Annual Report on the Japanese Economy and Public Finance 2022

(Report by Minister of State for Economic and Fiscal Policy)

－Investment in human resources to realize a virtuous cycle of growth and distribution－

July 2022

Cabinet Office, Government of Japan

Key points of each chapter

☐ Chapter 1: Economic and Public Finance Trends and Challenges

The Japanese economy continues to grow under “living with COVID-19” initiatives. In the future, Japan should put the economy on a path of autonomous growth led by private sector demand through pay hikes and government-private cooperation in systematic investment, while responding appropriately to behavioral transformation and changes in the international economic environment caused by COVID-19. The Japanese economy, though not plagued with the so-called stagflation, must promote continuous, stable pay hikes and the steady reduction of demand-supply gaps to become an economy with rising pay and prices and break away from deflation. As public finance is based on the economy, Japan should reconstruct its economy robustly to realize economic growth through government-private cooperation in systematic investment and integrally promote the development of a sustainable social security system and fiscal consolidation.

☐ Chapter 2: Challenges towards Securing Labor and Improving Labor Quality

Pay per capita has stagnated in the absence of sufficient growth in the entire economy’s earning power amid prolonged deflation and of sufficient distribution meeting labor productivity growth. Pay must be raised to meet labor productivity growth and inflation. As labor input is expected to decrease in line with a population fall, Japan should promote labor participation by females and elderly people and improve working people's performance through labor turnover. Japan should also spread the principle of equal pay for equal work for the purpose of narrowing gender-based pay gaps and enhance business people’s relearning to improve labor quality through investment in human resources.

☐ Chapter 3: Challenges regarding Investment to Increase Growth Potential

As business investment has generally remained cautious, Japan should promote government-private cooperation in stimulating investment in decarbonization and digitalization. This should link the resolution of social challenges, such as heavy dependence on energy imports, to the creation of value added. Japan should also pave the way for pay to be raised continuously and stably for the purpose of allowing decarbonization costs to be passed on to prices of goods and services. While the promotion of digitalization is expected to contribute to resolving social challenges, such as decarbonization and regional revitalization, Japan should enhance investment in human resources in consideration of the quantitative and qualitative shortages in human resources for information technology (IT) that have become a bottleneck to digitalization.

Contents

- Real GDP almost restored the level before the COVID-19 outbreak. As the government has tried to allow economic and social activities to be sustained as much as possible under the living with COVID-19 concept, the impacts of the COVID-19 infection spread on the economy, including consumer spending, have declined since early 2022 (Figure 1). Capital investment, though rebounding amid earnings improvements, still slips below the level before the COVID-19 outbreak, leaving the expansion of investment as a challenge.
- As consumer spending in the immediate future is supported by excess household savings, which increased substantially in 2020, a consumer spending recovery is expected to grow more robust under pay hikes (Figure 2). The business sector, which has retained excess savings since the 2000s, is required to implement more proactive investment under the new capitalism.

Figure 1 Recovery processes of GDP and its components

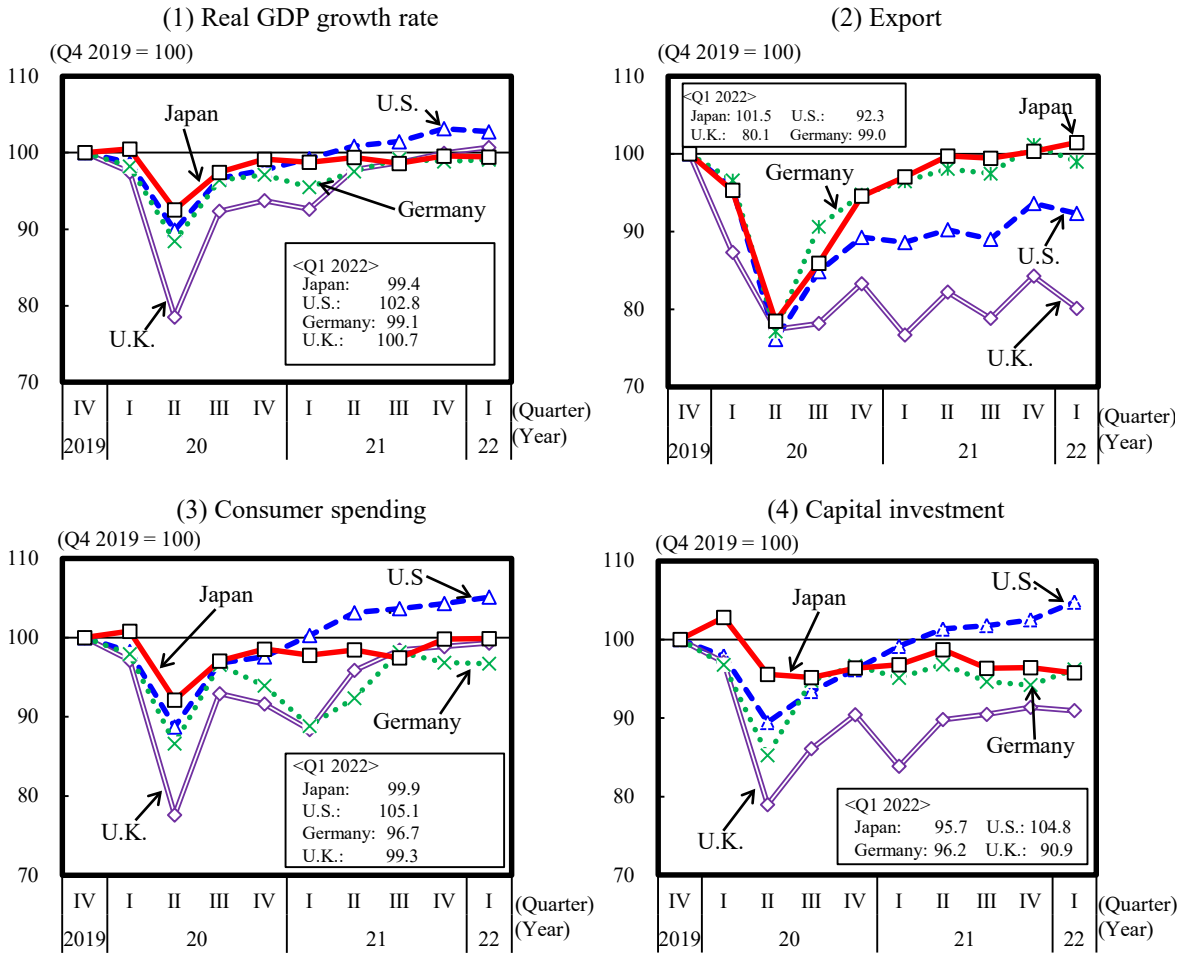
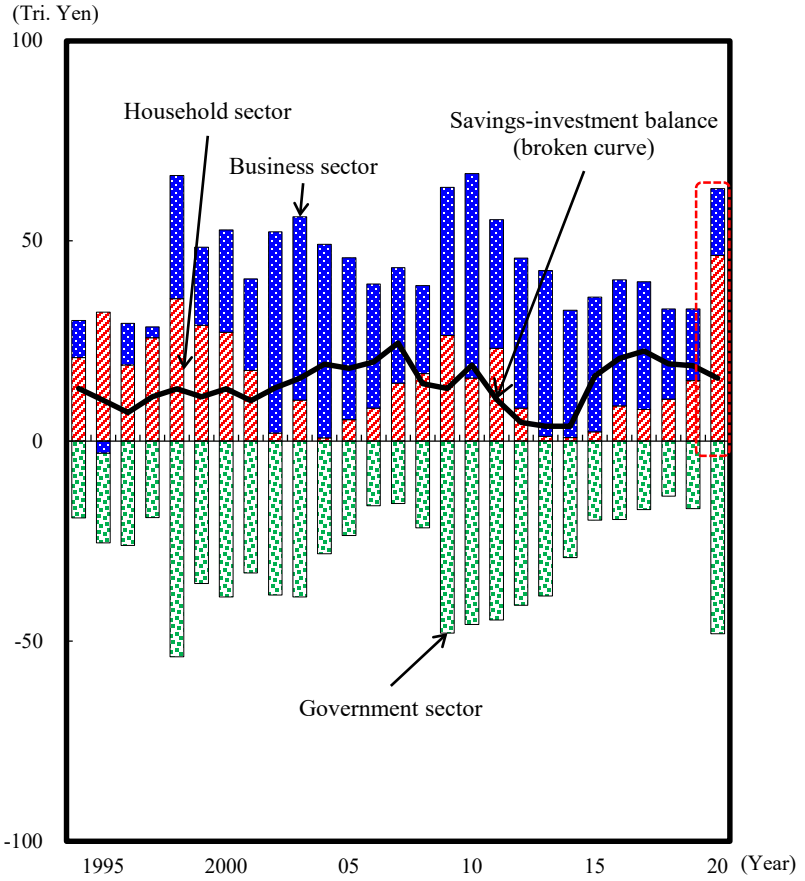


Figure 2 Breakdown of Japan's savings-investment balance



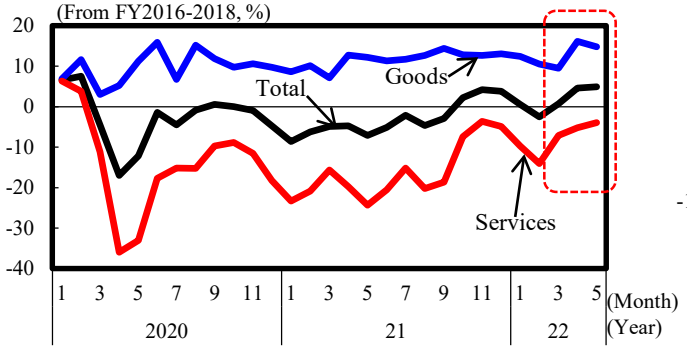
(Source) Figure 1: Compiled based on System of National Accounts, Cabinet Office; U.S. Department of Commerce; Office for National Statistics; and Federal Statistical Office. Figure 2: Compiled based on System of National Accounts, Cabinet Office.

(Household and business sector trends after the COVID-19 outbreak)

- Consumer spending has been rebounding since March 2022, centering on eating-out and travel (Figure 3). However, middle-aged and older people (aged between 40 and 59 and between 60 and 74) are more cautious of spending money on services than younger people aged between 25 and 39. Group travel spending indicates a weak rebound. Business travel spending is generally weak (Figure 4).
- Under progress in vaccination, the link between an increase in human traffic at night and the spread of the COVID-19 infection has declined (Figure 5).
- Transportation, electrical, information and communication machinery manufacturers among others face supply constraints, such as global semiconductor shortages, leaving the enhancement of supply chains as a challenge (Figure 6). The external trade balance has been affected by a decline in export competitiveness of electrical machinery and industrial materials manufacturers and an increase in mineral fuel imports after the Great East Japan Earthquake (Figure 7).

Figure 3 Consumer spending trend after the COVID-19 outbreak

(1) Consumption expenditure trend



(2) Consumer spending trends by age group (services)

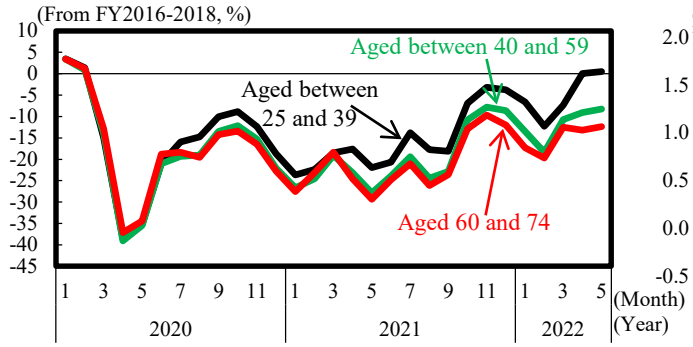


Figure 4 Travel spending trend after the COVID-19 outbreak

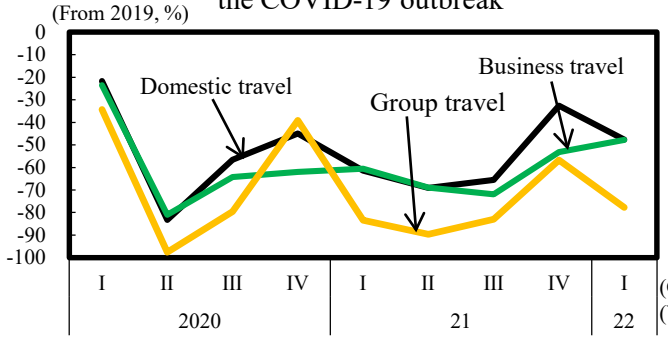


Figure 5 Rate of increase in the number of new COVID-19 infections after growth in night human traffic in entertainment zones

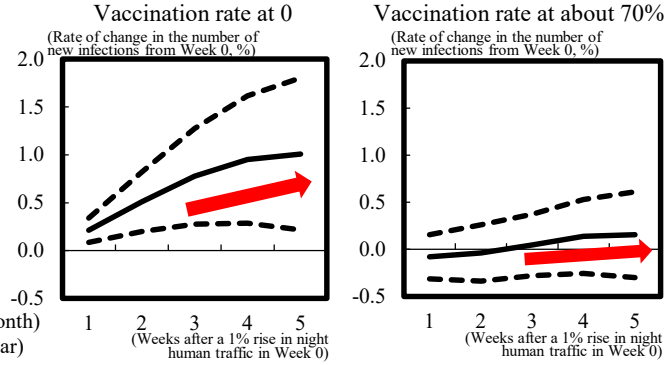


Figure 6 Year-on-year production growth in the second half of 2021

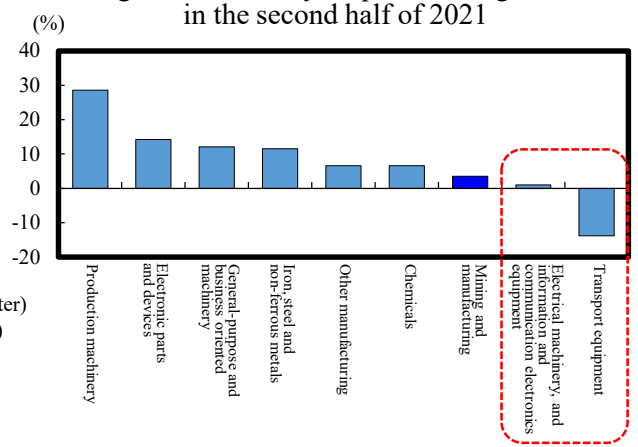
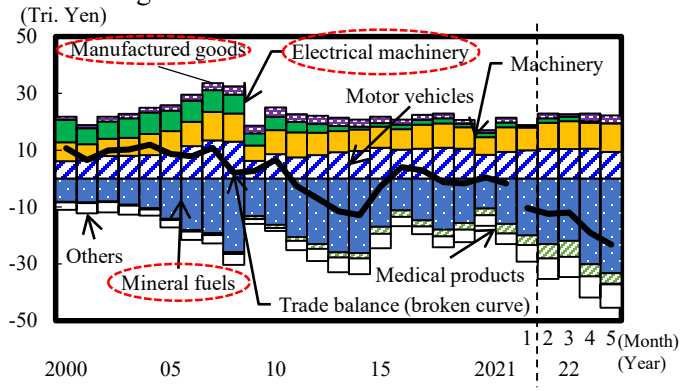


Figure 7 External trade balance trends



(Source) Figure 3: Compiled based on Nowcast Inc.; and JCB Consumption NOW, JCB Co., Ltd. (2) indicates rates of changes from the FY2016-2018 average by age group. Figure 4: Compiled based on Travel and Tourism Consumption Trend Survey, Japan Tourism Agency. January-March 2022 data are preliminary. Figure 5: Compiled based on Anti-COVID-19 Measures, Office for COVID-19 and Other Emerging Infectious Disease Control, Cabinet Secretariat; COVID-19 Vaccination Status, Digital Agency; COVID-19 Information Learned from Data, MHLW; etc. Rates of changes in the number of new COVID-19 infections after Weeks 1 to 5 after a 1% increase in night human traffic (difference in human traffic gap between 9 p.m. and 4 a.m.) in 63 entertainment zones in Japan in Week 0. The vaccination rate indicates the second vaccination status. The broken lines indicate the upper and lower bounds of the 90% confidential interval. Figure 6: Compiled based on Indices of Industrial Production, Ministry of Economy, Trade and Industry (METI). Figure 7: Compiled based on Trade Statistics of Japan, Ministry of Finance (MOF). Monthly data in 2022 are annualized.

- Crude oil price hikes since 2021 are equivalent to those during the second oil crisis (Figure 8). On the other hand, price hikes in Japan are slower than in Europe and North America (Figure 9). The first oil crisis led to spiraling hikes in prices and pay, triggering stagflation (Figure 10). Given that the economy is currently rebounding in the absence of remarkably high price hikes, the economy is not in a situation called stagflation.
- Japan's GDP gap still remains negative (Figure 11), indicating that upside pressure on prices in the Japanese macroeconomic environment is weaker than in Europe and North America. In order to prevent stagflation, Japan should continuously and stably raise pay and steadily reduce the supply-demand gap to break away from deflation.

Figure 8 Crude oil price trend

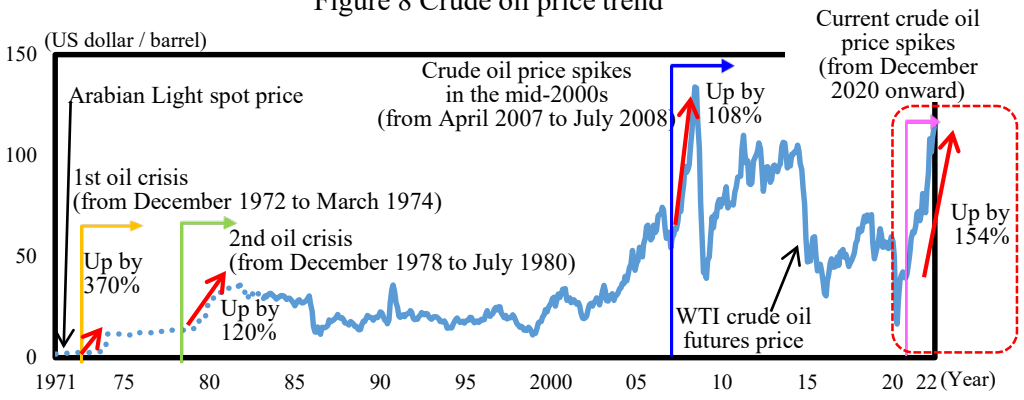


Figure 9 International comparison of consumer price indexes (overall)

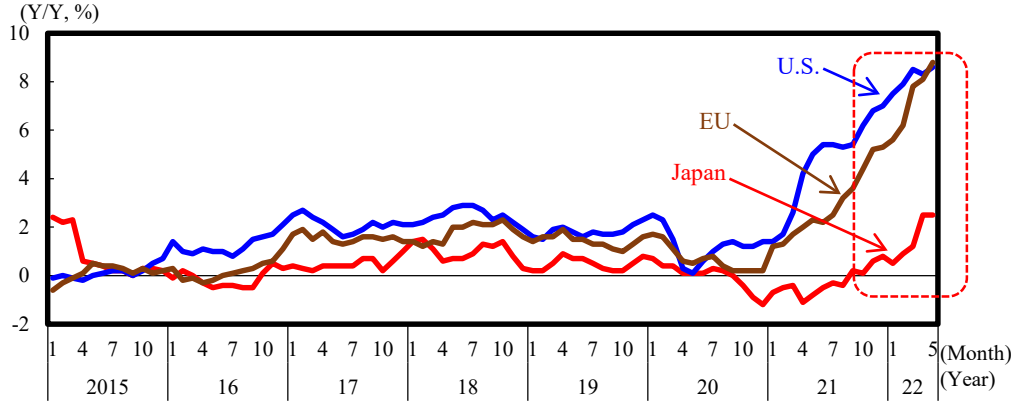


Figure 10 Macroeconomic indicator trends compared with those during past oil price hikes

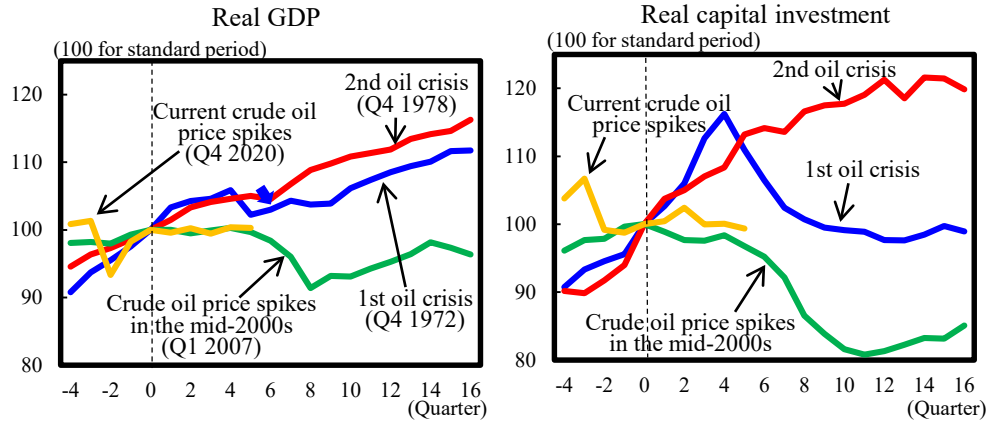
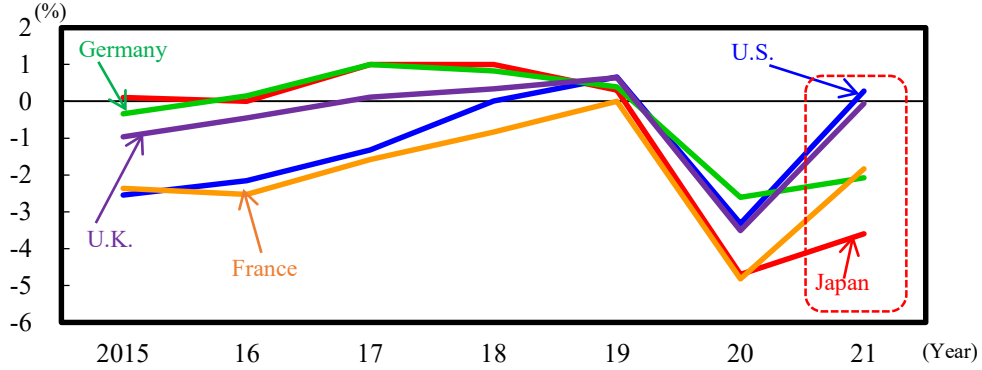


Figure 11 International comparison of GDP gap



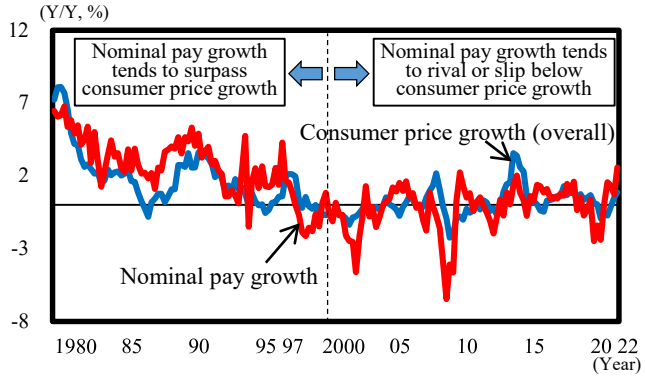
(Source) Figure 8: Compiled based on Bloomberg. Arabian Light is a Saudi Arabian light crude oil brand that had been adopted as a benchmark for prices of crude oil produced by the Organization of the Petroleum Exporting Countries (OPEC). It had been a global benchmark crude oil in the 1970s and 1980s. Crude oil price spike periods for the first and second oil crises and the hikes in the mid-2000s are each defined as between the oil price upturn and the end of hikes by reference to the Annual World Economic Report for 1980. The latest crude oil spike period is between December 2020 and June 2022. Figure 9: Compiled based on Consumer Price Index, Ministry of Internal Affairs and Communications (MIC); and the statistics of each country. Figure 10: Compiled based on System of National Accounts, Cabinet Office. Figure 11: Compiled based on System of National Accounts, Cabinet Office; World Economic Outlook 2021, IMF; etc. GDP gap = (actual GDP － potential GDP) / potential GDP.

Chapter 1 Section 2: Raw Material Price Hikes and Prospects for Breaking Away from Deflation
(Price trends and challenges towards breaking away from deflation)

- Although it is important for nominal pay to increase in tandem with price hikes and labor productivity growth to break away from deflation, nominal pay hikes are insufficient in comparison with price hikes (Figure 12). Growth in real hourly pay has remained below labor productivity growth. Japan should not only promote pay hikes to raise workers' share of national income but also stem the deterioration of terms of trade.
- Although pay-scale and bonus increases are important for raising pay per capita, pay-scale hikes were limited to less than 0.2% in 2020 and 2021 (Figure 13). Given the prolonged deflation, enterprises have failed to see labor productivity and price trends as important for determining pay levels. The government and private sectors should share how adequate pay hikes should be, based on data and evidence.
- On the occasion of the second oil crisis, robust growth in capital investment, including energy conservation investment, limited the crisis's impacts on the economy and improved energy consumption efficiency (Figure 14). By reference to experiences with the second oil crisis, the government and private sectors should cooperate in promoting systematic investment in priority areas under the new capitalism to stimulate private sector investment, which has stagnated over the long term.

Figure 12 Relationship between pay hikes and labor productivity

(1) Relationship between consumer prices and nominal pay



(2) Breakdown of cumulative contributions to real pay

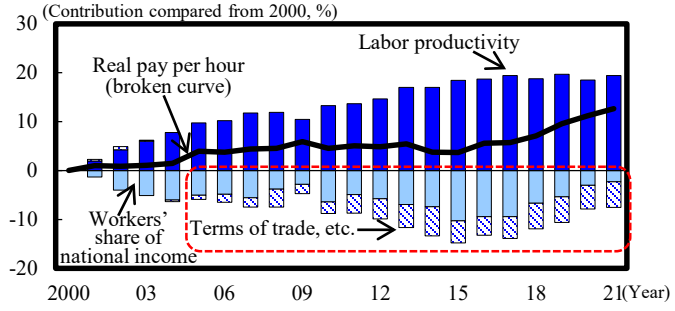
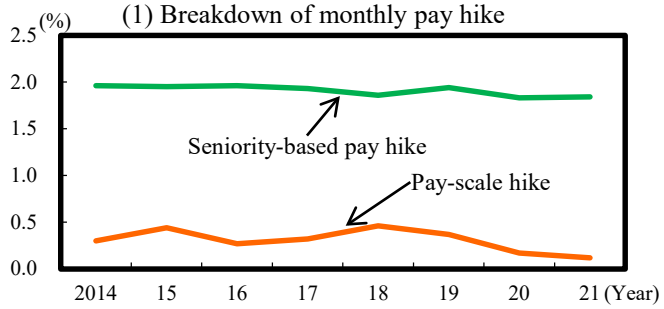


Figure 13 Enterprises' pay-increasing actions

(1) Breakdown of monthly pay hike



(2) Factors considered for determining pay

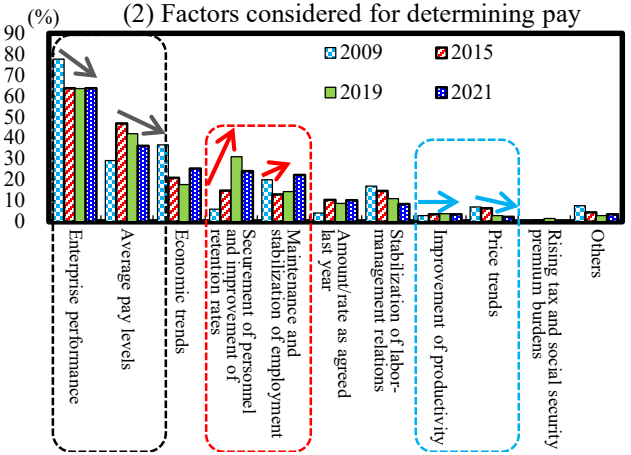
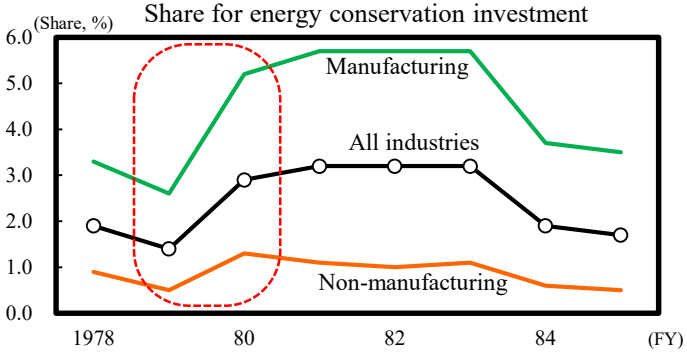
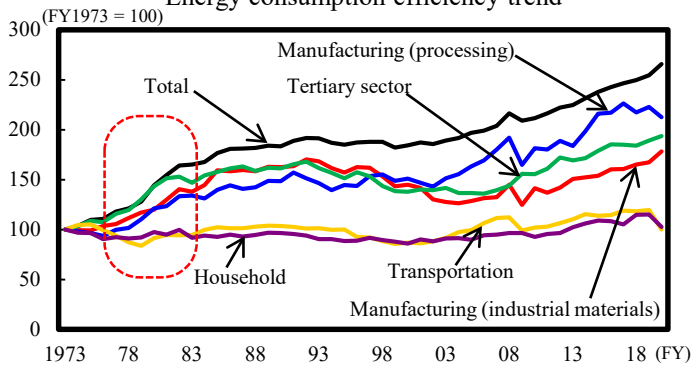


Figure 14 Energy conservation investment and energy efficiency improvements

Share for energy conservation investment



Energy consumption efficiency trend



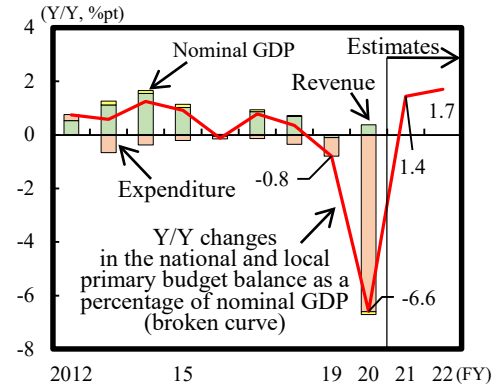
(Source) Figure 12: Compiled based on Consumer Price Index & Labor Force Survey (Basic Tabulation), MIC; Monthly Labour Survey, Ministry of Health, Labour and Welfare (MHLW); and System of National Accounts, Cabinet Office. Real pay and labor productivity are on a man-hour basis. Real pay = Nominal employment compensation / Household final consumption expenditure deflator (excluding imputed rent) / Employment / Work hours. Figure 13: Compiled based on Seniority-based Pay and Pay-scale Hike Survey, Keidanren. The survey period is between January and June each year. Each enterprise was asked to specify both. Figure 14: Compiled based on Survey on Planned Capital Spending, Japan Development Bank (Development Bank of Japan Inc.); and Comprehensive Energy Statistics, Agency for Natural Resources and Energy (ANRE). Energy consumption efficiency = Real GDP / Final energy consumption (households: Household final consumption expenditure / Final energy consumption).

(Fiscal policy under COVID-19 and challenges towards medium to long-term economic and fiscal management)

- As large-scale economic packages have been formulated during the current COVID-19 crisis, the primary budget balance deficit and government debt as a percentage of GDP have increased sharply (Figure 15). While the economy has posted a substantial nominal contraction, tax revenue has increased due to a consumption tax increase, the maintenance of household income under government economic support and corporate profit growth (Figure 16).
- Before the COVID-19 crisis, nominal GDP growth was contributing to pushing down government debt as a percentage of GDP after the end of the deflationary situation in 2013 (Figure 17). Due to expenditure reform and revenue growth, contributions to the primary budget deficit were almost halved from the 2000-2012 period. While expenditure growth accompanying population aging, supplementary budgets and a consumption tax increase deteriorated the primary budget balance, nominal GDP growth through a natural revenue increase and other factors contributed much to improving the primary budget balance as a percentage of GDP (Figure 18). After reconstructing its economy robustly, Japan should integrally promote economic growth, the development of sustainable social security systems and fiscal consolidation as medium to long-term challenges.

Figure 15 National and local government finance

(1) Changes in the national and local primary budget balance as a percentage of GDP



(2) National and local government debt as a percentage of GDP

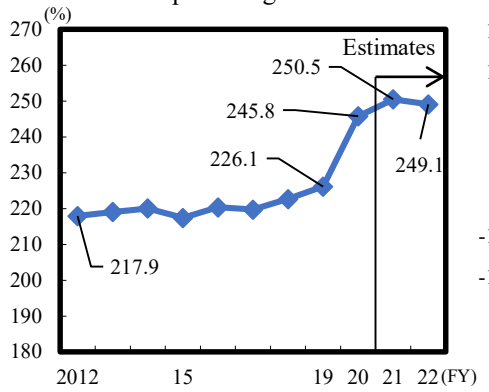


Figure 16 Nominal GDP and national tax revenue trends

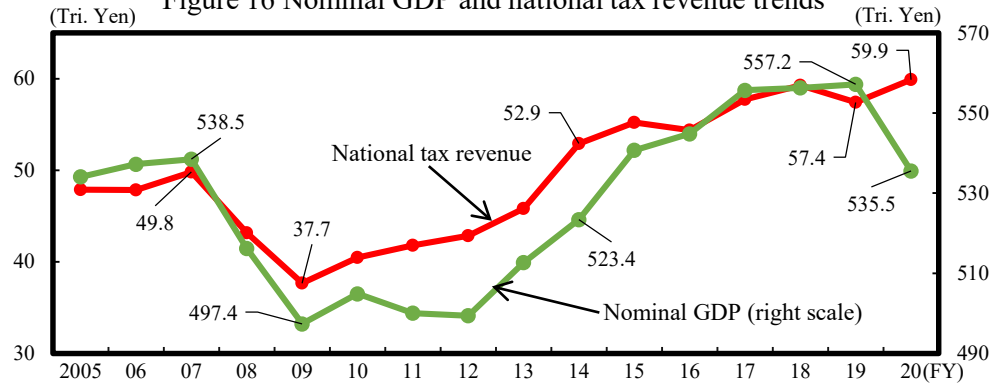
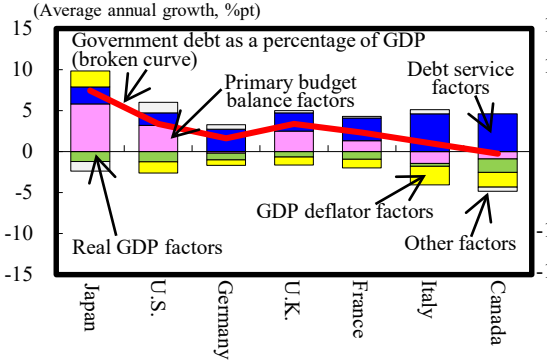


Figure 17 Changes in general government debt as a percentage of GDP in major countries

(1) 2000 to 2012



(2) 2013 to 2019

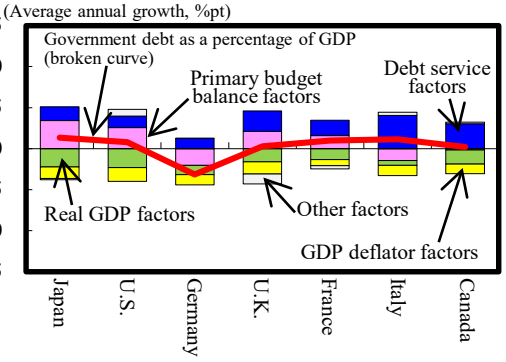
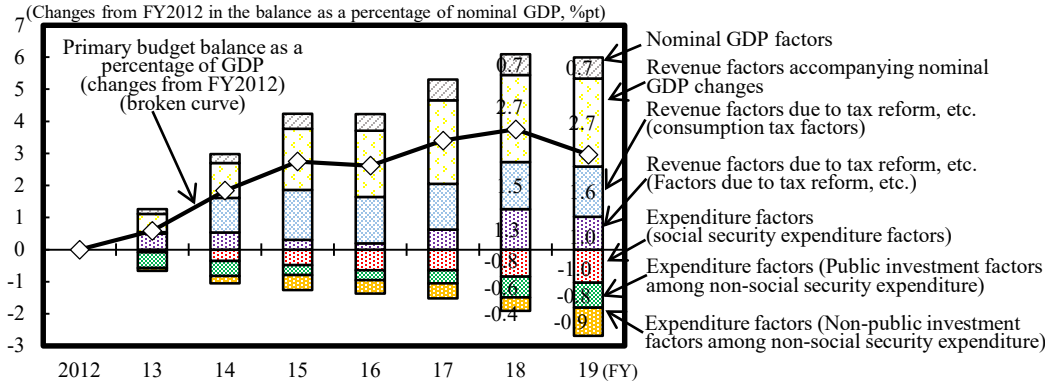


Figure 18 Changes in the national and local government primary budget balance as a percentage of GDP since FY2013



(Source) Compiled based on System of National Accounts & Economic and Fiscal Projections for Medium to Long Term Analysis (released on January 14, 2022), Cabinet Office; Survey of the Amount settled of Tax and Stamp Revenue, MOF; OECD.Stat; and World Economic Outlook, IMF. Figure 15: (1) FY 2021-22 data are from estimates in Economic and Fiscal Projections for Medium to Long Term Analysis. (2) FY2021-22 data represent FY2020 data plus later accumulated budget balance data in Economic and Fiscal Projections for Medium to Long Term Analysis.

- Japan's real GDP growth has been limited to moderate levels for about 30 years. Labor input factors behind the limited growth include declining population and a decrease in work hours per capita through the diffusion of the complete five-day work week system and an increase in the number of non-regular employees. Real GDP per work hour in Japan has grown as much as in other major developed countries (Figure 1). While total factor productivity and labor contributions have grown in Japan since 2013, capital contributions have decreased substantially, widening their gaps with those in other major developed countries (Figure 2).
- Nominal pay per capita has stagnated (Figure 3). Factors that have been pushing down nominal pay capita have been a decline in work hours per capita and an increase in the number of females and elderly workers with relatively lower pay levels. Meanwhile, positive contributions by growing hourly pay have expanded since 2013.
- Hourly pay has moderately increased for females among ordinary workers (full-time) (Figure 4). For males, hourly pay has turned up since 2013. For those in their 40s, however, hourly pay has followed a downtrend. Hourly pay for male workers in their 50s has increased moderately since the mid-2010s due to the postponement of retirement.

Figure 1 Real GDP trends in major developed countries

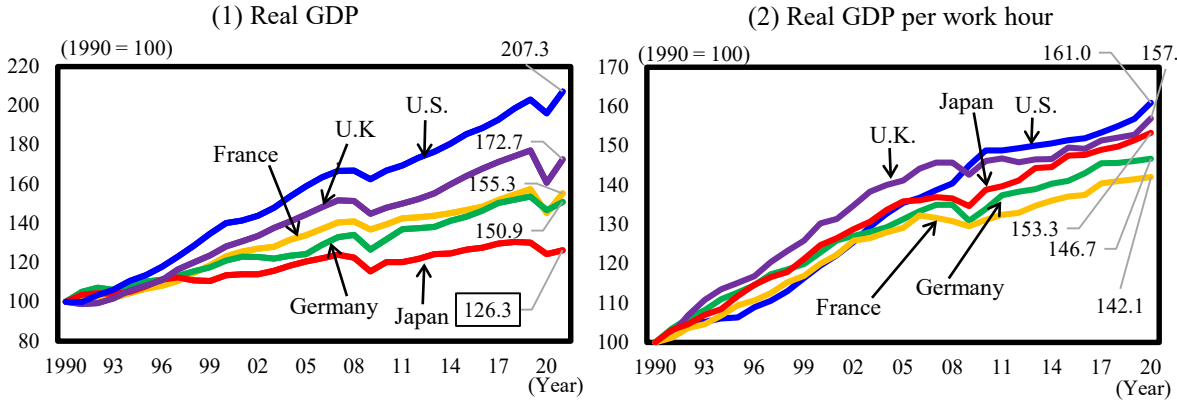


Figure 3 Nominal pay per capita breakdown by factor

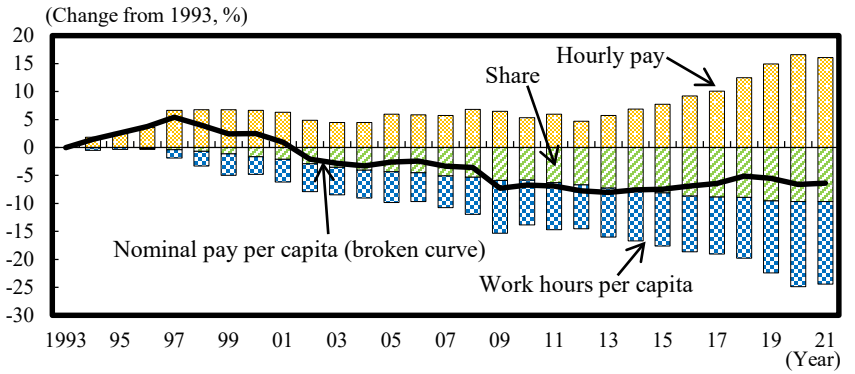


Figure 2 Real GDP growth breakdown by factor (total factor productivity, labor and capital)

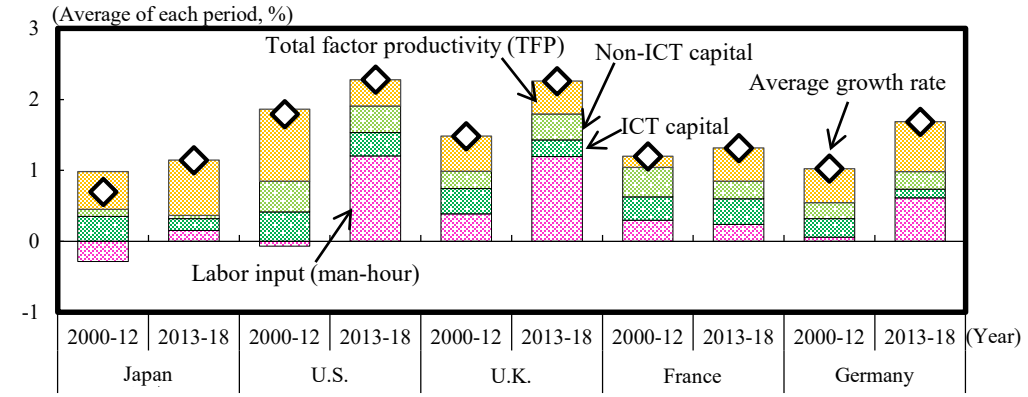
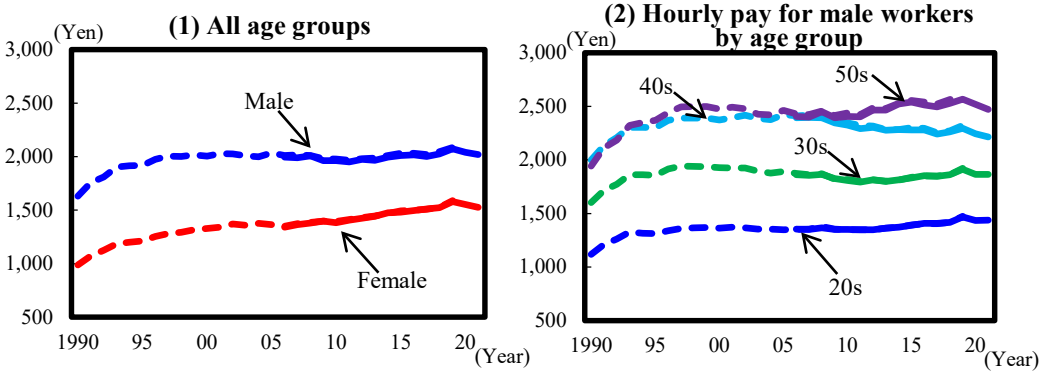


Figure 4 Hourly pay for ordinary workers



(Source) Figures 1 & 2: Compiled based on OECD.Stat. Figure 3: Compiled based on Monthly Labour Survey & Basic Survey on Wage Structure, MHLW. Figure 4: Compiled based on Basic Survey on Wage Structure, MHLW; and the website of an online search system for labor statistical data developed by the Japan Institute for Labour Policy and Training (JILPT). Broken line data are based on the estimation method in or before 2010 and solid line data on the method in 2020.

- Employment has increased even under falling population thanks to progress in females' labor participation since the mid-2010s (Figure 5). As population decline and aging accelerate in the future, man-hour labor input (work hours per capita × employment) may decrease at an annual rate of 0.6-1.1% even amid progress in labor force participation (Figure 6).
- To ease a decline in labor quantity, females' and elderly people's labor participation must be promoted further. In addition to unwilling non-regular employees, jobless people and job seekers, who account for nearly 10% of Japan's population (Figure 7), short-term workers hoping to increase work hours (Figure 8), and people adjusting work hours (Figure 9) should be encouraged through institutional reform and job assistance to promote their labor participation.

Figure 5 Breakdown of employment by factor

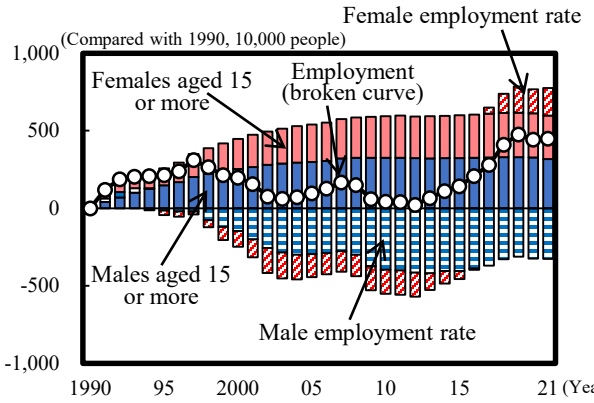


Figure 6 Future scenario of labor input

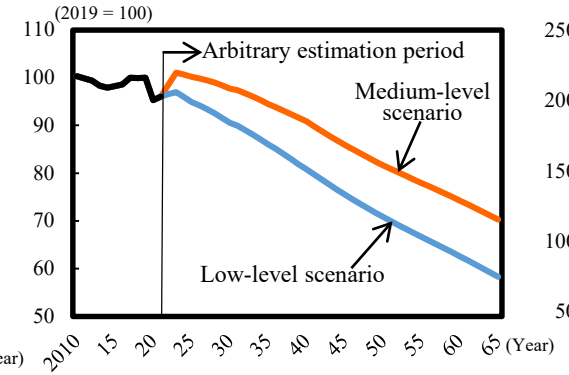


Figure 8 Short-time workers hoping to increase work hours

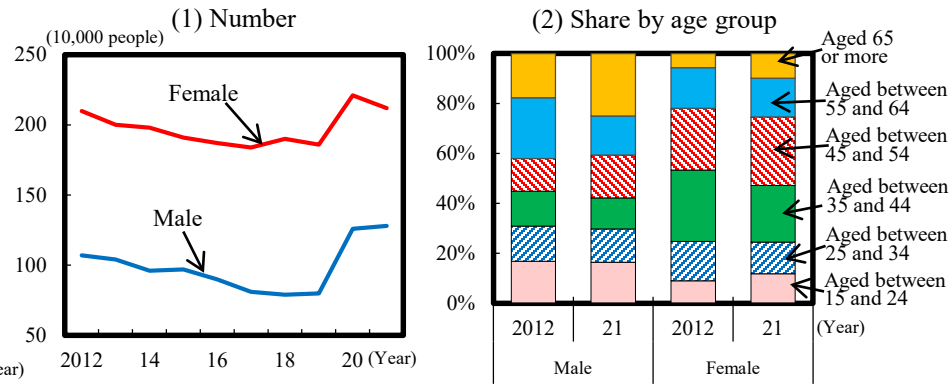


Figure 7 Job seekers (unemployed at present)

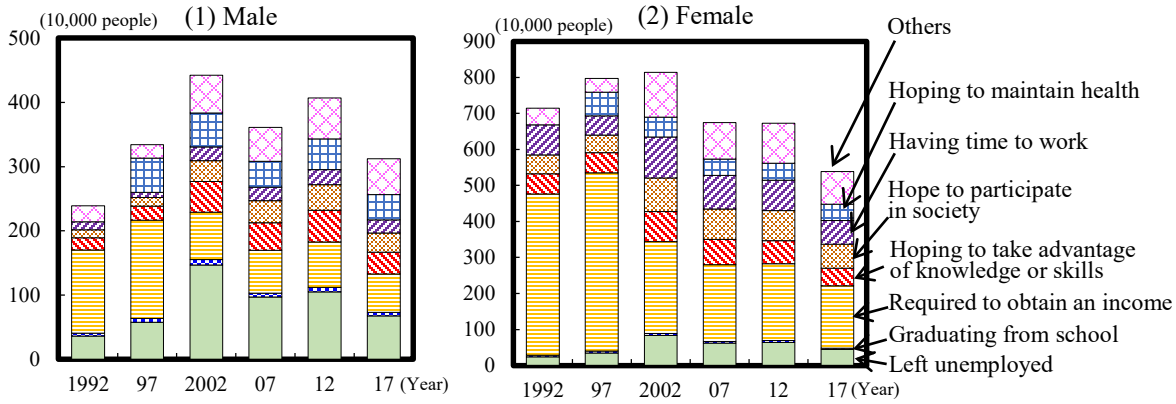
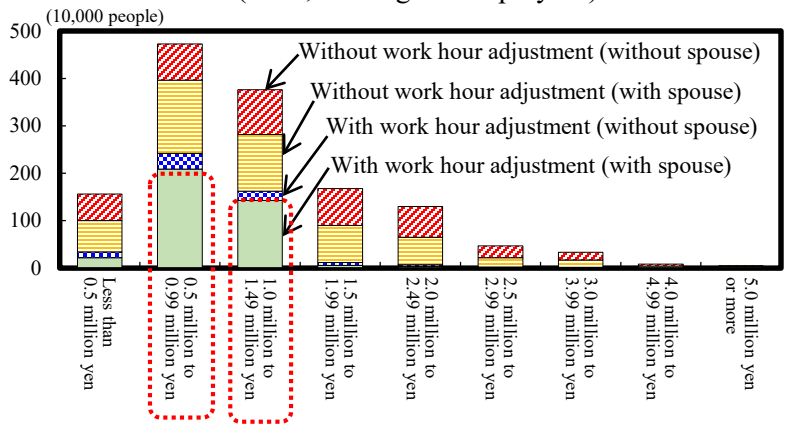


Figure 9 Female workers' work hour adjustment (2017, non-regular employees)



(Source) Figure 5: Compiled based on Labor Force Survey (Basic Tabulation), MIC. Figure 6: Compiled based on Labor Force Survey (Basic Tabulation), MIC; Population & Household Projection for Japan: 2015-2040, National Institute of Population and Social Security Research; and Labor Supply and Demand Projection – Projection with Labor Supply and Demand Model (FY2018 edition), JILPT. The medium-level scenario refers to data for medium birthrate/mortality and economic growth realization/labor participation scenarios, and the low-level scenario to data for low birthrate/medium mortality and zero growth/present labor participation scenarios. Figures 7 & 9: Compiled based on Employment Status Survey, MIC. Jobless people include fully unemployed people. Figure 8: Compiled based on Labor Force Survey (Detail Tabulation), MIC.

- Regarding labor mobility, the share for employees hired after their job changes has been rising for males in their 30s and for females in their 40s and 50s (Figure 10). Pay has increased after job changes remarkably for males under 40s and for females in their 30s and 40s (Figure 11). Annual income for regular employees one year after their job changes has increased for those aged below 50. Annual income growth one year after job changes has been higher for changes within the same industry than for cross-industrial changes (Figure 12). Under the COVID-19 crisis, the number of regular employees hoping to change jobs has increased (Figure 13). A future challenge is to encourage employed workers in various age groups to perform better through changing jobs.
- Workers with side or multiple jobs are mainly among young people at present (Figure 14). It is hoped that the number of people with side jobs and multiple jobs will increase through workers' sharing of success stories and challenges and the diffusion of relevant guidelines.

Figure 10 Changes in the share for employees hired after job changes

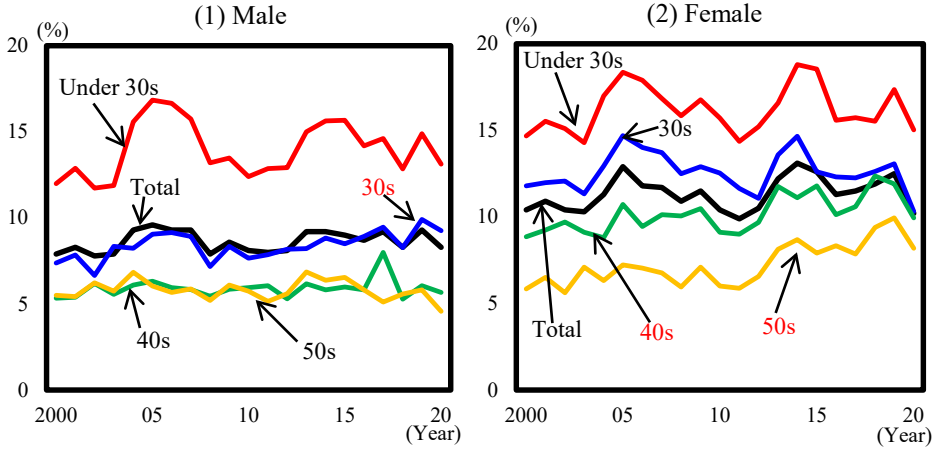


Figure 11 Pay changes for general workers hired after job changes (2019)

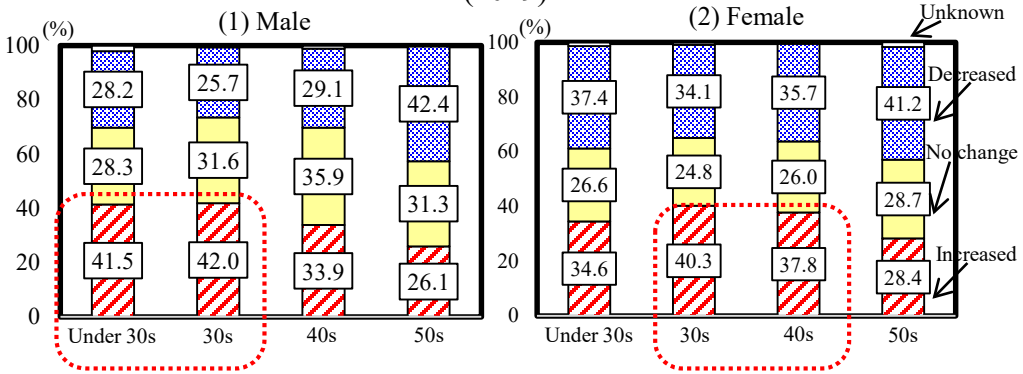


Figure 12 Annual income changes for regular employees before and after their job changes (2016-2020)

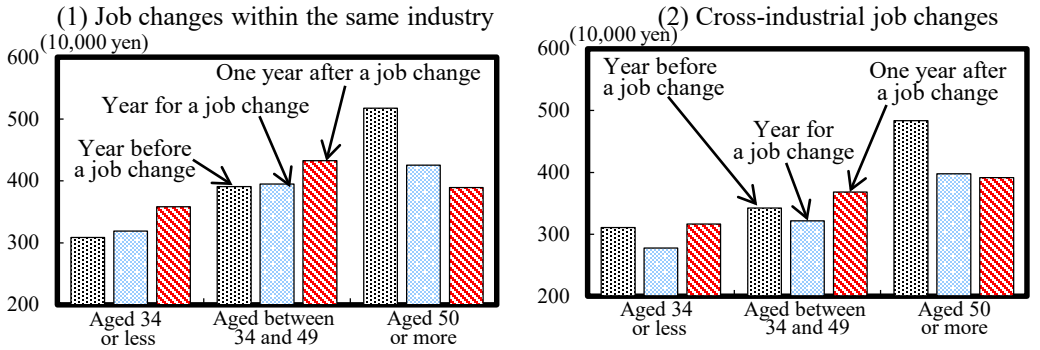


Figure 13 Changes in workers hoping to change jobs

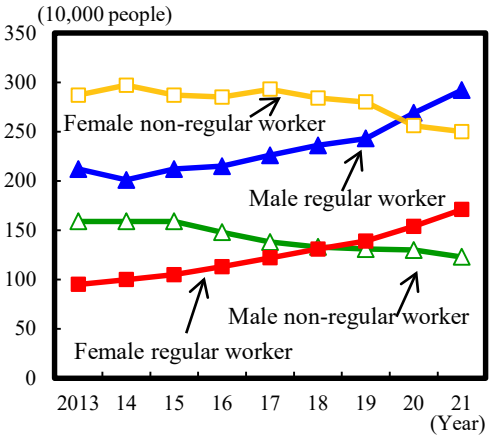
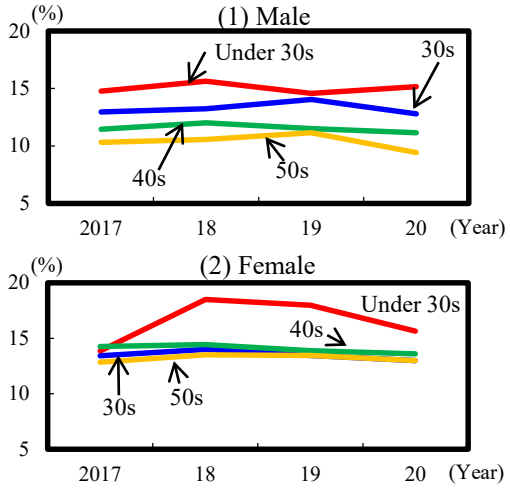


Figure 14 Share for people with side jobs or multiple jobs



(Source) Figures 10 & 11: Compiled based on Survey on Employment Trends, MHLW. Share for employees hired after job changes = Number of employees hired after job changes / Total number of ordinary employees. Employees hired after job changes refer to employees hired after job changes within the past one year. Figures 12 &14: Compiled based on Japanese Panel Study of Employment Dynamics, Recruit Works Institute. Microdata were specially tabulated with a weighted tabulation method. Figure 12 tabulates annual income data for people who changed jobs between 2016 and 2020. Figure 13: Compiled based on Labor Force Survey (Detail Tabulation), MIC.

(Gender-based pay gap/non-regular employment and labor quality, promotion of recurrent education)

- Factors behind the gender-based pay gap include: (1) females' lower shares of regular employees and higher job positions, and a shorter average duration of services for females; (2) Lower pay hikes for regular female employees and lower seniority-based pay hikes for females (Figure 15).
- The share for non-regular employees has followed an uptrend for males over the medium to long term and a downtrend for females since the mid-2010s (Figure 16). The share for female employees who found non-regular jobs just after school graduation and currently have non-regular jobs is larger (Figure 17), indicating that non-regular employment is fixed for females.
- Indicating the effects of recurrent education, some 20% of people assumed jobs they wanted or achieved annual income growth after recurrent education at universities, etc. (Figure 18). In particular, workers who implement both off-the-job training and personal development earn higher annual income than those who implement either (Figure 19). It is hoped that enterprises will encourage their employees' to engage in recurrent education by specifying skills or capabilities required for their jobs, leading to the improvement of treatment and annual income growth for their employees.

Figure 15 Breakdown of gender-based pay gap

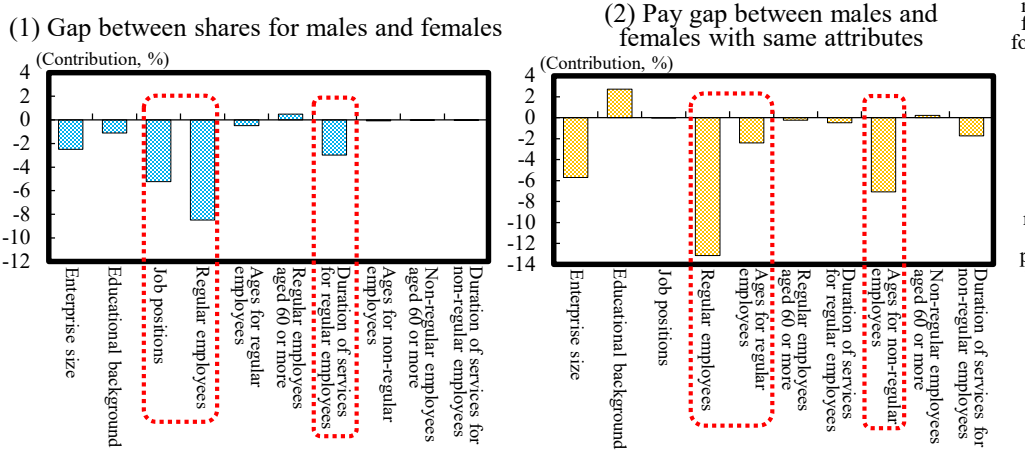


Figure 17 Employees who found non-regular jobs just after school graduation and currently have non-regular jobs

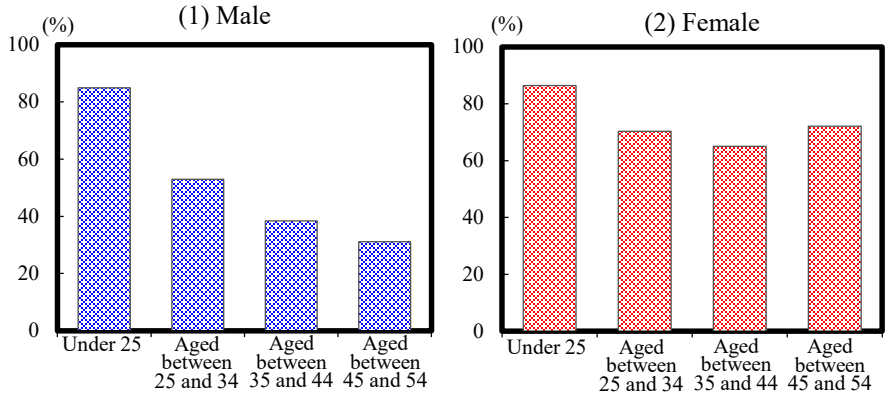


Figure 16 Non-regular employee share trend

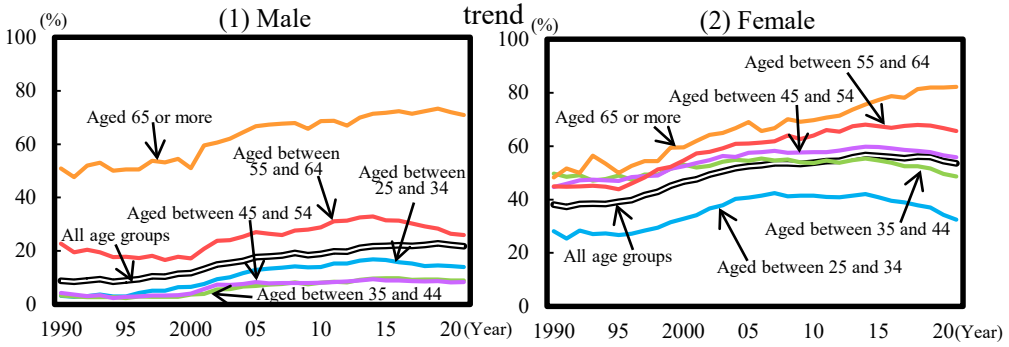


Figure 18 Effects of recurrent education

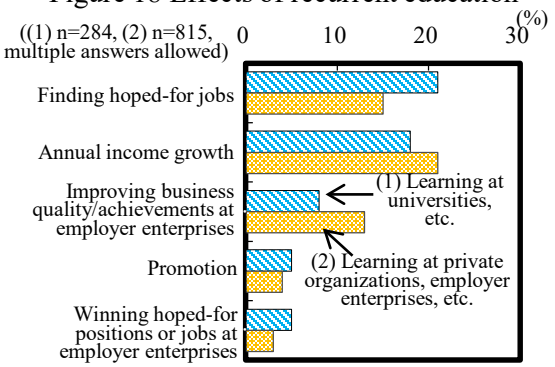
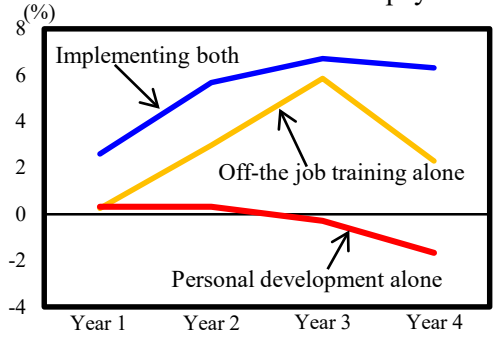


Figure 19 Secular changes in effects of recurrent education on pay



(Source) Figures 15, 17 & 19: Compiled based on Japanese Panel Study of Employment Dynamics, Recruit Works Institute. Microdata were specially tabulated with a weighted tabulation method. Ages in Figure 17 are for 2020. "Others" include board members and self-employed workers. Figure 19 classifies regular employees staying at the same enterprises since 2017 by whether they have continued to implement off-the-job training and/or personal development since 2017. Figure 19 compares regular employees implementing off-the-job training and/or personal training with those implementing neither. Figure 16: Compiled based on Labor Force Survey (Special Survey and Detailed Tabulation), MIC. Figure 18: Compiled based on a fact-finding survey on recurrent education of business people in FY2019, Ministry of Education, Culture, Sports, Science and Technology (MEXT).

- Household income gaps before redistribution expanded against the backdrop of increased shares for single-person and elderly households (Figure 20). The share for annual income of up to 3 million yen increased at single-parent households among household categories, indicating severer conditions (Figure 21).
- The improvement of the Gini coefficient through redistribution expanded from 25 years earlier, indicating the growing effect of redistribution. Among elderly households, low-income households receive more healthcare and nursing care benefits, while high-income households serve to support social security systems against the backdrop of growing employment (Figure 22). Couple-and-child households receive more education and nursing benefits while paying more social security premiums. Single-parent households receive more childcare-related benefits but less pension benefits, indicating severe conditions.

Figure 20 Income distribution among all households

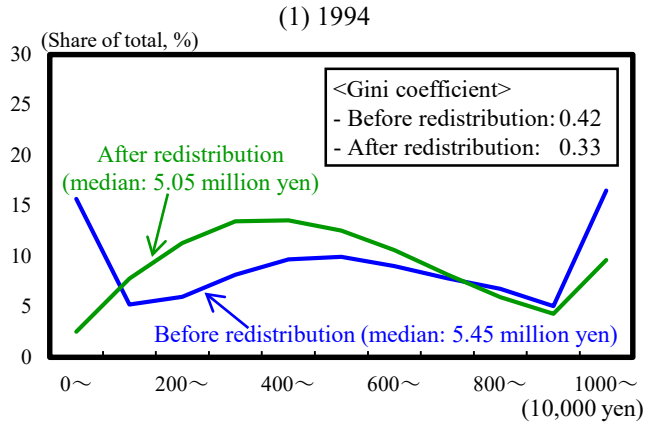


Figure 21 Income distribution by household category (before redistribution)

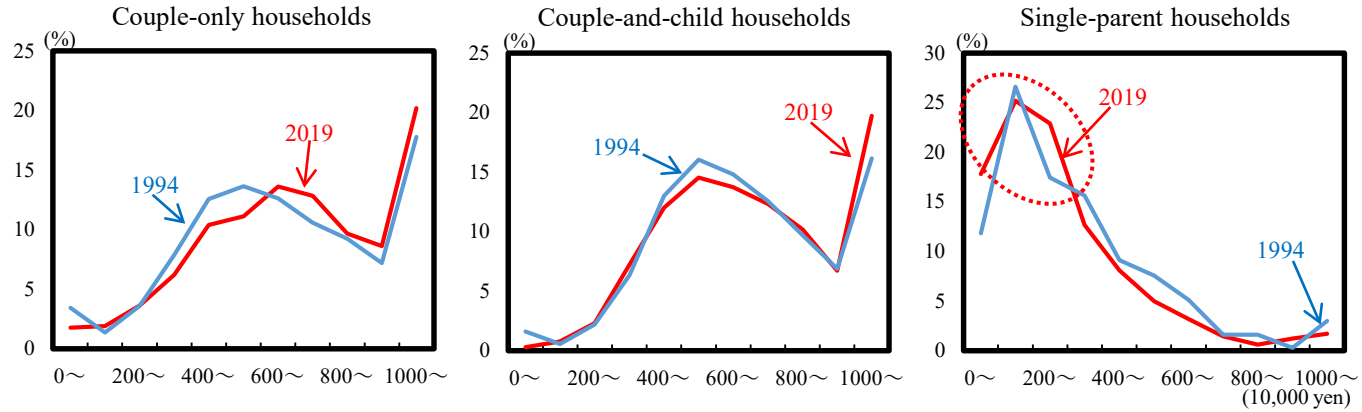
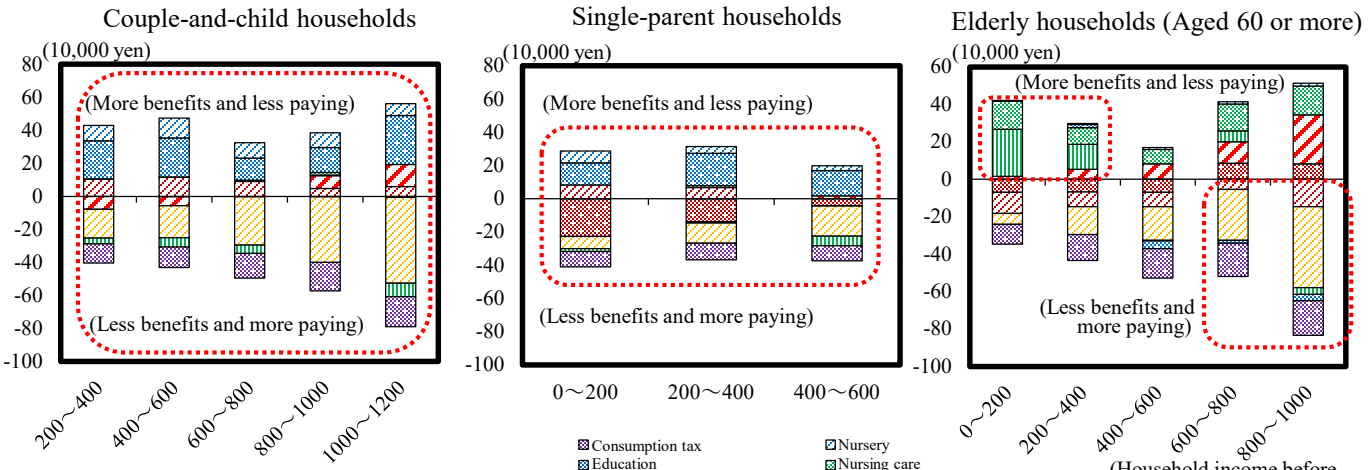


Figure 22 Effects of income redistribution by household category (changes from 1994 to 2019)



(Source) Figures 22 to 22: Compiled based on National Survey of Family Income, Consumption and Wealth & National Survey of Family Income and Expenditure, MIC. Microdata from each survey were tabulated and compiled by the Cabinet Office. Tabulation covers couple-and-child and single-parent households in which the youngest children are aged below 18. Households other than elderly ones have householders aged under 60. Gini coefficients in Figure 20 are simple estimates. Income distribution by household category in Figure 21 indicates shares within each category.

Chapter 3 Section 1: Background behind Stagnant Investment and Recent Environmental Changes (Investment and digitalization/decarbonization)

- Investment by Japanese enterprises, though indicating a rising overseas investment share, has generally remained cautious against the backdrop of a fall in anticipated growth and conservative business administration represented by a net debt-free status (Figures 1 & 2).
- Industry-by-industry anticipated growth has a correlation with anticipated capital investment (Figure 3). Digitalization and decarbonization have the potential to structurally change demand in a wide range of industries. In fact, enterprises with more progress in digitalization have achieved better earnings than those with less progress in each industry since the COVID-19 outbreak (Figure 4). It is hoped that systematic investment will be promoted under government-private cooperation to exert favorable impacts on anticipated private-sector demand and stimulate private-sector investment, with predictability improved.

Figure 1 Investment-profit ratios

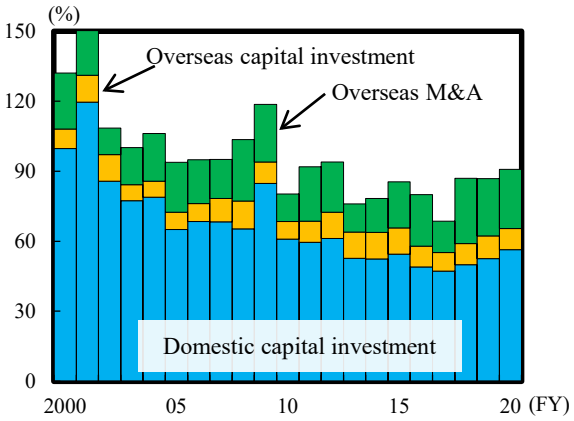


Figure 2 Trend of shares for net debt-free enterprises

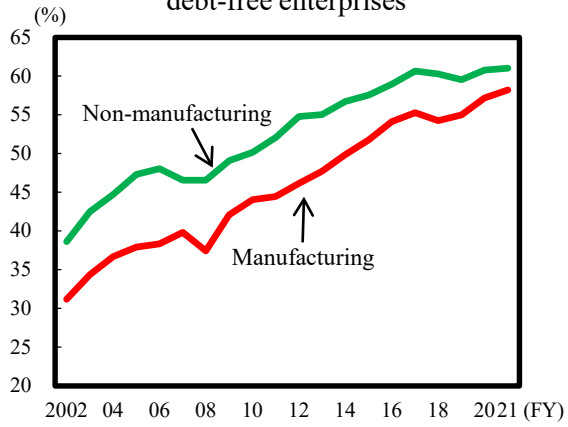


Figure 3 Relationship between anticipated growth and capital investment by industry

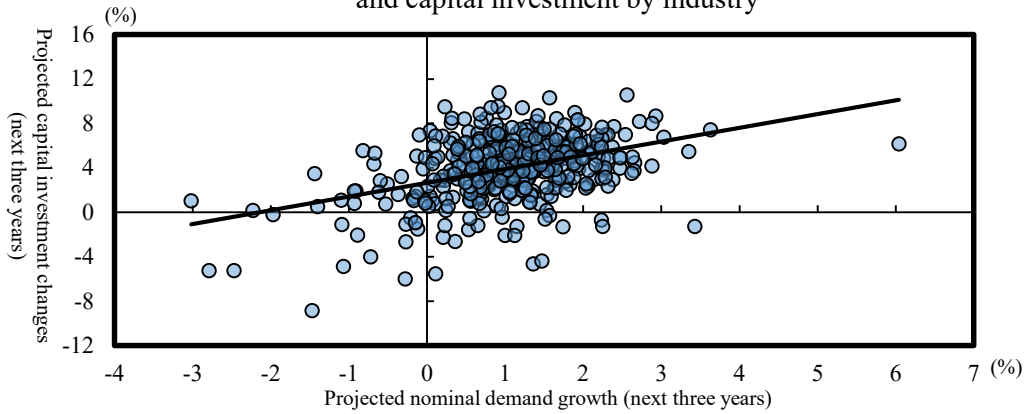
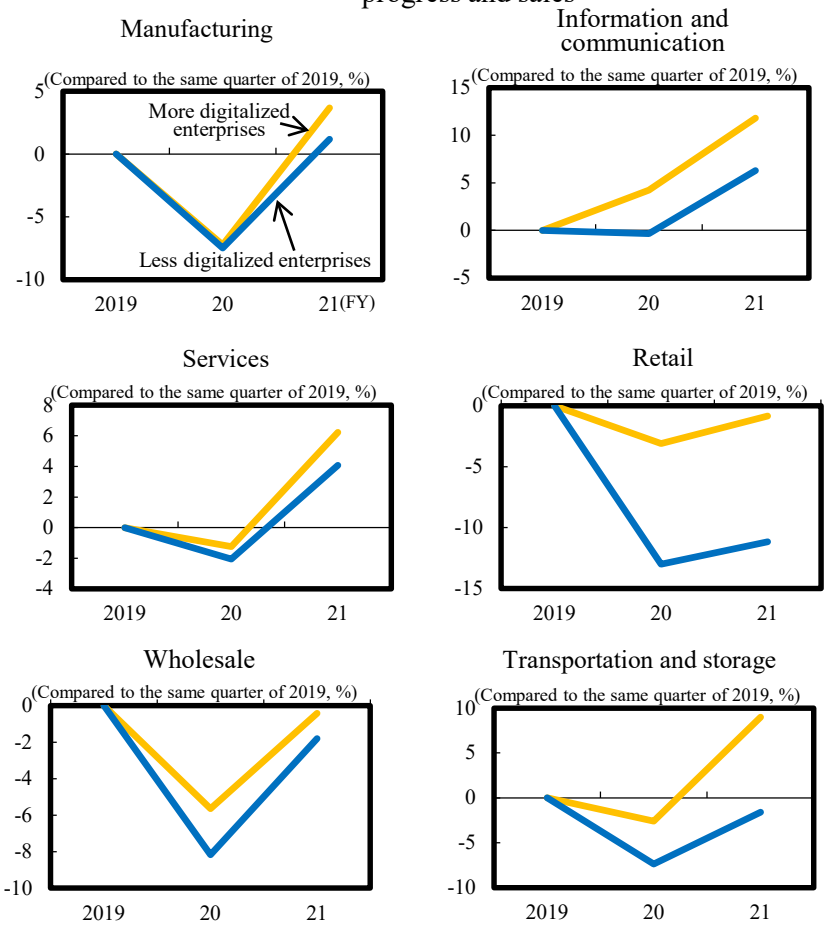


Figure 4 Relationship between digitalization progress and sales



(Source) Figure 1: Compiled based on Basic Survey on Overseas Business Activities, METI; Financial Statements Statistics of Corporations, Annually, MOF; and Bloomberg. Figure 2: Compiled based on NIKKEI NEEDS. Net debt-free enterprises' share of all listed enterprises closing annual books in March (net debt-free enterprises have more cash and deposits than debt). Figure 3: Compiled based on Questionnaire Survey on Business Behavior, Cabinet Office. Relationship from FY2003 to FY2021. Figure 4: Compiled based on NIKKEI NEEDS. Tabulation covers enterprises disclosing software assets among those closing annual books in March. More digitalized enterprises are defined as enterprises where the value of software assets per employee in FY2019 was at or more than the median level in the same industry, and less digitalized enterprises as those where the value was less than the median level. The median changes in sales from FY2019 in the two groups are compared.

- International data estimation using the OECD Environmental Policy Stringency Index (Note 1) indicates no evidence of conflict between environmental policy and economic growth (Figure 5). The enhancement of emission standards and emissions trading systems tends to contribute to reducing trade deficits. In Japan, tough exhaust gas regulations in the 1970s contributed to enhancing the automobile industry's competitiveness.
- Although the enhancement of environmental regulations has been limited so far (Figure 6), Japan should integrate regulations and support to promote relevant investment in consideration of the international community's transition to decarbonization, the reduction of external income outflow accompanying crude oil price spikes, and energy security.
- Foreign countries as well as Japan are required to make additional emission reduction efforts (Figure 7). As Japan's competitiveness in the environment area is relatively higher (Figures 8 & 9), Japan should promote government-private cooperation to further enhance its international competitiveness and create value added.

Figure 5 Relationship between environmental policy and GDP/trade balance (1990-2015)

Explained variable	Explanatory variable: Environment tax	Emissions trading system	Feed-in tariff system	Emission standards	R&D subsidies
Real GDP per capita	-	-	-	-	1 years later
Trade balance	3 years later	3 years later	-	5 years later	-

Figure 6 Enhancement of the Environmental Policy Stringency Index

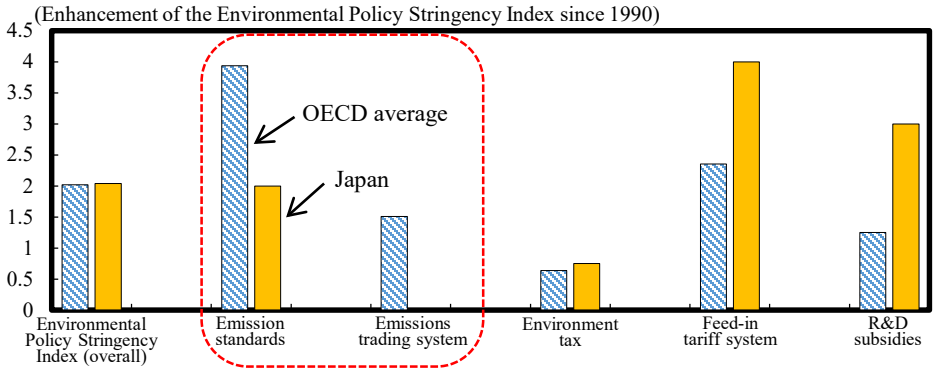


Figure 7 Trends of greenhouse gas emissions and national emission reduction goals

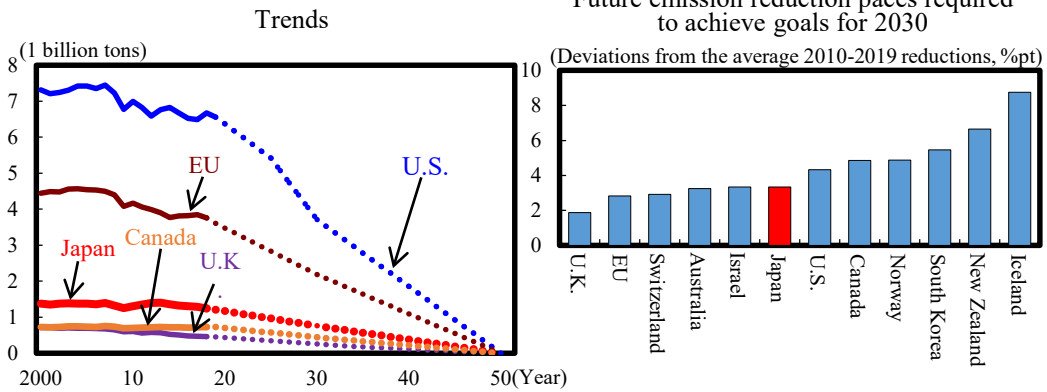


Figure 8 Energy-GDP intensity (2019)

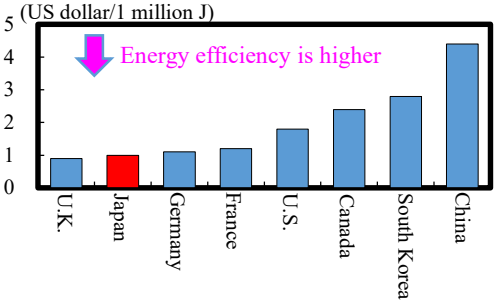
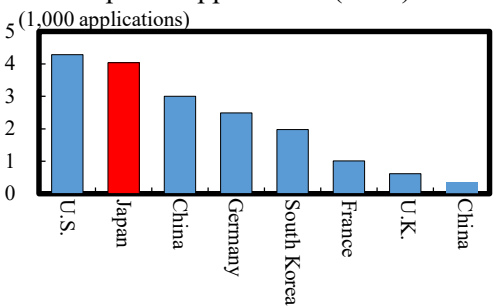


Figure 9 Number of environment-related patent applications (2019)



(Note 1) The Environmental Policy Stringency Index was developed by the OECD to compare countries' environmental policy stringency levels in chronological order.

(Source) Figures 5 & 6: Estimated by the Cabinet Office from OECD.Stat and World Bank data. An up arrow for real GDP per capita indicates significance for pushing up GDP. Up arrows for trade balance indicate significance for expanding a trade surplus or reducing a trade deficit. The number of years indicates the timing for a variable to become significant. "—" indicates "not significant." Figure 7: Compiled based on Nationally determined contributions & Greenhouse Gas Inventory Data, UNFCCC. Greenhouse gas emissions are CO2 equivalents. Dotted lines in the figure at left represent the linear interpolation of goals and results. The figure at right compares gaps between annual emission cuts required to achieve goals for 2030 and average annual cuts from 2010 to 2019 for OECD countries that have submitted emission reduction goals for 2030 to the United Nations. Figure 8: Compiled based on FY2021 Annual Report on Energy, METI. Energy-GDP intensity = Primary energy consumption / Real GDP. Figure 9: Compiled based on OECD.Stat. Patent applications filed under the Patent Cooperation Treaty are broken down by country of inventor residence.

- The restart of nuclear power plants after the Great East Japan Earthquake has been delayed, with coal-fired power plants' share of power generation remaining high (Figure 10). As it is pointed out that geographical constraints make it difficult for Japan to promote renewable energy power sources, such as onshore and offshore wind farms, Japan must consider utilizing nuclear power generation on the premise of secure safety.
- The weight of the industrial materials sector plagued with higher costs for transition to decarbonization in Japan is higher than in other developed countries, indicating that appropriate support for the sector should be considered (Figure 11).
- Japan's R&D efficiency is low (Figure 12). Japan should enhance its R&D capabilities through open innovations by supporting start-up enterprises, increasing doctorate holders and cross-border exchanges among research human resources (Figure 13) and enhancing industry-academia-government cooperation further (Figure 14).

Figure 10 Power mix changes

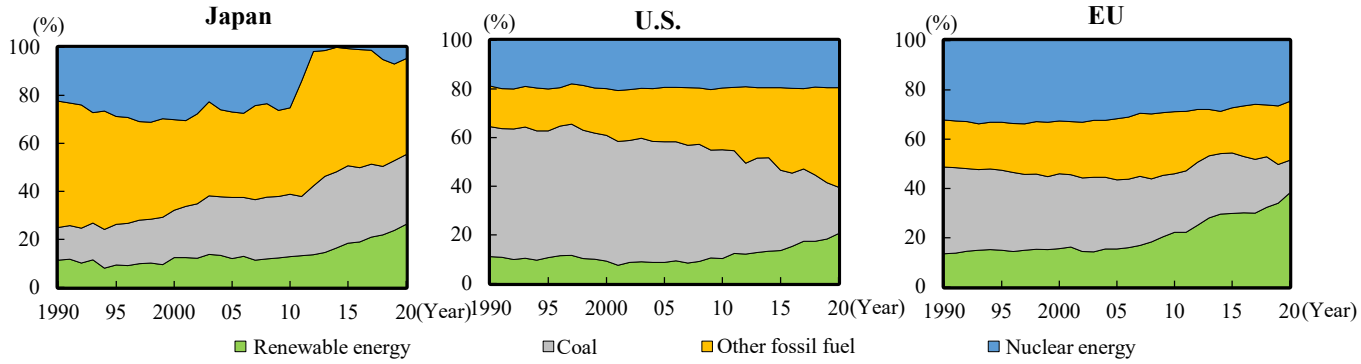


Figure 13 Doctorate holders and cross-border exchanges among research human resources

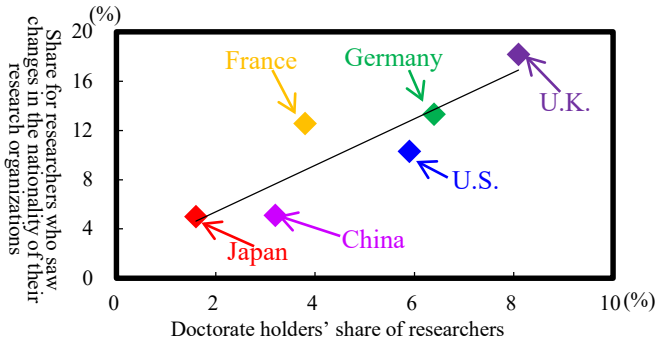


Figure 11 Manufacturing sector breakdown

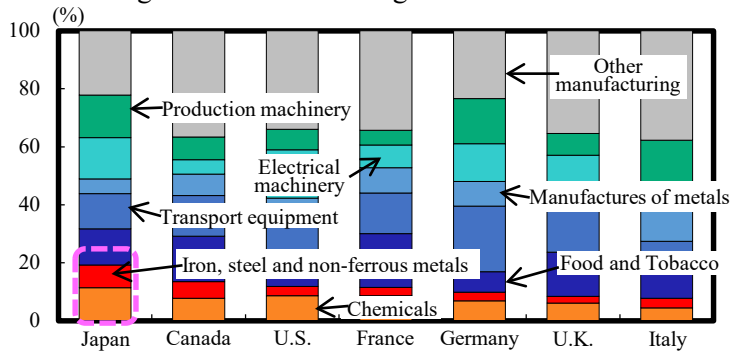


Figure 12 R&D efficiency trend

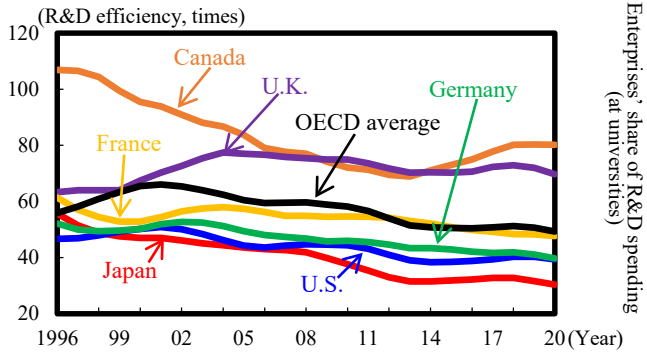
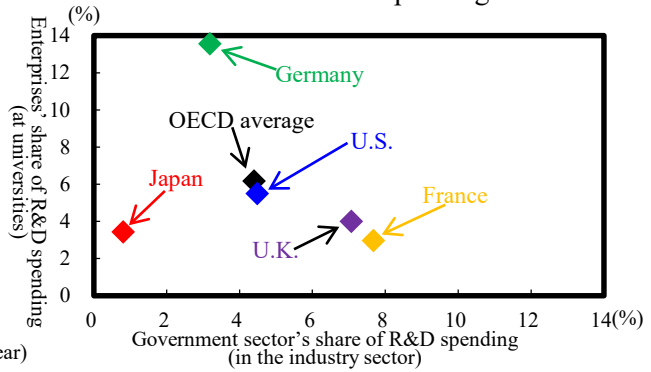


Figure 14 Industry, academia and government shares of research spending



(Source) Figure 10: Compiled based on Our World in Data. Figure 11: Compiled based on OECD.Stat. Each sector's share of value-added output. Figure 12: Compiled based on OECD.Stat. The R&D efficiency represents a five-year increase in the five-year backward moving average of the industry sector's value added to production and R&D spending on a dollar PPP basis in each country. Figure 13: Compiled based on OECD Science, Technology and Industry Scoreboard 2017, OECD; and Japanese Science and Technology Indicators 2021, MEXT. Doctorate holder share = Number of doctorate holders (2018) / Number of researchers (2019, 2018 for the U.S. alone). The share for researchers who saw changes in the nationality of their research organizations was computed by dividing the number of outflowing and inflowing researchers by the total number of researchers. As of 2016. Figure 14: Compiled based on OECD Main Science and Technology Indicators, OECD. As of 2019.

- Listed enterprises have taken leadership in decarbonization initiatives (Figure 15). Some 70% of enterprises have launched some decarbonization initiatives (choosing Nos. 1 to 6). However, the share for enterprises that have begun to implement emission reduction plans (choosing No. 6) is limited to some 40%. More than 70% of unlisted enterprises have yet to launch any decarbonization initiatives (choosing No. 7), indicating that unlisted enterprises have lagged behind listed ones in launching such initiatives. Challenges toward their promotion of decarbonization initiatives include knowhow and labor shortages (Figure 16).
- Of enterprises that have launched decarbonization initiatives (choosing Nos. 1 to 6 in Figure 15), some 70% plan to invest in their own energy-saving or renewable energy equipment (Figure 17). Some 30% have implemented or plan to implement aggressive green investment, including capital and R&D investment in decarbonization or energy savings for other enterprises and consumers. The government and private sectors should cooperate in promoting systematic investment in priority areas to increase enterprises' business predictability and stimulate their investment.
- More than 60% of enterprises feel the need for addressing cost increases towards decarbonization, indicating that it is important to develop an economic environment where cost increases can be passed on to product prices throughout supply chains (Figure 18).

Figure 15 Japanese enterprises' decarbonization initiatives

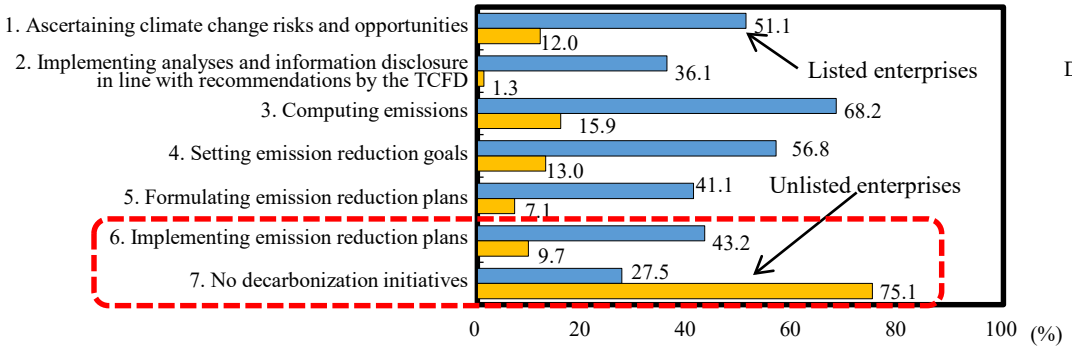


Figure 16 Challenges towards promoting decarbonization initiatives

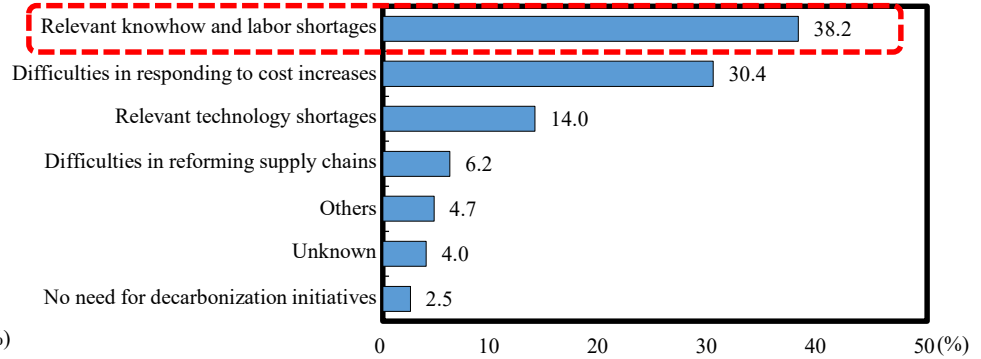


Figure 17 Capital investment plans through 2050

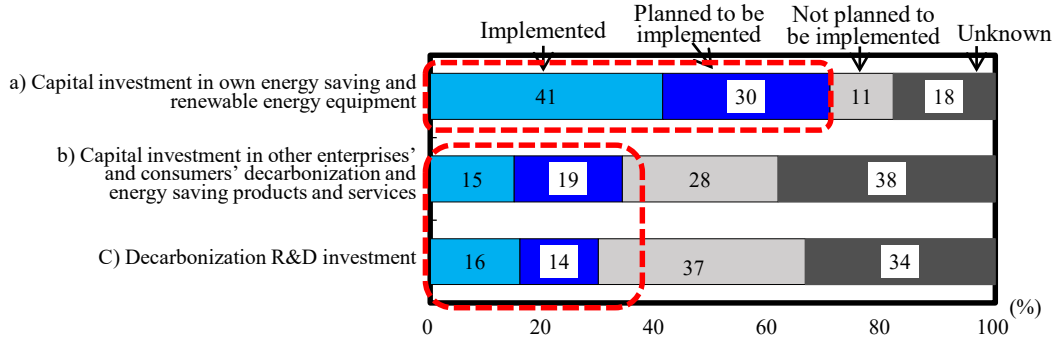
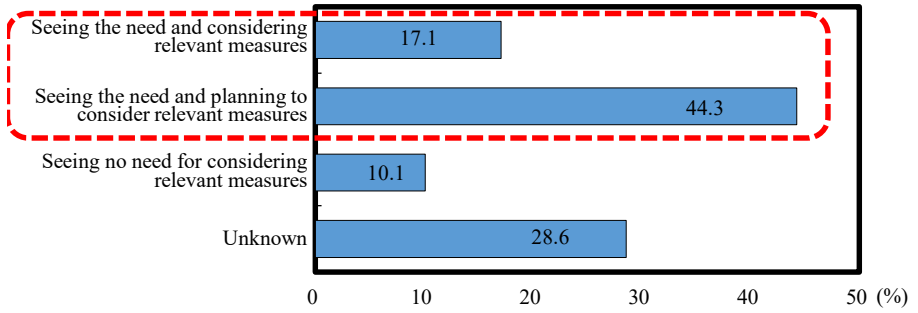


Figure 18 Need for addressing cost increases towards decarbonization



(Source) Figures 15 to 18: Compiled based on "Impacts of carbon neutrality initiatives on business activities," Cabinet Office. Multiple responses were allowed for Figure 15. Respondents were 280 listed and 1,412 unlisted enterprises. Figures 16 to 18 cover questions for enterprises that implemented some decarbonization initiatives as given in Figure 15 (chose Nos. 1 to 6). The number of respondent enterprises for Figure 16 is 550. The number of respondent enterprises in Figure 17 is 571 for a) and 565 each for b) and c). The number of respondent enterprises for Figure 18 is 574.

- In Japan, there is a shortage of human resources for promoting IT investment (Figure 19) and IT human resources are less competitive than in foreign countries (Figure 20). Education and training investment tends to push up software investment quantitatively and qualitatively (Figure 21). Human capital accumulation shortages might have become a bottleneck to promoting digitalization.
- As IT human resources concentrate in the IT industry, non-IT enterprises are required to develop pay and treatment systems to secure IT specialists (Figure 22). It is important to upgrade digital skills throughout society by improving the recurrent education of business people qualitatively (Figure 23), utilizing outside personnel proactively and promoting IT in elementary and secondary education (Figure 24).

Figure 19 IT human resources' share of employees

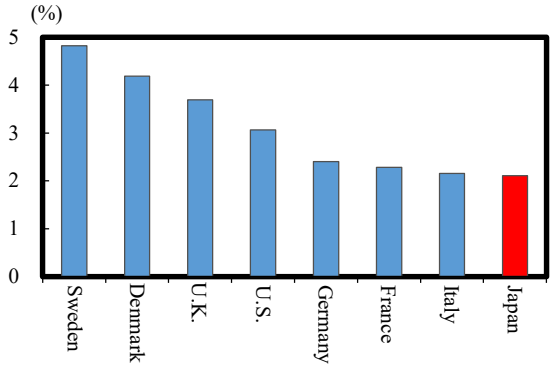


Figure 21 Effects of human resource investment on quantity and quality of software investment

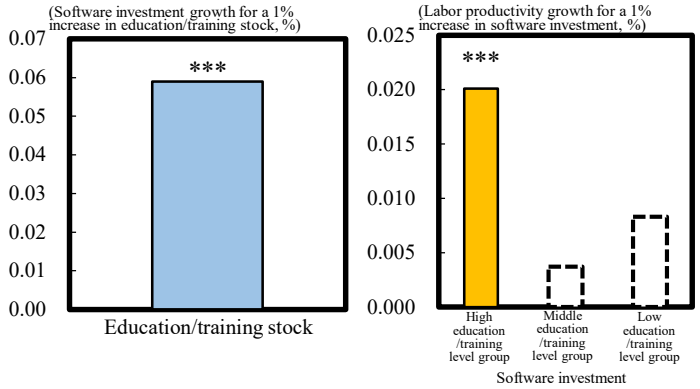


Figure 23 Recognition of effects of recurrent education

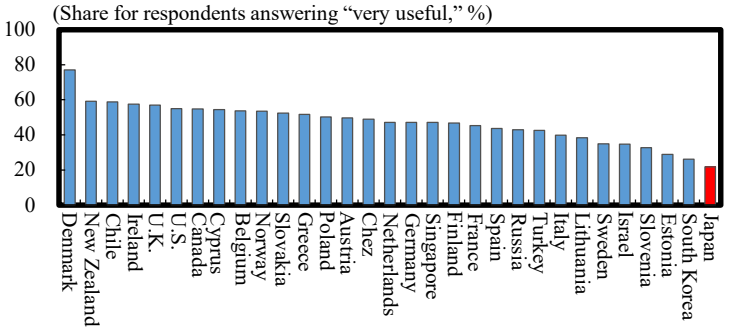


Figure 20 Ratings for Japanese IT human resources in digital competitiveness ranking

	2017 (Among 63 countries)	2021 (Among 64 countries)
Overall (human resources)	41st	47th
Educational assessment (PISA－Math)	4th	5th
International experience	63rd	64th
Foreign highly skilled personnel	51st	49th
Management of cities	9th	15th
Digital/technological skills	59th	62nd
Net flow of international students	23rd	26th

Figure 22 Industries for IT human resources

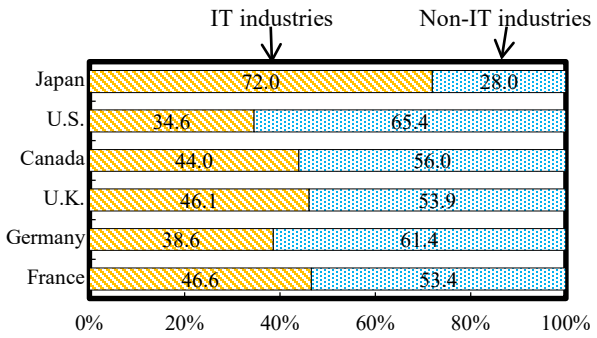
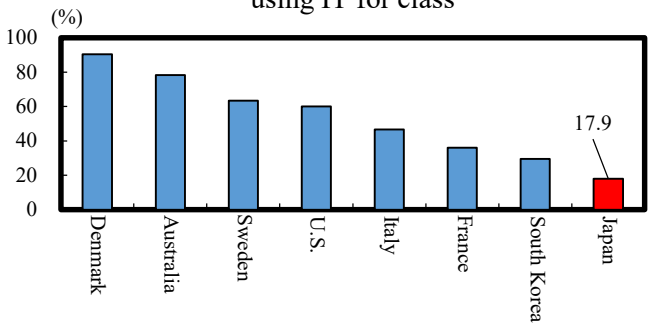


Figure 24 Share for junior high school teachers using IT for class



(Source) Figure 19: Compiled based on statistics by ILO; and Employment Status Survey, MIC. IT human resources cover "25 Information and Communications Technology Professionals" and "35 Information and Communications Technicians" in the International Standard Classification of Occupations. The data is for 2017. Figure 20: Compiled based on IMD World Digital Competitiveness Ranking, IMD World Competitiveness Center. Figure 21: Compiled based on Basic Survey of Japanese Business Structure and Activities, METI. *** indicates "significant at 1%." The figure at left shows the estimated effects of education/training stock (skill development costs transformed into stock under some premises) on software investment. The figure at right compares software investment's elasticity to labor productivity by dividing enterprises by the education and training level into three groups. Figure 22: Quoted from IT human resources white paper 2017, Information-technology Promotion Agency. Figure 23: Compiled based on Programme for the International Assessment of Adult Competencies, OECD. The survey covered 250,000 people in 33 countries. People who used correspondent education, practical training, training by supervisors or colleagues, and other seminars were asked "How useful was this training for the job or business you had at that time or still have?" Figure 24: Compiled based on Teaching and Learning International Survey 2018, OECD.

- Hopes are placed on digital technology's contributions not only to improving value added by enterprises but also to social problem solutions, including the promotion of decarbonization using digital technology (so-called green by digital). The promotion of digitalization tends to allow enterprises to estimate greenhouse gas emissions and set emission reduction goals more easily (Figure 25). In Japan, IT technology has contributed to cutting energy consumption mainly in the manufacturing sector (Figure 26).
- In Japan, population has concentrated in the Tokyo metropolitan region, leaving challenges regarding rural industrial development and environmental conservation (Figure 27). Digitalization to improve rural business environments and life infrastructure can contribute to vitalizing rural economies. For instance, comparison of urban and rural households with the same attributes (including annual income and ages) shows that rural households are less likely to use e-commerce (Figure 28), indicating communications infrastructure gaps.

Figure 25 Effects of digitalization on estimating emissions and setting emission reduction goals

	Probability to estimate enterprises' own emissions	Probability to set emission reduction goals
Digitalization progress (as measured by software assets per employee)	○	○
Education/training cost	-	-
Operating income margin	-	-
Enterprise size dummy	-	○
Listed enterprise dummy	-	-
Industrial category dummy	○	○

Figure 26 Impacts of IT capital on energy consumption

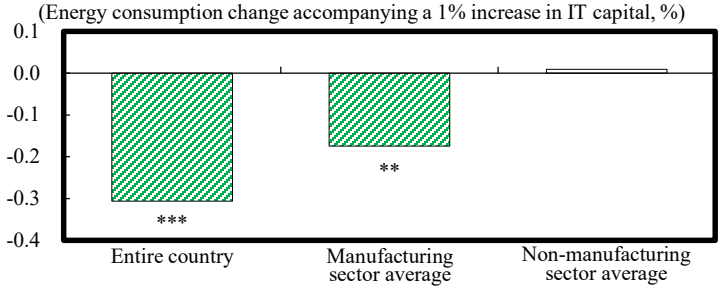


Figure 28 Probability to use e-commerce by prefecture

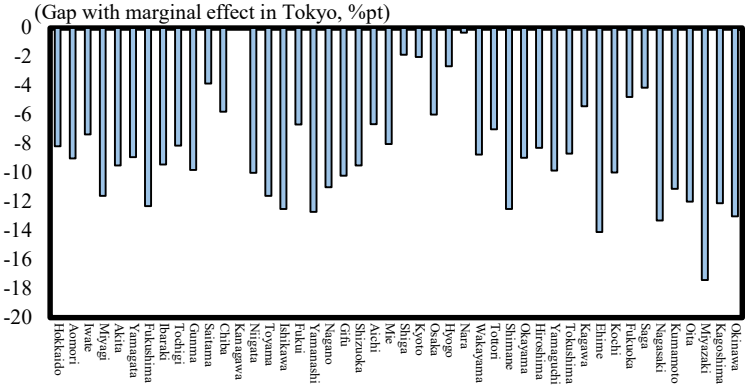
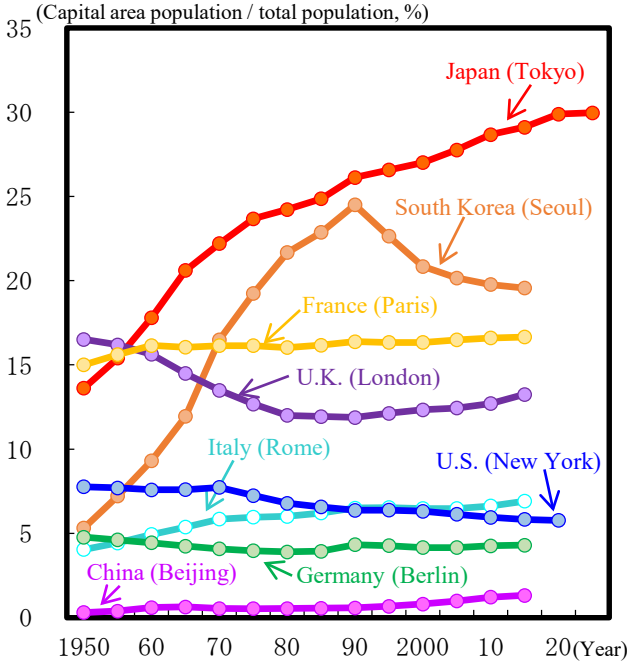


Figure 27 International comparison of capital area population shares



(Source) Figure 25: Compiled based on "Impacts of carbon neutrality initiatives on business activities," Cabinet Office. Logistic regression analysis covering 360 enterprises. Variables significant at 10% are circled (○). Figure 26: Compiled based on System of National Accounts, Cabinet Office; Comprehensive Energy Statistics, ANRE; and Corporate Goods Price Index, Bank of Japan. A regression analysis that uses energy consumption as an explained variable and the IT capital amount as an explanatory variable was implemented, with GDP and energy prices controlled. Sector-wise panel analysis results for manufacturing and non-manufacturing sectors. ***indicates "significant at 1%" and ** "significant at 5%." Figure 27: World Urbanization Prospects: The 2018 Revision, UN; Census & Population Estimates, MIC; and U.S. Department of Commerce. Figure 28: Compiled based on Survey of Household Economy, MIC. A marginal effect for each prefecture dummy was measured in a probit analysis that uses the presence or absence of e-commerce utilization as an explained variable and controls annual income and ages.