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Bank of Japan

Demographic Changes and Macroeconomic Performance:

Japanese Experiences

*Opening Remark at 2012 BOJ-IMES Conference
hosted by
the Institute for Monetary and Economic Studies,
the Bank of Japan*

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I. Introduction

Good morning. I am very pleased to have a lot of participants from central banks, international organizations, and academia in this year's annual BOJ-IMES Conference. On behalf of my colleagues at the Bank of Japan, I am privileged to welcome you all here in Tokyo.

The theme of this year's conference is "demographic changes and macroeconomic performance." On the theme, I am sure that Japan is the most notable case that provides a basis for discussion. Japan's population and the working-age population — that is, the population aged between 15 and 64 years — came to decline after their peak-years in 2007 and in 1995 respectively. The share of the population aged 65 years or older rose rapidly to 23% in 2010 from 12% in 1990 (Chart 1). In the meantime, Japan's economic growth gradually slowed during the past two decades mainly for two reasons. In the former half of the period, the Japanese economy was hobbled by the crippling effect of the burst of the bubble. In the latter half, the rapid population aging hampered the Japanese economy through a variety of channels. In an attempt to illustrate that, I frequently rely on the cross-country comparison of growth rates including Japan. Among G-7 countries, the Japanese GDP growth rate per working-age population — an indicator least affected by demographic changes in the short run — was the highest. By contrast, the Japanese per capita GDP growth rate was almost the same as the average, and the Japanese GDP growth rate, which is subject to the decreases in the total population, was below average (Chart 2). Neoclassical growth theories normally do not distinguish the overall population from the working-age population due to analytical simplicity. However, without taking into account the distinction between the two variables explicitly, the very challenges that Japan is currently faced with will be outside the scope of analysis.

In the macroeconomic policy discussions in other economies, Japan's experiences are frequently cited, and a lot of lessons are drawn over the past decade. However, a general conclusion obtained in such policy discussions without considering the differences in the demographic factors between Japan and other economies could sometimes be misleading.

Various challenges posed by demographic changes have been and will be among the paramount issues lying ahead for a broad group of countries including Japan. For example, growth rate of the Chinese working-age population has slowed since the late 1980s, and is projected to turn negative by 2020 (Chart 3). Other Asian economies will also find themselves in the midst of population aging in due course. It is a must-face reality which is just yet-to-come. Looking at Europe, in the Euro-area peripheral countries, immigration contributed to the expansion of the populations until 2007. Conversely, after the global financial crisis, the immigration momentum was lost and some countries in the region are now faced with even some emigration while suffering from lower economic growth owing to the lower population growth or even because of the declining population.

Rather than trying to cover all of the relevant topics under the theme of demographic changes and macroeconomic performance in my remark, I focus on Japan's experience of population aging that, I hope, will help ensuing discussions in this conference, because Japan can be addressed an "advanced country" in a sense that it has been faced with various challenges that stem from population aging ahead of other countries. I begin by explaining demographic changes in Japan briefly, and then move on to identifying the issues related with macroeconomic performance. Finally, I will touch on the policy implications of demographic changes.

II. Demographic Changes in Japan

I begin by pointing out four relevant facts in order to consider the linkage between Japanese demographic changes and macroeconomic performance.

First, in former times, the Japanese population growth rate was high, and the Japanese working-age population was remarkably large. Today, this may sound way beyond our imagination. However, in the aftermath of World War II, overpopulation was considered a challenge to cope with. For example, Japanese emigration to Brazil by sea was restarted in 1952 and continued until 1973. It is usually understood that Japan's period of high-growth began in the mid-1950s and ended in the early 1970s.

The expansion of the working-age population, in tandem with the free trade regime, provided strong grounds for rapid growth. A comparison of the Japanese population by age group between the beginning and the end of the high-growth era clearly points to a rapid increase in the Japanese working-age population taking place during the period as confirmed by Chart 4 showing a blip moving upward in the population pyramid. For your reference, the average growth rate of the total population and the growth rate of the working-age population from 1955 to 1975 were 1.3 percent and 1.9 percent, respectively. A quick cross-country comparison can confirm that Japan's population and the growth rate of the working-age population in those days were relatively high, or sometimes even the highest, among the advanced countries.

Second, the rapid pace of decrease in the growth rate of the Japanese population and that of the working-age population were globally unprecedented. The trend of a population depends crucially on the birth rate and the death rate (Chart 5). The Japanese total fertility rate declined substantially after the 1950s, and reached 1.39 in 2010, a lower level compared to that in other advanced countries. The Japanese death rate also declined substantially after World War II and reached 6.0 (per thousand persons) in 1979. Then it increased gradually and reached 9.5 in 2010.

Third, interestingly, the recurrent declines in the total fertility rate have long been regarded as a one-off aberration for each point in time. Such mis-recognition led to the recurrent overestimation in the official projection of the fertility rate every five years, which has been used in the actuarial valuations for the Japanese public pension system, since the year 1976 (Chart 6). In the official projections, the long-run fertility rate have even been assumed to rise to two in due course until 1992 when the projection was revised downward well below two for the first time.

Fourth, in addition to the delay in recognition of the ongoing demographic changes, comprehension of the far-reaching implications of the changes was even more delayed. Consequently, it took further time for Japanese people to take the measures to respond to the expected demographic changes. Incidentally, if you look back at 1992, the White Paper on the National Life Style published by the government that year was titled,

“The Advent of Society with Low Birth Rates: Its Effect and Response.” With hindsight, Japan around that time was painfully looking for ways to recover in the aftermath of the bubble economy. At that stage, I recall that most Japanese people along with economists did not grasp the gravity of population aging coupled with a low birth rate for Japan’s economy as properly as we later came to realize. In that regard, for example, a database on Japanese news paper articles indicates that articles on population aging or a low birth rate started increasing in the 1990s. However, it was only until in the middle of the 2000s, articles on population aging or a low birth rate outnumbered those on asset price bubbles or non-performing loans (Chart 7). Up until around that time, the working-age population had declined for about ten years.

III. Effects of Demographic Change on Japanese Economy

In the light of Japan’s experience, I will elaborate on three aspects, first, the economic growth rate, second, inflation and, third, the current account balance, of the impact of demographic changes from the viewpoint of macroeconomic performance.

Economic growth rate

At the outset, I pick up the most paramount consequence of demographic changes for the Japanese economy, among others, that is, the economic growth rate.

The economic growth model supposes that everyone works at a given intensity. With a labor-augmenting technological change, in the long run steady state, per capita variables grow at the rate of technological change, and aggregate variables grow at the rate equal to the sum of population growth and technological change. In aging economies, including Japan, where the working-age population has started decreasing, the labor force also declines, given the participation rate being held constant. Because the scarce labor force imposes a natural constraint on labor supply, the marginal product of capital declines accordingly. As a result, macroeconomic growth would be impeded. With this idea in mind, the Japanese economic data in the past decade indicates that the workforce declined by 0.3 percent point, labor productivity increased by 0.8 percent point, and they add up to real GDP growth rate increase by 0.6 percent¹ (Chart 8).

¹ The contributions do not add up to the total GDP growth rate (0.6 percent) because of the rounding errors.

Having said that, while such an analysis would provide a useful first-order approximation to consider the effects of population aging and the declining population, for the sake of policy consideration, we need slightly more realistic approaches that incorporate other factors.

The first factor is the possibility that labor participation may adjust to the demographic changes in the long run. For example, the labor participation rate of Japanese females was notably lower than that in other advanced countries. In particular, Japanese females in their 30s participate in the labor market noticeably less, which was creating a stark M-shaped curve in the participation ratio over ages in the past and in the present as well. However, the gap between Japan and other advanced countries in the depth of a dip on the M-shape is dissipating in recent years (Chart 9).

The second effect comes from the gap between the per capita growth rate and the growth rate per working-age population. The economic growth model by Solow supposes that a nation's population coincides with that nation's labor force. In practice, as population aging advances, the gap between the population and the labor force grows larger. In the process of an increase in the share of the old non-working population, the per capita growth rate would be lower than the growth rate per working-age population. The growth rate per working-age population is important from a viewpoint of the supply capacity; however, the growth rate per capita is a more important indicator when we think about the income level of an average consumer who supports aggregate demand for goods and services in the macroeconomy. Even if the growth rate per working-age population is high, as long as the per capita growth rate is decreasing, downward pressure to demand could impede macroeconomic growth.

Third, we may need to consider the so-called "spending wave" hypothesis (Chart 10). For one reason, the Japanese asset price bubble was caused by Japanese baby boomers who experienced their peak spending years, particularly, for mortgages. During the bubble period, they indeed actively purchased their homes. Likewise, demographic changes, among other factors, were highly responsible for the decrease in domestic car sales after the late 1990s. On the other hand, the progress in population aging means

that the elderly increase demand for services, such as medical and nursing care. Currently, the population aged 60 years or older accounts for around 40% of Japanese consumption. Their shares in the Japanese consumption are projected to increase further. If Japanese firms change their products in responding to such increase in the potential demand, their efforts should slow the reductions in the potential growth rate.

The fourth factor arising from demographic changes could come into play through fiscal balance (Chart 11). Rapid population aging is the dominant factor in increasing a fiscal deficit. Obviously, the continued population aging increase a fiscal deficit through the decrease in the growth rate of tax revenues reflecting the decrease in the economic growth rate and through the increase in the social security related expenditure, such as medical services, nursing services and public pension. If the uncertainty regarding the future fiscal balance increased, that could restrain the consumption by working-age generations. Demographic changes also affect fiscal balance through a political process. Population aging will necessarily mean the aging of voters. If the elderly have a higher voting percentage compared with the young, and if the elderly have a stronger preference for sustaining the current social security system, then a fiscal deficit tends to increase reflecting the elderly's preference.

Fifth, demographic changes may affect the portfolio selection of households (Chart 12). Especially, we need to examine the effects of an increase in the number of elderly people on the selection of households' financial assets, from a viewpoint of who and how to supply risk money, which is an indispensable engine for economic growth. However, the determinants of households' financial asset portfolio include not only age, but also labor income. Moreover, households choose their asset portfolio while making decisions on their housing purchases simultaneously. We do not have empirical studies based on Japanese micro-data enough to answer the following questions, such as, all else being equal, whether the elderly prefer stocks or whether they tend to sell their stocks and buy into the bond market for safer assets.² Looking ahead, further studies on that area are much awaited.

² See Fujiki, Hirakata and Shioji [2012].

So far, my analyses focus on the effects of demographic changes on macroeconomic performance of the Japanese economy as a whole. In practice, demographic changes, such as population aging or a low birth rate, advance unevenly across regions. For example, the population growth rate, the working-age population and the share of the population aged 65 years or older vary substantially from region to region (Chart 13). Behind the dispersion in prefectural growth rates, regional fiscal balances and the strategies of financial institutions lie uneven developments in demographic changes across prefectures.

Rate of price increase

Next, I elaborate on the linkage between demographic changes and deflation from a viewpoint of macroeconomic performance. Seemingly, there would be no linkage between demography and deflation. But it may not be the case. A cross-country comparison among advanced economies reveals intriguing evidence: Over the decade of the 2000s, the population growth rate and inflation correlate positively across 24 advanced economies (Chart 14).³ That finding shows a sharp contrast with the recently waning correlation between money growth and inflation (Chart 15).⁴ How could we square those facts with each other?

To some extent, the correlation between population growth and inflation could in part be explained by the co-movement caused by business cycles. In some advanced economies in Europe and North America, it could be the case that the fluctuations in economic activity would vary the size of an output gap, creating pressure up or down on inflation while attracting or discouraging immigration that amplifies variations in population. That hypothesis, however, appears to be impertinent in some countries including Japan where the impact of immigration on the total population is extremely small and thus can be disregarded. On that ground, business cycle fluctuations have had a minimal impact on demographic changes. A closer look at the case of Japan confirms the increasingly positive correlation between inflation and population growth

³ Another cross-country inspection based on a broader sample, including developing countries, does not detect positive correlation between inflation and population growth in the 2000s and in earlier periods likewise.

⁴ See Kimura, Shimatani, Sakura, and Nishida [2010].

since the 1990s (Chart 16). That would reflect the momentum towards real income creation being undermined by population aging.

As I have discussed, repercussions of the bubble-burst, the rapid aging and stagnation of productivity have been underway in Japan. Against the backdrop, the real per capita GDP growth rate has remarkably declined from somewhere around four percent back in the 1980s to almost one percent these days (Chart 17). With the yet-to-accelerate population aging well envisaged for the foreseeable future, the decline in the real GDP growth rate could undermine the medium- to long-term expectations for potential growth, giving rise to a lower permanent income of households.

The decrease in potential growth, which effectively means a stagnant supply capacity, gives rise to a lower permanent income. On the flip side, the corresponding contraction in aggregate supply would offset such decline in aggregate demand. Simultaneous changes in aggregate demand and aggregate supply keep the price level unchanged. I reemphasize the fact, however, that the public had long remained by and large unaware of the dangers created by demographic changes but, over time, the awareness has slowly been phased in. Along with such gradually phased-in public awareness, yet-to-materialize declines in GDP growth have also been factored in, precipitating today's decrease in aggregate demand and all the forward-looking responses have come into play behind Japan's deflation.⁵

In the meantime, the real per capita GDP growth rate in most of American and European advanced economies has declined to Japan's neighborhood range (Chart 17).

Looking ahead, aging and the declining working-age population are expected to continue in those American and European countries. I cannot entirely rule out the looming menace that may unveil itself into downward pressure on inflation rates if such demographic changes are to undermine the momentum toward income creation in the economy.

⁵ See Katagiri [2012] for a mechanism that a series of unexpected revisions in the forecasts for the Japanese population could lead to protracted deflation.

Current account

The final issue that I am taking up from a viewpoint of macroeconomic performance and the demographic changes is the current account. Some argue that, as signaled by the swing to a deficit of the Japanese trade balance in fiscal year 2011, the current account balance will also turn into deficit over time (Chart 18). I disagree with such views.

The swing to a deficit in the trade balance reflected the declines in exports and increases in imports, both of which are driven by temporary factors: Exports subsided resulting from the disruption to the supply chains due to the Great East Japan Earthquake. The sharp increase in imports of liquefied natural gas and other fossil fuels was needed to meet the increased demand from thermal power plants, which substituted nuclear power lost by the accident.

In general, the current account broadly reflects the savings-investment balance of the economy. On one hand, as for savings, a higher elderly population share in the economy would reduce the aggregate savings rate as a life-cycle model indicates. On the other hand, population aging affects investment at least through two channels. First, if a decrease in the labor force substitutes for capital, domestic investment could increase. Second, a decrease in domestic demand due to the declining population reduces domestic investment. If population aging shifts consumption towards the service industry where firms find it hard to substitute labor for capital, the second effect will dominate the first effect. Anyway, the Japanese income balance recorded 12.4 trillion yen, or 2.5 percent of nominal GDP on average from the year 2002 to year 2011, which reflects the net international investment position of 253 trillion yen as of the end of 2011, or more than 50% of nominal GDP. Those figures suggest that the Japanese current account surplus will continue for the time being.

IV. Can Japan Respond to Demographic Changes?

Demographic changes have affected the Japanese economy slowly but steadily and profoundly. Downward pressure on the Japanese economic growth rate resulting from various channels reflecting the continuing population aging will persist in the

foreseeable future. With the pressure underway, should we live with the dwindling economy and quietly accept it as the fate that we cannot escape? My answer is definitely no. The effects of population aging on an economy can vary, depending on the flexibility of that nation's economy and society. The current difficulties come not from the continued population aging itself, but from the delayed response to it. On that ground, I emphasize that, if society correctly recognizes the challenges coming from demographic changes, and if society judges that changes in the systems are needed, we should find remedies in our hands. I offer a couple of options for possible changes if Japanese people are determined to take action.

The first option is to make various efforts to increase the labor force. Setting aside the issues that go beyond the mandate of a central bank governor, for example, whether to accept more foreign workers, we can increase the labor force by raising the birth rate and/or the labor participation rate. Interestingly, labor participation of female workers and the birth rate have a positive relationship, according to a cross-country data analysis. Among 47 Japanese prefectures, labor participation of females aged from 30 to 44 and the birth rate have a positive relationship (Chart 19). Recently, labor participation of Japanese female and elderly workers increased steadily. Efforts to increase the labor force have already started and some progress has been made (Chart 20).

The second option is to adjust the supply-side structure with the ongoing changes in line with the demand pattern. Typical examples on the domestic front include the response to the potential demand from the elderly, such as medical and nursing services (Chart 21). In the last decade, the population of aged 65 or over increased 33 percent in Japan and 16 percent in the U.S. During the same period, spending on medical and nursing services increased 11 percent in Japan and 74 percent in the U.S. Those figures suggest the large potential demand not only in the market of medical and nursing services but also in medical equipment and other related investments in Japan.

Third, businesses should respond to the growing demand overseas by making the most of the momentum towards globalization. If the Japanese economy is a "closed economy," Japan will not be able to avoid all the repercussions of the decreasing

population. However, Japanese businesses can grow by meeting the demand overseas, especially in economies with higher population growth or in fast-growing emerging economies. One option to meet the foreign demand is exports, while other options may include, for example, bolstering foreign direct investment by Japanese businesses in pursuit of higher profitability which would result in a surplus in the income balance. The real GDP increased by 0.6 percent annually on average in the 2000s while, the real GNI excluding the terms of trade gains/losses, an indicator comparable to the real GDP, grew more rapidly by 0.7 percent (Chart 22). Of related matters, the ratio of Japanese foreign direct investment is notably lower than that in other advanced countries. Room for increasing the ratio would be substantial (Chart 23). Increases in the income balance surplus may require a renewed focus on GNI, which summarizes the income earned by Japanese people. Finally, businesses can better reallocate their capital in line with the aforementioned three options to raise productivity. I have already referred to the growth rate of Japanese labor productivity, and now I point out that the level of labor productivity is lower than that in other advanced countries (Chart 24). Put differently, per capita income could increase substantially if businesses reallocate their capital to be better aligned with the efficient allocations.

V. Concluding Remarks

I have explained how demographic changes affect the Japanese economy through various channels. In retrospect, up until the global credit bubble-burst, both academics and policy makers did not fully appreciate the significance of a bubble-burst. The Japanese experience of a bubble-burst tended to be underestimated as an idiosyncratic episode. Likewise, bystanders' apprehension about the ongoing demographic changes in Japan may, I fear, be falling short of the mark. My sense is that full apprehension of the consequences of rapid population aging, coupled with the low birth rate, is yet to be seen in light of the importance of the issue. Economics has dealt with the issue of population, not to mention a few examples such as, Petty's *Political Arithmetic* or Malthus's *An Essay on the Principle of Population*. For the sake of economic policy formulation, basic research on demographic changes and their policy implications is indispensable. I hope that this conference would help contribute to the accumulation of such research. Thank you.

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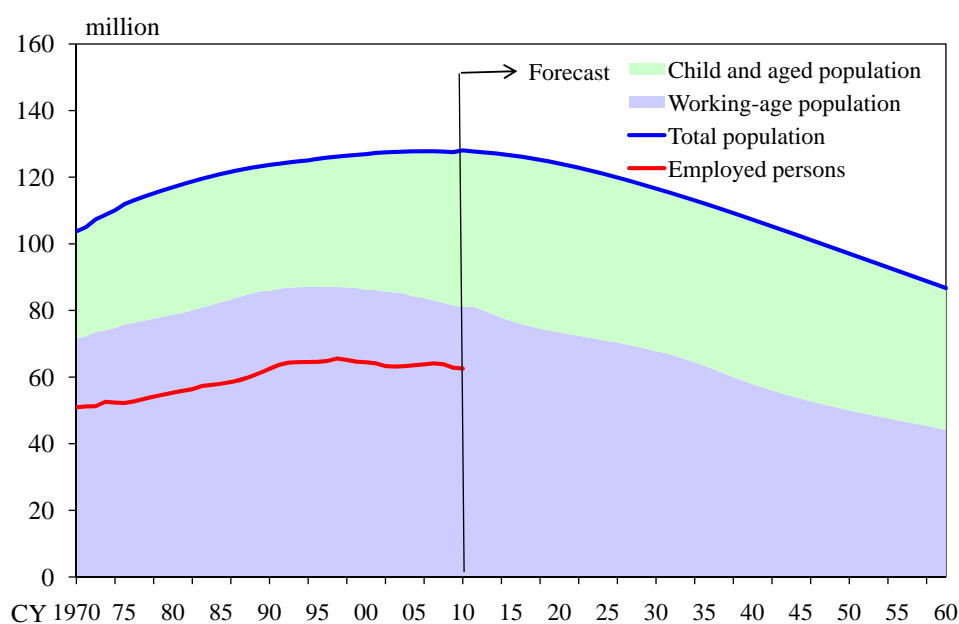
Demographic Changes and Macroeconomic Performance: Japanese Experiences

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Masaaki Shirakawa
Governor of the Bank of Japan

Chart 1

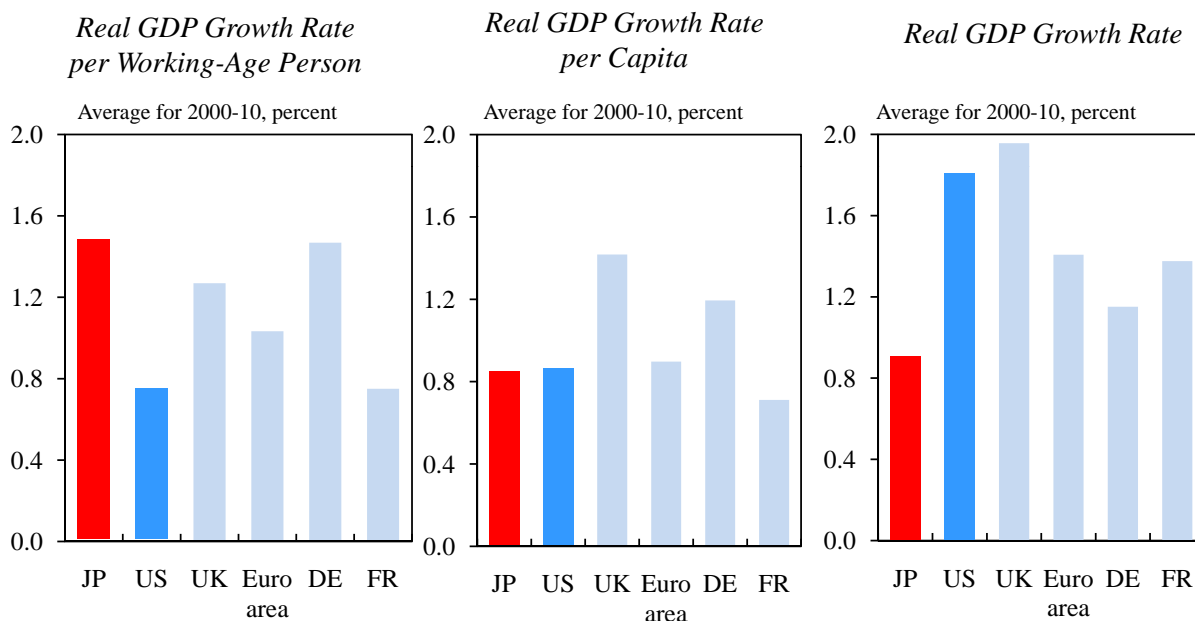
Demographic Changes in Japan



Note: Child population, working-age population, and aged population refer to the number of persons under 15 years, those between 15 and 64 years, and those over 64 years, respectively.

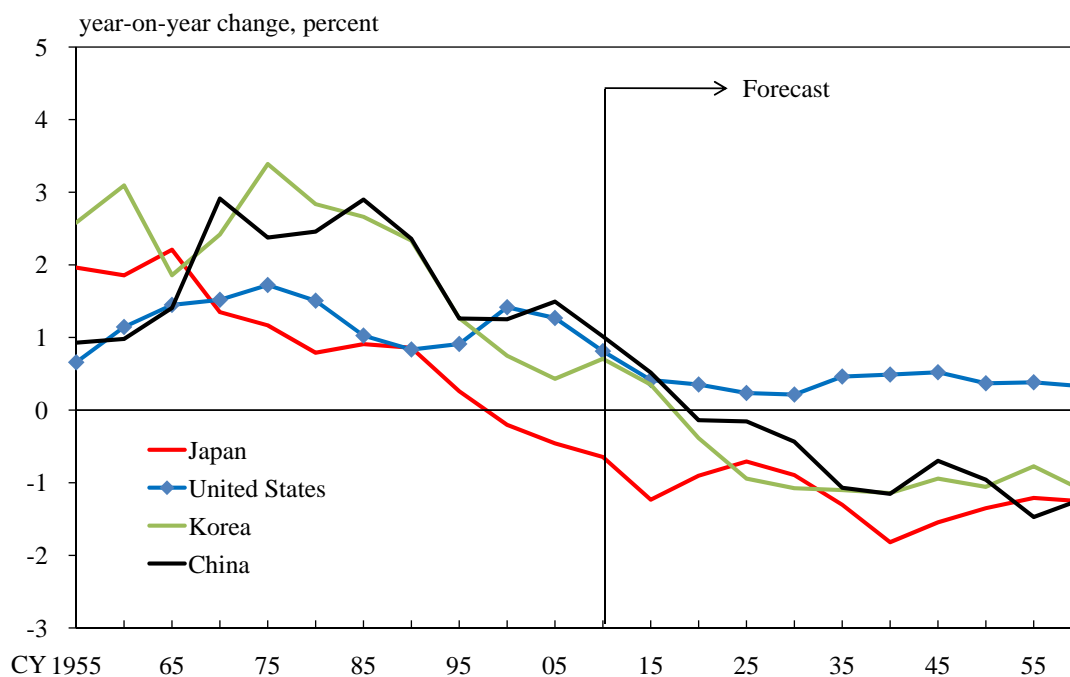
Sources: National Institute of Population and Social Security Research; Ministry of Internal Affairs and Communications.

Effects of Rapid Population Aging



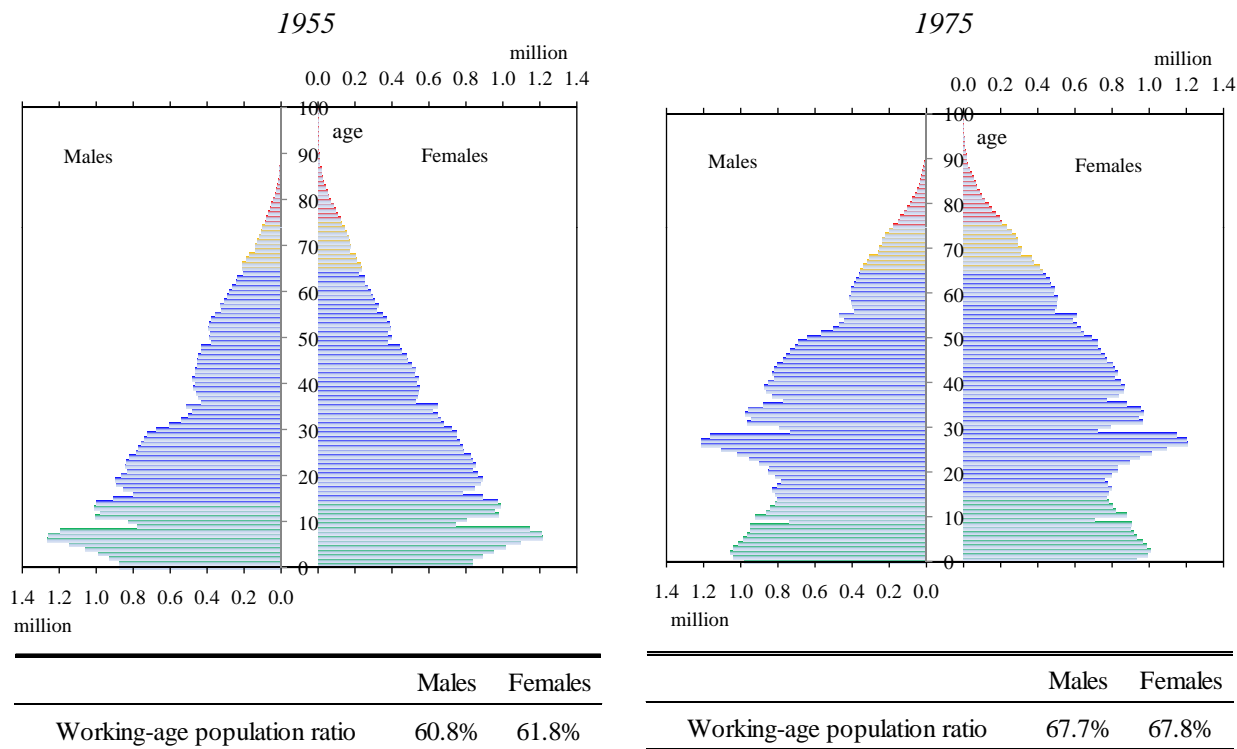
Note: A working-age person refers to those between 15 and 64 years old.
Sources: World Bank; Haver.

Growth Rate of Working-Age Population



Sources: National Institute of Population and Social Security Research; United Nations.

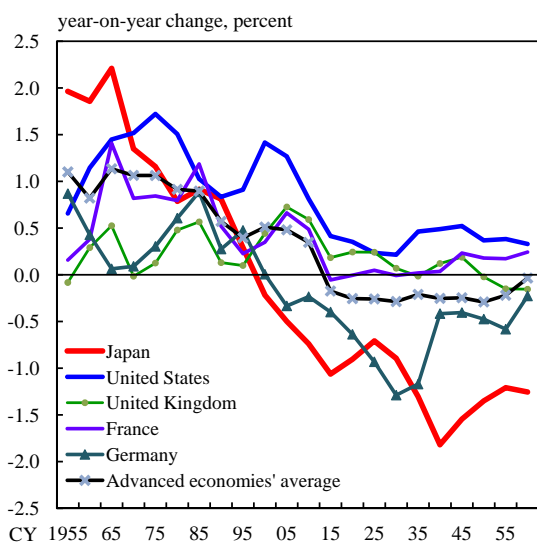
Japanese Age Structure in the High-Growth Era



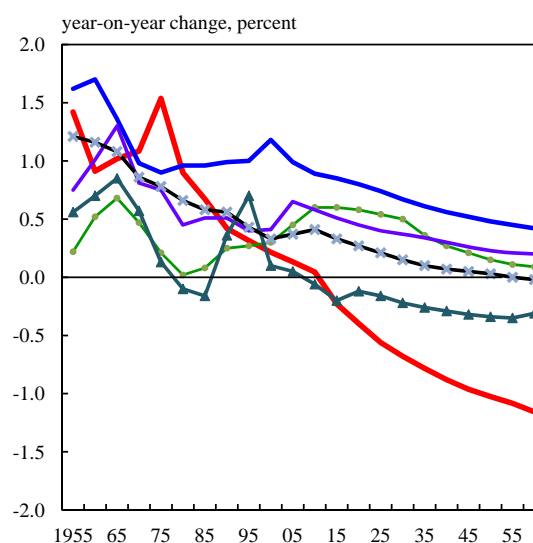
Source: Ministry of Internal Affairs and Communications.

Total and Working-Age Population

Growth Rate of the Working-Age Population



Growth Rate of the Population

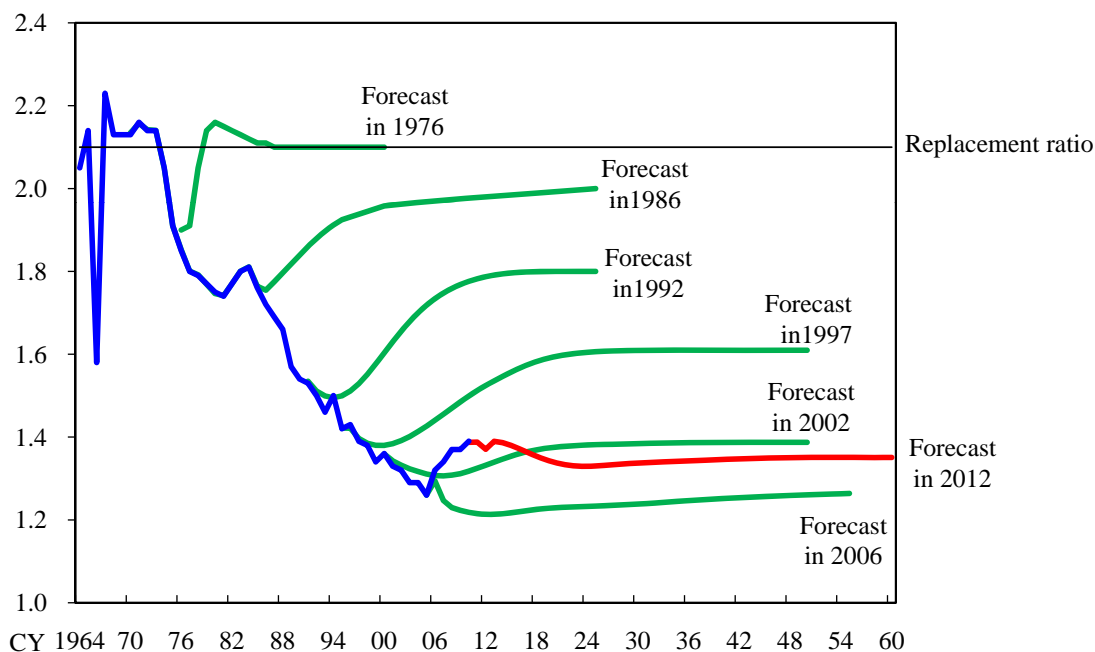


Growth Rate in 2010, percent

	Japan	United States	United Kingdom	France	Germany	Advanced economies' average
Working-age population	-0.74	0.81	0.59	0.49	-0.23	0.35
Total population	0.05	0.89	0.60	0.58	-0.06	0.41

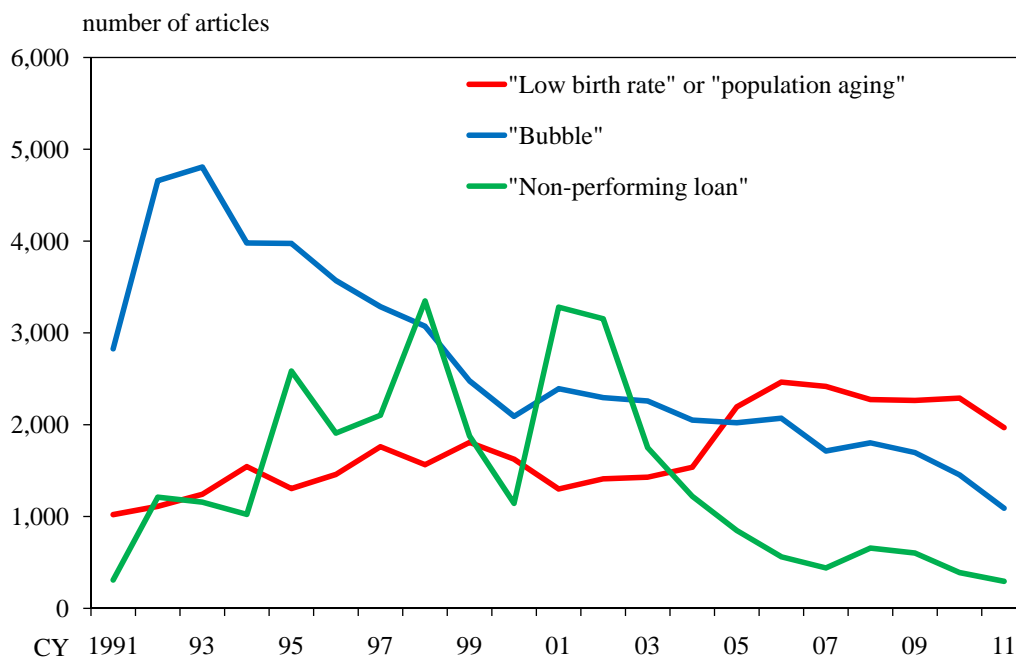
Sources: United Nations; National Institute of Population and Social Security Research.

Revisions in the Japanese Total Fertility Rate Forecast



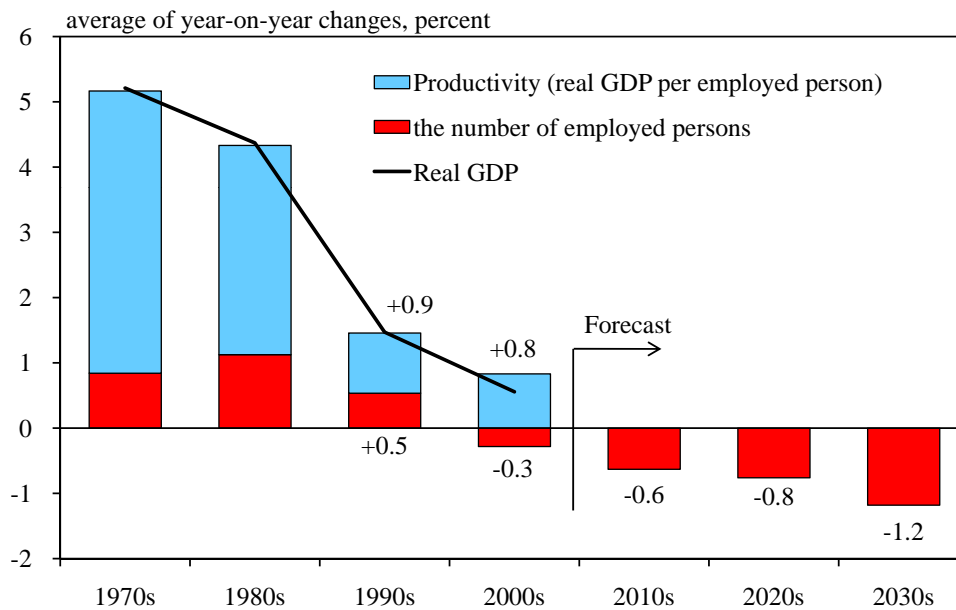
Sources: Ministry of Health, Labour and Welfare; National Institute of Population and Social Security Research.

Newspaper Citations on Low Birth Rate and Population Aging



Note: Number of articles found in *The Nikkei*, *The Nikkei Business Daily*, and *The Nikkei MJ*.
Source: Nikkei Telecom.

Decomposition of Real GDP Growth in Japan

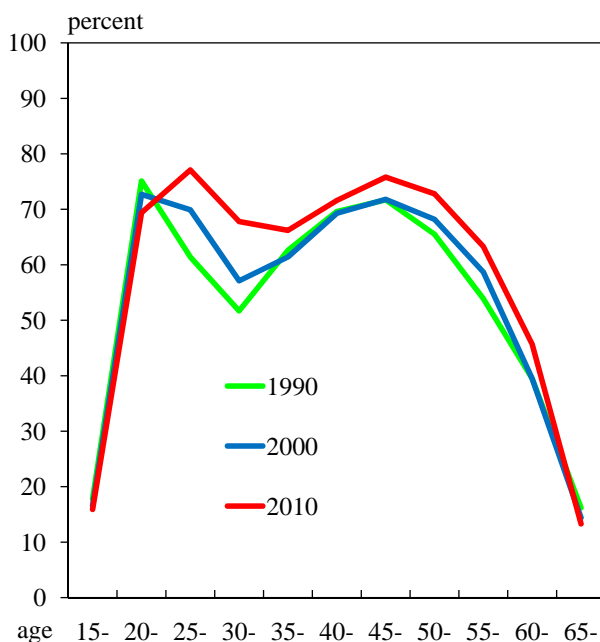


Note: Fiscal-year basis. The rates of change in the number of employed persons from the 2010s onward are calculated using the population outlook (medium variant) and the projected labor force participation rates (assuming the labor force participation rates in each age/sex group to remain the same as those in 2010).

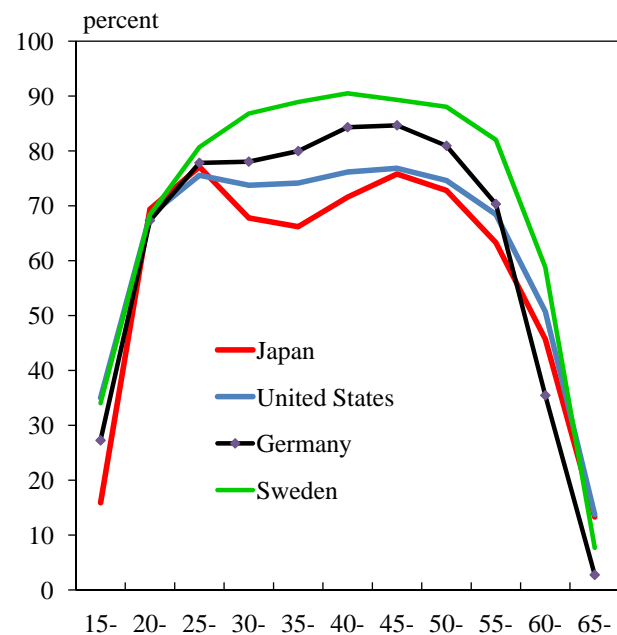
Sources: Cabinet Office; Ministry of Internal Affairs and Communications; National Institute of Population and Social Security Research.

Labor Participation of Female Workers

Labor Participation of Female Workers in Japan

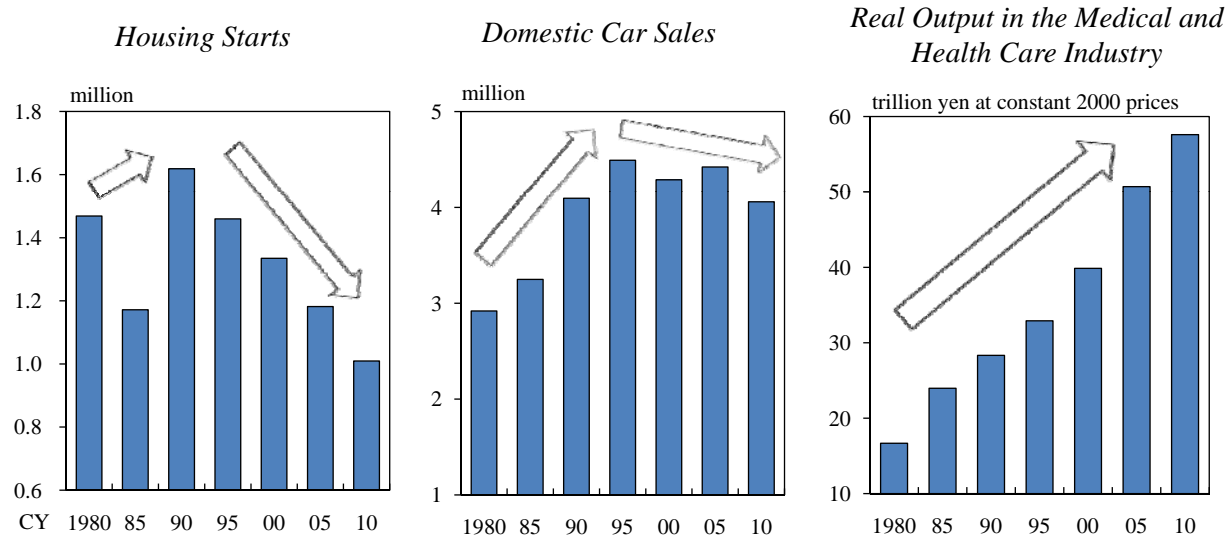


Comparison of Labor Participation of Female Workers in 2010



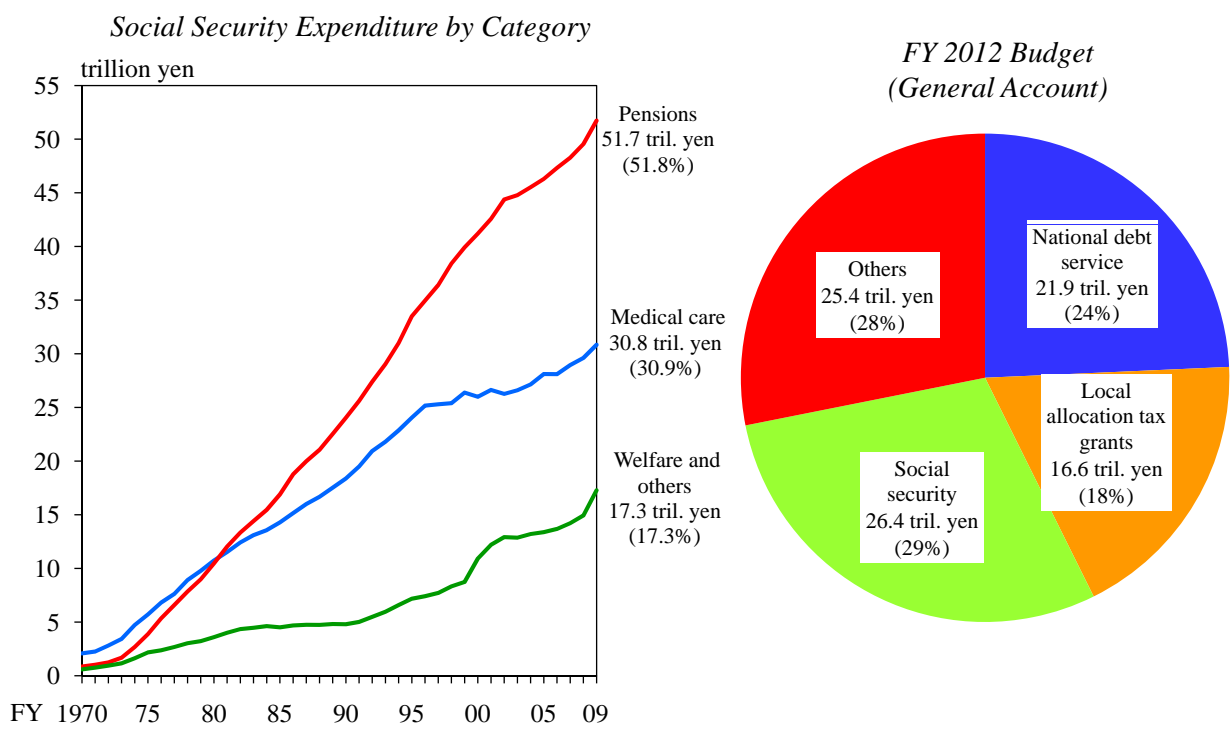
Sources: Ministry of Internal Affairs and Communications; OECD.

“The Spending Wave”



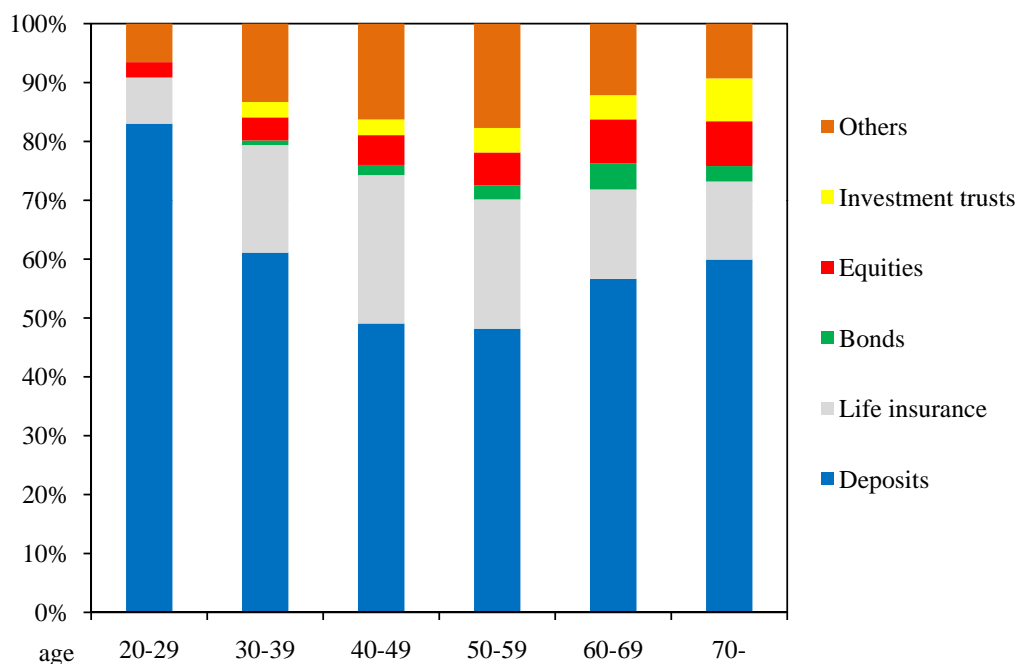
Note: Average in the last five years. The value in 2010 for “Real Output in the Medical and Health Care Industry” is calculated using year-on-year changes from 2006 to 2008.
 Sources: Ministry of Land, Infrastructure, Transport and Tourism; Japan Automobile Dealers Association; Japan Mini Vehicles Association; Research Institute of Economy, Trade and Industry.

Fiscal Balance in Japan



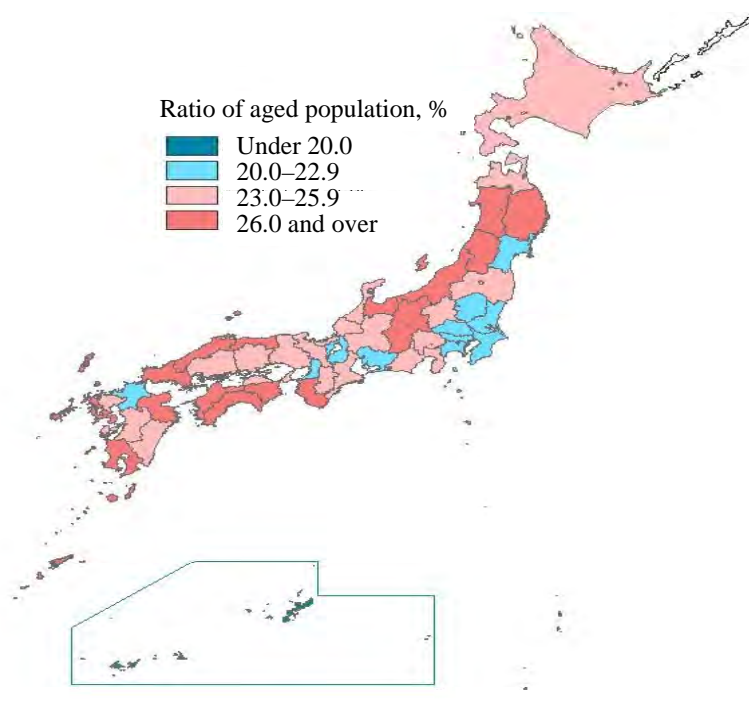
Note: The scope of social security expenditure is based on the International Labor Organization standards for international comparison.
 Sources: National Institute of Population and Social Security Research; Ministry of Finance.

Household Financial Assets



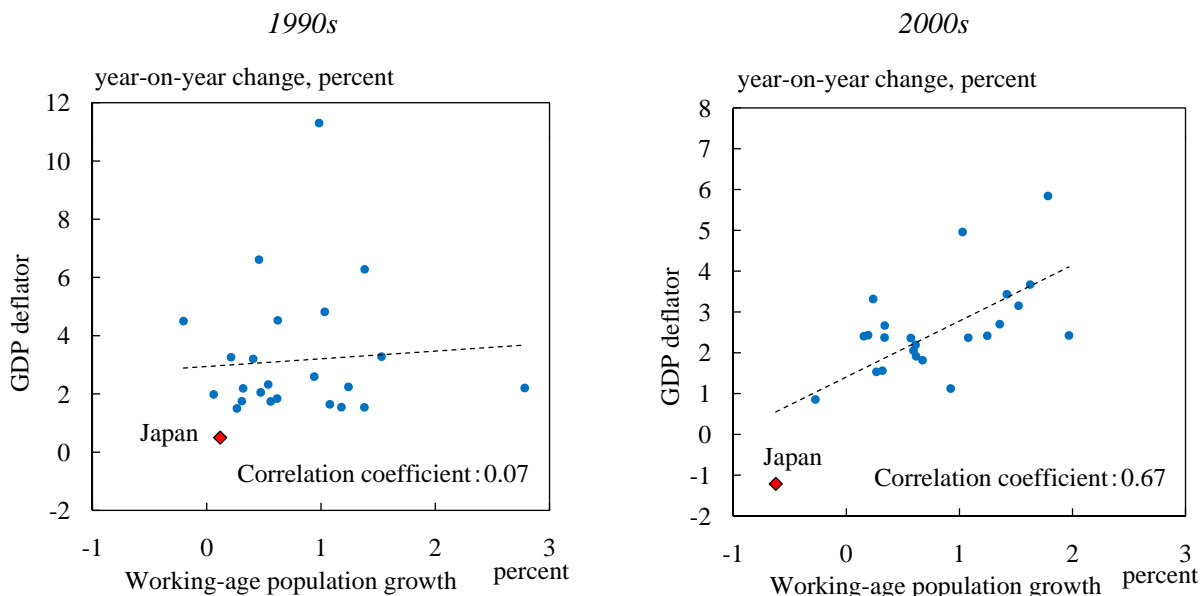
Note: As of 2011.
Source: Central Council for Financial Services Information

Ratios of Population over 65 Years by Region



Note: As of 2010.
Source: Ministry of Internal Affairs and Communications.

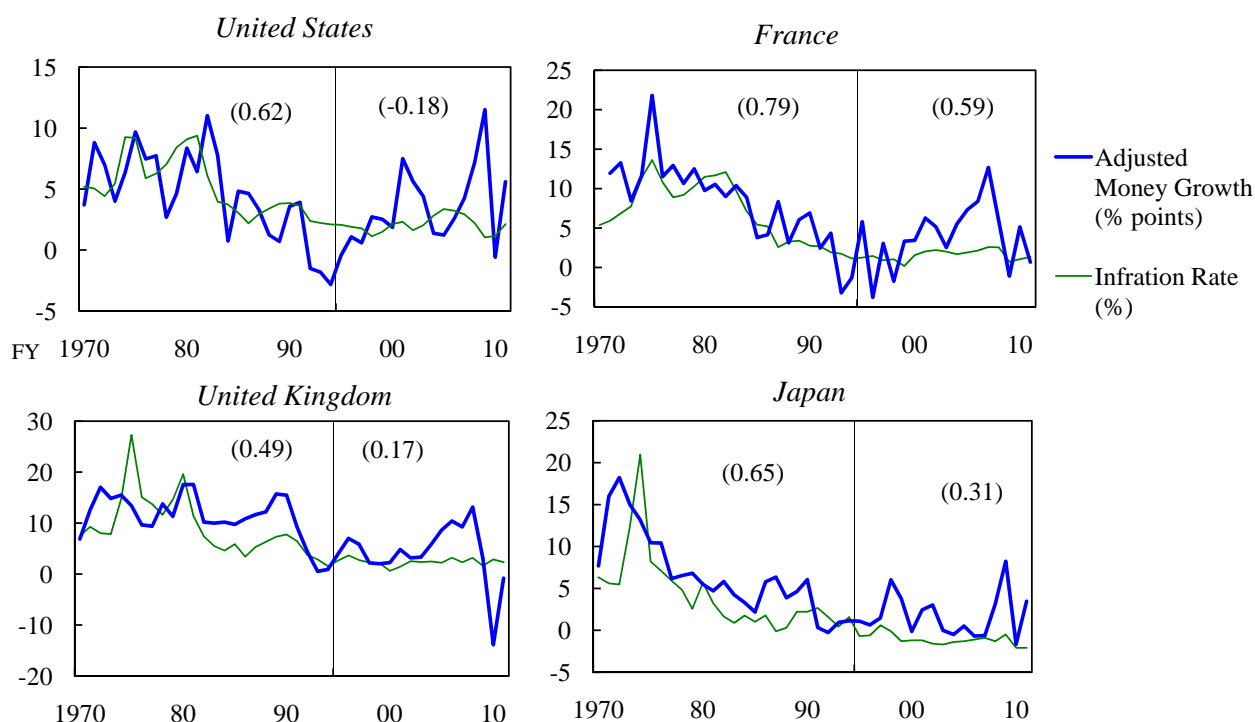
Working-Age Population Growth and Inflation: Cross-Country Comparison



Note: For the 24 countries where the data are available among those that joined the OECD by the 1990s.
Source: OECD.

Chart 15

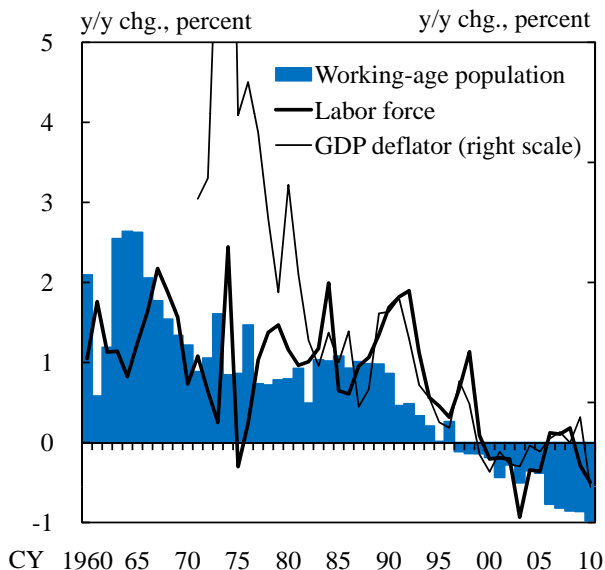
Money Growth and Inflation



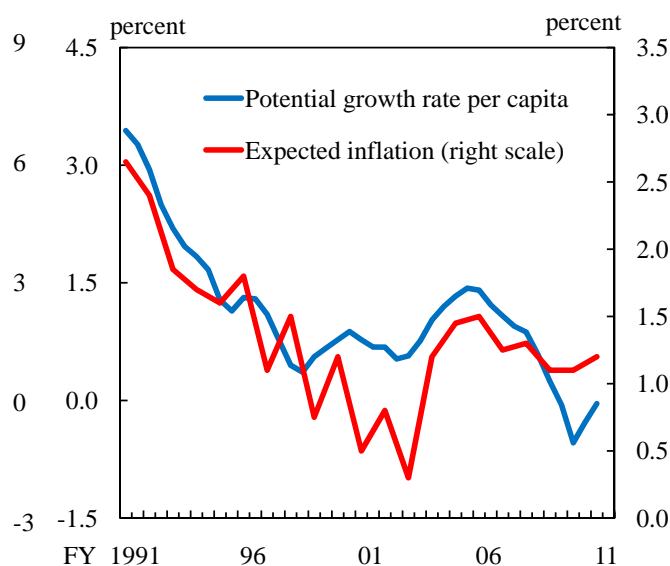
Notes: 1. Figures in parentheses are correlation coefficients of 1970-1994 and 1995-2011.
2. Money growth is selected as M2 for the US and Japan, M3 for France, and M4 for the UK, respectively. Adjusted money growth is defined as money growth minus real GDP growth.
3. Because of the data discontinuity of Germany in 1990's, French is selected as the representative of the euro area.
Sources : International Monetary Fund; Statistics by individual countries.

Population Growth and Inflation in Japan

Population and the GDP Deflator



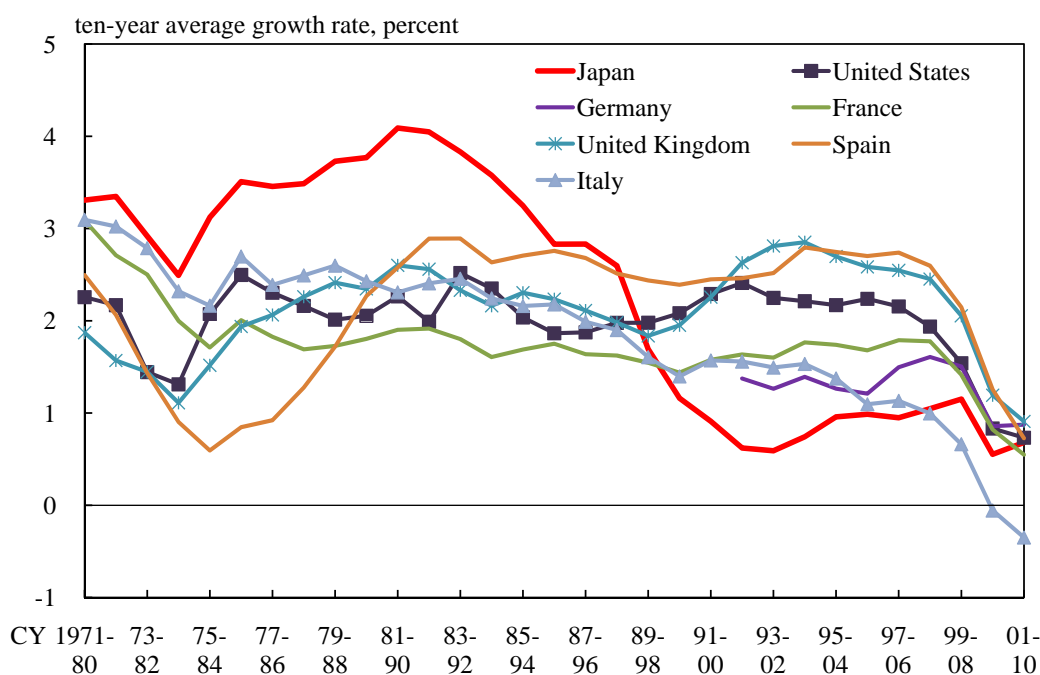
Potential Growth Rate and Expected Inflation in the Medium to Long Term



Note: Lagged values are used for population growth because they precede inflation by a year. Expected inflation is the inflation outlook for CPI in the next 6 to 10 years by the Consensus Forecast (average of the April and October surveys in each year). The potential growth rate is calculated by the Bank of Japan.

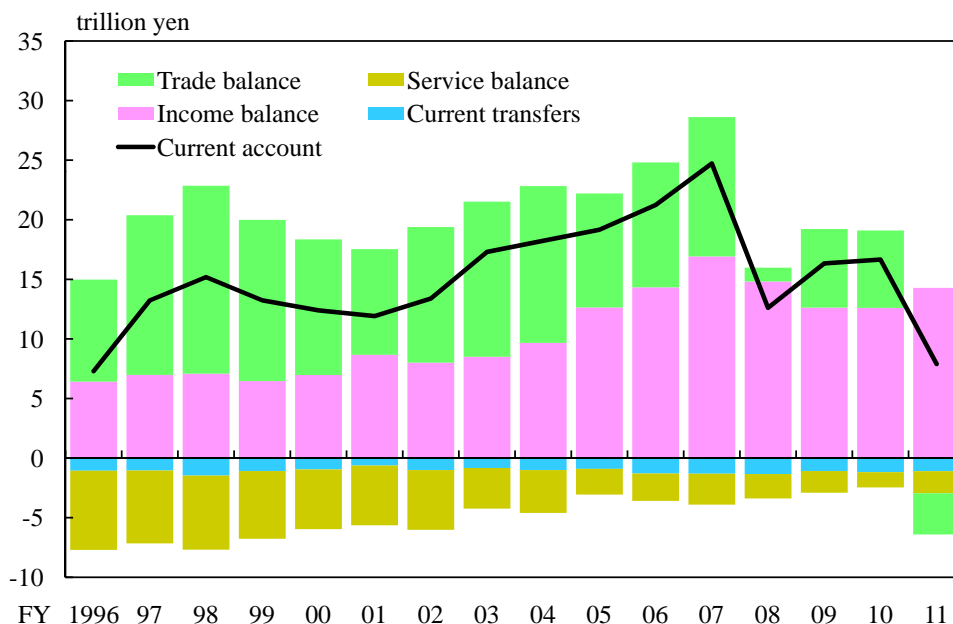
Sources: Bank of Japan; Consensus Forecast; Ministry of Internal Affairs and Communications.

Real per Capita GDP Growth Rate in Advanced Economies



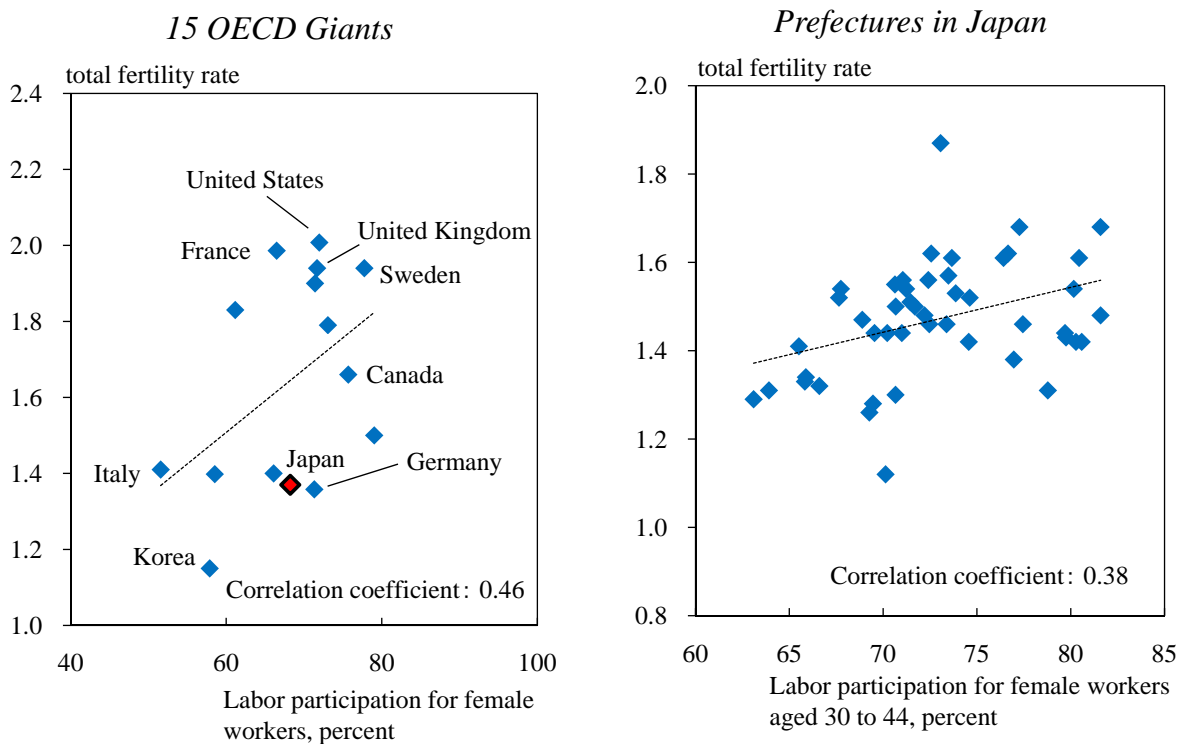
Sources: United Nations; Statistics by individual countries.

Current Account, Trade Balance and Income Balance



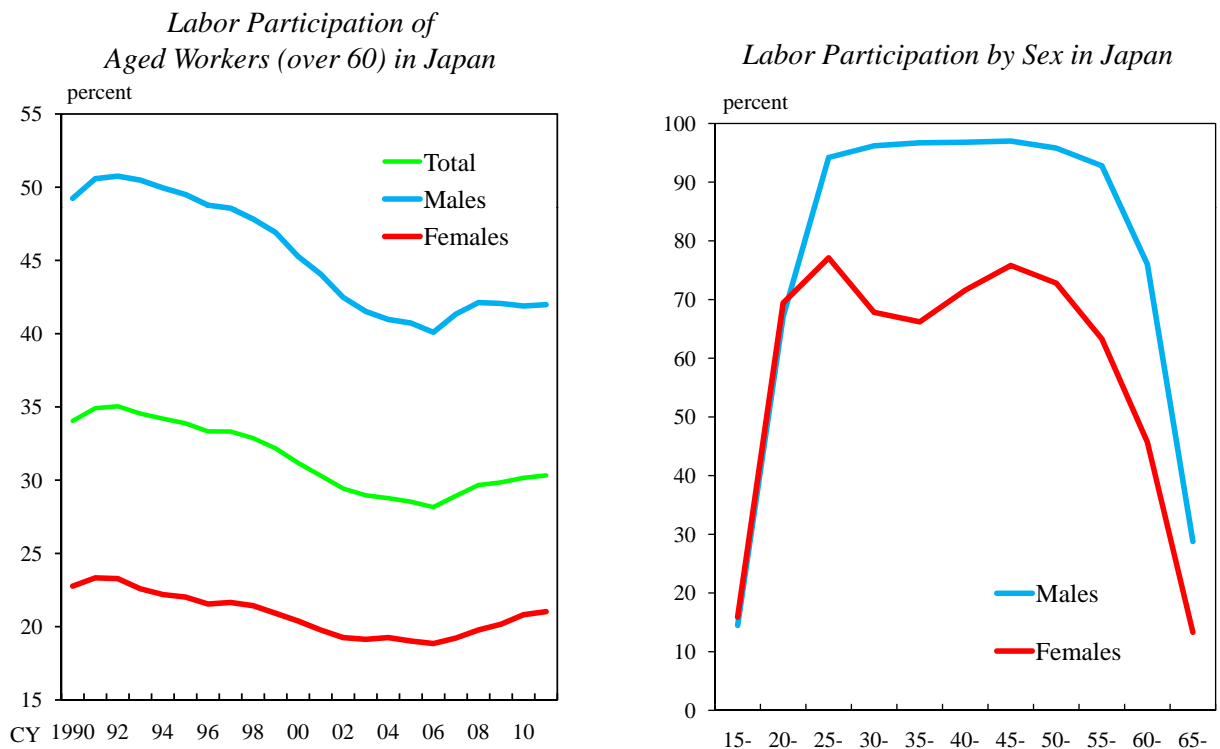
Sources: Ministry of Finance; Bank of Japan.

Labor Participation of Female Workers and Fertility Rate



Note: The left panel includes the 15 largest countries in terms of nominal GDP in 2009. The right panel shows the values in 2010.
 Sources: National Institute of Population and Social Security Research; Ministry of Internal Affairs and Communications; OECD.

Labor Participation of Aged Workers



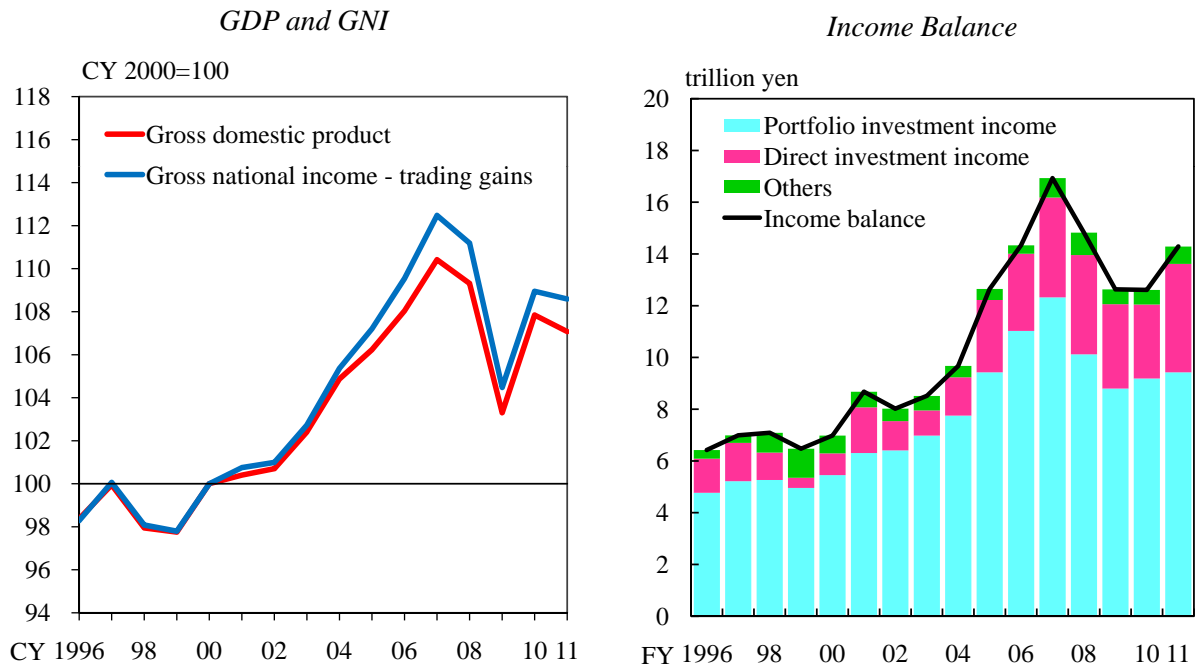
Note: The statistics do not include the data for Fukushima, Miyagi, and Iwate prefectures in 2011.
Source: Ministry of Internal Affairs and Communications.

Population Aging and Health Care Expenditure

	Japan	Germany	United States	France	United Kingdom
Population over 65 Years (Change from 2000 to 2010, percent)	33	25	16	11	11
Expenditure for Health Care (Change from 2000 to 2008, percent)	11	25	74	49	85

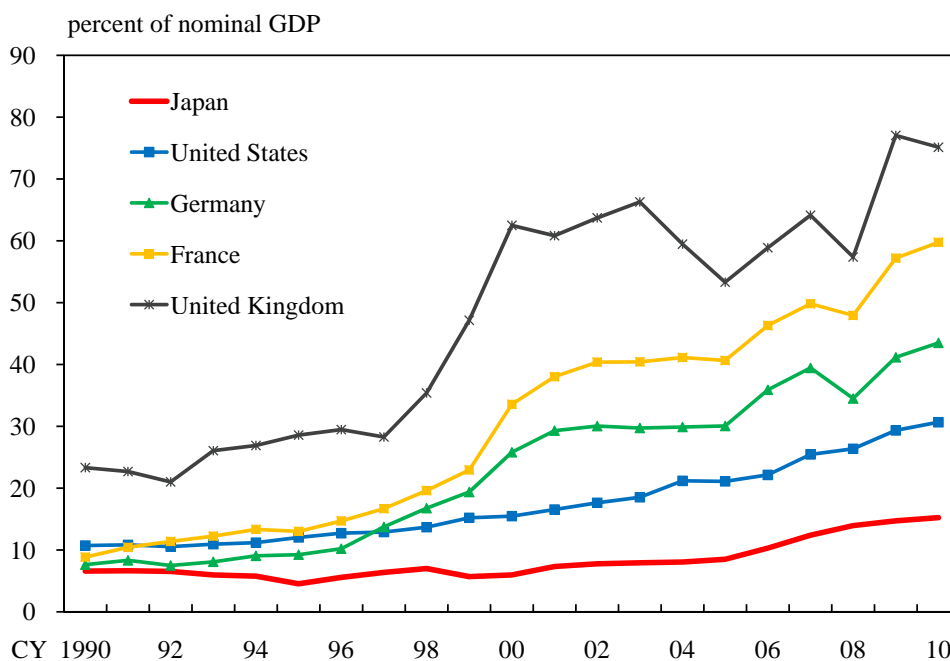
Source: United Nations; OECD.

Gross Domestic Product and Gross National Income in Japan



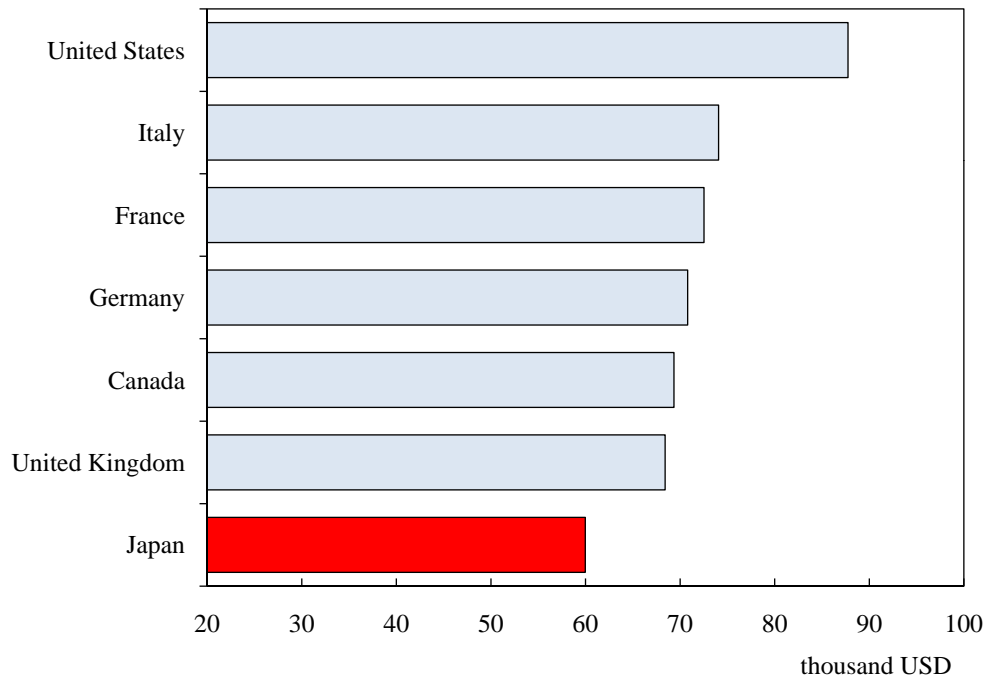
Sources: Cabinet Office; Ministry of Finance; Bank of Japan.

Foreign Outward Direct Investment



Source: OECD.

Labor Productivity per Employed Person by Country



Note: Average in 2000s.
Source: World Bank.