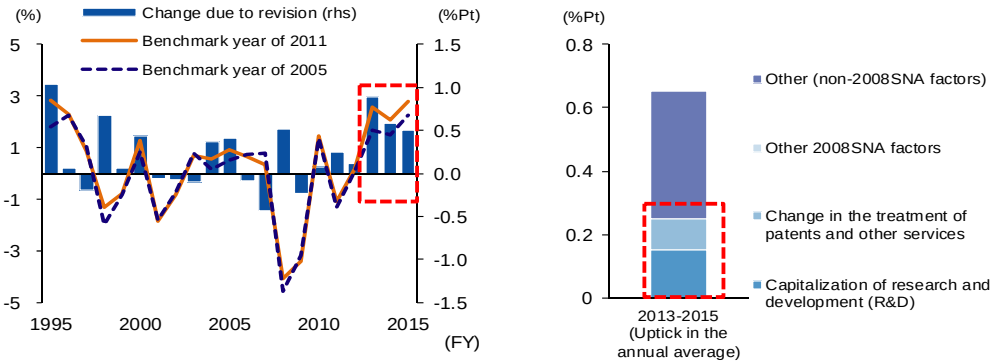
In December 2016, the Japanese System of National Accounts (SNA) underwent a quinquennial revision of its base year. This time, revisions were also made to conform with the latest international statistical standard for the national accounts (the "2008SNA", the predecessor was "1993SNA"), in addition to retroactive revisions of past GDP to reflect detailed data released every few years such as the *Population Census* and the *Input-Output Table*. The latest revision drew keen attention as it was the most significant revision in accordance with the international standard in 16 years since 2000.

The main items changed in the latest revision include (1) expansion of the scope of non-financial produced assets, (2) more elaborated recording of financial assets and liabilities, (3) elaborated treatment of general government and public corporations, and (4) consistency with the balance of payments statistics[1]. Of these, the item that had a major impact on the GDP level is (1), and in particular, "capitalization of research and development (R&D)," on which Japanese companies have placed emphasis in recent years, pushed up the GDP growth rate significantly.

Thus far, R&D was treated as intermediate consumption (or intermediate input to produce final products) and was not included in GDP statistics. Following the latest revision, however, R&D is now treated as fixed assets in the category of "intellectual property products," and the increment (flow) is recorded as gross fixed capital formation (GFCF), including public investment and capital investment. Furthermore, patents are incorporated into R&D, and net external receipts of patent royalties are to be recorded as net exports as a component of GDP.

Then, to what extent did the capitalization of R&D push up nominal GDP? **Chart 1** shows changes in the nominal growth rates due to the revision of GDP and factors for the changes. First, the nominal growth rates in the three years (2013-2015) since the introduction of Abenomics were revised upward by the annual average of about 0.7 percentage points because of the GDP revision (in value

**Chart 1: Impact of GDP revision on nominal GDP**




Source: Made by MHRI based on Cabinet Office, *SNA, Annual Report on National Accounts for 2015 Annual Estimates (Expenditure Approach) (Benchmark Year Revision of 2011)*

[1] For details, see Department of National Accounts, Economic and Social Research Institute, Cabinet Office (2016a) and other data.

terms, an increase of ¥11.3 trillion over 2012). During the same period, R&D and patent services increased by about ¥4.3 trillion over 2012, pushing up the annual average growth rate of nominal GDP by about 0.3 percentage points. This accounts for a little over 40% of the uptick in the nominal growth rate traced to the GDP revision, indicating the magnitude of the impact[2].

International comparison of the effects of the R&D capitalization of pushing up nominal GDP, conducted by the Cabinet Office covering the years around 2010[3], places Japan on the high level along with South Korea and Ireland (the effect of pushing up nominal GDP by approximately 3.5%), indicating a greater impact than most other countries.

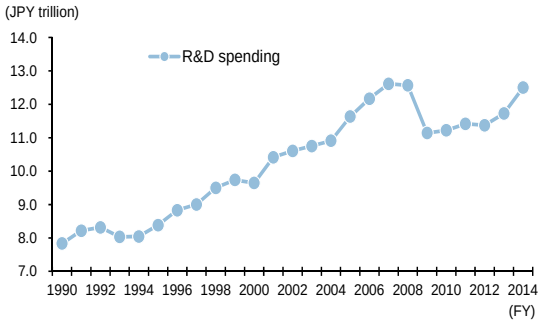
In the next section onward, we look at the status of R&D and examine its potential impact going forward on capital investment as a component of GDP.

## 2. Share of private corporations in R&D spending is high

First, we look at the size of R&D spending made by private corporations. According to **Chart 2**, R&D spending by private corporations fell sharply in 2009 following the financial crisis triggered by the bankruptcy of Lehman Brothers, but subsequently turned around and recovered to around ¥13 trillion in FY2014. Considering that the total of R&D spending, including the public sector, stands at approximately ¥17 trillion, it can be said that private corporations account for the bulk of R&D in Japan.

**Charts 3** and **4** show R&D spending by corporate size and by industry, respectively. By corporate size, the share of large corporations is very high (89%), and by industry, the manufacturing sector accounts for the bulk of R&D spending (87%). In the manufacturing sector, transportation equipment, chemical and applied products (including pharmaceuticals), information and communication electronics equipment, and general-purpose, production and business-oriented machinery have high

**Chart 2: R&D spending by private corporations**




Note: R&D spending show the sum of material cost, lease fees, other expenses, and labor cost.
Source: Made by MHRI based on Ministry of Internal Affairs and Communications, *Survey of Research and Development*

[2] The biggest contributing factor is considered to be "Other factors (for the revision other than 2008SNA factors)," or more specifically, the change in the estimation method to the commodity flow method for construction. For the construction portion of gross fixed capital formation as a component of GDP, the value added calculated by deducting intermediate input from output of the construction sector, which is estimated based on the input-output table. For years for which the input-output table is not available, the output was extrapolated by calculating it with an alternative method (estimating costs such as labor and material input). It has been pointed out, however, that under this method, the margin of revision is prone to be wide in the quinquennial update of the input-output table. Thus, in the latest GDP revision, the construction output was estimated using volume-based basic statistics. For details, see Katsuragi (2013).

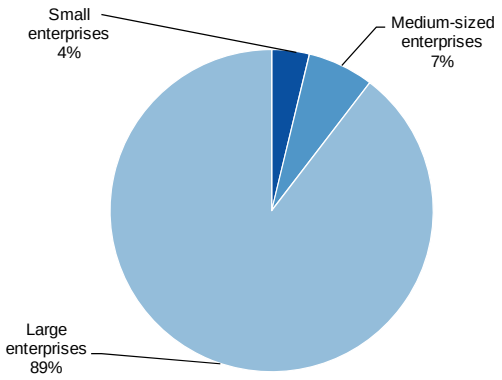
[3] See Tada (2015).

shares.

**Chart 5** shows the international comparison of R&D spending by private corporations (the ratio to nominal GDP). Japan ranks third after South Korea and Israel, worthy of the description that Japan is the nation that places more emphasis on R&D than other countries.

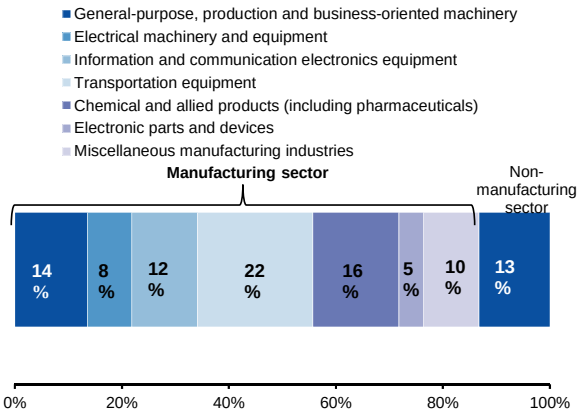
In recent years, Japanese corporations have also been putting muscle into R&D at their overseas

**Chart 3: R&D spending by corporate size (FY2014)**



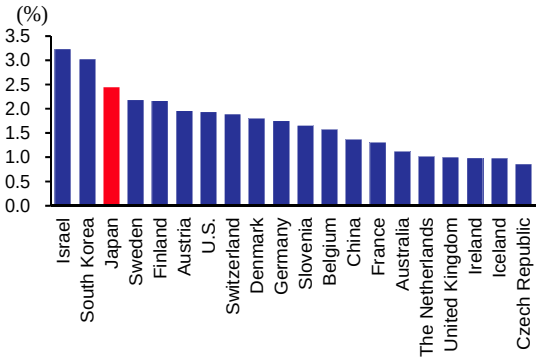

Note: 1. The method of computing R&D spending is the same as for Chart 2.
2. Large enterprises with capital of ¥1 billion or more, medium-sized enterprises with capital of ¥100 million to less than ¥1 billion, and small enterprises with capital of ¥10 million to less than ¥100 million
Source: Made by MHRI based on Ministry of Internal Affairs and Communications, *Survey of Research and Development*

**Chart 4: R&D spending by industry (FY2014)**



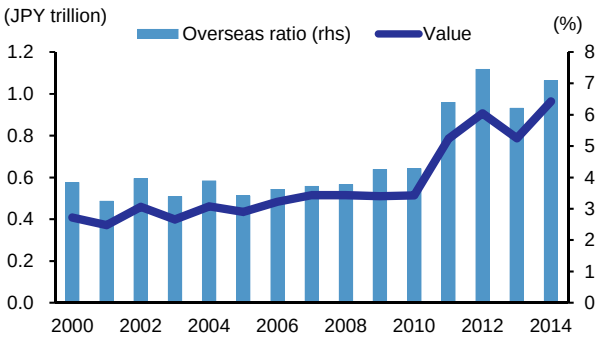

Note: The method of computing R&D spending is the same as for Chart 2..
Source: Made by MHRI based on Ministry of Internal Affairs and Communications, *Survey of Research and Development*

**Chart 5: International comparison of R&D spending (private corporations, ratio to nominal GDP)**




Note: 1. Figures obtained by deducting expenditures on tangible fixed assets from R&D spending for countries other than the U.S. Overall R&D spending for the U.S.
2. 2012 figures for Switzerland and Ireland, and 2013 R&D figures for all other countries
Source: Made by MHRI based on OECD

**Chart 6: R&D at overseas establishments**




Source: Made by MHRI based on Ministry of Internal Affairs and Communications, *Survey of Research and Development*, Ministry of Economy, Trade and Industry, *Basic Survey of Overseas Business Activities*

business establishments. **Chart 6** shows R&D spending by overseas subsidiaries of Japanese corporations. The chart indicates that R&D spending have risen sharply since 2011, with the ratio of overseas R&D to total R&D activities by Japanese corporations also growing higher.

Lying behind this development is the fact that amid the protracted sluggish growth of major developed economies in the wake of the Lehman crisis, Japanese corporations, in an effort to seize on the stronger growth of emerging economies in Asia and other regions, have bolstered R&D activities to roll out products customized for target local markets. In fact, the results of a questionnaire survey on the functional comparison of business expansion initiatives for domestic and overseas markets show that overseas business locations tend to expand R&D aimed at changing specifications for local markets, while domestic R&D activities have been geared up more toward the development of new products (**Chart 7**). It is estimated that strengthened R&D activities overseas are increasingly taking up the role of more adequately responding to the needs of local markets, something that is difficult to do from business bases in Japan, rather than substituting for domestic R&D operations.

## 3. Capital investment as a component of GDP going forward is likely to show greater strength, driven by R&D

Next, we would like to consider what impact the recording of R&D is going to have on capital investment as a component of GDP going forward.

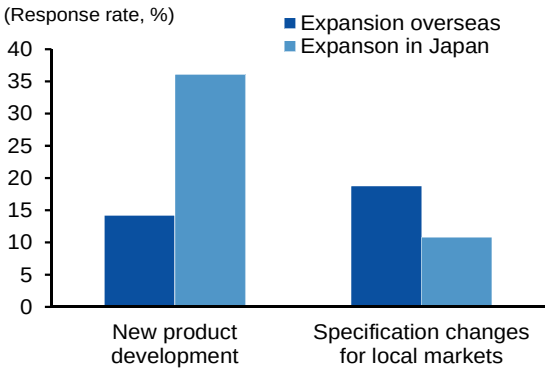
In recent years, as pointed out in Konishi (2016), Japanese corporations are said to be showing rapidly increasing interest in M&A and investment in brands and other intangible assets, rather than in conventional capital investment, namely investment in tangible fixed assets. In particular, they appear to have a high level of interest in R&D. Since Japanese corporations have already accumulated sufficient levels of stocks of tangible fixed assets, such as domestic factories and machinery and equipment, it is conceivable that they now view that it would be more effective for private corporations to raise production efficiency and enhance competitiveness by investing in intangible assets rather than in tangible fixed assets.

**Chart 8** shows the results of a questionnaire survey on prioritized investment among business investments. The survey found that the priority of R&D investment for Japanese corporations is the second highest next only to human resource investment. Regarding the outlook for R&D spending over the medium term of around three years, about 30% of corporations surveyed indicated that they are going to “increase” R&D spending.

As seen in the survey results, Japanese corporations possess strong interest in R&D and the ratio of R&D to total capital investment is seen likely to rise further. In other words, given the addition of R&D to capital investment as a component of GDP, capital investment under the new standard is likely to stay more robust than that under the old standard. In fact, looking at the breakdown by form of gross fixed capital formation in **Chart 9**, intellectual property products that include R&D have been increasing steadily in FY2013-2015 after the introduction of Abenomics. Since FY2014, R&D has

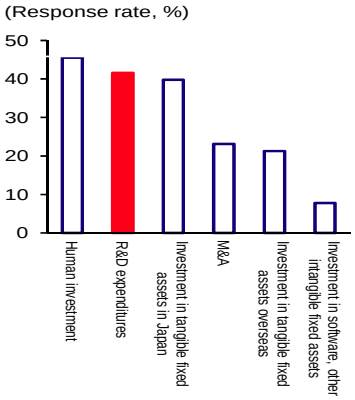
registered higher growth than construction investment and machinery and equipment investment. Consequently, the ratio of intellectual property products to gross fixed capital formation (excluding residential investment) has climbed to around 28% in FY2015.

**Chart 7: Functions to be expanded in Japan and overseas (R&D)**




Note: Results for large-scale firms in the FY2015 survey, multiple answers allowed.
Source: Made by MHRI based on Japan External Trade Organization, *FY2015 Survey on the International Operations of Japanese Firms*

**Chart 8: Prioritized investment for business growth**



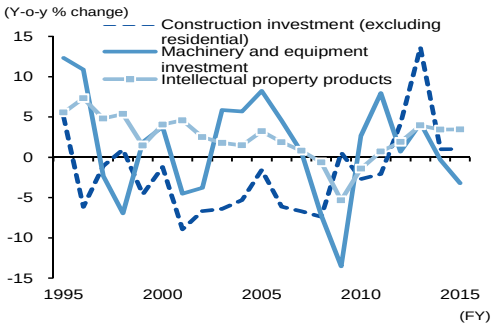

Source: Made by MHRI based on Development Bank of Japan, *Special Questionnaire Survey on Corporate Behaviors (Large Corporations) June 2016*

## 4. Policy support with improved lending mechanisms and preferential tax treatment holds the key to future promotion of R&D investment

However, there remain some problems that need to be addressed for the further promotion of R&D investment by corporations.

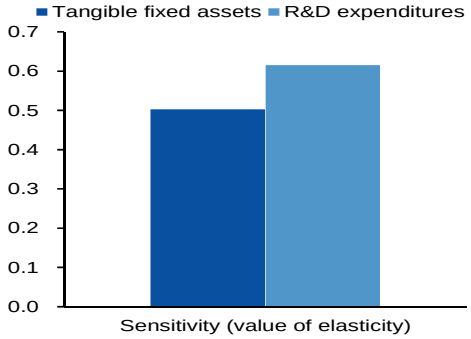
Compared with investment in tangible fixed assets, R&D is said to be more sensitive to cash flows, or internal funds, of corporations. Thus, we conducted a regression analysis of R&D spending and cash flows using panel data by industry (for details, refer to the original Japanese report at http://www.mizuho-ri.co.jp/publication/research/pdf/insight/jp161220.pdf,). As shown in **Chart 10**, the outcome of the analysis confirms that R&D spending have a greater value of elasticity to cash flows than investment in tangible fixed assets.

**Chart 9: Growth of gross fixed capital formation**




Note: Gross fixed capital formation includes investment not only by the private sector but also by the public sector.
Source: Made by MHRI based on Cabinet Office, *System of National Accounts*,

**Chart 10: Sensitivity of capital investment to cash flow**




Note: For details, refer to the original Japanese report at http://www.mizuho-ri.co.jp/publication/research/pdf/insight/jp161220.pdf
Source: Made by MHRI

The reasons that can be cited to explain the sensitivity of intangible asset investment to cash flows include that (1) the asymmetry of information between lenders and borrowers is large due in part to constraints on the screening capabilities of lenders of funds; and that (2) the collateral value is low because the secondary market is not fully developed (in the first place, a great deal of R&D is recorded as expenses under the corporate accounting system). In short, borrowing funds for investment in intangible assets, including R&D, is difficult, and as a result, the implementation of R&D is premised on the sufficient level of cash flows. Viewed in this light, it is understandable that R&D activities are usually led by large corporations. This is also consistent with the fact that since the introduction of Abenomics, large corporations, which saw their earnings improve against the backdrop of the tailwinds, including the yen's weakness, have driven R&D investment. In fact, the *Survey of Research and Development* by the Ministry of Internal Affairs and Communications shows that large corporations accounted for 70% of the increases in R&D spending since FY2013. This trends is quite likely to continue going forward.

On the other hand, there are problems that need to be addressed. One of them is how to promote

R&D by medium-sized and small enterprises whose cash flows are usually not so abundant as large corporations. If the base of R&D investment can be broadened to reach small enterprises, it should lead not only to robust numbers in statistics but also to the enhancement of productivity over the medium term. To that end, support from improved lending mechanisms and preferential tax treatment that take into account the actual conditions of small enterprises is indispensable.

The Japanese government is poised to support the broadening of the base of R&D investment in a bid to achieve the goal of lifting the ratio of R&D investment to GDP to 4% or higher. In the FY2017 Tax Reform, adopted on December 8, 2016, R&D for services (for example, employing artificial intelligence (AI)) were added newly to items eligible for R&D tax cuts. Further promotion of R&D is crucial for the "realization of the fourth industrial revolution" and the realization of "enhanced productivity of the services industry" in order to achieve the goal of ¥600 trillion in nominal GDP envisioned under Abenomics. Whether the revision of GDP statistics helps drive the "visualization" of R&D and more effective policy measures may determine the final assessment of Abenomics going forward.

In closing, I could like to call attention to some technical problems with statistics concerning the recording of R&D investment as a component of GDP.

It has been decided that in recording R&D investment on a quarterly basis from now on, R&D spending on a fiscal year basis will first be estimated based upon research on R&D investment plans such as surveys by the Development Bank of Japan and by dividing such fiscal-year figure to obtain quarterly data using past patterns of selling, general and administrative expenses in the *Financial Statements Statistics of Corporations by Industry* by the Ministry of Finance. Problems with this method include that (1) there is a gap in the growth rate between R&D investment plans and the actual investment[4], and that (2) in the event of a sharp economic contraction as experienced at the time of the Lehman crisis, even if corporations immediately rein in R&D investment, that is unlikely to be reflected instantaneously in GDP statistics. In order to enhance the accuracy of estimation on a quarterly basis, there is an urgent need to survey R&D spending by corporations in basic statistics and to publicly release the survey results as statistical data. In the Bank of Japan's quarterly *Short-Term Economic Survey of Enterprises in Japan* (*Tankan*), beginning with the March 2017 survey, the *Tankan* will add the amount of R&D investment as a new survey item and release "Capital Investment, including Software and R&D (excluding Land Purchasing Expenses)" (fiscal year basis). It is hoped that the *Financial Statements Statistics of Corporations by Industry* by the Ministry of Finance and the *Business Outlook Survey* by the Ministry of Finance/Cabinet Office will also conduct additional

[4] According to the Cabinet Office (2016b), the extrapolation on a fiscal year basis will be conducted by taking into consideration the actual results in the past years and the year-on-year growth of R&D investment plans.

surveys on R&D spending and release the relevant data.

**Addendum: regression analysis of R&D spending and cash flows using panel data**

Refer to the original Japanese report at
http://www.mizuho-ri.co.jp/publication/research/pdf/insight/jp161220.pdf

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