IMES DISCUSSION PAPER SERIES

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and Sustained Economic Growth:
Lessons from Japan's Experience since the Late 1980s

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Discussion Paper No. 2004-E-19

IMES

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Abstract

In this paper, we examine implications of asset price fluctuations and resultant structural adjustments on sustained economic growth, based on Japan's experience since the latter half of the 1980s. In doing so, we offer the view that the protracted economic stagnation in Japan can be seen as a result of the incomplete economic adjustments to significant changes in relative prices, in part triggered by the bursting of the asset price bubble. Such changes in relative prices include movements in both intertemporal and cross-sectional dimensions, which interacted crucially to lower the economy's trend growth. This aspect of Japan's asset price bubble, with its consequences for structural adjustments since the 1990s, is important because it illustrates the specific environment in which the Bank of Japan has to conduct monetary policy: namely, not a standard stabilization policy around a stable growth trend. Rather, it has operated in an environment of unanswered policy management questions coupled with hampered sustained growth.

Keywords: Asset price bubble; Relative price changes; Structural adjustments; Productivity growth.

JEL Classification: C43, E44, E52, E58, O47

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I.   Introduction

In this paper, we examine the implications of asset price fluctuations and resultant structural adjustments on sustained economic growth, based on Japan's experience since the latter half of the 1980s.

Japan's experience of the emergence, expansion, and bursting of an asset price bubble since the latter half of the 1980s is typically seen as an example that a boom-and-bust cycle of asset prices severely impacts the business cycle.   This view, however, does not capture the full story.[1]   That is, Japan's economic predicament in the 1990s is better understood as a significant downward shift in trend growth, beyond a boom-and-bust cycle, rather than an amplified business cycle alone.   Although the importance of cyclical aspects cannot be denied, further declines in asset prices after the mid-1990s seem to reflect the downward shift in trend growth beyond the boom-and-bust cycle of the asset price bubble.

In the late 1990s, excessive optimism, the main feature of a major asset price bubble, induced businesses to build up their capital stocks, payrolls, and debts that would have made sense only in a sustained environment of accelerated growth.   When the bubble burst, however, the ensuing adjustments were all the more painful and prolonged.   At the moment, mild deflation of less than 1 percent per annum has attracted public attention, but it is asset price deflation, which has continued for 10 years at an annual rate of close to 10 percent, that has likely exerted the most significant pressure on the economy.

We propose the view that the protracted economic stagnation in Japan can be seen as a result of the incomplete economic adjustments to significant changes in relative prices, partly triggered by the bursting of the asset price bubble.   Such changes in relative prices occur in intertemporal as well as cross-sectional dimensions.   On the one hand, relative prices in the intertemporal dimension are relative prices between current and future prices.   This is observed as changes in relative prices between consumer prices and asset prices, as documented by Alchian and Klein (1973).   On the other hand, relative prices in the cross-sectional dimension are relative prices across goods and services as well as factors of production.   Moreover, it should be noted that

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[1] See Okina, Shirakawa, and Shiratsuka (2001) for a detailed examination of the emergence and expansion of the asset price bubble in the late 1980s.

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a crucial interaction arises between intertemporal and cross-sectional relative prices which has implications for how resources are allocated in the economy.

The above aspect of the asset price bubble, with its consequences for the structural adjustments since the 1990s, is important because it illustrates the specific environment in which the Bank of Japan (BOJ) has to conduct monetary policy.[2] If a significant and unforeseen slowdown in the potential output growth rate were due to structural problems, monetary policy would inevitably be required to differ greatly from stabilization policy in normal circumstances.

This paper is organized as follows. Section II reviews asset price deflation in Japan and summarizes discussions on Japan's economic stagnation. Section III examines interpreting the long-lasting stagnation from the viewpoint of misguided relative price information both in the intertemporal dimension and the cross-sectional dimension. Section IV explores the effects of insufficient structural adjustments on economic growth, based on the extended framework of growth accounting under factor market distortions. The section also discusses the policy implications of structural adjustments. Section V offers a concluding discussion.

II. Viewpoints on Japan's Asset Price Deflation and Economic Stagnation

In this section, we review the development of asset price deflation in Japan, and summarize arguments as to what lies at the root of Japan's economic predicament.

A. Asset Price Deflation and Declined Growth Trend

Asset prices have continued to decline remarkably for a decade since the bursting of the asset price bubble at the beginning of the 1990s, while consumer prices have remained almost constant (Figure 1).

Among these developments, mild deflation of less than 1 percent per annum has attracted public attention. However, we should stress that asset price deflation is deemed far more significant than mild deflation. Stock prices plunged in the early 1990s and have since followed a downward trend, albeit with continual ups and downs.

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[2] See the series of our previous studies, including Fujiki, Okina and Shiratsuka (2001), Fujiki and Shiratsuka (2002), Okina (1999), and Okina and Shiratsuka (2002, 2003, 2004), for research on Japan's monetary policy during this period.

Land prices started declining with a two-year lag relative to stock prices, and subsequently have kept declining at an annual rate of around 10 percent.

In addition, the standard deviation of stock price changes across industries (Figure 2) initially declined after the bursting of the bubble, while it has begun to increase since 1997. Stock prices show more divergent movements since 1997, with a mild downward trend and some weak cycles. Land prices also show fairly divergent movements by area and type of usage (Figure 3).

At the same time, trend growth tended to shift downward during the 1990s (Figure 4). The volatility of the output growth rate expanded in the 1990s, compared with that in the 1980s. Although some temporary high-growth periods were observed, such cyclical upturns were not strong enough to lead to self-sustainable growth. The average duration of expansions was short, and the growth rate declined remarkably, and, as a result, Hodrick-Prescott (HP) filtered trend kinked downward in the 1990s.

As of the writing of this paper, Japan's economy has entered its third recovery phase since the bursting of the bubble. The question remains as to whether the cyclical upturn this time will lead to self-sustaining higher growth, which did not happen during previous upturns in the 1990s.

B. Two Views on Japan's Stagnant Economic Conditions

In considering monetary policy management in a period of continuing stagnation, it is necessary to specify the most significant factor hampering sustainable economic growth. Broadly speaking, there are two views on this.

One view considers insufficient aggregate demand as the essential problem. The basis for this view seems to be that, even though there are structural problems, since the economy will shortly return to a sustainable growth path as insufficient demand is resolved by expanding effective demand, structural policy should be implemented pending recovery of the economy.

Based on the above view, an important thing for Japan's economy is to create effective demand. In this case, the problem boils down to the question of how economic policy authorities, especially a central bank, which is bound by the non-negativity constraint of nominal interest rates, can create further effective demand.

Another view regards structural problems as the most important factor. If this is the case, it is necessary to work steadily toward resolving structural problems to raise the growth trend.

The list of structural problems in Japan includes rigid corporate governance, inefficiency of the non-manufacturing sector, the issue of non-performing assets associated with the generation and bursting of the asset price bubble, and the savings-investment imbalance.[3]   In addition, significant structural changes in the economic environment also occurred during the 1990s: for example, the changing pattern of the division of labor between Japan and its East Asian neighbors, a rapidly aging population, and advances in information and communications technology.

To resolve the above problems, it is an important question whether the government can continuously implement policy actions consistent with the overall conception of structural reform, including resolution of the non-performing loan (NPL) problem.   However, it is extremely difficult to fully carry out such structural policies, as they are very likely to be accompanied by deflationary effects in the short term, even though positive effects will follow in the medium to long term.   Therefore, to execute all the necessary structural policy measures, an important point at issue is their sequencing: in what order specific policies should be implemented.   In this regard, macroeconomic policy is required to maintain an expansionary stance capable of mitigating the deflationary effects stemming from the pursuit of structural policies.

Given that mild deflation in Japan is associated with low economic growth, it is undeniable that insufficient aggregate demand was one of the major causes of weak price development in the late 1990s.   However, it should be noted that the nature of insufficient demand is not just temporal but more persistent.   In this case, separation of demand and supply factors in the medium to long term is incredibly difficult because of their dynamic interaction.[4]

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[3] See Maeda, Higo, and Nishizaki (2001) for a more comprehensive analysis of structural problems. Unfortunately, however, this paper is available only in Japanese.

[4] Mio (2002) estimates a bivariate output-price structural vector autoregression model for Japan to decompose the inflation rate time-series into two components, explained by aggregate demand (AD) and aggregate supply (AS) shocks.   Mio (2002) finds that the coincidence of negative AS and AD shocks explains the combination of price stability and output stagnation soon after the bursting of the asset price bubble in the early 1990s.   We update his results by using newly revised 93SNA (System of National Accounts) data, and succeed in reproducing qualitatively equivalent results.   We also produce similar but puzzling results for the dynamic response of prices due to AS shocks.   That is, it initially shows a negative response, but turns positive after about two years.   These results seem to indicate the difficulty of identifying the effects of AD and AS shocks in the medium to long term because of their dynamic interaction.

Notwithstanding which view is valid as to the most significant factor hampering sustained economic growth, it is hard to deny that structural impediments affect the persistent economic stagnation seen in Japan and that expansionary macroeconomic policy is required. Economic stagnation, in turn, makes it increasingly difficult to resolve the structural problems. Although the necessary structural adjustments, such as reorganization of corporate management and reallocation of economic resources, were deferred by the emergence of the asset price bubble, their resolution became urgent when the bubble burst. In addition, the bursting of the asset price bubble not only triggered the materialization of adverse effects but also amplified them as time passed, thereby making such structural adjustments more difficult.

C.   Structural Changes

Although it is hard to deny that the emergence and bursting of the bubble played an important role in economic fluctuations from the early 1990s, the above observations suggest that structural impediments to the smooth reallocation of economic resources could be fundamental reasons for the current deflationary economic situation.

1. NPLs and low profitability of Japanese firms

NPLs of major financial institutions continued to increase up until end-March 2002 (Figure 5). NPLs of major Japanese banks reached 11.9% of nominal GDP by end-March 2002, calculated as the sum of risk management loans (6.4%) and the accumulated direct write-offs since fiscal 1992 (5.5%). Substantial progress in dealing with the NPL problem has occurred only very recently, during the past year or so. Although the pace of disposal has varied across individual institutions, on average major banks have made considerable progress in disposing of NPLs. Regional banks have also made progress in reducing NPLs, but the pace of disposal has been much slower than that at major banks.

One of the major causes of Japan's long-term stagnation since the early 1990s is lending forbearance to inefficient firms that finally caused deterioration in the soundness and efficiency of Japan's economy (as described by Sekine, Kobayashi, and Saita [2003], and Caballero, Hoshi, and Kashyap [2003]). Continued forbearance lending that permits "zombie" firms to exist indicates the existence of incentives to resist factor reallocation, even though economic adjustments are necessary for the economy to return to its long-term sustainable growth path. In other words, the

malfunctioning of financial intermediation prevents the resource allocation mechanism in financial markets from working smoothly.

To examine the capital efficacy of corporate sector in Japan, Figure 6 plots the return on assets (ROA) and return on equity (ROE) for the manufacturing and non-manufacturing sectors over time. We can see from this figure that profitability in the corporate sector has remained low since the early 1990s, and does not yet show signs of recovery. This observation suggests that a structural shift in the Japanese economy from declining industries to growing industries is unlikely to proceed smoothly during this period of continuing economic stagnation.

2. Globalization

Ongoing globalization, including the incorporation of the Chinese and other developing economies into the system of the international division of labor, influences relative prices in the global economy. The rapid rise of the Chinese and other economies puts pressure on the global economy to reallocate production bases as well as creates and destroys employment opportunities.[5] To be sure, international reallocation of production and employment is beneficial for all countries in the long run. Nevertheless, such developments are often mistaken for the importation of unemployment and deflation from these countries, especially from China.

To enjoy the benefit from reallocation, the Japanese economy is required to shift its industrial structure in response to changes in its comparative advantages due to the rise of these economies. Such adjustments in industrial structure will surely pay off in the long term by improving the terms of trade. In the case of the rise of the Chinese economy, for example, we expect that a broad range of products, such as clothing, daily necessities, and agricultural and livestock products, will become available at lower prices.

Some cautions, however, are in order regarding the adjustment process in the short term. First, the pains of economic reform are most likely to be concentrated in firms and employees in the declining industries. The prevention of changes to relative prices and forbearance lending to declining firms and industries tend to result in locked-in resources in the declining industries, thereby hindering economic growth. Second,

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[5] Another often-cited example is U.S. firms in the information and communications industry make active use of outsourcing to Indian firms in software development.

international competition is less likely to function as a pressure to improve the productivity and efficiency in non-tradable goods industries.

Figure 7 is a scatter plot of general price levels against per capita GDP across member countries of the Organisation for Economic Cooperation and Development (OECD). In this figure, general price levels and per capita GDP are defined as the ratio of PPP to exchange rates, and per capita nominal GDP deflated by PPPs, respectively.[6] This figure shows the so-called Balassa-Samuelson effect of a positive correlation between domestic price level and per capita income.[7] This effect arises because economic growth induces structural shift from manufacturing industries to non-manufacturing industries with relatively low productivity. It is often pointed out that non-manufacturing industries lack incentives to improve their efficiency, because they are isolated from international competitive pressures due to regulation and other protections.

A closer look at Figure 7 offers the observation that Japan is an outlier located far above the upward trend line. In other words, Japan's price level is still far higher than the international standard level, even after taking into account its high per capita income. This implies the wide productivity differences between manufacturing and non-manufacturing industries in Japan, reflecting the low productivity and inefficiency of the non-tradable goods industries.

3. Population growth

Demographic factors, such as the rapid decline in the birth ratio and an aging society, are also often cited as factors behind declining trend growth.

Figure 8 plots the official projections of Japan's future population, compiled by National Institute of Population and Social Security Research. The projections have been revised downward continuously, as new projections are released every five years.

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[6] PPP is calculated using price and expenditure data collected by the Eurostat-OECD PPP Programme. The basket of goods and services is a sample of all goods and services covered by GDP, including consumer goods and services, government services, equipment goods, and construction projects. PPP is computed as a geometric mean of price relatives of various products in the basket.

[7] In the time-series dimension, a real exchange rate for a nation with higher economic growth tends to appreciate more rapidly.

Based on the projections in January 2002,[8] total population is projected to peak at 128 million in 2006 and continue to decline thereafter until it reaches 61 million at the end of the projection in 2100 (upper panel of Figure 8). The working-age population (15-64 years old) started declining after peaking at 87 million in 1995, and is projected to decline by half to 43 million in 2072, and to 33 million in 2100 (mid panel of Figure 8). As a result, the dependent population index, defined as the ratio of the non-working-age population (total population minus working-age population) to the total population, is projected to increase until 2053 when it peaks at 87.4%, and remain high afterward (bottom panel of Figure 8).

Even if the growth rate of per capita GDP remained unchanged, a population decline in Japan would result in a slowdown of economic growth. The rise in the dependent population index implies a decline in the work force in the economy. It suggests a constraint on economic growth, because more resources are shifted into service sectors where it is difficult to improve productivity, such as the care of aged persons.

III. Two Dimensional Changes in Relative Prices and Declined Potential Output

Protracted economic stagnation in Japan is deeply related to the asset price deflation and structural changes mentioned above. The problems created by asset price deflation and structural changes (except for the population growth issue) can be seen as the incomplete economic adjustments to significant changes in relative prices.

Such changes in relative prices occur in both the intertemporal dimension and the cross-sectional dimension. On the one hand, relative prices in the intertemporal dimension are relative prices between the current prices of goods and services and their future prices.[9] This is exactly the aforementioned observation of changes in relative prices between consumer prices and asset prices. On the other hand, relative prices in the cross-sectional dimension are relative prices among goods and services as well as

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[8] In the baseline projection (median variant) published in January 2002, total fertility is assumed to decline initially from 1.36 in 2000 to 1.31 in 2007, and then gradually start reversing and reach 1.39 in 2049.

[9] See Alchian and Klein (1973), Shibuya (1992), and Shiratsuka (1999) for details on measures for intertemporal price changes.

production factors, including terms of trade with foreign trading partners. Moreover, it should be noted that a crucial interaction exists in the aforementioned changes in relative prices in two dimensions.

A. Relative Price Changes in the Intertemporal Dimension

The first point regarding relative price changes concerns implications of changes in relative prices in the intertemporal dimension. Asset price deflation has continued for the last 10 years at an annual rate of close to 10 percent. As a result, relative prices in the intertemporal dimension have dramatically changed under extremely stable consumer prices since the mid-1980s.

As an inflation measure for incorporating the dynamic elements of price fluctuation, Alchian and Klein (1973) propose the idea of an intertemporal cost of living index (ICLI). This index traces the intertemporal changes in the cost of living that are required to achieve a given level of intertemporal utility. Consumer behavior possesses a dynamic nature such that current consumption depends on not only current prices and incomes but also the future path of prices and incomes. When considering the intertemporal maximization problem for a household, it can be seen that its budget constraint is its lifetime income.[10] In this case, we can take asset prices as a proxy for the future prices of goods and services.

More precisely, Alchian and Klein (1973) assume that consumer preference depends on both current and future consumption expenditure, as expressed by the following utility function:

$$U = U(x_{11}^A, \ldots x_{n1}^A, \ldots, x_{it}^A, \ldots) \quad \text{for } i = 1, \ldots, n; t = 1, \ldots, \infty, \tag{1}$$

where x_{it}^A represents the consumption expenditure for good i at time t with economic condition A.

The consumer's budget constraint corresponds to total assets (W^A), including both tangible and intangible assets as follows:

$$W^A = \sum_{t=1}^{\infty} \sum_{i=1}^{n} p_{it}^A x_{it}^A = \sum_{j=1}^{m} q_j^A y_j^A, \tag{2}$$

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[10] A necessary condition for this discussion is that there exists a perfect capital market, which makes it possible to borrow money against collateral of all tangible and intangible assets.

where p_{it}^A, q_j^A, and y_j^A represent the current price of good i at time t under economic condition A,[11] and the price and quantity of asset j at time t under economic condition A.

Suppose that a price of a current or future good changes, and the new economic condition B is realized. As a result, suppose also that the required asset value for the consumer to achieve the same utility level as under economic condition A becomes W^B. The ICLI between the economic conditions A and B is defined as

$$ICLI^{AB} = \frac{W^B}{W^A} = \frac{\sum_{t=1}^{\infty}\sum_{i=1}^{n} p_{it}^B x_{it}^B}{\sum_{t=1}^{\infty}\sum_{i=1}^{n} p_{it}^A x_{it}^A} = \frac{\sum_{j=1}^{m} q_j^B y_j^B}{\sum_{j=1}^{m} q_j^A y_j^A}. \tag{3}$$

Shibuya (1992) extends the ICLI into a practical index formula, and names it a dynamic equilibrium price index (DEPI). To this end, he employs a one-good and time-separable Cobb-Douglas utility function, instead of the general form of preference assumed in Alchian and Klein (1973). Then, he derives the DEPI as a weighted geometric mean of the changes in the current price index (the GDP deflator: p_t) and the changes in asset prices (the value of the national wealth: q_t),[12] as shown in equation (4):

$$DEPI_{0t} = \left(\frac{p_t}{p_0}\right)^{\alpha} \cdot \left(\frac{q_t}{q_0}\right)^{1-\alpha} \tag{4}$$

where α represent the weighting used for current goods and services $\alpha=\rho/(1+\rho)$, and ρ represents time preference.[13]

Figure 9 shows the movements of the DEPI from 1957 to 2001, which updates the estimation in Shiratsuka (2001). This figure portrays the large divergence between the DEPI and the GDP deflator during the late 1960s, the early and late 1970s, and the early 1980s. Focusing on developments since the mid-1980s, the DEPI rises sharply

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[11] This is the present value of the future product and service prices discounted by the discount factor.

[12] In calculating the DEPI, we should use asset prices to represent the value of total assets, which includes all the intangible assets, such as human capital. Shibuya (1992) used the data on national wealth in the SNA statistics, which have the broadest coverage among the readily available data sources. However, the coverage of intangible assets, which consist largely of households' assets, is very limited.

[13] α can be written as $\alpha_t = (1+\rho)^{-t} / \sum_{s=0}^{\infty}(1+\rho)^{-s}$ in general form. It corresponds to the standardize factors of time preference, which add up to one. Following Shibuya (1992), we assume the rate of time preference ρ as 0.03, which deducts the rate of depreciation (0.06), the growth rate of labor (0.01), and the rate of technological progress (0.03) from the real return on asset (0.13).

from 1986 to 1990 and then starts declining in 1991. During this period, although the GDP deflator remains relatively stable, the inflation rate measured by the GDP deflator accelerates until 1991 and then remains subdued from 1992. This development of the DEPI can be interpreted as an understatement in conventional inflation measures regarding the inflationary pressure that occurred in the late 1980s and the deflationary pressure that has continued since the early 1990s.

Alternatively, the aforementioned development of the DEPI can be viewed as a large swing in relative prices in the intertemporal dimension. Although current prices of goods and services, measured by the consumer price index and GDP deflator, remain stable, expected prices of future goods and services, observed by asset prices, increased dramatically in the late 1980s and then continue to decline in the 1990s. An interpretation of this from the standpoint of intertemporal relative price changes suggests that the intertemporal misallocation of resources due to misguided information of intertemporal relative prices was behind the emergence, expansion, and bursting of the asset price bubble.

B. Relative Price Changes in the Cross-sectional Dimension

Let us next turn to the second point regarding changes in relative prices in the cross-sectional dimension.

Figure 10 graphically depicts the relationship between output growth and price changes by industry. The horizontal and vertical axes plot annualized output growth and inflation by industry, respectively. Observations shown as circles and crosses, respectively, indicate data for the period from 1980 to 1990 and that from 1990 to 2001. An overall negative relationship between output growth and inflation suggests that supply-side factors play an important role in determining cross-sectional differences in the rate of inflation over the long term. Resources are allocated to growing industries where relative prices are declining, reflecting their relatively higher productivity growth.

A closer look at the figure, however, reveals that the above negative relationship between output growth and inflation varies between two periods. The figure also shows four regression lines through the scatter plots: thin and bold solid lines for the observations for the periods 1980-90 and 1990-2001, respectively; and thin and bold dotted lines for the observations for the corresponding periods but excluding electrical machinery, equipment, and supplies. The slopes of the observations for the period of 1980-90 are negative, regardless of inclusion or exclusion of the outlier observation for

electrical machinery, equipment, and supplies.   In contrast, the slope of the observations for the period 1990-2001 turns slightly positive, if the outlier observation for electrical machinery, equipment, and supplies is excluded.

To gauge distortions in the cross-sectional dimension, Nakakuki, Otani, and Shiratsuka (2004) propose an indicator for factors' marginal productivity differential across sectors.   Suppose the production function of each sector is homogeneous of degree one and is defined by the equation

$$Y_i = A_i F_i(K_i, L_i),$$ (5)

where the subscript i denotes the sector, and Y, A, K, and L represent output, total factor productivity (TFP), capital stock, and labor input, respectively.   Dividing the above equation by labor input yields labor productivity ($y = Y/L$) which can be expressed by the capital-labor ratio ($k = K/L$) as follows:

$$y_i = A_i f_i(k_i),$$ (6)

where $f_i(k_i)$ is $F_i(K_i/L_i, 1)$.[14]   Since the ratio of wages (w_i) to rate of return on capital (r_i) in sector i is equal to the ratio of labor's marginal productivity to capital's marginal productivity, the following equation holds:

$$\frac{w_i}{r_i} = \frac{f_i(k_i) - f_i'(k_i)k_i}{f_i'(k_i)}.$$ (7)

The labor share in sector i (α_i) equals $1 - f_i'(k_i)k_i / f_i(k_i)$, and the capital share $(1-\alpha_i)$ equals $f_i'(k_i)k_i / f_i(k_i)$.   Using these, equation (7) can be transformed as follows:

$$w_i / r_i = a_i k_i,$$ (8)

where a_i corresponds to $\alpha_i/(1-\alpha_i)$.   Under perfect factor markets, the ratios of wage to rate of return on capital are identical in all sectors.   In the discussion below, we assume the ratio of wage to rate of return on capital for sector i is $1/\gamma_i$ times that of the base sector ($i=1$, $\gamma_1=1$).   In this case, the ratio of relative factor prices in sector i to the base sector can be expressed as follows:

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[14] In the following discussion, it is assumed that Inada's condition holds, i.e., if $k_i \rightarrow 0$, $f'(k_i) \rightarrow \infty$ and if $k_i \rightarrow \infty$, $f'(k_i) \rightarrow 0$.

$$\gamma_i = \frac{a_1 k_1}{a_i k_i}. \tag{9}$$

The value $\gamma_i = 1$ implies that the marginal condition holds between the two sectors. If γ_i exceeds unity, then sector i has a lower capital-labor ratio than the base sector. That is, the labor input is too large and/or the capital stock is too low. Conversely, if γ_i is less than unity, it means that the capital-labor ratio of sector i is too high.

Figure 11 is a scatter plot of the estimates of γ in each sector for both the bubble period (1986-91) and the post-bubble period (1992-98).[15] We can see from the figure that the estimates of γ for many industries in the non-manufacturing sector, such as agriculture, forestry, and fisheries, construction, wholesale and retail trade, finance and insurance, and services activities, increase in a range significantly higher than unity. In contrast, those for the manufacturing industry, except food products and beverages, remain almost unchanged in the range close to unity. Figure 12 shows the standard deviation of γ across industries for each year. We can see from this figure that the standard deviation jumps in the early 1990s and remains high thereafter, reflecting these larger deviations of γ from unity in non-manufacturing industries.

These observations imply that the capital-labor ratios for these sectors remain considerably below the optimum level that the marginal condition indicates (either capital accumulation has been too small or labor input has been too large).

C.   Interaction of Relative Price Changes in Two Dimensions

As discussed above, protracted economic stagnation in Japan can be seen as the incomplete economic adjustments to significant changes in relative prices in two dimensions: the intertemporal and cross-sectional dimensions. In addition, it should be stressed that a crucial interaction exists in the aforementioned changes in relative prices in two dimensions. The cross-sectional and intertemporal resource misallocation interacts to amplify the negative impacts of the structural factors on the economy as a whole.

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[15] Nakakuki, Otani and Shiratsuka (2004) employ the electrical machinery industry as the base industry to compute γ, based on their presumption that this industry is the most efficient of all the industries in Japan.

In general, frictions and distortions in factor markets lead the economy to exhibit inefficient resource allocations. Figure 13 illustrates the economic intuition for this point. Suppose that the economy produces two goods, denoted by *M* and *N*. To keep the graph simple, assume further that the supplies of capital and labor are fixed. The production possibilities frontier (PPF) shows all feasible pairs of two goods. Now suppose that an economy is at the efficient allocation at point *A* under relative prices P_m/P_n, and relative price changes occur. Point *C* is attained if no frictions and distortions exist, while point *B* is attained if frictions and distortions prevent resource reallocation.

The above argument implies that distortions in factor markets lead an inward shift of the nation's PPF and lower attainable output. In this case, without reallocating resources from declining sectors to ones enjoying high productivity, asset prices, which correspond to the discounted present value of future cash flow, can hardly be expected to recover. As long as productivity growth rates remain stagnant, ROE will continue to be depressed.

Moreover, as discussed earlier, the relative price of asset prices to general prices means intertemporal relative prices. Thus, the economic situation in which asset prices drastically decline while general prices remain relatively stable can be interpreted as one in which downward pressure on the prices of future goods works to influence intertemporal resource allocation. It follows that downward pressure on the trend growth rate strengthens as the capital accumulation in high-productivity sectors declines.

To sum up, in the situation in which inefficient firms survive and the economy's PPF continues to expand very slowly over the long term, not only the trend growth rate falls but also downward pressure on the asset prices influence the economy.

IV. Structural Adjustments and Declined Economic Growth

In this section, based on the empirical study by Nakakuki, Otani, and Shiratsuka (2004), we first summarize the extended framework of growth accounting to incorporate the effects of factor market distortions, and quantitative assessment of the impacts of such distortions on Japan's economic stagnation. We then discuss policy implications of structural adjustments.

A.   Effects of Factor Market Distortions on Economic Growth

Research on growth accounting in Japan, however, has not focused on the implications of structural impediments; rather, many studies assume perfect markets, thereby regarding the difference between the observed output growth and the hypothetical output growth under perfect utilization of resources as TFP growth.   As a result, if structural impediments do exist, then contributions of factor accumulations are overstated, and TFP growth shows the sum of positive impacts of technology growth and negative impacts of structural impediments.   Thus, the contribution of technological progress in growth accounting is underestimated when the TFP is solely attributable to technological progress.

For example, Hayashi and Prescott (2002) argue that economic stagnation in Japan in the 1990s is attributable to declines in both the TFP growth rate and working hours.   They then conjecture that policies to subsidize inefficient firms and declining industries result in lower productivity, and discourage investment to improve productivity.   It should be noted, however, that their analysis assumes the slowdown of TFP growth as exogenous, and does not explicitly deal with structural impediments against more efficient resource allocation.

B.   Growth Accounting that Incorporates Factor Market Distortions

To quantify the impacts of distortions in factor markets during the period of continuing economic stagnation in the 1990s in Japan, Nakakuki, Otani, and Shiratsuka (2004) propose an analytical framework to incorporate factor market imperfections into growth accounting.

Real GDP, denoted by Y, is expressed by using the labor input, labor input share of each sector, and labor productivity of each sector, as follows.

$$Y = \sum_{i=1}^{n} Y_i = \sum_{i=1}^{n} LS_i A_i f_i(k_i) , \tag{10}$$

where Y_i, L, and S_i denote real output of sector i, labor input of the economy on a man-hour basis and the share of labor input in sector i, respectively.   In addition, the production functions of each sector are assumed to be homogeneous of degree one. Transforming equation (10) into growth rate form yields equation (11) below.

$$\frac{\Delta Y}{Y} = \sum_{i=1}^{n} \frac{Y_i}{Y} \frac{\Delta A_i}{A_i} + \frac{\Delta L}{L} + \sum_{i=1}^{n} \frac{LS_i A_i f_i(k_i)}{Y} \frac{\Delta S_i}{S_i} + \sum_{i=1}^{n} \frac{LS_i A_i f_i'(k_i) k_i}{Y} \frac{\Delta k_i}{k_i}. \tag{11}$$

Under imperfect factor markets, the ratios of wages to rate of return on capital differ across sectors. By using a ratio of relative factor prices for industry i to a benchmark sector, γ_i, defined in equation (8), further decomposition of the terms of ΔS_i and $\Delta k_i / k_i$ yields equation (12) below.

$$\begin{aligned}
\frac{\Delta Y}{Y} = &\sum_{i=1}^{n} \frac{Y_i}{Y} \frac{\Delta A_i}{A_i} + \frac{\Delta L}{L} + (1-\alpha)\frac{\Delta k}{k} \\
&- \sum_{i=1}^{n} \frac{Y_i}{Y}(1-\alpha_i)\left\{ \frac{\Delta \gamma_i}{\gamma_i} - \sum_{j=1}^{n}\left(\frac{S_j}{\gamma_j a_j} \bigg/ \sum_{m=1}^{n} \frac{S_m}{\gamma_m a_m} \right) \frac{\Delta \gamma_j}{\gamma_j} \right\} \\
&- \sum_{i=1}^{n} \frac{Y_i}{Y}\left[(1-\alpha_i)\left\{ \sum_{j=1}^{n}\left(\frac{S_j}{\gamma_j a_j} \bigg/ \sum_{m=1}^{n} \frac{S_m}{\gamma_m a_m} \right) \frac{\Delta S_j}{S_j} \right\} - \frac{\Delta S_i}{S_i} \right].
\end{aligned} \tag{12}$$

In the above equation, the first to third terms on the right side correspond to the growth accounting formula without any distortions. The fourth and fifth terms are added to reflect the effects of factor market distortions. The fourth term represents the impact of intersectoral capital allocation induced by changes of γ when the capital-labor ratio for the economy is held constant. The fifth term indicates the effect of change of labor input share.[16]

Table 1 shows the results of decompositions of GDP growth in Japan since the 1980s, based on equation (12), shown in Nakakuki, Otani, and Shiratsuka (2004).[17,18]

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[16] The effect of the change in labor input shares consists of two parts. One is the indirect effect of the changes in labor input on GDP growth rate through the changes in the capital-labor ratio in individual sectors. The other is the direct effect of labor share changes among high and low labor productivity sectors on the GDP growth rate.

[17] Data used in labor productivity decompositions are as follows: Y: real GDP (SNA), L: number of workers times work hours (SNA), K: real capital stock times capital utilization rate (Japan Industry Productivity Database <JIP Database>), α: nominal compensations for workers divided by nominal gross domestic income (*System of National Accounts*). See Fukao *et al.* (2003) for the details of the JIP database. Note that capital stock and capital utilization rate in the JIP Database are available only up to 1998.

[18] It should be noted that the quality of workers is assumed to be constant over all industries. Thus, labor reallocation from a low-productivity sector to a high-productivity sector results in an increase in aggregate labor productivity.

We can see from the table that, in addition to the declines in TFP growth and in number of workers, capital accumulation and distortions in factor markets contribute to lowering GDP growth in the 1990s. From the bubble period to the post-bubble period, the total decline in GDP growth is −3.6%. The contribution from the TFP growth is estimated at −1.6%, that from the capital deepening is −1.3%, that from the number of workers is −0.9% and that from factor market distortions is estimated at −0.5%, respectively. In this sense, the results are broadly in line with Hayashi and Prescott (2002).

Factor market distortions can account for one-seventh of the decline in the GDP growth rate from the bubble period to the post-bubble period. On the face of it, a contribution of 1/7 of the decline in the GDP growth rate may look small, compared with other factors mentioned above. It should be noted, however, that the above result shows the estimate of the direct impacts of factor market distortions, so that it ignores the indirect impacts. As Hayashi and Prescott (2002) argue, inefficient resource allocation results in lower productivity, and discourages investment that could improve productivity. In other words, the cross-sectional resource misallocation induces intertemporal resource misallocation, and then amplifies the negative impact on the economy. In particular, downward pressure on the trend growth rate, partly due to persistent distortions in factor markets, is likely to result in a decline in capital accumulation in high-productivity sectors. Thus, negative indirect effects of distortions in factor markets are likely to be counted as the effects of other factors such as the decline in capital deepening.

C. Policy Implications of Structural Adjustments

The aforementioned aspect of Japan's asset price bubble, with its consequences for structural adjustments since the 1990s, is important because it illustrates the specific environment in which the BOJ has had to conduct monetary policy. What the BOJ has faced is not a standard stabilization policy around a stable trend growth path, but unanswered policy management questions in an environment in which sustained growth has been hampered due to insufficient structural adjustments in response to significant changes in relative prices. In other words, the Japanese economy is suffering from a large-scale and quite persistent adverse shock within the framework of a standard macroeconomic model.

As we have emphasized up to now, the cross-sectional resource misallocation induces intertemporal resource misallocation, which then amplifies the negative impact on the economy. This observation implies that structural factors are more important than cyclical factors as the major cause for the economy's plunge into a deflationary economic environment. It also suggests that the elimination of structural factors themselves is a more effective policy response than measures taken to offset cyclical factors. In other words, monetary policy is no panacea for the economic decline and cannot substitute for policies designed to resolve the structural problems that exist on the supply side.[19]

In the case of a downward shift in the potential growth rate, the economy is likely to fall into deflation and a zero interest rate environment again, since the rate of growth and the natural rate of interest in the steady state are low. It should be noted, however, that this does not necessarily mean that a central bank becomes powerless. Even in such a situation, a central bank can reduce the burden of transition to the new steady state by stimulating aggregate demand mainly through its policy commitments. It may be the case that such structural policies trigger a significant adverse shock in the short term. A central bank could make an unprecedented commitment to assist in correcting a distortion in the economy if the commitment helped the government and firms take consistent actions to restore the potential growth that could make monetary policy meaningful.

In this regard, it is crucial to understand the nature of the adverse shock to the economy. Japan's experience indicates that the economy is suffering continuing stagnation not only because the magnitude of the shock is quite large but also because the shock is quite persistent. Although the central bank can alleviate any large one-time adverse shock, it should be emphasized that it cannot offset a permanent shock to the economy.

V. Concluding Remarks

In this paper, we have examined implications of asset price fluctuations and resultant

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[19] See Yamaguchi (1999) and Shirakawa (2000) for further discussion in the context of Japan. As Bhagwati (1971) discusses, the basic policy response to structural problems is to directly attack their sources and induce a transfer of economic resources from agents that gain to those that lose, thereby promoting structural reform.

structural adjustments on sustained economic growth, based on Japan's experience since the latter half of the 1980s.

In doing so, we proposed that asset price deflation in Japan in the 1990s is better understood as a reflection of a significant downward shift in trend growth rather than the bursting of a gigantic bubble which amplified the business cycle. A significant downward shift in the growth trend can at least partly be seen as the result of the incomplete economic adjustments to significant changes in relative prices in two dimensions: the intertemporal and cross-sectional dimensions. In this regard, it should be noted that a crucial interaction exists in the changes in relative prices in two dimensions, resulting in a decline in the trend growth rate. Put differently, a downward shift in the growth trend resulting from the incomplete economic adjustments to significant changes in relative prices in the Japanese economy can be regarded as a large-scale and quite persistent adverse shock.

The above observation implies that structural factors are more important than cyclical factors as the major cause for the economy to plunge into a deflationary economic situation in Japan. This aspect of the asset price bubble, with its consequences on the structural adjustments in the 1990s, is important because it illustrates the specific environment in which the BOJ had to conduct monetary policy.

The lesson from the experience of the BOJ since 1990s is that, if a significant and unforeseen slowdown of the potential output growth rate were due to structural problems, monetary policy would inevitably differ greatly from stabilization policy in normal circumstances. Under such circumstances, it is also stressed that the elimination of the structural impediments themselves is a more effective policy response than measures taken for a sustained period to offset cyclical factors. Whether Japan's current economic recovery will turn into sustained economic growth and put an end to deflation depends on its progress in eliminating structural impediments. Of course, monetary policy could assist in correcting a distortion in an economy in transition, but is no panacea for all types of economic maladies and cannot substitute for policies designed to resolve the fundamental structural problems that exist on the supply side.

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Table 1.   Effects of Distortion in Factor Markets on Labor Productivity

	1980-85	1986-91 (Bubble Period) (a)	1992-98 (Post-Bubble Period) (b)	(b)-(a)
GDP Growth	3.96	4.82	1.24	−3.58
TFP	1.39	2.18	0.61	−1.58
Capital deepening	1.51	2.77	1.45	−1.32
Number of workers	0.79	1.29	0.34	−0.94
Work hours	0.04	−1.85	−1.12	0.73
Distortions	0.23	0.44	−0.03	−0.47
Relative MP	0.18	0.11	−0.15	−0.26
Labor input share	0.06	0.32	0.12	−0.21

Source: Nakakuki, Otani, and Shiratsuka (2004), Table 2.

Figure 1. Asset Price Deflation

(1989/IV = 0, in log-scale)
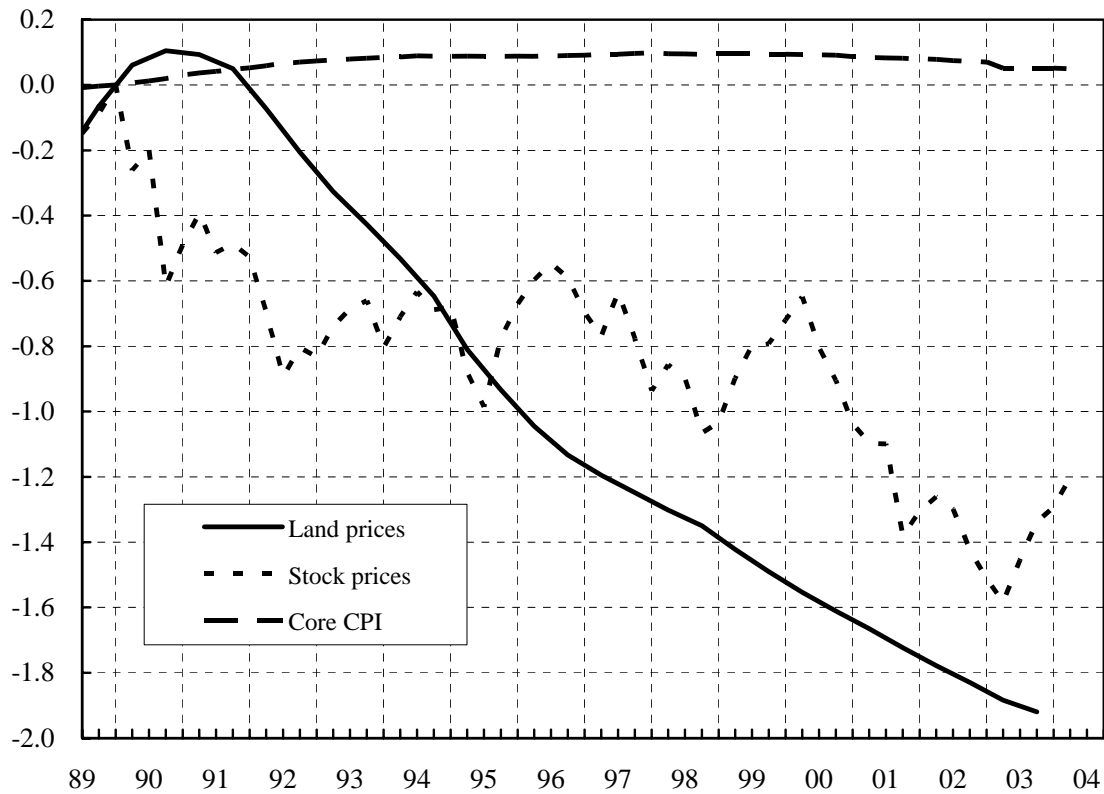
Sources: Bank of Japan, *Financial and Economic Statistics Monthly*; Ministry of Public Management, Home Affairs, Posts and Telecommunications, *Consumer Price Index*; Japan Real Estate Institute, *Urban Land Price Index*.

Notes: CPI excluding fresh food is seasonally adjusted by X-12-ARIMA with options of (0 1 2)(0 1 1) ARIMA model and level shifts in April 1989 and April 1997 when the consumption tax was respectively introduced and subsequently hiked.

Figure 2.   Cross-sectional Volatility of Equity Prices

(01/04/1968=100)
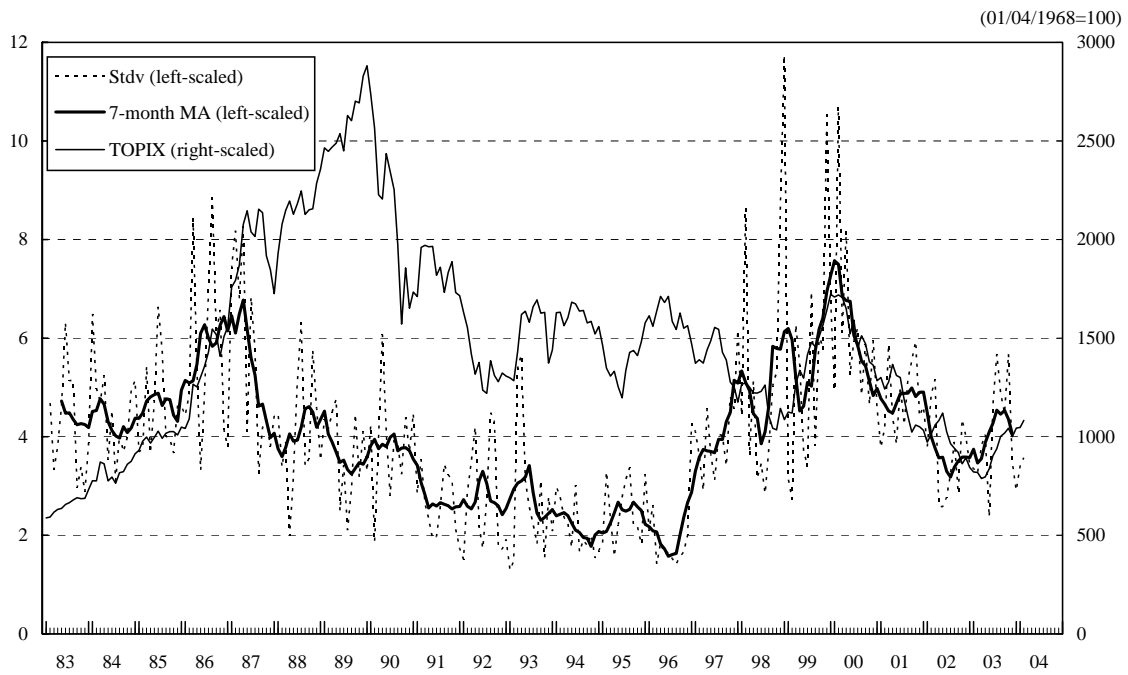
Sources: Tokyo Stock Exchange (http://www.tse.or.jp/english/index.shtml)

Note: Stdv is the standard deviation of monthly changes in TOPIX by industries, categorized by
          33 industries.

Figure 3.   Land Prices

(y/y changes, %)
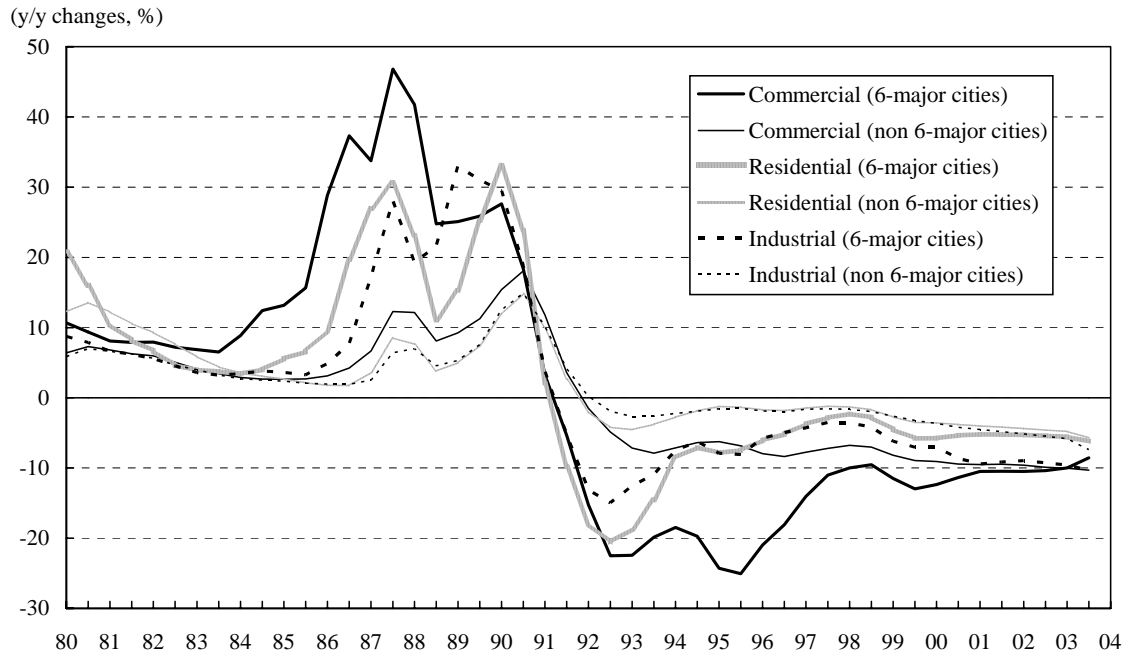
Sources: Japan Real Estate Institute, *Urban Land Price Index.*

Figure 4.   Trend Growth Rate

[1]   Real output level

(trillion yen in logarithm)
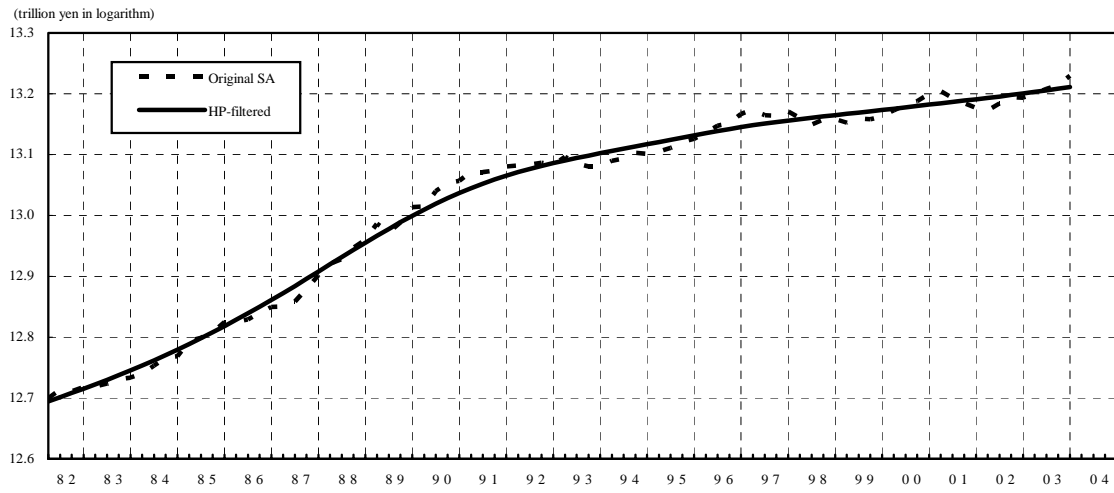
[2]   Real output growth

(%)
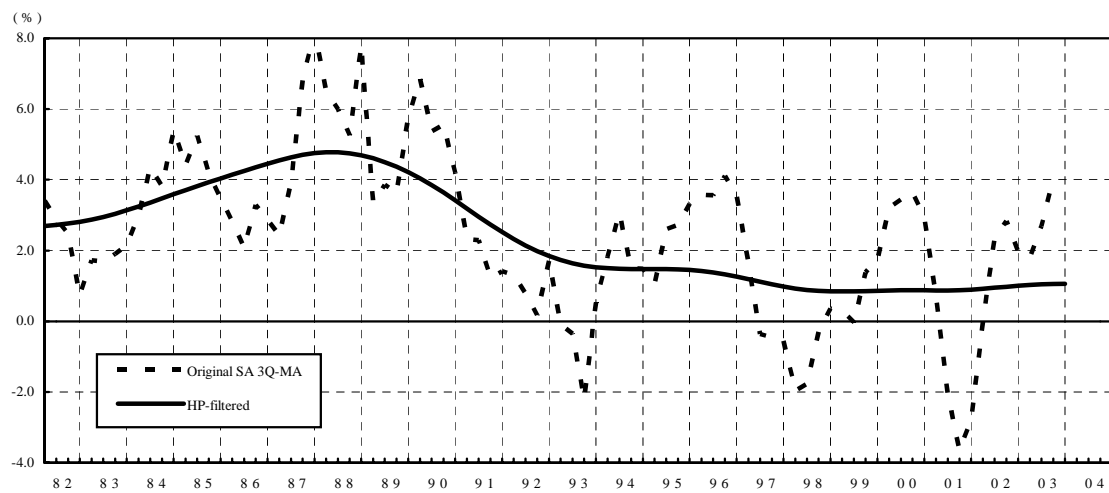
Sources: Bank of Japan, *Financial and Economic Statistics Monthly*; Cabinet Office, *Annual Report on National Accounts*.

Notes: Real GDP on 93SNA basis.   The HP-filtered series is computed for the period from 1980/1Q to 2002/3Q by using the smoothing parameter $\lambda = 1,600$.

Figure 5.　Non-Performing Loans

(Ratio to Nominal GDP, %)

Source:　Financial Service Agency (http://www.fsa.go.jp); Cabinet Office, *Annual Report on National Accounts.*

Notes:　1. Figures are summations of data for city banks, long-term credit banks, and trust banks. (Data for all banks and all deposit-taking institutions are not available before fiscal 1995.)

2. Risk management loans are summations of loans to borrowers in legal bankruptcy, past due loans in arrears for six months or more, and loans in arrears by three months or more and less than six months.

Figure 6. Profitability of Enterprises
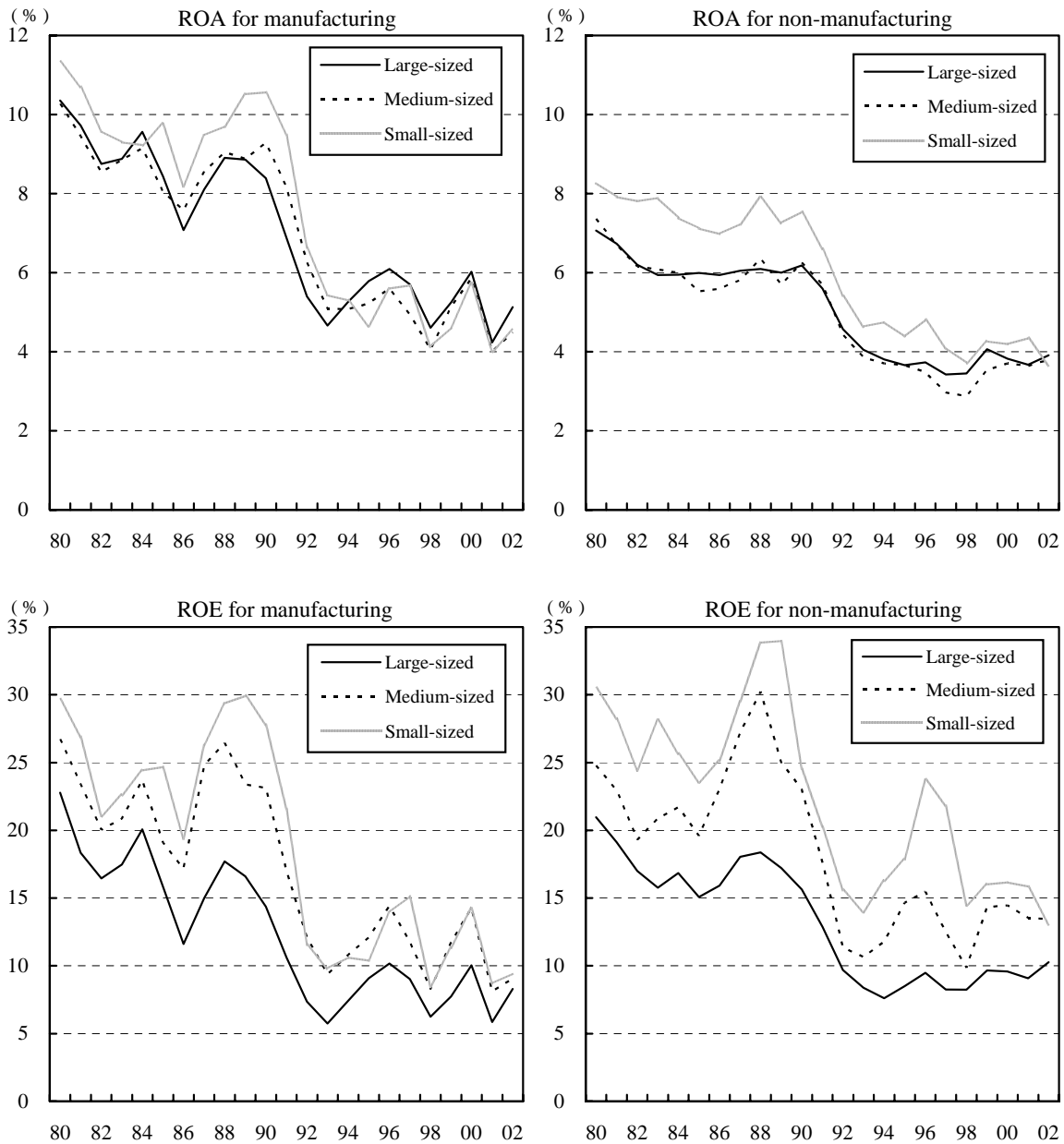
Notes: Definitions of ROA (return on assets) and ROE (return on equity) are as follows:

ROA = (operating profits + other profits)/(total assets)

ROE = (current profit)/(total equities),

where total assets and equities are average values of beginning and end of the period.

Figure 7. Per Capita GDP and Price Level

Source: OECD data (http://www.oecd.org)
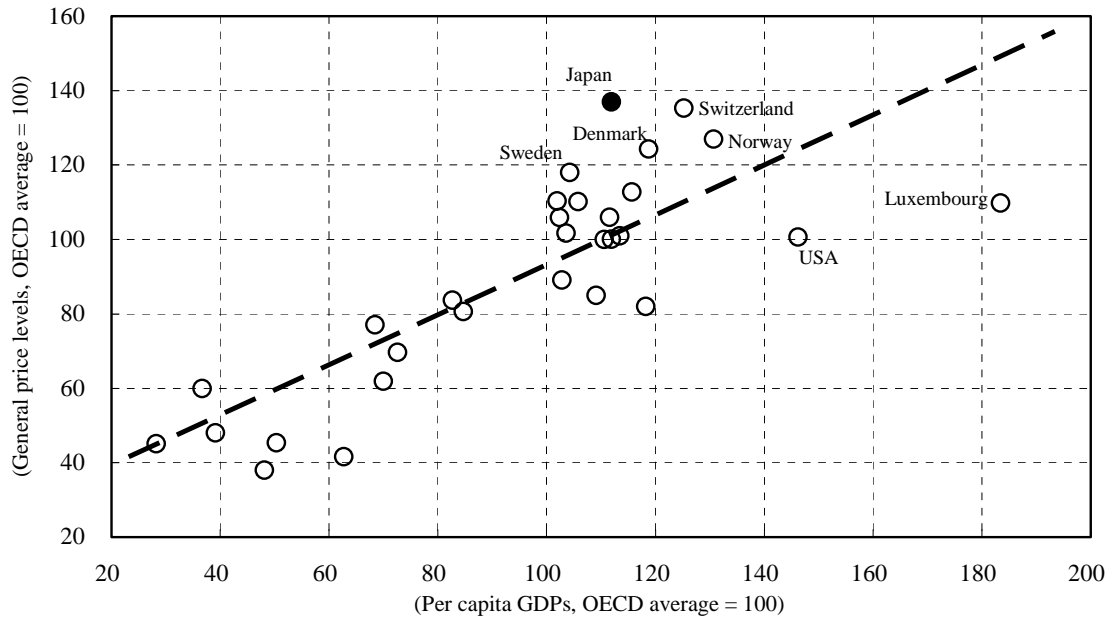
Notes: 1. General price levels and per capita GDP are defined as the ratio of PPP to exchange rates, and per capita nominal GDP deflated by PPP, respectively.

2. Figures are indexed to the USA (equal to 100), and averaged from 1996 to 2002.

## Figure 8. Population Projections

[1]　Total population

(million of persons)
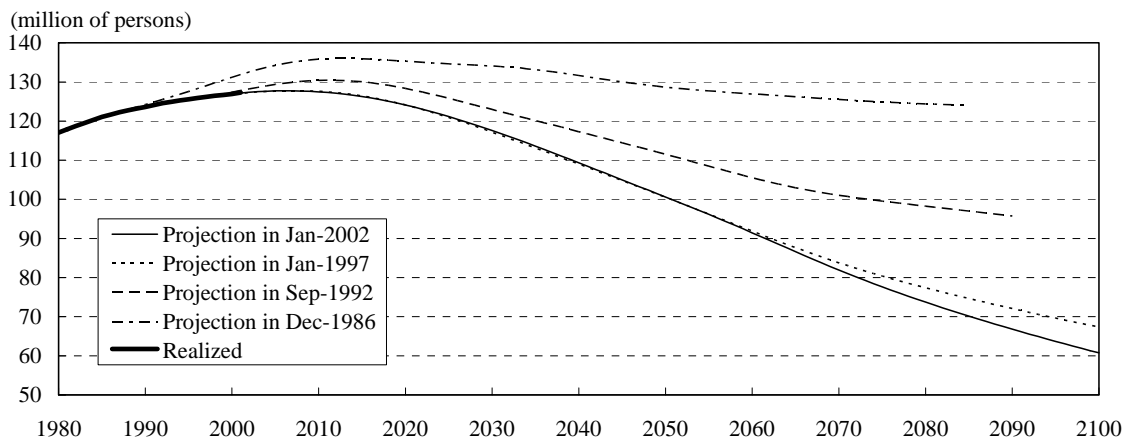
[2]　Working-age population

(million of persons)
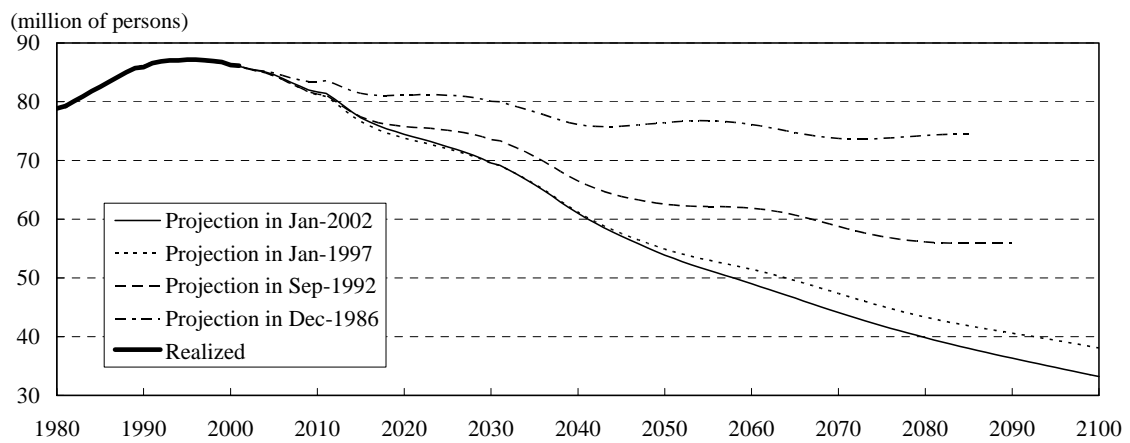
[3]　Dependent population index

(%)
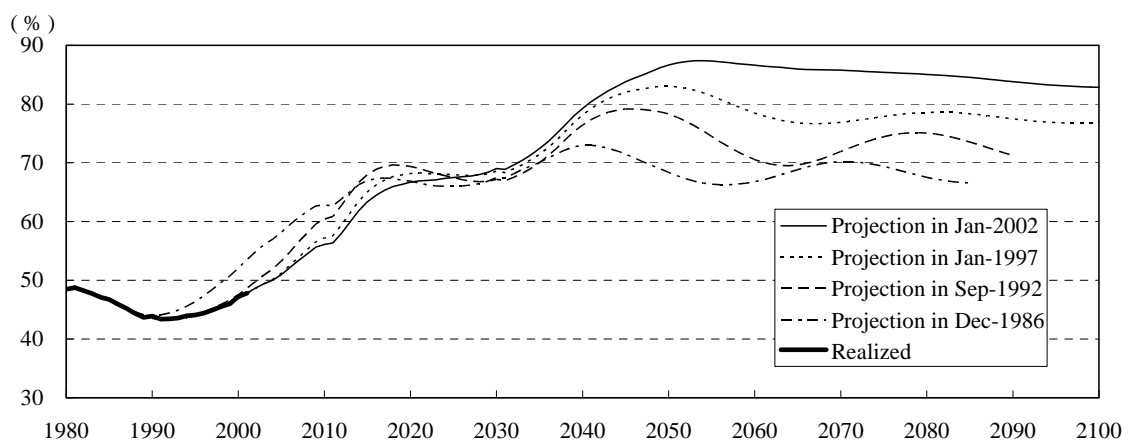
Source: National Institute of Population and Social Security Research, *Population Projections for Japan*, various issues.

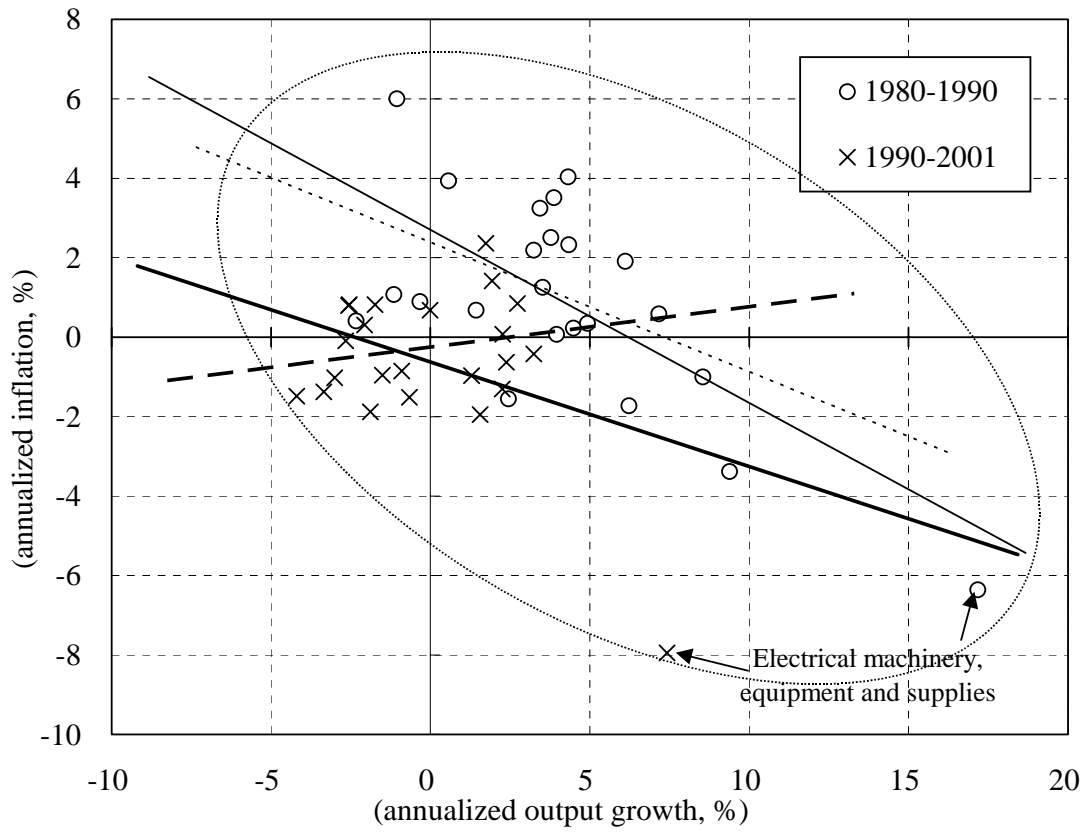Note: Dependent population index is defined as 1−(Working-age population)/(Total population).

Figure 9. Dynamic Equilibrium Price Index (DEPI)
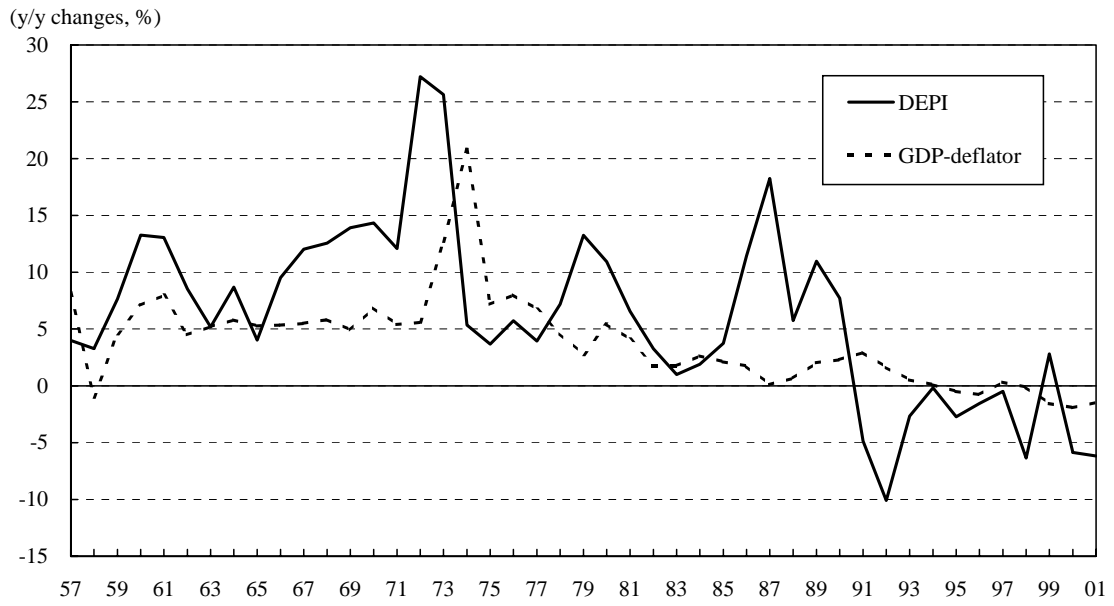
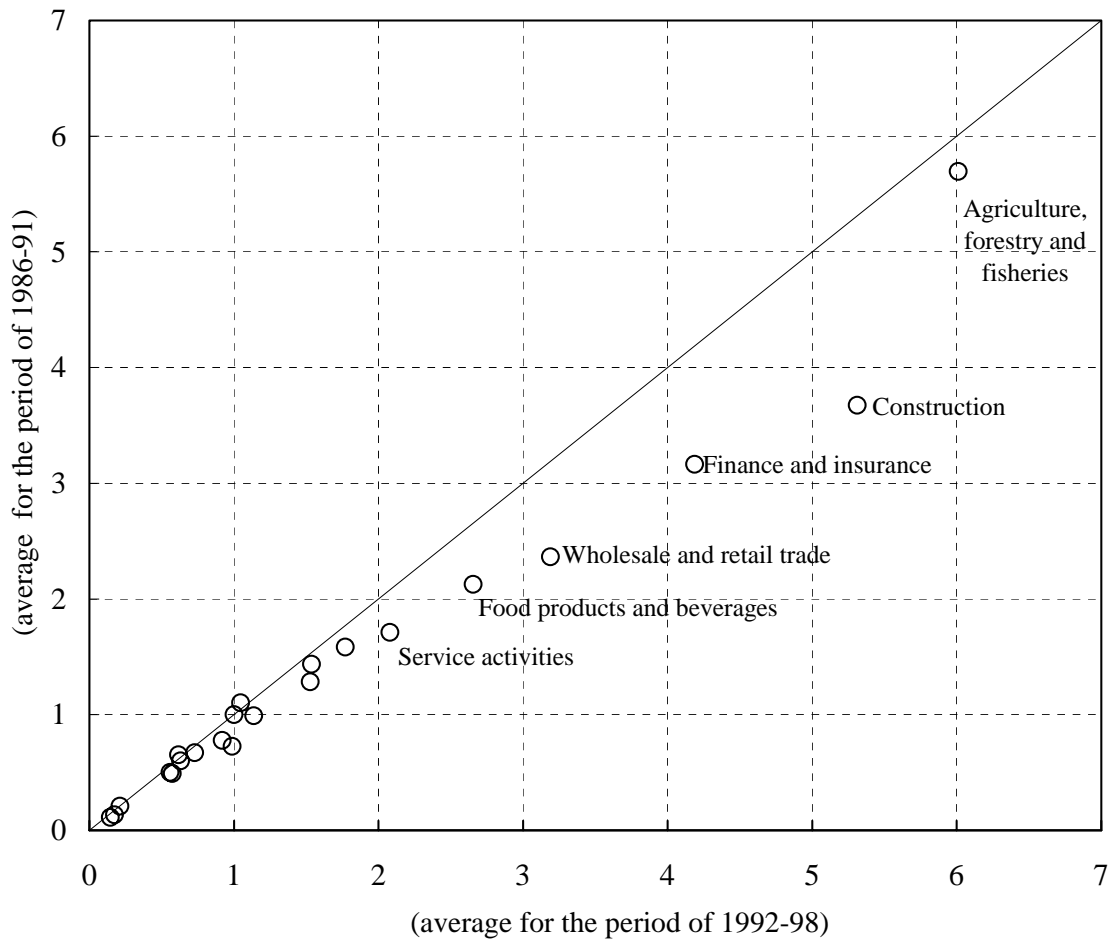Sources: Cabinet Office, Annual Report on National Accounts.
Notes: For details on the calculation method for DEPI, see Shibuya (1992).

Figure 10.   Output Growth and Inflation by Industry

Source: Cabinet Office, *Annual Report on National Accounts*.

Figure 11. Changes in Estimates of γ by Industry

Source: Nakakuki, Otani, and Shiratsuka (2004).

Notes: γ_i is the ratio of relative factor prices in sector i to the base sector. The value $\gamma_i = 1$ implies that the marginal condition holds between the two sectors. If γ_i exceeds unity, then sector i has a lower capital-labor ratio than the base sector. That is, the labor input is too large and/or the capital stock is too low.

Figure 12.   Standard Deviation of Estimates of γ across Industries
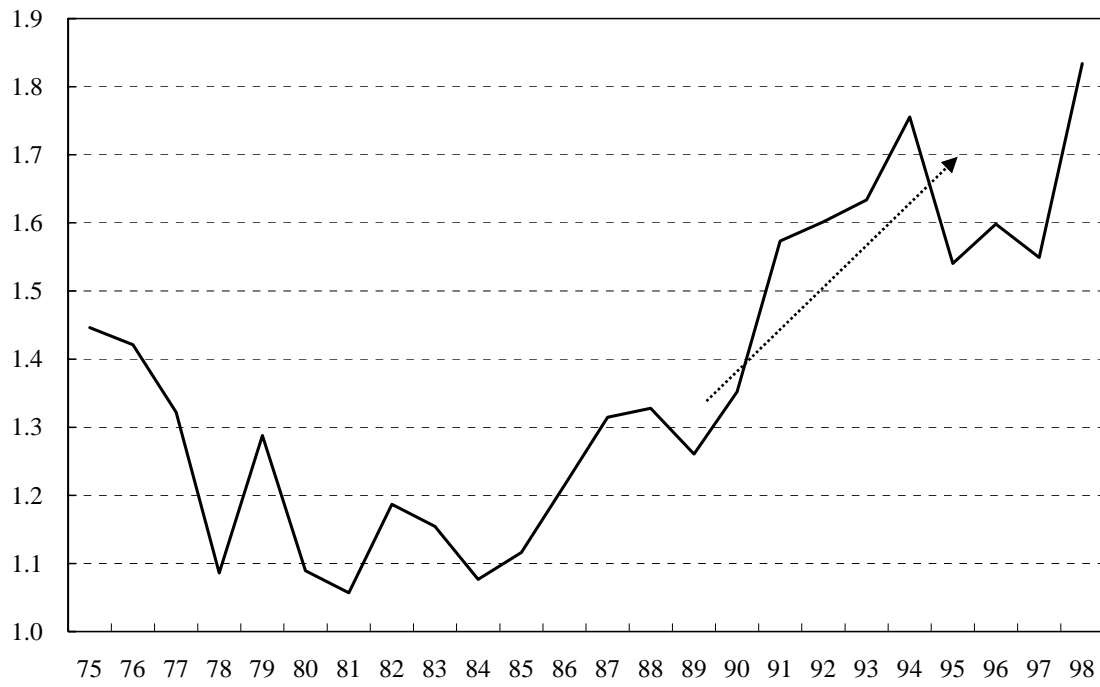
Note: Figures are the standard deviation of γ across industries for each year, based on the estimates in Nakakuki, Otani and Shiratsuka (2004).

Figure 13.   Production Possibilities Frontier