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Does Japan Save Too Much?
Or Do Other Major Countries Save Too Little?
International comparison of savings rates from the modified golden rule approach

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Does Japan Save Too Much?
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Abstract

The purpose of this paper is to examine whether Japan's savings (investment) rate is higher than the optimal level in the neoclassical framework and if so why. Our first finding is that Japan saves optimally when the rate of time preference is assumed to be zero while it over-saves when the real interest rate is used to approximate the rate of time preference. Meanwhile, major Western countries except Germany save close to the optimal level when the real interest rate is assumed to be the rate of time preference while they under-save when the time preference is set to be zero. We also calculate the implicit rate of time preference, assuming that the actual saving rate is equal to the optimal level and found that Japan and Germany have a low and stable time preference throughout the period while the other major countries show a rapid rise in the rate of time preference after the late 1970's.

Regarding European countries except Germany, we make a case that the household sector, which is supposed to have a higher time preference than the other sectors, became more sensitive to the capital returns gained by the corporate sector since the end of the 1970s when capital's share of income had started to rise. This increasing sensitivity of the household sector to capital returns led to contain corporate sector capital expenditure and to stimulate instead household consumption.

Based on these analyses, we conclude that Japan's savings are not too high for the purpose of maximizing long-term economic growth. The low and stable rate of time preference may reflect the fact that the Japanese corporate sector has not been exposed to stricter corporate governance or more intense pressures from institutional investors. As a result, the corporate sector has been able to make investment

decisions based on its own time preference. These factors for the low and stable time preference in Japan, however, have started to fade out gradually as Japanese capital markets go through the same experience seen in Europe during the 1980s. This implies that Japan's savings rate is likely to decline, and, consequently, the investment-savings gap ratio over GDP may start to diminish in the near future.

1. Introduction

Japan's savings have often been regarded as being excessively high and thus causing an international problem. Behind this argument is the view that it is this exceptionally high savings rate which entails Japan's huge current account surplus, based on the idea that the investment-savings balance determines the size of the current account balance. The fact that Japan's prolonged recession is partly due to stagnant consumption also supports the argument for Japan's "excessive" savings.

Whether or not a country is over-saving or under-saving, however, should not be argued based on the absolute amount of the current account balance or by a simple comparison to other countries. Savings is consumption "in the future" by itself, and present and future consumption are connected through investments which expands a country's future output. Thus, it is natural to assume that consumers behave so as to maximize their utility of consumption over their lifetime rather than present consumption. Under this assumption, only when the cost of giving up a present consumption is greater than the marginal utility of future consumption after being discounted at present value, we can conclude that current savings are excessive. This is because reducing savings (future consumption) and increasing present consumption would improve the total lifetime utility. This idea is formulated as the "modified golden rule" in the neoclassical growth theory. The "optimal" savings rate in this context is defined as the one where the intertemporal utility of lifetime consumption is maximized.

The level of this optimal savings rate basically depends on the following two factors: (a) the magnitude of the return from past investment (past savings), and (b) the

degree of impatience to give up present consumption for future consumption[1]. Capital's share of income and the rate of time preference represent these two determinants, respectively.

To help intuitive understanding, let's suppose a society where capital has a 20% share of income while 30% of income goes to long-term savings. We can fairly say that this society is over-saving because they give up 30% of income while the income that past investments create is merely 20% of the total income. In other words, the level of capital stock is so high that it does not produce sufficient returns to compensate for present savings (investment). They can consume more in the present without significantly reducing the future consumption, which is obviously Pareto improving. The optimal savings rate also depends on how the society values present and future consumption (the rate of time preference). The more patient people are toward future consumption, the higher the optimal savings rate and vice versa.

It should be noted that optimal savings in our framework refers not only to household savings, but to national savings which covers the government and corporate sectors as well. Our motivation to focus on national savings is to incorporate the effects of socially embodied savings schemes such as the seniority wage system and publicly run pension funds[2]. Under the corporate and government veil, it is reasonable to assume that households choose national savings to maximize their intertemporal utility.

The purpose of this paper is to examine whether Japan's savings (investment)

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[1] Under the modified golden rule, the optimal savings rate is described as

$$s = \alpha^*\mu/(\mu+\rho)$$

where

s: optimal savings rate, α: capital's share of income, μ: the rate of natural growth, ρ: rate of time preference.

It is obvious that when $\rho=0$, the optimal savings rate is equal to capital's share of income. See the next section for a more detailed explanation.

[2] For example, the seniority oriented wage system and the publicly run pension system may function so that the corporate and government sectors, respectively, serve as agents for household sector savings. In this case, the development of household saving rates over time does not necessarily show a hump-shaped line as implied by the life cycle hypothesis, even if households behave as assumed by the life cycle hypothesis.

rate is higher than the optimal level in the neoclassical framework and if so why. International comparison enables us to say whether the other major industrialized countries save less than the optimal level as well. The structure and the main findings of this paper may be summarized as follows.

We first look at recent developments of savings and investment rates in major countries, and review the concept of optimal growth and savings rates in the neoclassical framework. Then, we examine the difference between the actual savings rates and the optimal rates which are derived assuming the time preference rates suggested by the previous studies. We conclude that Japan saves optimally when the rate of time preference is assumed to be zero while it over-saves when the real interest rate is used to approximate the rate of time preference. Major Western countries except Germany save close to the optimal level when the real interest rate is assumed to be the rate of time preference while they under-save when the time preference is set to be zero.

Next, we calculate the implicit rate of time preference, assuming that the actual savings rate is equal to the optimal level. Then we examine whether the development of the implicit rates can be explained as a reflection of rational economic behavior or not. In the latter case, we may suspect that the savings are likely to be over or under the optimal level. What we found is that Japan and Germany have a low and stable time preference throughout the period while the other major countries show a rapid rise in the rate of time preference after the late 1970's. The underlying reasons may be that in the European countries, the household sector which is supposed to have a higher time preference than the other sectors, became more sensitive to the capital returns gained by the corporate sector since the end of the 1970s when capital's share of income and pressures to increase capital returns had started to rise. This increasing sensitivity of the household sector to capital returns led to contain the corporate sector capital expenditure and to stimulate instead household consumption. In the United States, government as well as household saving rates have fallen during the period for several reasons.

Finally, our analysis indicates that Japan's saving is not too high for the purpose of maximizing long-term economic growth. The low and stable rate of time preference may reflect the fact that the Japanese corporate sector has not been exposed

to stricter corporate governance or more intense pressures from institutional investors. As a result, the corporate sector has been able to make investment decisions based on its own time preference. It is also important to note that the stable time preference rate from the 1990s was caused by the expansion of government expenditures (the decrease in government sector savings), which significantly offset the rapid increase in household savings, caused by growing uncertainty regarding future income. These factors for the low and stable time preference in Japan, however, have started to fade out gradually as Japanese capital markets go through the same experience seen in Europe during the 1980s. Also, it seems unlikely that government expenditures will be cut smoothly along with a recovery of household consumption caused by lessened uncertainty regarding future income. Thus, we conclude that Japan's savings rate is likely to decline, and, consequently, the investment-savings gap ratio over GDP may start to diminish in the near future.

2. Trends in savings rates, investment rates, and capital output ratios

(Developments of savings and investment rates in major countries)

Chart 1 demonstrates that Japan's national savings rate, both gross and net of depreciation, has far exceeded that of other countries. Japan's gross savings rate, net savings plus depreciation in percent of gross national product, has been stable since the 1970s, while other major nations have seen their savings rates decline during the same period. The net saving rates of all seven countries seem to have declined moderately since the 1970s.

Investment rates show a very similar pattern (Chart 2). Clearly, Japan has invested the biggest fraction of national income for the last several decades. Since the 1980s, the trend in Japan's investment rate remains flat, with some fluctuations caused by the business cycle, while the investment rates of other countries have declined during the same period. Capital's share in income has been around 30--35% and not much divergence is seen among the countries (Chart 3).

(Optimal savings rate)

The modified golden rule states that, under perfect consumption, the marginal product of capital converges to the sum of the natural rate of growth (population growth rate + depreciation rate + technical progress rate) and the social rate of time preference, as a result of a typical household's intertemporal utility maximization. In other words, as the capital stock accumulates and the economy grows, the return from additional investment diminishes. The question is to what extent additional investment is sustainable. The modified golden rule indicates that additional investment should continue until the marginal product of capital equals the sum of the natural rate of growth and the rate of time preference. As a result, under a steady state, we see the following relationship:

$$f(k)' = MPK = \mu + \rho \qquad (1)$$

where

k: capital stock per unit of effective labor,

f(k): gross product (income) per unit of effective labor,

μ: natural rate of growth (sum of population growth, technical progress[3], and depreciation ratio) , and

ρ: social rate of time preference or subjective discount rate.

We assume here the production function with the homogenous of degree 1, substitute f'(k) with the rate of return from capital (r=MPK), and multiply both sides by k/y thereby replacing directly unobservable r with directly observable capital's share of income rk/y. Then the equation can be rewritten as follows:

$$\alpha / (\mu+\rho) = k/y. \qquad (2)$$

[3] Due to the underlying production function, Y=F(K,AL), the technical progress is Harrod-neutral. The terms used here are transformed to effective labor units since they are divided by AL.

Since $\mu k/y$, the break-even-investment to maintain constant capital stock per unit of effective labor, equals investment at a steady state, we can rewrite equation (2) and compute the optimal savings (investment) rate as follows:

$$i = s = \mu k/y = \alpha\mu / (\mu+\rho) \qquad (3)$$

where
i: gross investment rates [4]
s: gross savings rates

Thus, the higher capital's share of income is or the lower the social rate of time preference is, the higher the optimal savings or investment rate (and vice versa).

3. Optimal and actual saving rates and implicit time preference

(Optimal and actual saving rates)

As can be seen from equation (3), the optimal savings (investment) rate is determined by the capital's share of income (α), the social rate of time preference (ρ), and the natural rate of growth (μ). Since we have not seen a big difference in α among countries, assuming the same value of μ across countries, the discrepancy between actual and optimal savings rates is caused by either of two possibilities; some countries save too much (or too little), or the preference to discount future consumption (the rate of time preference) differs among countries.

The rate of time preference cannot be observed directly and thus must be estimated in order to obtain the optimal savings rate when we assume that this rate

[4] In the framework of a closed economy, savings is identical to investment. As Evans (1986) pointed out, if the Horioka-Feldstein paradox holds, a nation's savings and investment rates are highly correlated, and thus this assumption (i = s) is not necessarily unrealistic even in the real world.

might differ from the actual savings rate. For this purpose, it is important to carefully redefine the rate of time preference. ρ is generally interpreted as the cost of giving up present consumption, as the "optimality" refers to the present generation's utility maximization. Many prior studies estimate ρ using Euler equations and consumption functions, or simply use benchmark rates or the real interest rate as a substitute. On the other hand, from the normative point of view, a social planner chooses the rate of time preference so as to maximize utility across all generations.[5] If we "should" give up present consumption for the welfare of unborn future generations, then a social planner chooses a considerably low value for ρ, even zero. Taking these two interpretations of ρ into consideration, we estimate the optimal savings rate by using two different rates of social time preference, namely, zero and the real long-term interest rate. [6]

(Discrepancies between optimal savings rates and the actual savings rates)

Chart 4 shows the comparison between optimal and actual savings rates when zero time preference and real interest rates are used. In Japan, the actual savings rate consistently moves close to the optimal level under the zero time preference while it is significantly above the optimal level if the real interest rate is used as the rate of time preference. Major countries except Germany have shown a contrasting result since the end of the 1970s. Their savings rates seem to be nearly optimal when the rate of time preference is set to be the real interest rate, and are well under the optimal levels when ρ is zero. Previous studies suggest similar results. Miranda (1995) concluded that Japan has not over-accumulated capital stock or saved too much, given the time preference rate below two percent. Boskin (1986) and Evans (1991) showed that the actual savings rate of the United States is clearly below the optimal level.

[5] Some economists such as Pigou, Harrod and Ramsey argue that the government should select desirable policy assuming the zero rate of time preference from the normative point of view (Jones (1976)). Previous studies such as Miranda (1995) and Evans (1991) also use relatively low rates of time preference to estimate the optimal savings rate for the same reason.

[6] In our study, since the estimated ρ from previous studies takes a wide range of values, we used the

(Implicit time preference rate)

If we assume that a representative agent maximizes his utility and hence optimally saves, we can deductively calculate the implicit rate of time preference from the equations shown above. In this case, if the movement contradicts any rational economic reasoning or explanation, it is probably because the saving rates are not optimally chosen and thus entail over or under-saving.

Chart 5 compares the implicitly calculated rate of time preference to the real interest rate. We find that Japan's time preference has been around zero throughout the period, while that of most of the other major countries jumped after the late 1970's along with the movements of real long-term interest rates. Among the major countries, however, Germany (Western Germany) showed a stable time preference of around two percent, until the unification in 1990.

(Summary and implications of the analysis)

From the above analysis, we find two major facts concerning the relationship between the optimal and actual savings rate, and the development of the rate of time preference.

1) The first fact concerns the "level" of the savings rate or the rate of time preference. The criterion for over or under-saving varies according to which rate of time preference is used to calculate the optimal benchmark. Japan's actual savings rate roughly traces the optimal level when the social rate of time preference is assumed to be zero, while it lies well above the optimal level when ρ is substituted by the real long-term interest rate "i". On the contrary, many of the major industrialized countries have been consistently under-saving when ρ is assumed to be zero, while they have saved optimally if ρ is assumed to be i. Germany being somewhere in the middle, exhibits under-saving when $\rho = 0$ and over-saving when $\rho = i$.

real long-term interest rate as an alternative .

2) The second fact concerns the "stability" of the implicit time preference rate. The implicit ρ of Japan and Germany have been remarkably stable since the 1970s, while that of the other major countries increased rapidly in the late 1970s in line with the developments in real long-term interest rates.[7]

Considering that the rate of time preference is basically determined by the shape of the household utility function, that is households' cost of giving up present consumption for the future, it is natural to assume a stable movement of the implicit time preference rate over the long run. The sharp rise of this rate in major countries except Japan and Germany, therefore, contradicts this assumption, implying the possibility of under-saving in those countries. As stated above, however, social systems such as tax and corporate governance systems can lead the time preference to appropriate the socially optimal level, which may be different from the optimal level for the individual.[8] If this is the case, we have to take a closer look at the structural changes that might change the social planner's rate of time preference in major countries except Japan and Germany. In the following section, we explore the underlying factors that give rise to changes in the rates of time preference in the major countries.

(Optimal investment and actual investment)

We also derived the optimal investment rates and the implicit time preference rates based on the actual investment rates in a similar manner. We find that after the 1980s the actual investment rates have deviated from the optimal level by a certain margin (Chart 4). More interestingly, Japan and Germany, where the implied ρ remains

[7] Obstfeld and Rogoff (1996) points out the possibility that the rapid increase in the real long-term interest rate in the 1980's, which may have been caused by the aging of the population, gave rise to the rapid decline in the national savings rates in the major industrialized countries.

[8] The socially optimal level of the time preference rate can deviate from the optimal rate for the individual when the former concerns not only the utility of the present generation but also that of future generation, as indicated by "the Rawlsian theory of Justice".

stable, show a negative divergence (a current account surplus) and the U.S., the U.K., and Canada, where ρ increased in the late 1970's, show a positive divergence (a current account deficit). This finding implies that only the implicit ρ for investments (and not for savings) tends to show some convergence since the 1980s when the liberalization of capital account transactions progressed (Chart 6).[9] This contrast can also be found in the variance of ρ across countries, as the rate for investment measures remained stable even after the 1980s while the variance of ρ calculated by savings measures became greater (Chart 7).

4. Factors that induced the different behavior of the rate of time preference between Japan and Germany, and other major countries

(Factors that changed the implicit ρ)

In this section, we explain the factors that induced the different behavior of the rate of time preference between Japan and Germany, and other major countries, referring to the previous studies. First, we select the period (from 1979 to 1987) when a marked rise in the time preference rate in many countries is observed, and then decomposes the change in ρ during this period into several factors including savings by sector, capital's share of income, and the rate of natural growth. As Chart 8 shows, in France, the United Kingdom, and Italy, the decline in household savings and the increase in capital's share of income contributed to the rapid increase in ρ during the period. In the United States and Canada, the increase in ρ is attributed mainly to the decline in the household and government savings rates.

[9] While the rate of time preference based on savings rates is supposed to be strongly influenced by the preference of the household sector, which is the main provider of savings, the rate based on investment rates seems to be influenced by the preference of investors who allocate their funds among specific corporations. So long as the household sector and investors are the same or share a similar preference, the above two rates of time preference should be similar. In the global economy, however, the investors tend to be increasingly mixed internationally and thus their preference could deviate from that of the domestic household sector.

(Background of the stable ρ in Japan and Germany)

Let's look at Germany first. Blanchard (1998) points out that the increase in capital's share of income in European countries including Germany was a result of the stagnant employment growth since the 1980s, which is considered to be a backlash to the experience in the 1970s when the pace of wage growth overwhelmed that of labor productivity growth. The subsequent increase in capital's share of income alone, however, cannot fully account for the change in ρ because its increase is usually followed by an increase in corporate sector savings (corporate sector savings actually increased in France, Italy and Germany during this period), which partly offsets the gap between capital's share of income and the savings rates.

What seems more dominant in determining the rate of time preference is savings by sector, especially, the decline in the household savings rate in European countries except Germany. Then, what is the driving force that fostered household consumption in those countries during this period? One possible explanation is that households' optimizing behavior has increasingly influenced corporate sector decision making in investment and profit distribution so as to stimulate household consumption at the expense of corporate investment.

Let's consider the historical development of corporate savings and investment rates (Chart 9). We see that in most European countries corporate savings have increased while corporate investment has not grown as much. As Fitoussi and Phelps (1988) pointed out, the expansionary fiscal policy and the high interest rates in the United States induced a worldwide increase in long-term interest rates when the international capital market became more and more unified. This factor, as well as the strong influence of American style return-oriented corporate management over European firms, has resulted in a rise in the required return on investment. This then constrained the investment opportunities of the corporate sector and created a gap

between corporate sector savings and investment. The distribution of this surplus, namely whether it is paid as dividend to shareholders or saved internally for funding future investments, was predominantly determined by shareholders, who increasingly represent the interests of households in many European countries except Germany, as discussed below.

Let's briefly examine the impact from the transfer of corporate decision making from corporate management to the household sector. This supposedly increases the social rate of time preference since the rate of time preference for households with a finite lifetime is considered to be significantly higher than that for the corporate sector, which supposedly runs businesses indefinitely. As a result, consumption increases while savings decrease and investment declines even further.

What distinguishes Germany from other European nations in the development of ρ lies in the difference in household asset holdings (Chart 10). In the United Kingdom and France, risky assets such as stocks and mutual funds have increased rapidly since the late 1970s while German households still own currency and deposits as a significant share of their total asset holdings. Interestingly, the household saving rates in many European countries declined during this period while that of Germany stayed flat. Apparently, this difference may be attributed to the difference in the type of assets held by households because an increase in capital's share of income and thus an increase in the value of stocks is likely to exert more downward pressures on the savings rate of households as the household sector shares in the increasing value of its stock holdings (Fitoussi and Cacheux (1993)).[10] [11] In other words, in major European countries except

[10] Chart 11 shows that stock prices in European countries remained low until the early 80's, then rose rapidly thereafter. One explanation is that after the rise in the required rate of return generally induced a fall in stock prices, stock prices rose due to efforts to improve profitability such as corporate streamlining.

[11] In European countries, the increase in the excess savings of the corporate sector resulting from the decrease in the corporate investment rate tended to increase household stockholders' income via an increase in capital gains rather than an increase in dividend payments. Since capital gains are not counted as income under the current SNA system, the increase in consumption induced by the capital gains is supposed to have push down the household savings rate.

Germany, the household sector came to have stronger interests in corporate profits via the increased sense of corporate governance or the increased popularity of stock assets. In European countries other than Germany, this phenomenon may have lifted the social time preference rate and thus contained the capital expenditures of the corporate sector, while stimulating household's consumption.

Japan, on the contrary, has not seen an increase in capital's share of income. As the previous studies suggest (Frankel(1991), Fukao(1993), Ando and Auerbach(1990), McCauley and Zimmer(1989)[12]), capital markets did not necessarily demand a higher required rate of return mainly due to the peculiar Japanese capital market structure, and the ratio of risky assets in total household asset holdings remained very low. As a result, the rate of time preference has remained low.

(Comparison of the U.S. and Japan)

Next, let's consider the factors that induced the decline in the household and government savings in the United States. Evans (1992) argues that the dissaving of the household sector was driven by (1) the wealth effect from the rise in asset prices in the real estate and stock markets, (2) the increased access to mortgages and loans, (3) the establishment and development of the social security system, and (4) the baby boomer's dissaving due to their aging.

In the case of the United States, however, it is not only the household savings rate but also the government savings rate which showed a marked decline during the 1980s. In the United States, the government budget balance deteriorated from the oil shock in the early 1970's until the early 1990's, mainly due to the drastic tax cuts and the increase in military and pension spending during the Reagan administration. Chart 12 shows the correlation coefficients between the household and government savings

[12] McCauley and Zimmer (1989) argues that the capital cost in Japan and Germany is low because (1) there is smaller risk premium due to the macroeconomic stability from proper government intervention, (2) there is less asymmetry of information between lenders and borrower due to their close ties under the main-bank system, and (3) households tend to evaluate future consumption relatively higher.

rates. (See Chart 13 for the savings rates of each sector in major countries.) While the other countries show relatively high sectoral negative correlations, we observe no such correlation in the United States. We also regressed the national savings rates on sectoral savings rates, and the results are shown in Chart 14. The results show that the corporate sector has a very strong influence on the national savings rates in Japan and Germany, indicating that the changes in household and government savings rates tend to cancel out each other. Interestingly, only the household savings rate in the U.S. shows a positive coefficient though it is statistically insignificant.

As the regression results indicate, Japanese and European households seem to save so that the overall saving rate remains roughly the same. This result is reminiscent of the Ricardian equivalence between debt and taxes. It states that as long as consumers take the government's intertemporal budget constraints into account, the increase in the government deficit has no effect on the economy. Rational agents, recognizing that debt implies future taxes with a present value equal to the value of the debt, behave so as to offset the decline in overall savings. Some of the previous studies suggest that a significant percentage of Japanese households behave like Ricardian type consumers. This explanation is, unfortunately, not very convincing to us since extensive empirical research has been conducted on this issue both for Japan and the United States, and the validity of the equivalence is still undetermined[13] .

The Japanese government savings rate has declined consistently during the 1990s due to the expansion of public expenditures as well as the decrease in tax revenues under the protracted post-bubble recession. Meanwhile, the Japanese household savings rate has risen from the 1990's. There is a widespread view that this is the result of growing uncertainty regarding future income. Nakagawa (1998) attributes this to the increase in precautionary savings due to the mounting uncertainty

[13] For example, Masson, Bayoumi, and Samiei (1996) showed that the changes in the savings rate of the government sector tend to be offset by those of the household sector in many countries, and the average size of this magnitude among their sample countries is roughly 60%. Kimura (1997) also showed that 60 to 80 percent of Japanese households behave as if Ricardian equivalence holds while the rest are characterized as Keynesian households who are constrained by the amount of liquidity they possess.

regarding future income conditions. In the following sections, we estimate the savings functions for Japan, the United States, and Germany to see if uncertainty is a determinant factor for these countries' consumption.

The method of our analysis is to derive an uncertainty measure and then estimate the savings function based on the permanent income hypothesis with liquidity constraint to see whether or not the uncertainty factor affects savings. The way to compute the variable that represents uncertainty in our analysis is to first estimate real income on the first order GARCH model and then to take the conditional variance of the error term as the variable.[14] The computed uncertainty for Japan is shown in Chart 15. It peaked during the first oil shock and it has been significantly high since 1994.

The results are shown in Chart 16. In the case of Japan only, uncertainty has a significant effect after 1978. This indicates a possibility that, during the 1990's when the government deficit deteriorated, the household savings rate rose as a result of an increase in uncertainty regarding future income conditions[15] .

5. Conclusions

This paper has demonstrated that Japan's saving rate has been high and that this behavior is consistent with the objective of maximizing long-term sustainable economic growth. We have also provided evidence that a rather unusual economic environment has resulted in the stable rate of time preference in Japan while the rates in other major countries except Germany experienced significant changes since the 1980's.

This unusual economic environment in Japan, however, shows some clear

[14] Nakagawa (1998) and Halm and Steigerwald (1999) used the Carlson-Parkin method to compute the expected variance of real income growth and regarded this as the uncertainty variable. We adopted the above method due to the data limitations for conducting international comparisons.

[15] In recent years (particularly after 1999), however, the negative correlation between the government and household savings rates seems to disappear, partly owing to diminished concern regarding the banking system and the subsequent recovery in the propensity to consume.

signs of changes recently, indicating that the Japanese national savings rate is also likely to follow a declining trend in the long run. To put it more concretely, the two factors that caused the increase in the social rate of time preference in European countries in the 1980's are currently underway or about to happen in Japan: the pressure to raise the rate of return on capital and the inclination toward riskier assets in households' portfolios. The large inflow of foreign capital into Japanese stock markets is inevitably putting pressure on the profitability of corporate activities and raising the required rate of return on capital. The percentage of riskier assets in total households' assets will be greater in the near future, considering that the financial intermediary function of banks is gradually diminishing while the role of pension funds is rapidly increasing.[16] In light of the European experience, Japanese household savings are likely to decline as investors pressure for firms to raise their returns is mounting and households gain a stronger influence over the resulting increase in the gap between corporate savings and investment.[17]

It is also unlikely to assume that the long-observed negative correlation between the household and government saving rates will be sustained. As pessimistic expectations of future income conditions are gradually diminishing, households are likely to reduce their precautionary savings. Meanwhile, government savings may not pick up any time soon because the ratio of non-discretionary payments such as interest payments and social security payments, to total spending has risen and because government revenue has become more inelastic to national income.

Given that the Japanese savings rate is likely to decline, we are now interested in what will happen to the Japanese IS balance. Under the changing environment described above, the investment rate is also likely to decline as increasing investor pressure for firms to raise their returns compels firms to become more selective in

[16] The recent widespread trend whereby firms are using their cross-holding shares to cover pension fund shortages may accelerate this development.

[17] It should be noted that it is an increase in the corporate savings rate rather than a decline in the household saving rate which occurs if this increase in the gap is returned to the household sector via dividend payments rather than capital gains.

selecting their investments. Nevertheless, the imbalance between investment and savings is likely to diminish as the decline in savings overwhelms that in investment. This is because one of the factors which expanded the IS gap in Japan since the 1980s is the asymmetric influence of other major countries' time preferences on Japanese investment (strong) and savings behavior (weak), as discussed in "Optimal investment and actual investment" in Chapter 3, and thus only the increase in influence on the savings side is supposed to reduce this gap.

Japan's huge current account surplus had often caused international friction and consequently allowed the frequent political intervention which distorts the market mechanism. In this sense, the decline in Japan's current account surplus might be a welcome sign. It may be true, however, that Japan's economic management in the past depended heavily on this peculiar economic make-up. For example, while continuously posting a current account surplus fosters expectations of a continuous appreciation of the yen, this also helps in realizing low interest and inflation rates on one hand, and low country risk and consequent smooth government financing on the other. A future decline in the savings rate and reduction in the IS gap, therefore, might require Japan to prepare a new economic management system which can maintain low inflation rates and smooth government financing without the benefits of a constant current account surplus.

Appendix 1: Data Explanation

This Appendix describes the parameter values that were used in this paper in detail. Since our methodology owes much to Miranda's work, the parameter values he used are also described.

Capital's Share of Output (α):

We define capital's share of output (α) as the ratio of operating surplus plus depreciation of fixed capital to gross national product. Furthermore, we deducted the operating surplus of the unincorporated non-financial enterprise sector by 65 percent, assuming that a part of the operating surplus goes to labor's income at the same proportion as labor's aggregate share of output. Chart 3 shows that the adjusted ratio (α) has been stable between 32 and 35 percent since the first oil shock while "net" capital's share, defined as (1 – compensation of employees / national income), declines over time. This implies that the adjusted ratio declined as the depreciation rate and the ratio of employees to total employed persons increased. Miranda, on the other hand, assumes this ratio to be 35%, an averaged value from national accounts, and 40%, an estimate based on the production function.

Rate of Depreciation of Fixed Capital (δ)

The rate of depreciation is defined as the depreciation of fixed capital (assets) divided by fixed reproducible capital stock of the previous year. Since Japan's Economic Planning Agency publishes two sets of capital stock, we accordingly use both gross- and net-based depreciation rates. Gross capital stock assumes that no depreciation occurs until the assets reach their average service life and they all exit simultaneously ("simultaneous exit"). Net capital stock, on the other hand, assumes that the capital stock depreciates according to the pattern that appears in corporate accounting. While the former assumption seems unrealistic, the latter may overstate the speed of depreciation as most of the Japanese firms adopt "declining balance depreciation" for

tax purposes, while most other major industrial countries adopt the straight-line-depreciation method. Unable to specify which assumption better approximates the true "economic depreciation", we use the results under both (gross and net) cases. See Chart 17 for the historical developments of depreciation rates in major industrial countries. Meanwhile, Miranda uses 7 and 9 percent as the rate, which does not seem to be consistent with any of the measures discussed above.

Rate of Technical Progress (g)

We assume the rate of technical progress to be one percent. This value is consistent with the total factor productivity estimated in Matsuura et al (1998). Miranda uses 0.5 and 1 percent.

Growth Rate of the Labor Force (n)

We calculated the growth rate of the labor force in each year and used this as the parameter value. Miranda uses 0.5 percent, which is close to the average of the last 5 years, 0.6 percent. See Chart 18 for an international comparison of labor force growth.

Social Rate of Time Preference (ρ)

There is little direct empirical evidence regarding the rate of time preference. We assume ρ to be zero as Miranda did, and also to be the level of real long-term interest rates[18] (See Chart 3). How the social rate of time preference is endogenously determined is a question to be investigated in future research.

[18] Real long-term interest rates are smoothed using the Hodrick-Prescott filter with the smoothing parameter set to be zero.

Appendix 2: Estimation of the Savings Function

In order to see whether or not uncertainty factor affects savings, we estimate the savings function based on the permanent income hypothesis with liquidity constraint, including one independent variable which represents the uncertainty factor. To put it more concretely, we estimate the following reduced form function using the maximum likelihood method assuming a first order serial correlation in the error terms.

$$S_t - S_{t-1} = a1 + a2 * R_t + a3 * RISK_t + a4 * \log(y_t / y_{t+1}) + e$$

Intuitively, the above function indicates that rational individuals who maximize their inter-temporal utility increase their precautionary savings at t when they face high uncertainty at t. Savings also increase when income at t increases due to the Latched effects.

We used the following data for this estimation:

R: Real short-term interest rate (assuming perfect foresight)
S: Household savings rate
y: Real household disposable income
RISK: Income uncertainty indicator (see P.9 for more detail)

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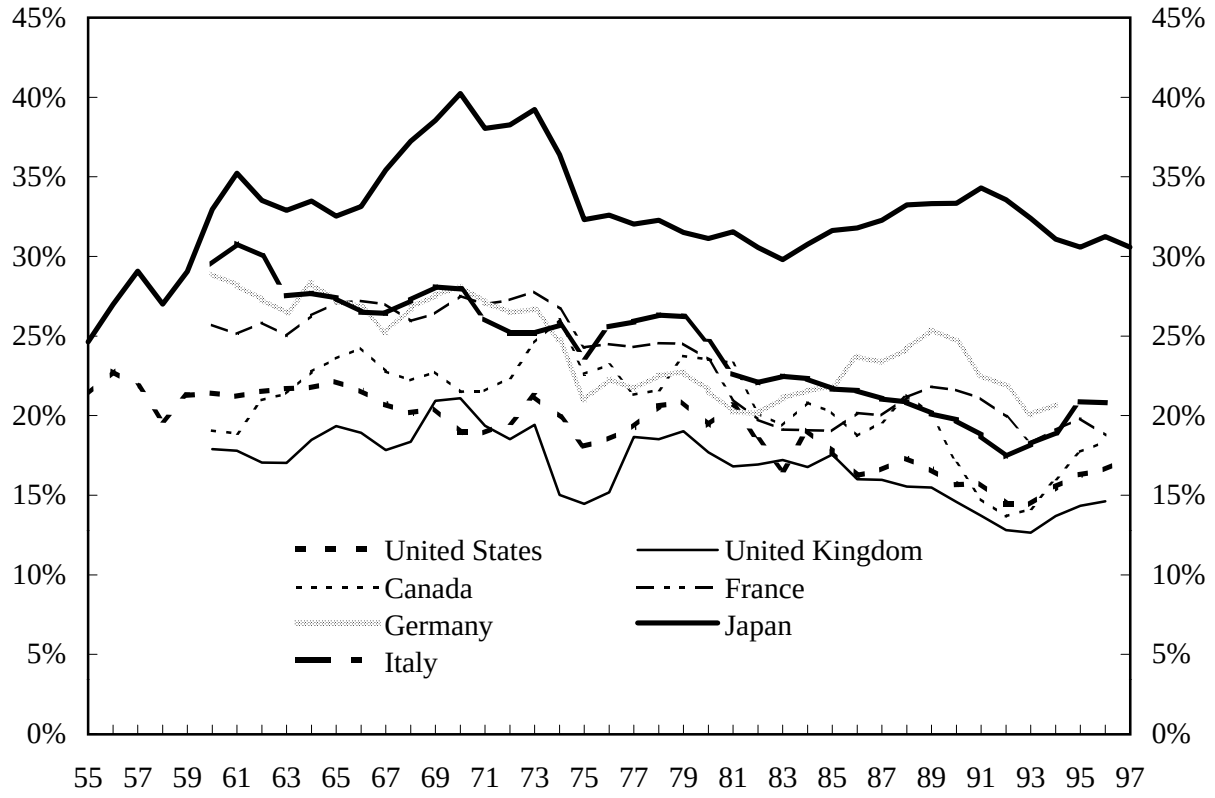
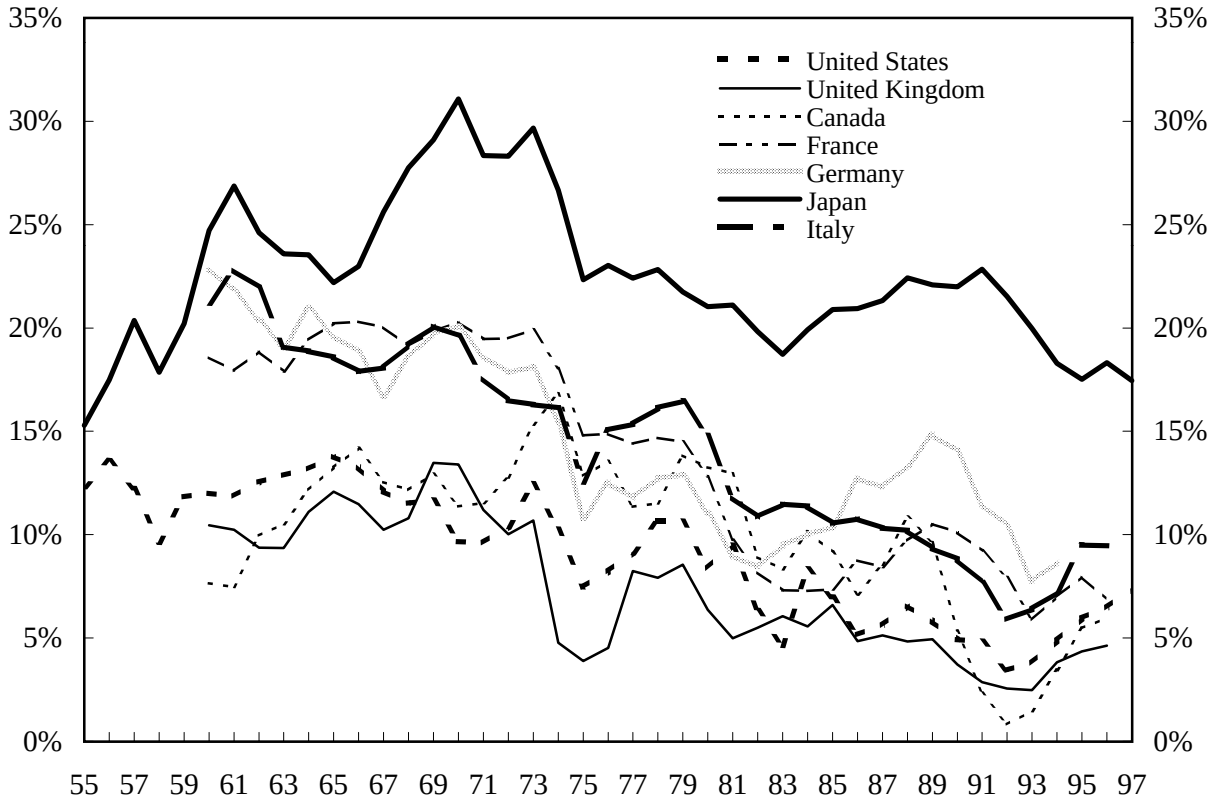
(Chart 1)

Gross National Saving Rates



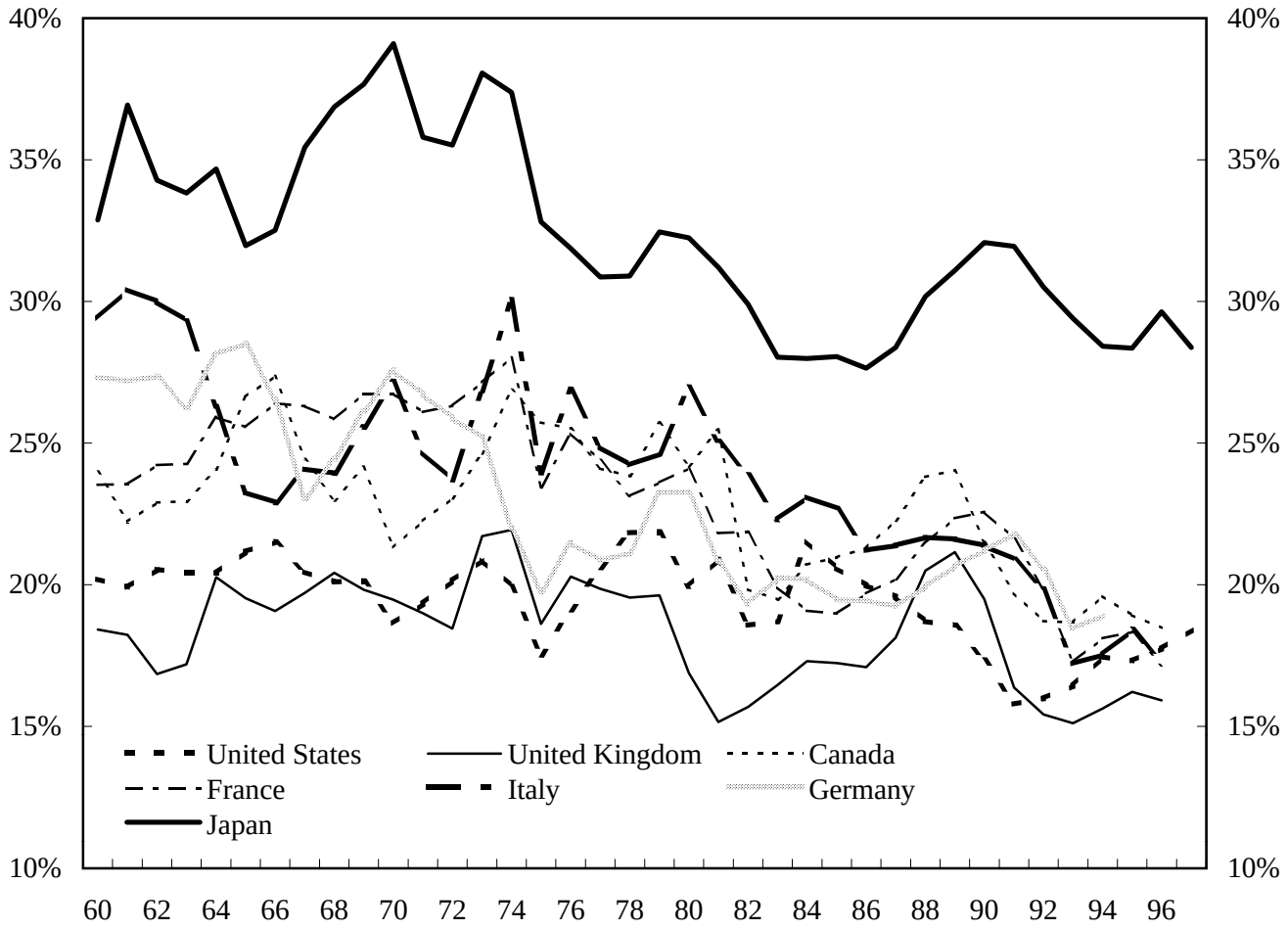
Net National Saving Rates



Notes: 1. Gross Saving Rate = {(Net Saving)+(Capital Depreciation)} / GNP
2. Net Saving Rate = (Net Saving) / NNP

(Chart 2)

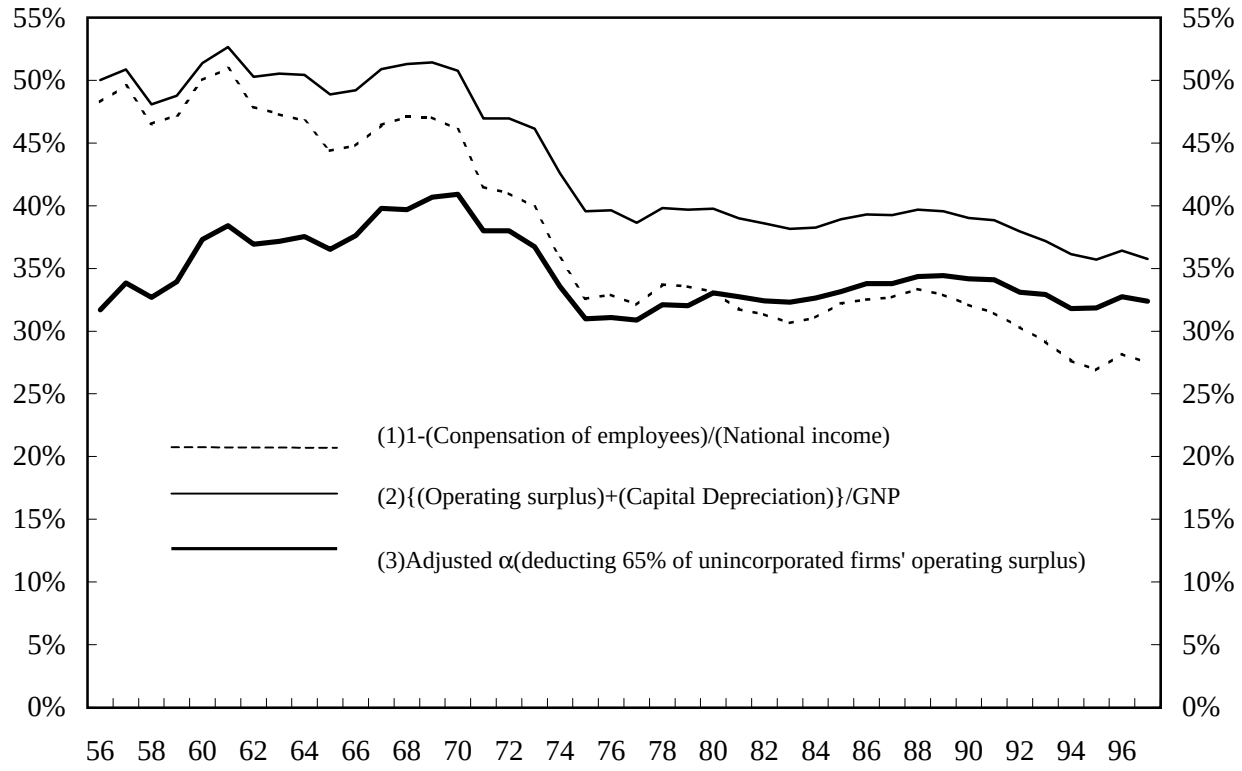
Gross Investment Rates



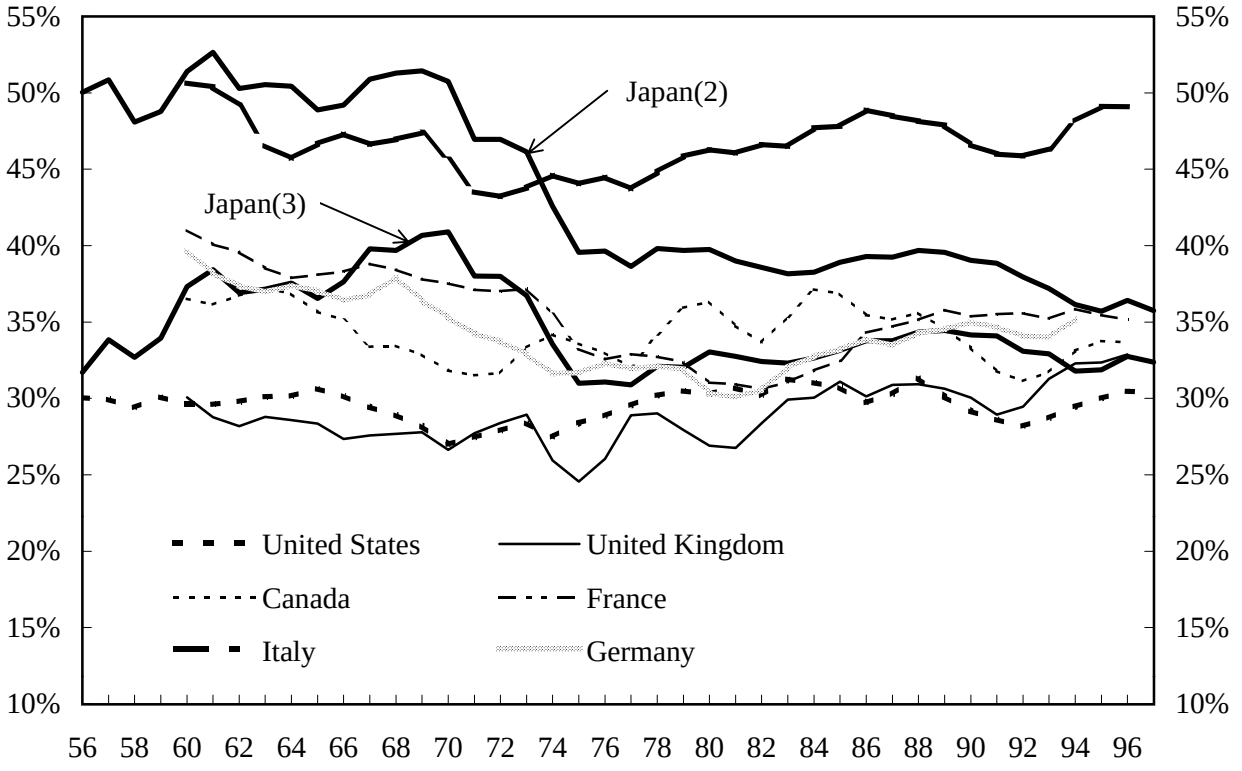
Note: Gross Investment Rate = {(Fixed capital formation)+(Increase in inventory)} / GNP

(Chart 3)

Capital's Share of Output(Japan)



Capital's Share of Output of Major Industrial Countries

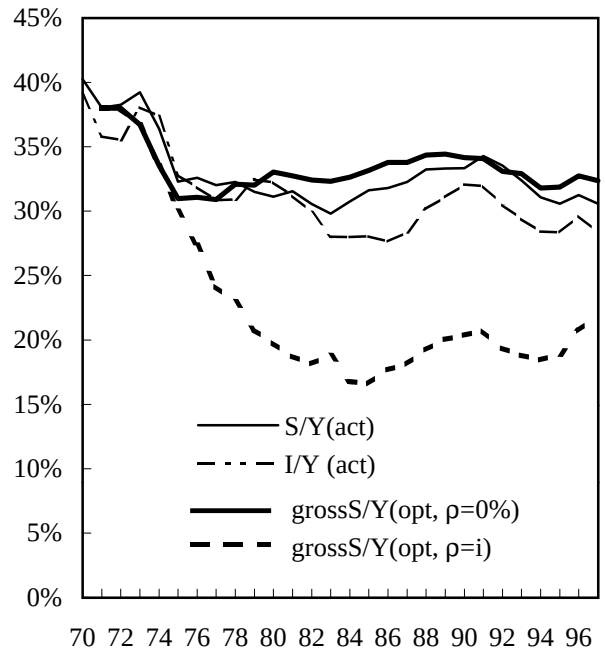


Notes: 1. Japan(3) subtracts two thirds of operating surplus (excluding imputed rent) of the uncorporated firms.
2. Capital's Share of Output in other nations are the sum of oeprating surplus and capital depreciation divided by nominal GNP.

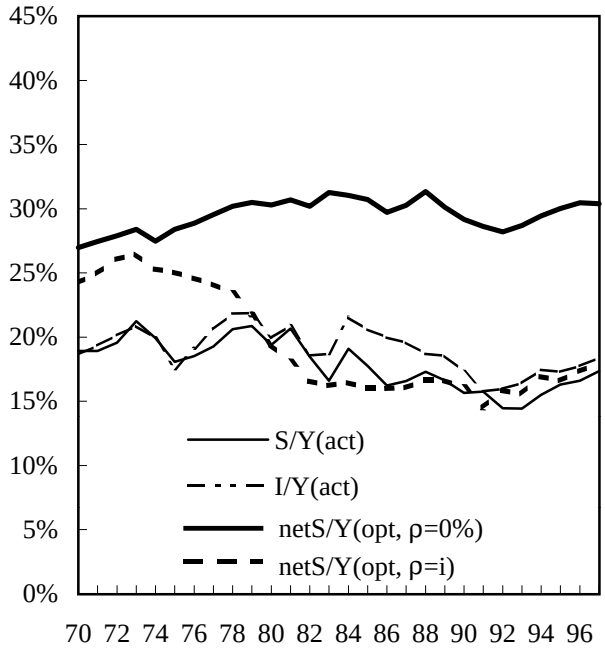
(Chart 4-1)

Optimal Saving/Investment Rate and Actual Saving/Investment Rate(1)

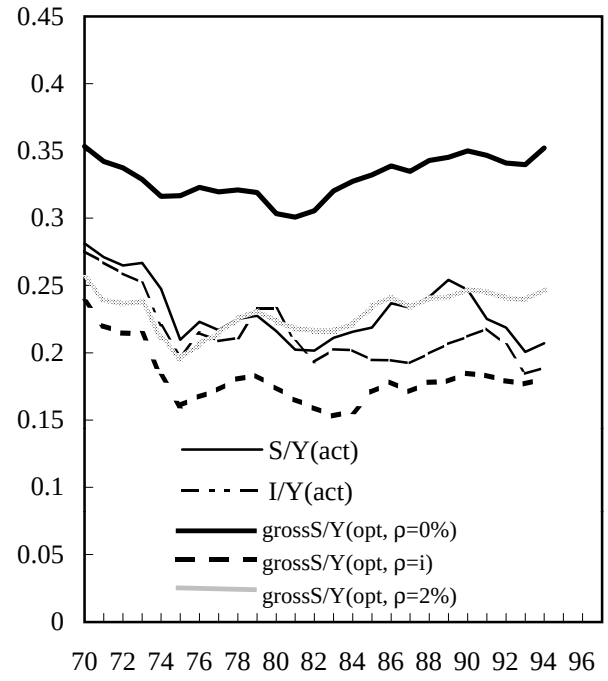
(1) Japan



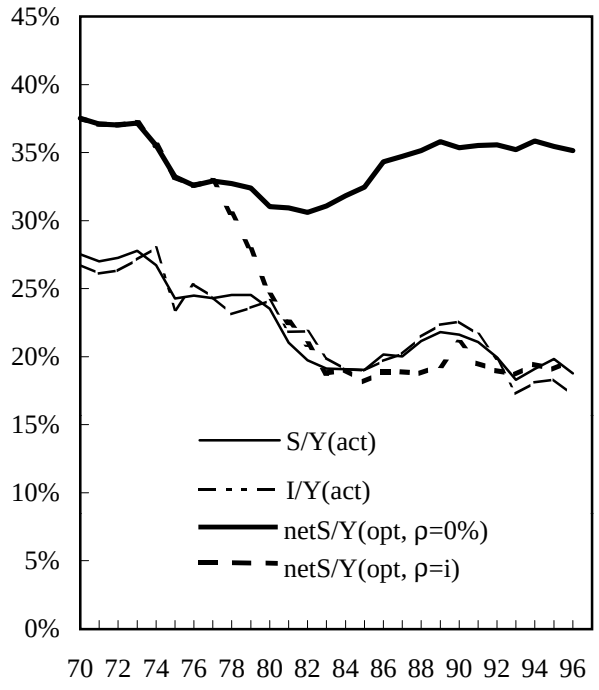
(2) United States



(3) Germany

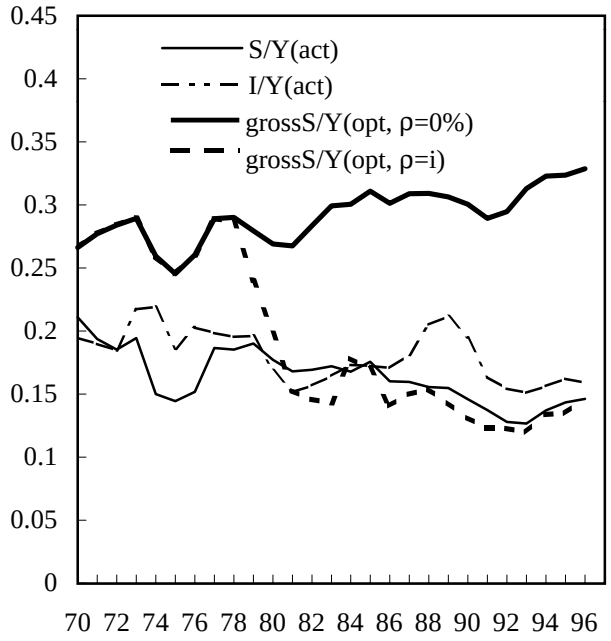


(4) France

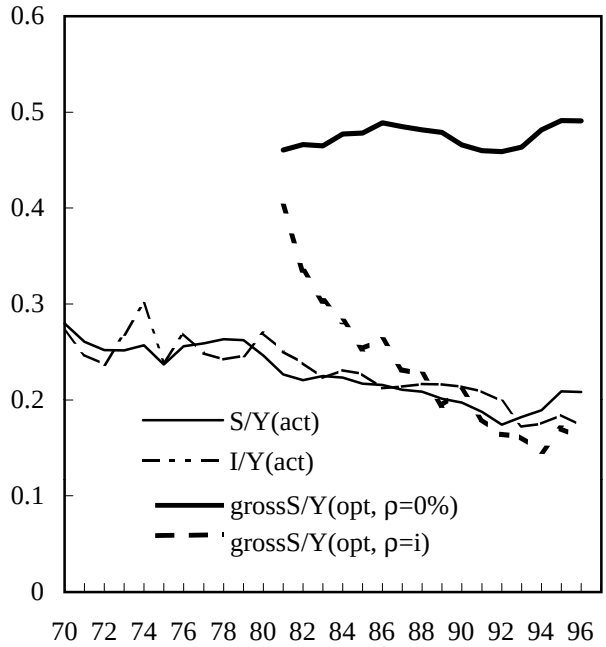


Optimal Saving/Investment Rate and Actual Saving/Investment Rate(2)

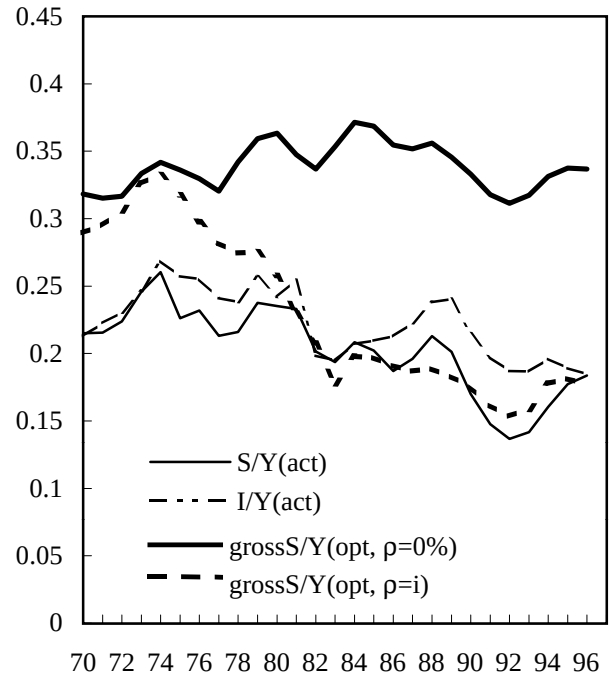
(5) United Kingdom



(6) Italy



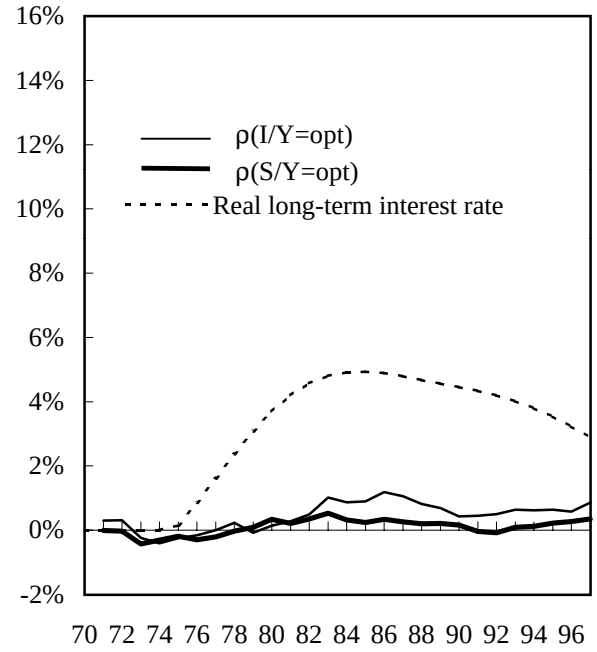
(7) Canada



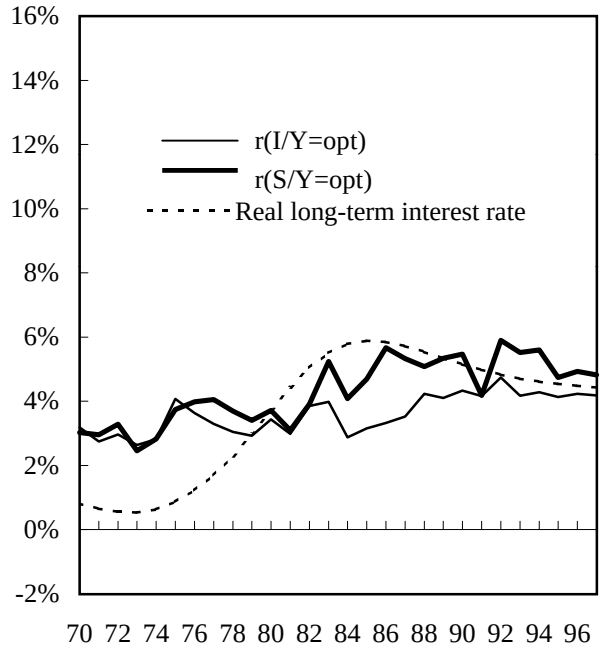
(Chart 5-1)

Implicit Rate of Time Preference and Real Long-term Interest Rate(1)

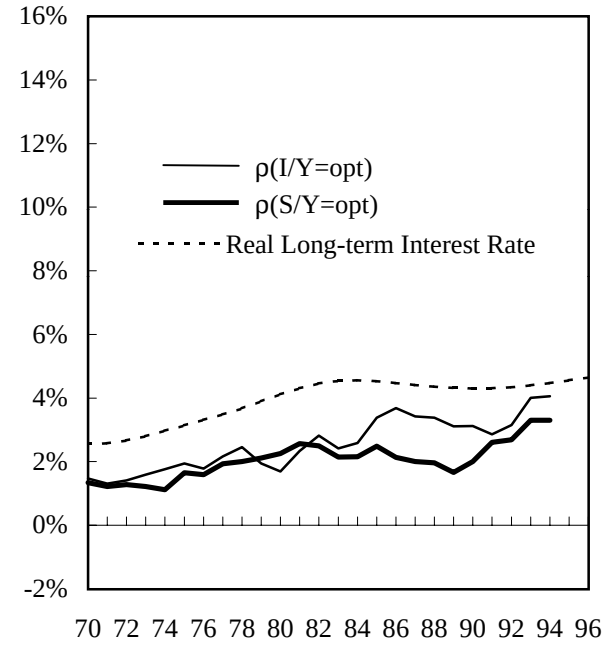
(1) Japan



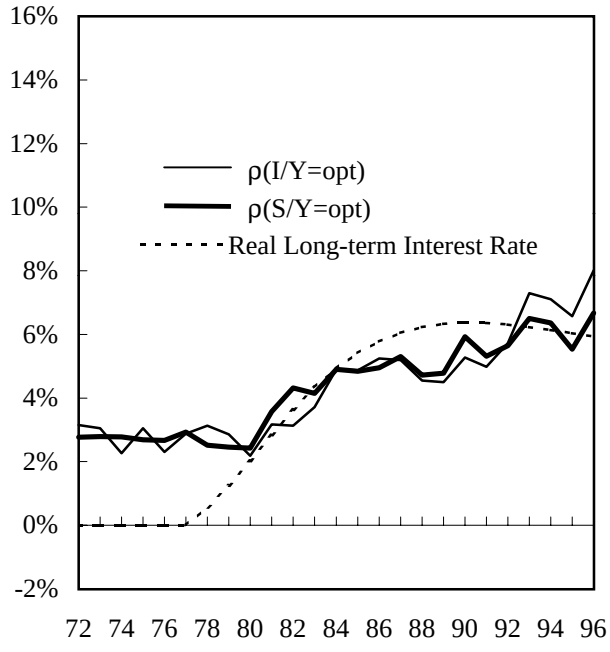
(2) United States



(3) Germany



(4) France



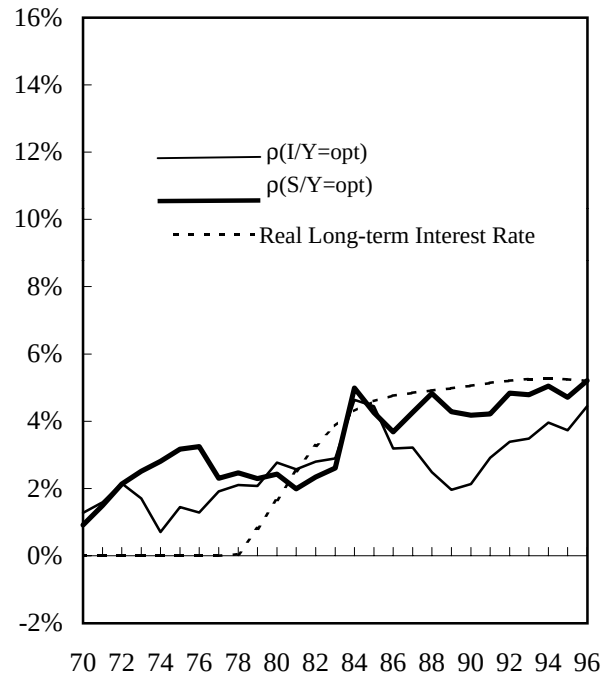
Notes: 1. Capital Stock Data for each country are:
Gross-based Capital Stock: Japan, Germany, United Kingdom, Italy, and Canada
Net-based Capital Stock: United States and France

2. ρ(S/Y=opt) represents implict rate of time preference when actual saving rate is optimized.
implicitρ={α/(actS/Y)-1}*(n+g+δ)
ρ(I/Y=opt)represents implict rate of time preference when actual investment rate is optimized.
implicitρ={α/(actI/Y)-1}*(n+g+δ)

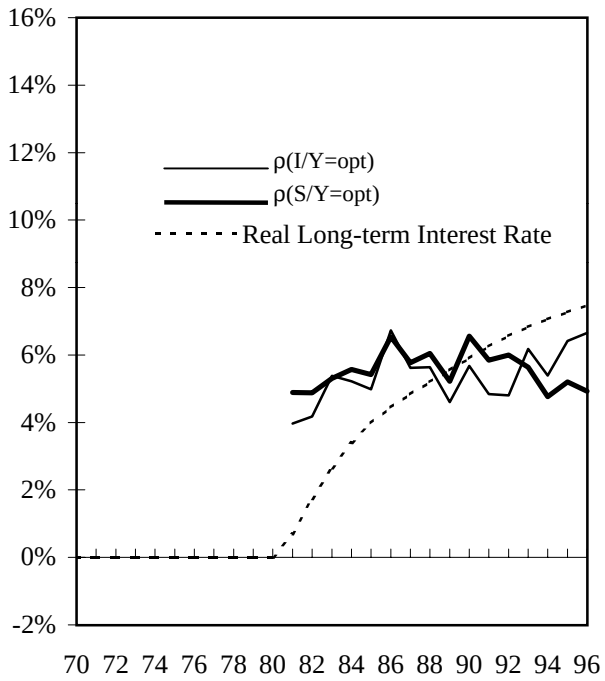
3. Real long-term interst rates are smoothed by Hodrik-Prescott Filter (smoothing parameter =100).

Implicit Rate of Time Preference and Real Long-term Interest Rate(2)

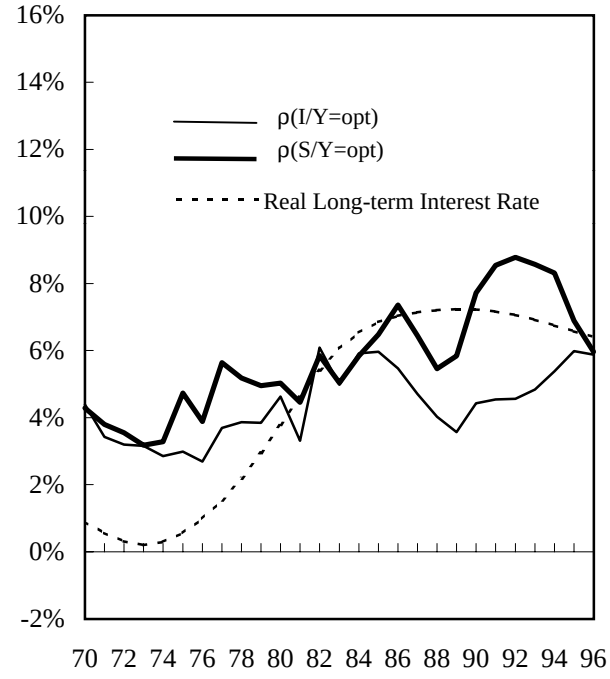
(5) United Kingdom



(6) Italy



(7) Canada



Notes: 1. Capital Stock Data for each country are:
Gross-based Capital Stock: Japan, Germany, United Kingdom, Italy, and Canada
Net-based Capital Stock: United States and France

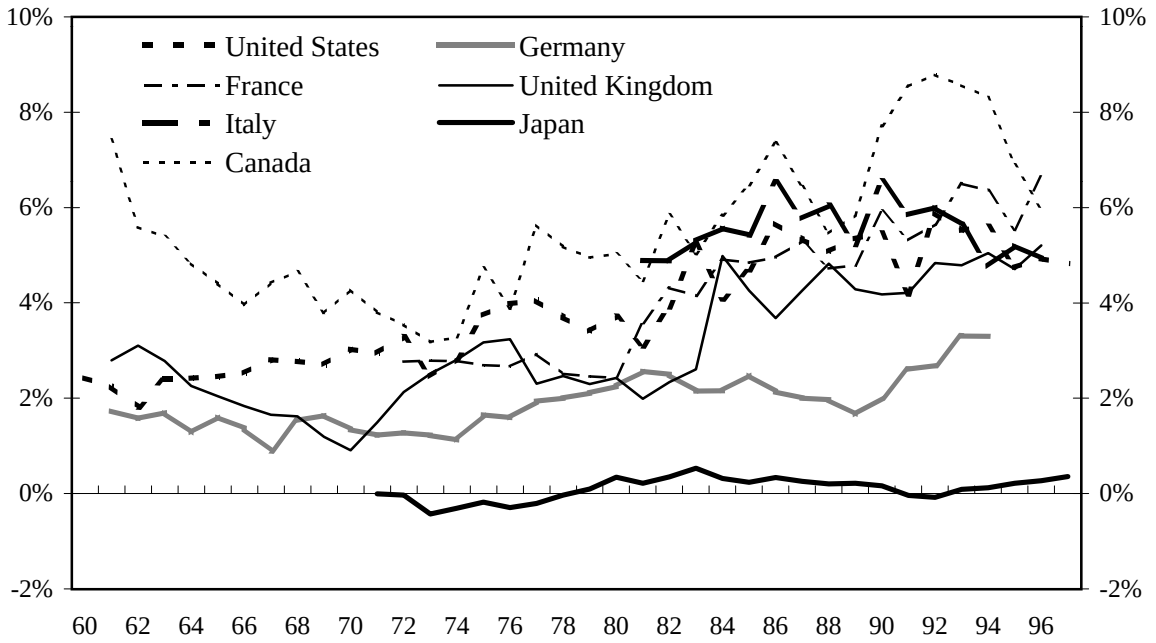
2. ρ (S/Y=opt) represents implict rate of time preference when actual saving rate is optimized.
implicitρ={α/(actS/Y)-1}*(n+g+δ)
ρ(I/Y=opt) represents implict rate of time preference when actual investment rate is optimized.
implicitρ={α/(actI/Y)-1}*(n+g+δ)

3. Real long-term interst rates are smoothed by Hodrik-Prescott Filter (smoothing parameter =100).

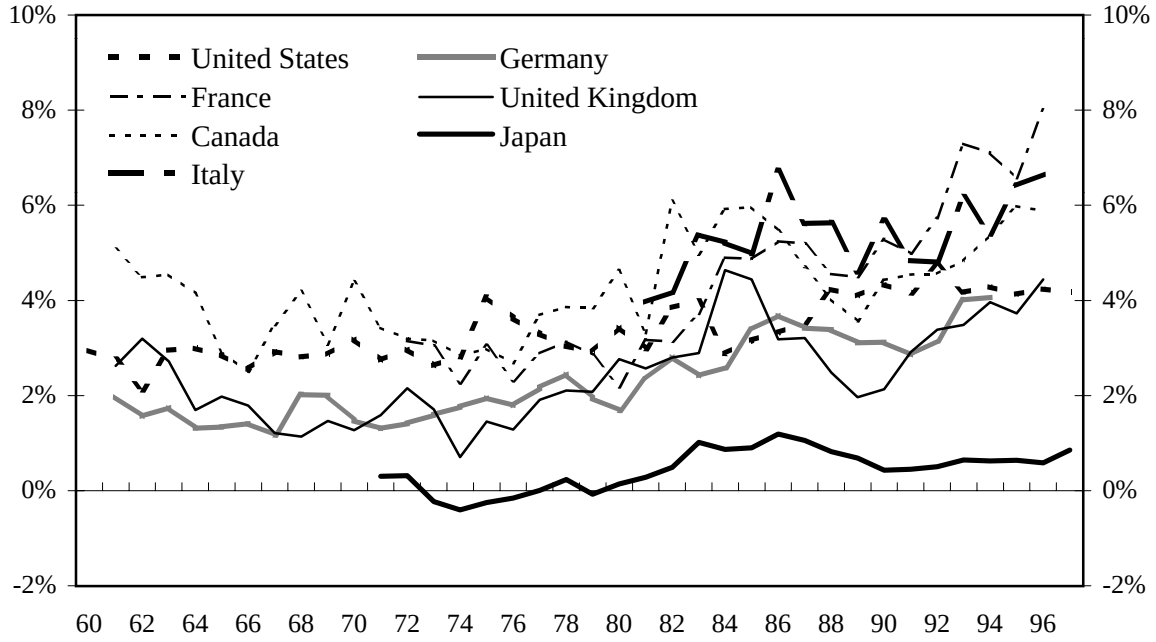
(Chart 6)

Implicit Rates of Time Preference of Major Industrial Countries

(1) ρ (S/Y=opt): when actual saving rate is on the optimal path



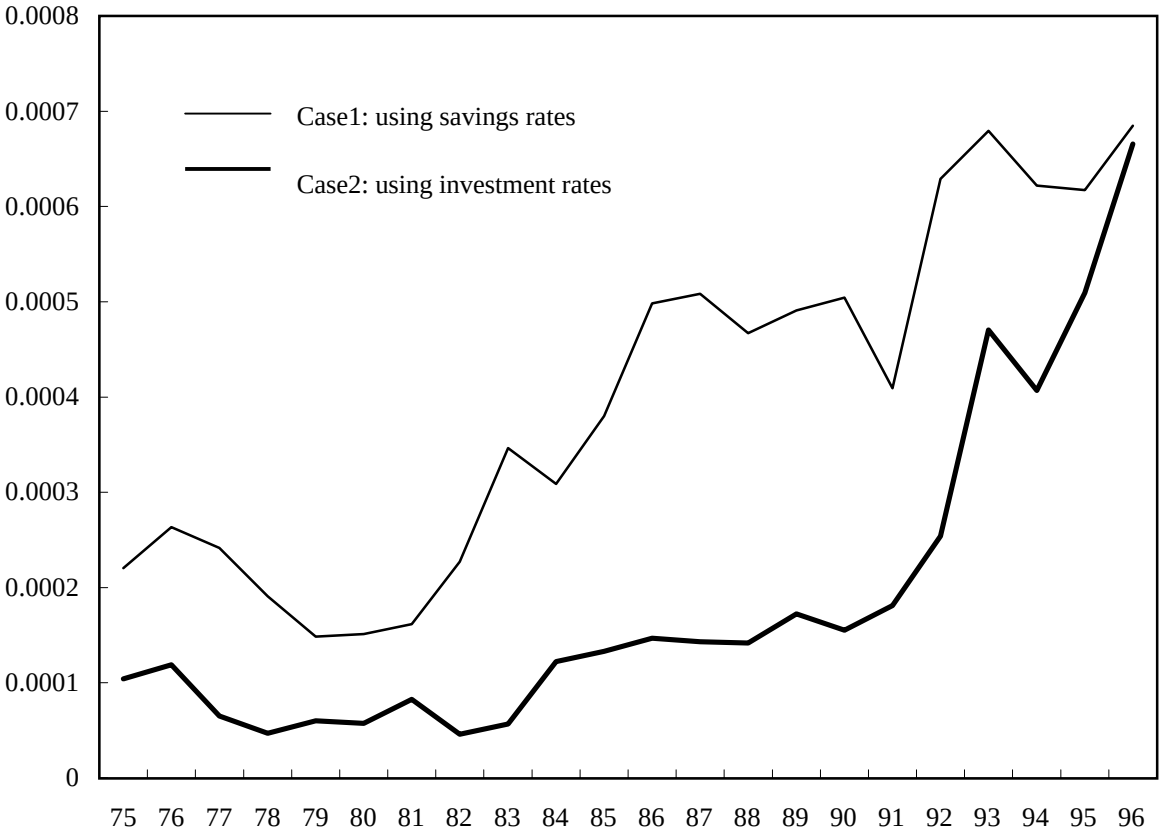
(2) ρ (I/Y=opt): when actual investment rate is on the optimal path



Note: ρ (S/Y=opt)={α/(actS/Y)-1}*(n+g+δ)
ρ (I/Y=opt)={α/(actI/Y)-1}*(n+g+δ)

(Chart 7)

Variance of Time Preference Rate across Major Countries



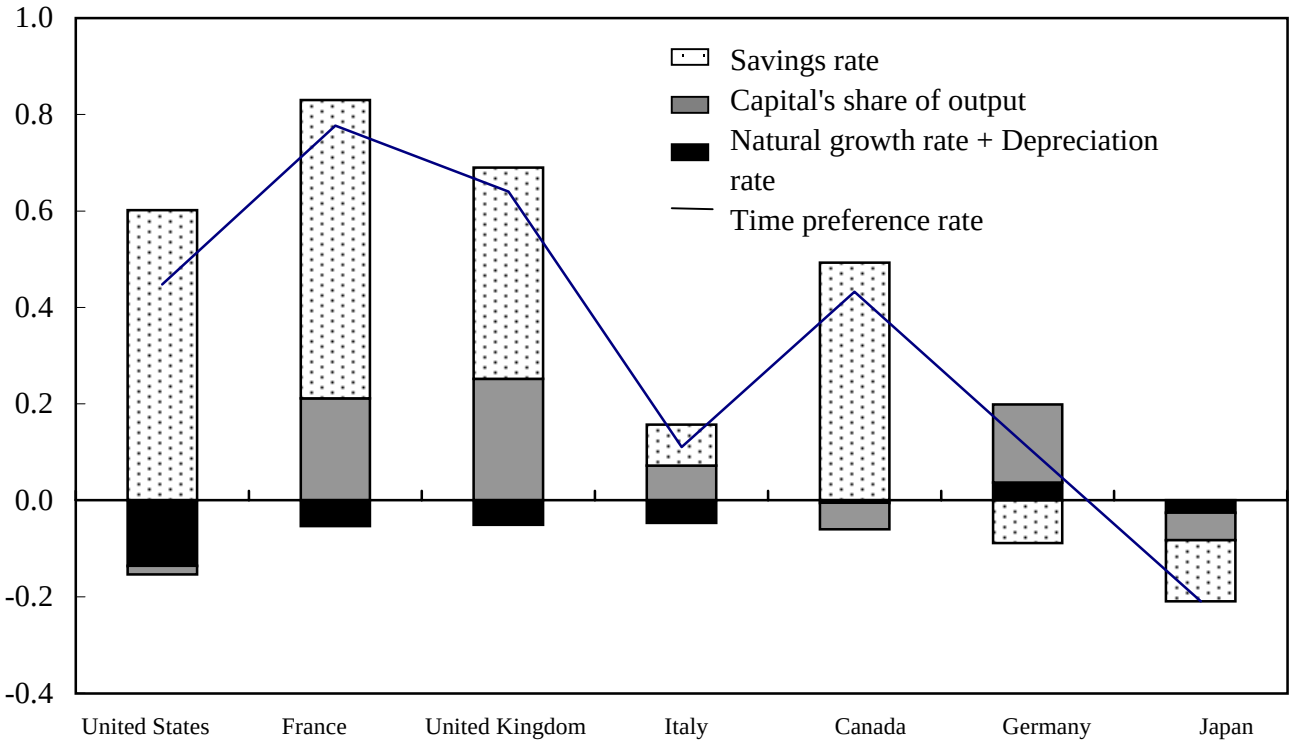
Note: Variances of implicit time preference rates across G5 countries are calculated using investme
as well as savings rates.

(Chart 8)

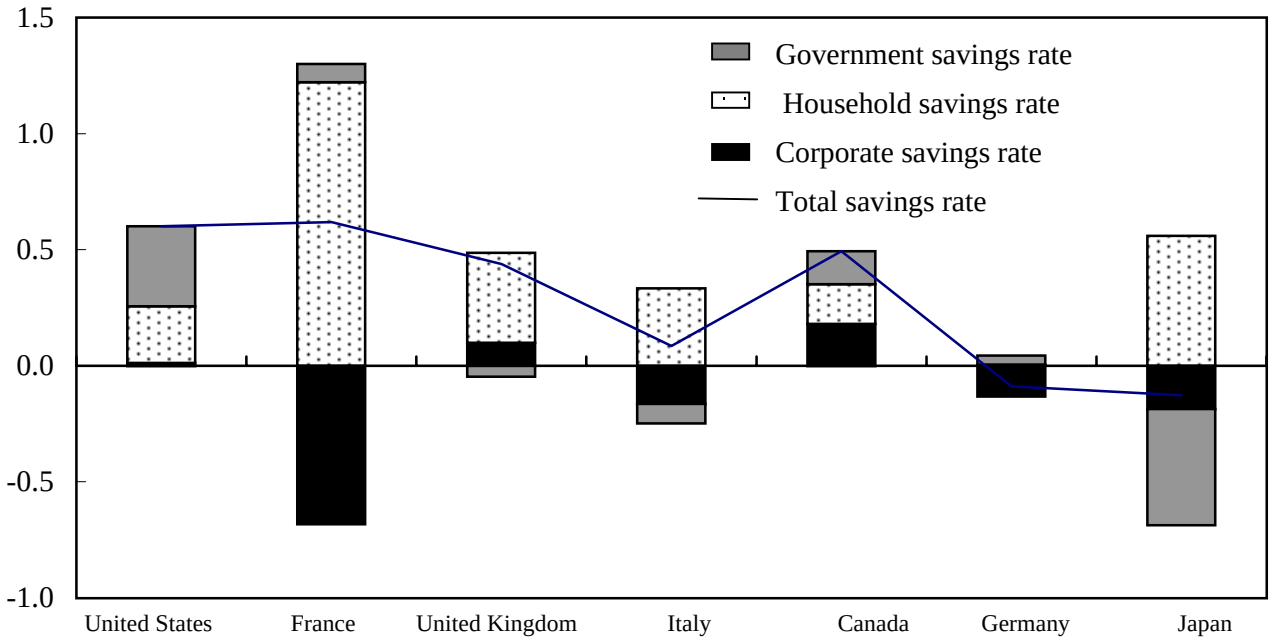
Breakdown Factors of Changes in Time Preference Rates

(1979-1987)

(1) Breakdown factors of changes in time preference rates



(2) Breakdown factors of changes in savings rates



Notes: 1. The direction of changes in savings rates in(2) is shown so as to be the same with their direction in (1), and thus opposite to the direction of changes in actual savings rates.

2. Breakdown factors are calculated as follows :

$\Delta\log\rho=\Delta\log(\alpha/(S/Y)-1)+\Delta\log\mu$

$=x*\Delta\log\alpha+(1-x)*(-\Delta\log(S/Y))+\Delta\log\mu$

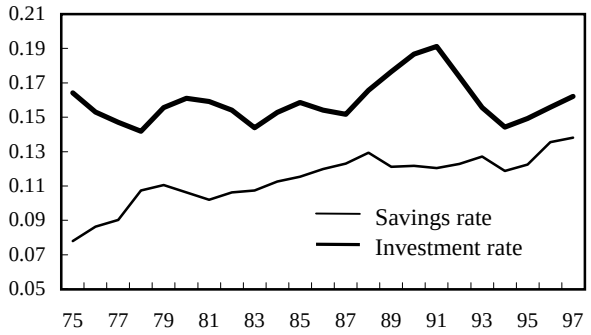
$x=\Delta\log(\alpha/(S/Y)-1)*\Delta\log\alpha/(\Delta\log\alpha+(-\Delta\log(S/Y)))$

S/Y:Savings rate, ρ:Time preference rate, α:Capital's share of output, μ:Natural growth rate + Depreciation rate

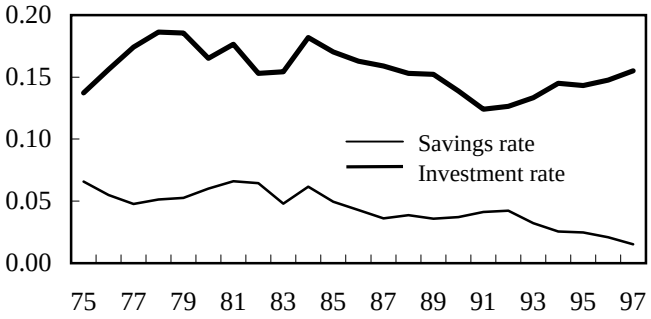
(Chart 9)

Savings and Investment Rates of the Corporate Sector

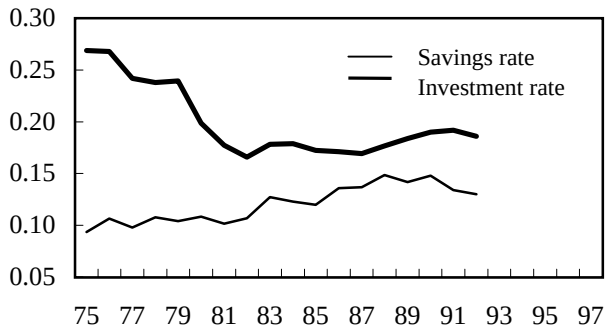
Japan



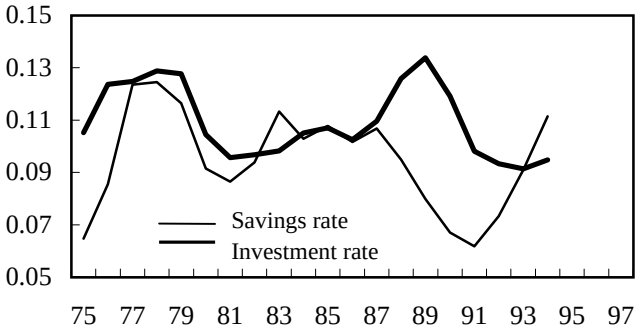
United States



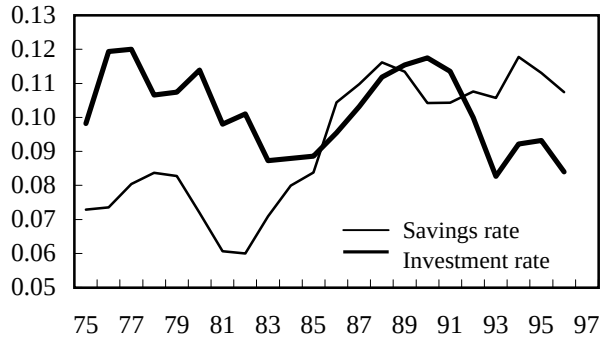
Germany



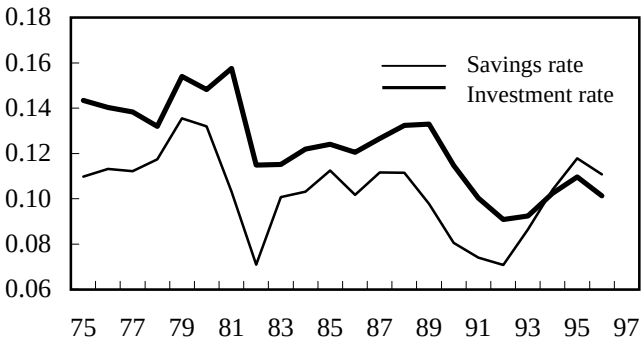
United Kingdom



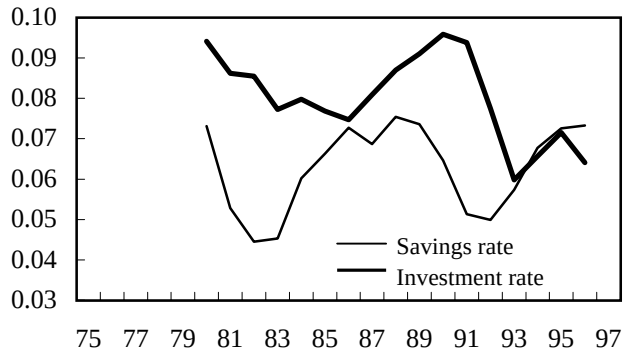
France



Canada

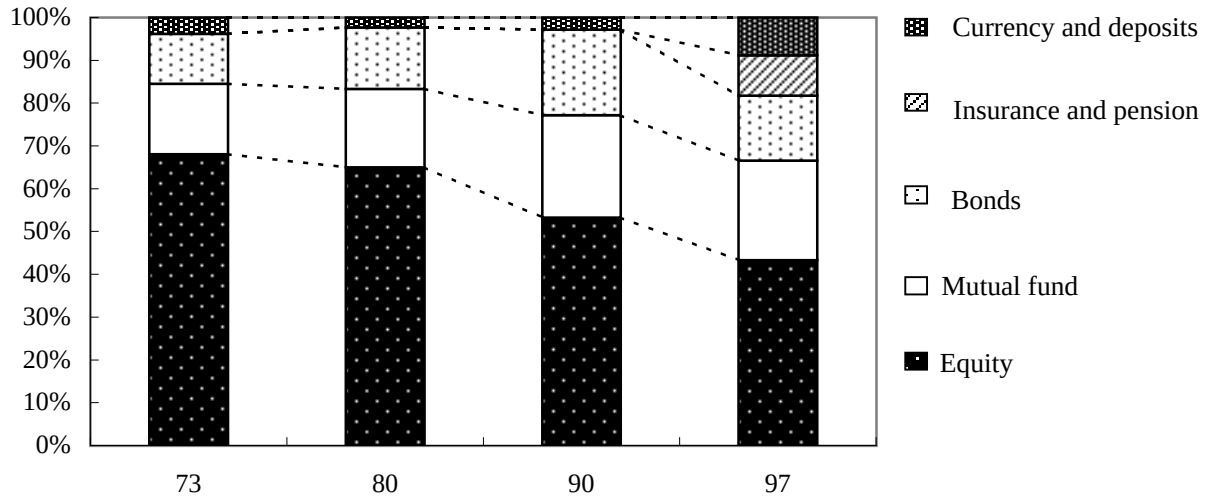


Italy

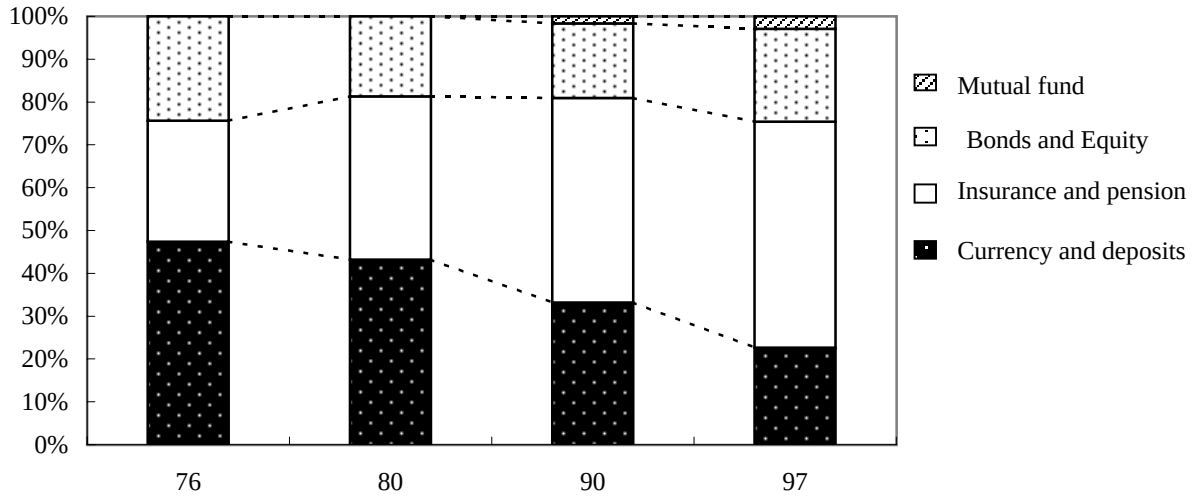


Financial Asset Holdings of the Household Sector (1)

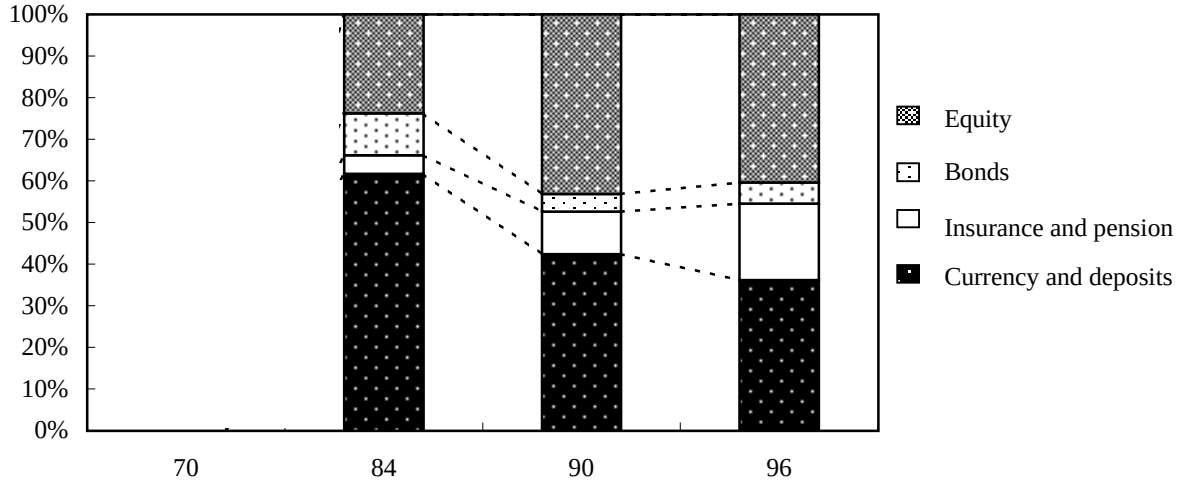
(1) Germany



(2) United Kingdom



(3) France

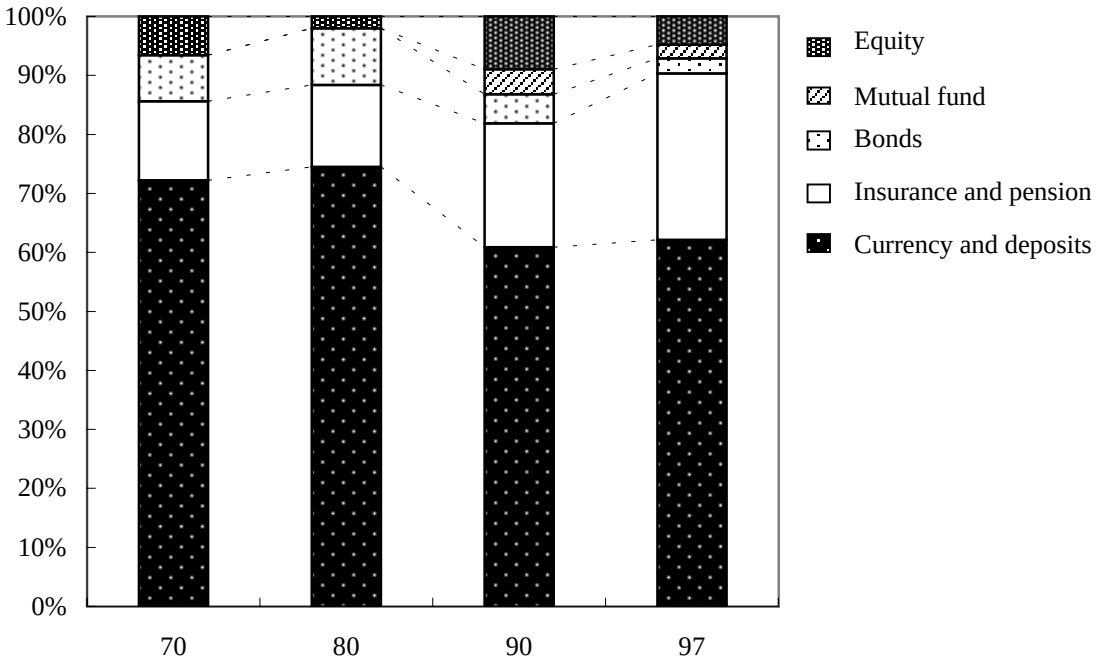


Note: The data for Germany in 1997 is based on the unified Germany.

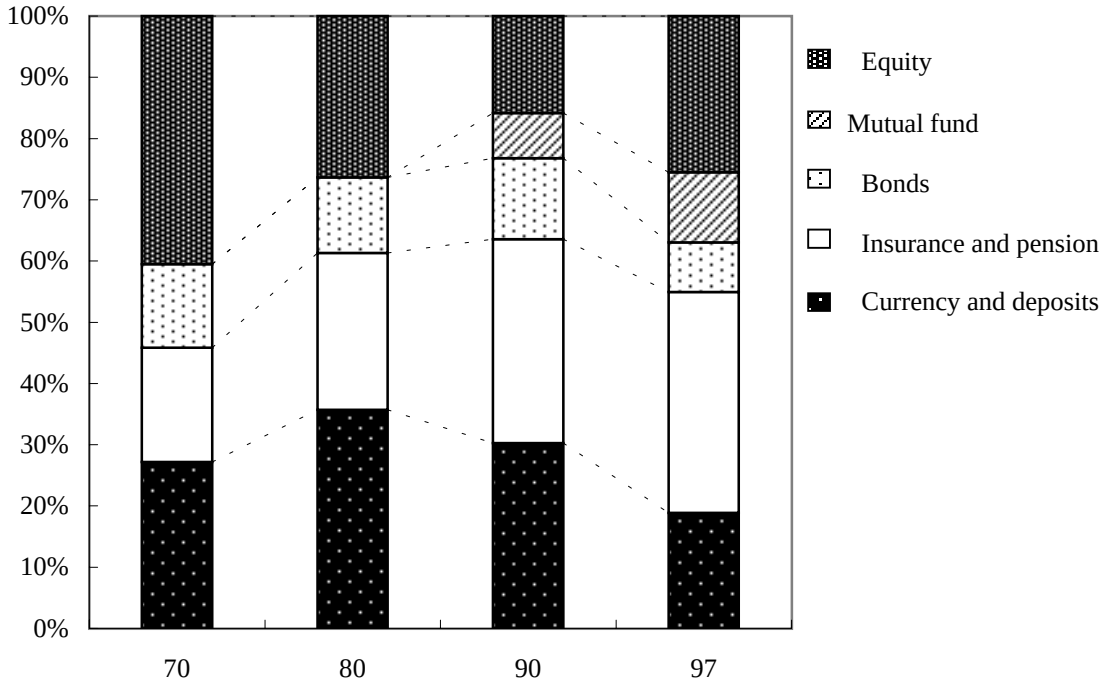
(Chart 10-2)

Financial Asset Holdings of the Household Sector (2)

(4) Japan



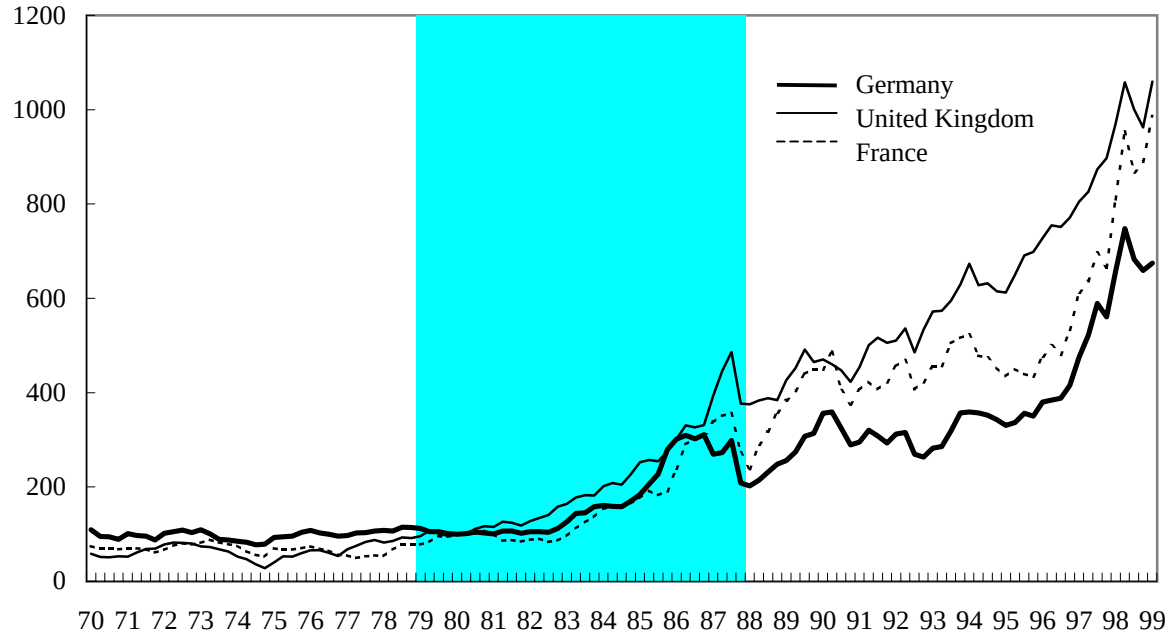
(5) United States



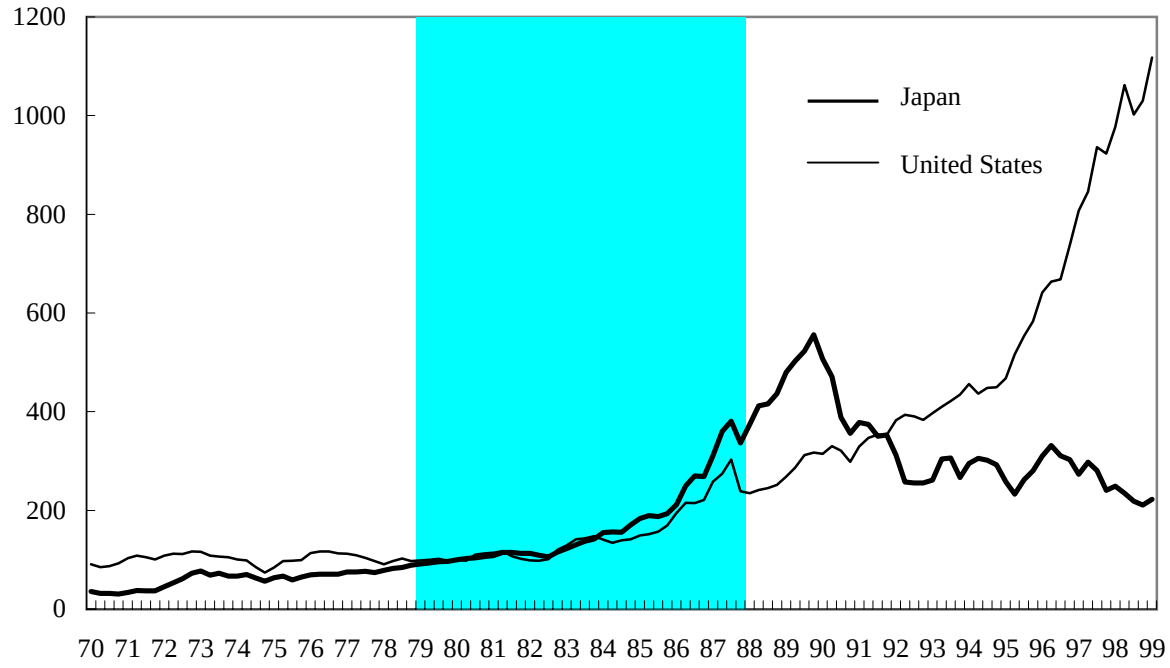
(Chart 11)

Developments of Stock Prices (80/1Q=100)

(1) European Countries



(2) Japan and the United States



(Chart12)

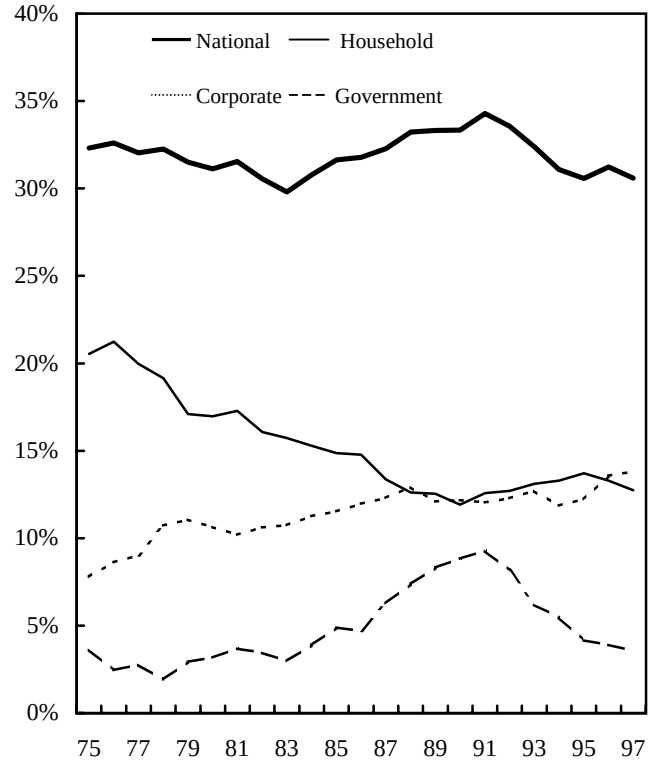
Correlation Coefficients between the Savings Rates of Different Sectors

		Household and Corporate	Household and Government	Corporate and Government
Japan	(75-97)	-0.408	-0.597	0.202
United States	(75-97)	-0.113	-0.171	-0.237
Germany	(76-92)	-0.24	-0.688	-0.097
United Kingdom	(76-94)	-0.448	-0.616	-0.133
France	(76-96)	-0.303	-0.695	0.005
Canada	(76-96)	-0.687	-0.509	0.336
Italy	(81-96)	-0.811	-0.747	0.556

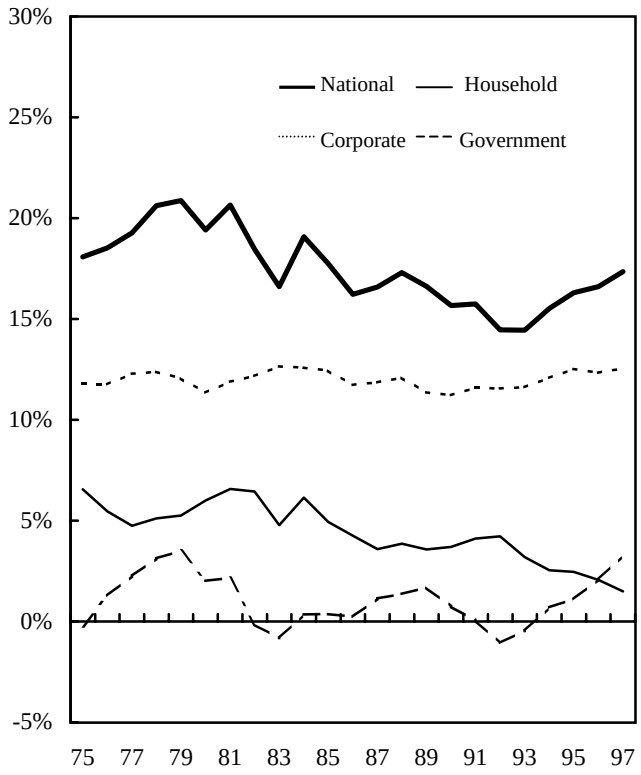
Note: Correlation coefficients are calculated for annual changes in the savings rates of different sectors.

Sectoral Savings Rates (1)

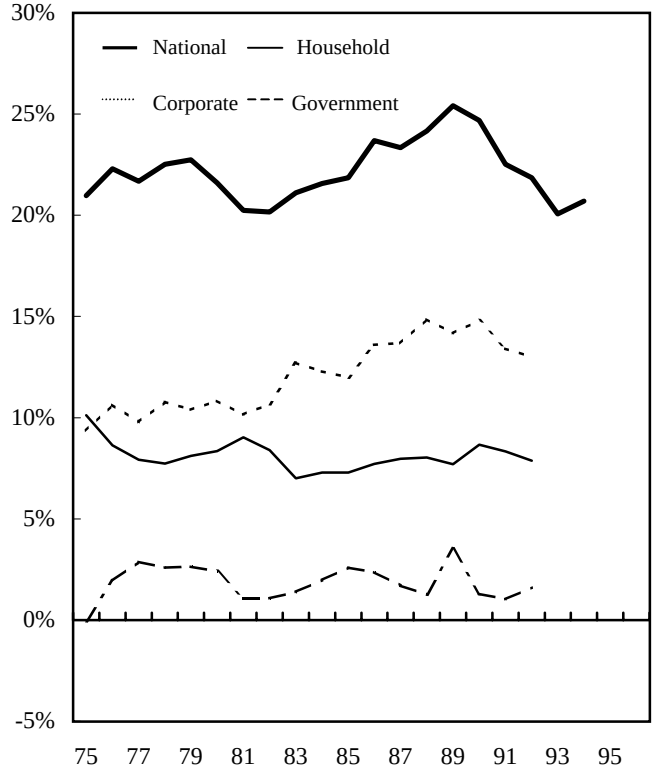
(1) Japan



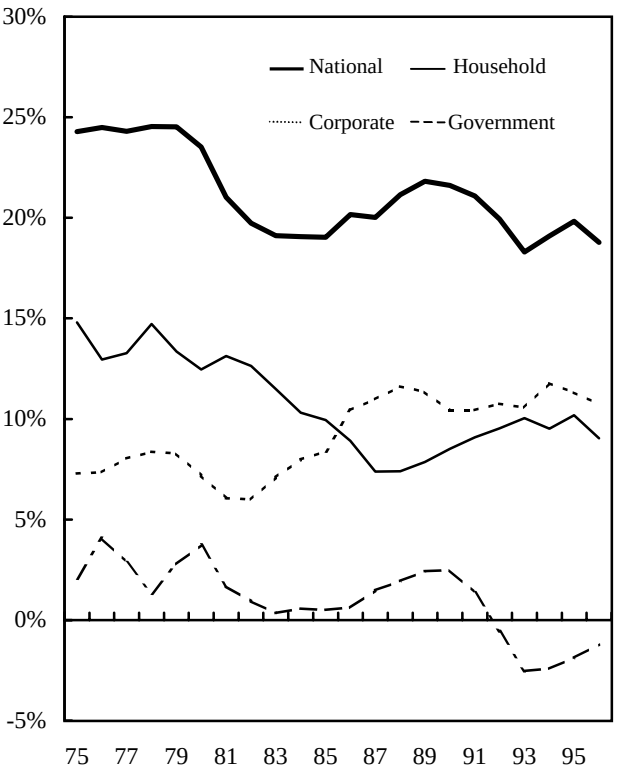
(2) United States



(3) Germany



(4) France

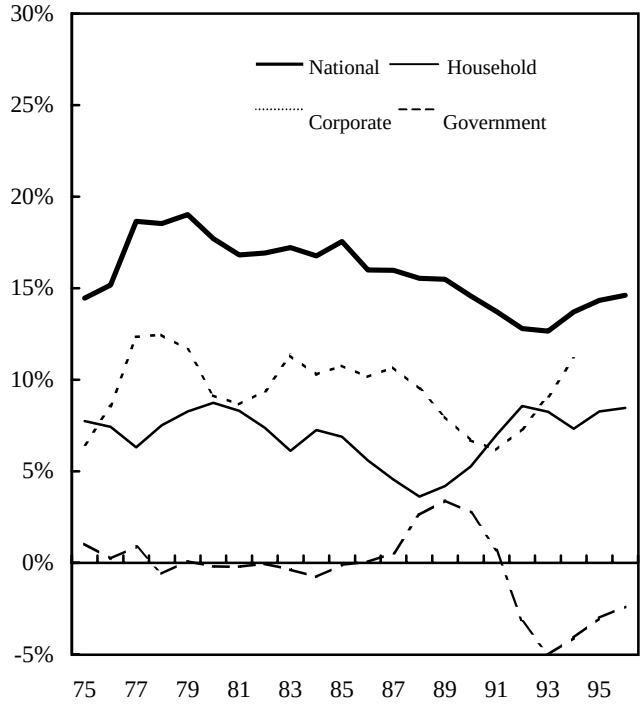


Note: The data since 1993 are not available for Germany.

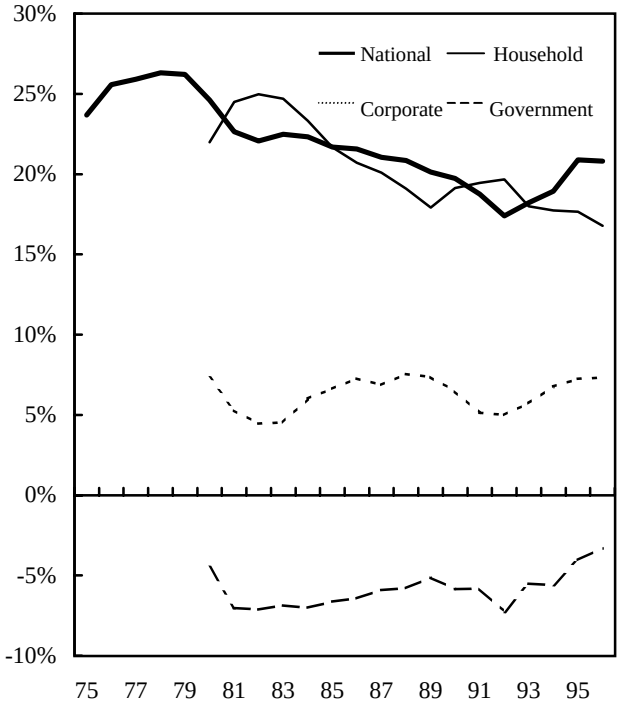
(Chart13-2)

Sectoral Savings Rates (2)

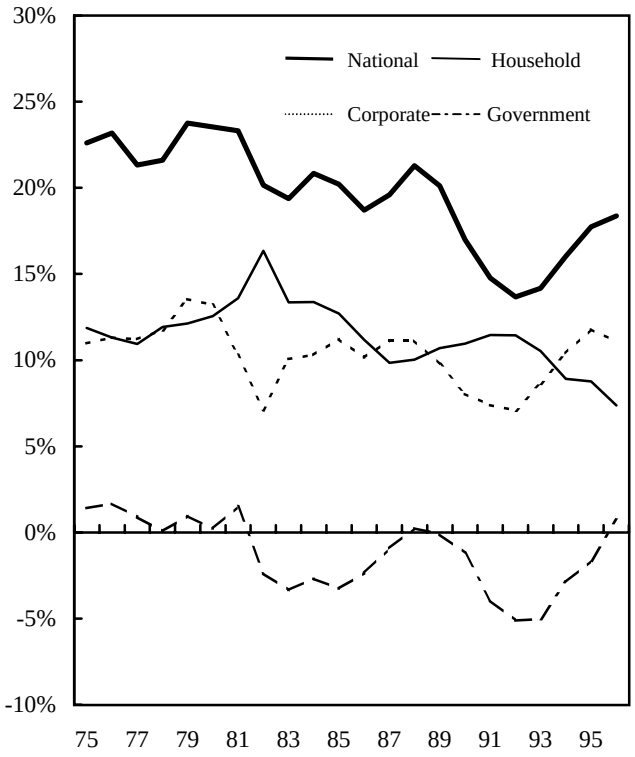
(5) United Kingdom



(6) Italy



(7) Canada



Note: The data of corporate sector since 1995 are not available for United Kingdom.

(Chart 14)

Relationship between the National Savings Rates and Sectoral Savings Rates

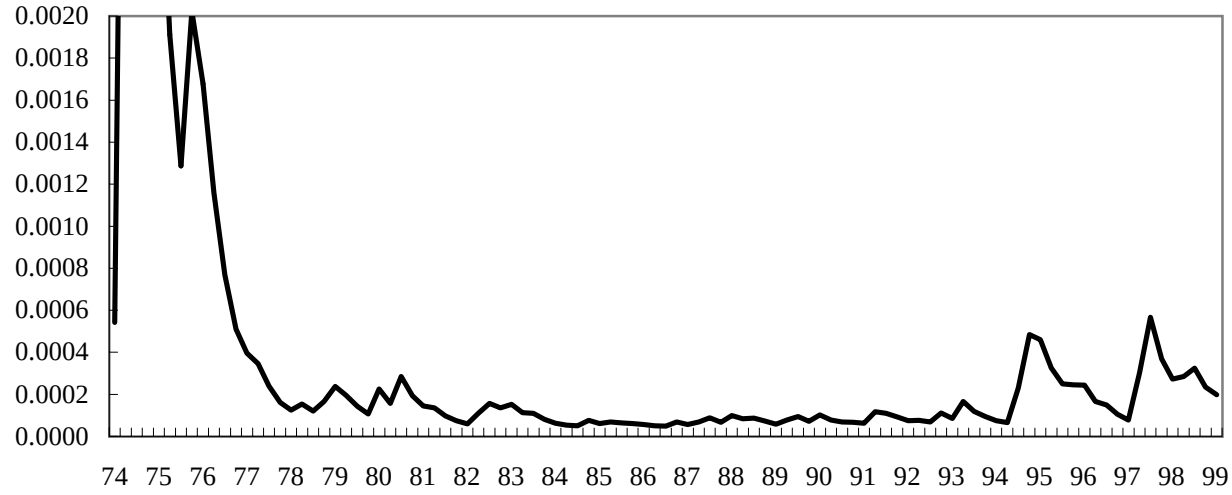
		Household	Corporate	Government
Japan	(75-97)	-0.32 (0.33)	0.90 (0.00)	0.73 (0.00)
United States	(75-97)	0.61 (0.10)	0.30 (0.56)	0.76 (0.00)
Germany	(76-92)	-0.45 (0.29)	0.71 (0.01)	0.47 (0.06)
United Kingdom	(76-94)	-0.41 (0.11)	-0.52 (0.00)	0.28 (0.16)
France	(76-96)	-0.12 (0.61)	0.65 (0.01)	0.44 (0.01)
Canada	(76-96)	-0.41 (0.17)	0.63 (0.00)	0.80 (0.00)
Italy	(81-96)	-0.36 (0.10)	0.63 (0.01)	0.69 (0.00)

Note: The above are coefficients of sectoral savings rates, which are obtained by the regression of the national savings rates on sectoral savings rates. Figures in parenthesis show P values and shadowed figures are statistically significant by 5% degree.

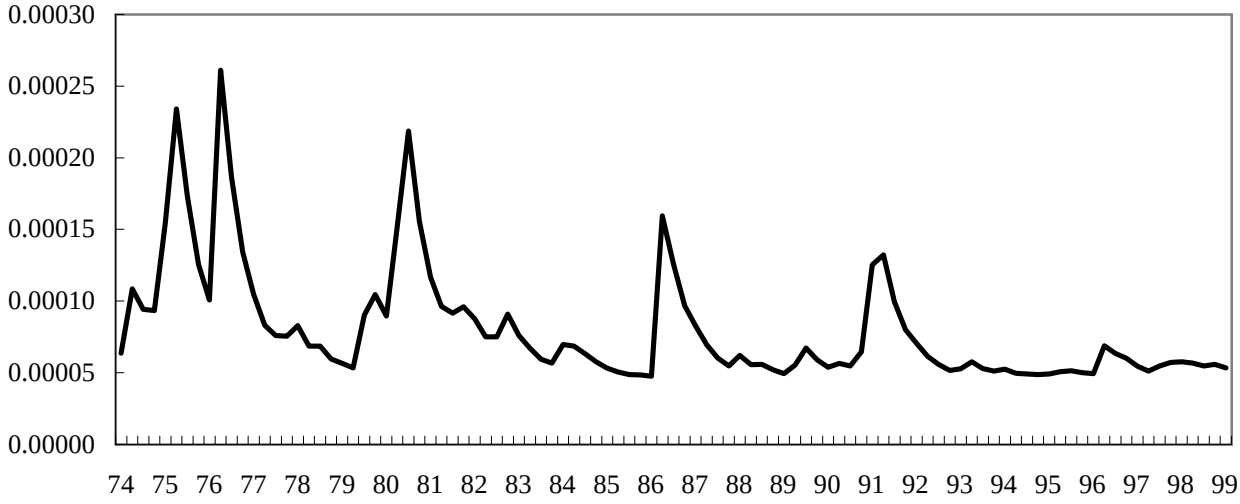
(Chart 15)

Developments of Uncertainty Factor

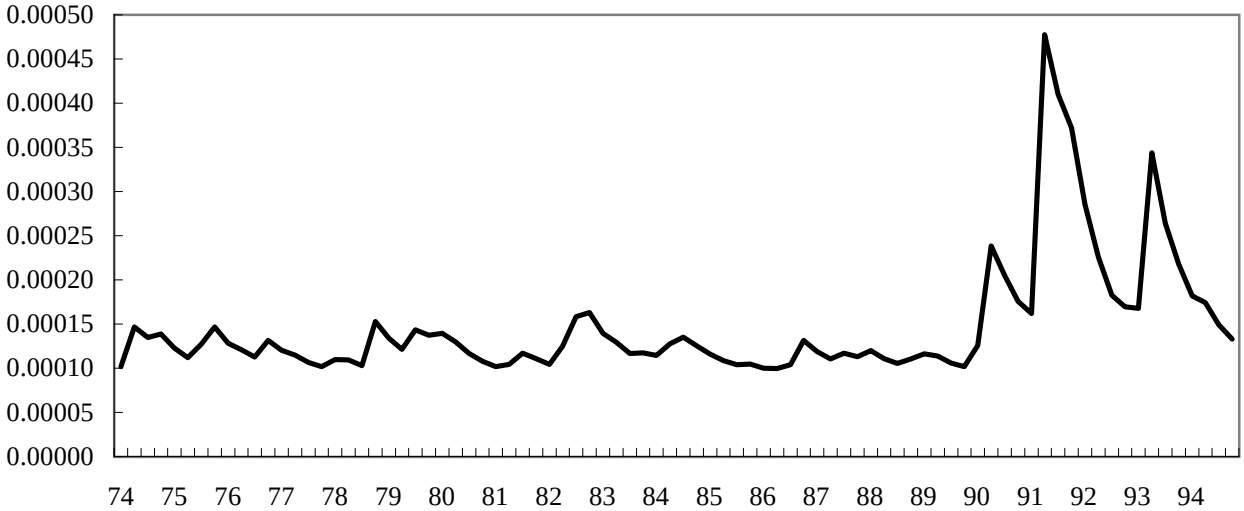
(1) Japan



(2) United States



(3) Germany



Note: For the above calculation, the following data for real income and sample periods are used;
Japan: Real wage index (1974.1Q-1999.1Q), United States: Real employment income(1974.1Q-1999.1Q)
Germany: Real household disposable income(1974.1Q-1994.4Q)

(Chart 16)

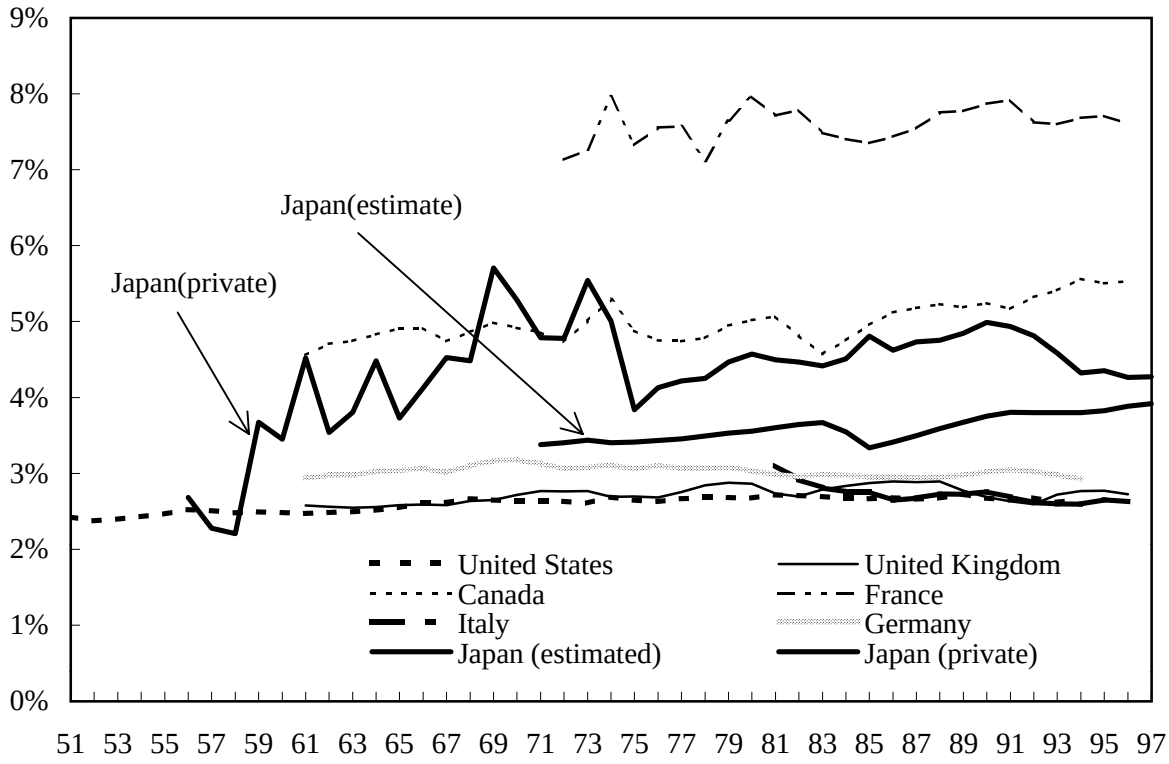
Estimates of the Savings Function

$$S_t - S_{t-1} = a_1 + a_2 * SINT_t + a_3 * RISK_t + a_4 * LOG(Y_t / Y_{t-1}) + \varepsilon_t$$

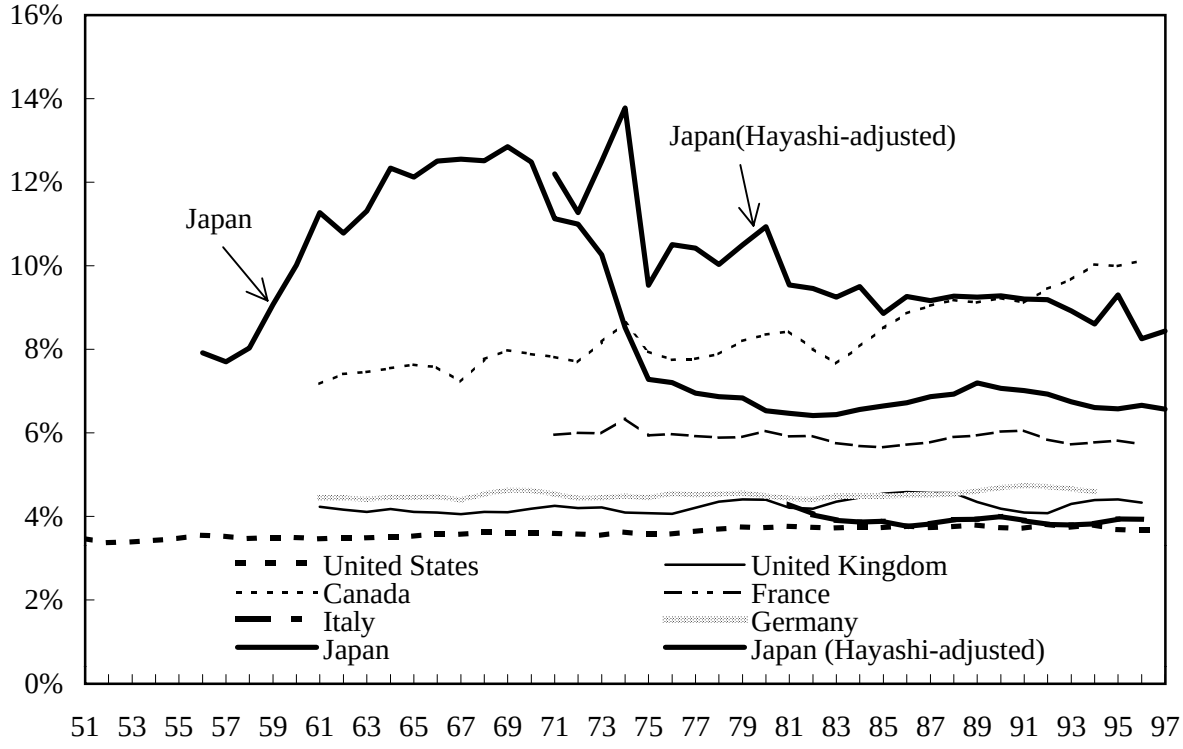
		a_1	a_2	a_3	a_4	AR(1)	adjR^2	D-W
Japan	1978-	-0.934	0.039	2510.075	58.984	-0.398	0.680	1.886
		(-3.99)	(0.88)	(3.23)	(9.31)	(-3.70)		
United States	1978-	-0.695	-0.011	3716.433	61.184	-0.043	0.445	1.965
		(-3.32)	(-0.47)	(1.82)	(7.86)	(-0.35)		
Germany	1978-	0.023	0.008	-842.854	12.380	-0.460	0.187	2.263
		(0.15)	(0.28)	(-1.12)	(2.43)	(-4.11)		

Note: Figures in parenthesis show T values and shadowed figures are statistically significant by 5% degree.
Details of the estimation process are shown in the Appendix II.

Gross Rate of Depreciation



Net Rate of Depreciation



Note: Japan (Hayashi-adjusted) adjusts for the difference in the historical and replacement values by the following method described in detail in Hayashi (1986).
Adjustment = Revaluation - Reconciliation Accounts
Revaluation = (Net Fixed Capital)*(ΔP/P) + (Net Capital Formation)*(ΔP/P)

(Chart 18)

Growth Rates of Labor Force