Preliminary and not to be quoted without authors' permission

The 1990s in Japan: A Lost Decade*

Fumio Hayashi

Tokyo University

Edward C. Prescott

University Of Minnesota and Federal Reserve Bank of Minneapolis

Prepared for Great Depressions of the 20th Century Conference, October 20-21, 2000

Federal Reserve Bank of Minneapolis

* We thank Sami Alpanda, Pedro Amaral, Igor Livshits, and Tatsuyoshi Okimoto for excellent research assistance and the United States National Science Foundation and the Japanese Government Economic Planning Institute of the Economic Planning Agency. The views expressed herein are those of the authors.

1. Introduction

The performance of the Japanese economy in the 1990s was less than stellar. Per capita GDP increased at only 0.6 percent in the 1990s. The comparable figure for the United States was 2.6 percent. Japan in the 1990s, after steady catch-up for 35 yeas, fell behind the industrial leader in the 1990s. The question is why.

A number of hypotheses have emerged. They include: inadequate fiscal policy, the liquidity trap, the low rate of investment due to over-investment during the bubble period of the late 1980s and early 1990s, and problems with financial intermediation. These hypotheses, while possibly relevant for business cycles in the 90s, do not seem capable of explaining the chronic slump as seen in the whole of 1990s. This paper offers a new explanation for the chronic slump: Japan in the 1990s was in a transition to a new and lower steady state growth path. The transition occurred because the growth *rate* of the total factor productivity was lower after 1991 than it was before. We show that the neoclassical growth model when calibrated to pre-1990 observations accounts for the important features of the Japanese economy in the 1990s.

Of the four existing explanations, the financial disintermediation hypothesis is becoming the accepted view even among academics, perhaps because the decline in bank lending has been so pronounced in the 1990s.[1] This hypothesis is inconsistent with our explanation, which assumes no friction in financial intermediation. Our first task, therefore, is to present evidence that the collapse of bank lending does not necessarily mean that corporate investment was constrained because both

[1] Kwon (1998) and Bayoumi (1999), using VAR analysis, concluded that fluctuations in asset prices affected output through bank lending. Ogawa and Suzuki (1998) find evidence from panel data on large Japanese firms that the price of land as collateral affected investment demand. Sasaki (2000) reports from micro data on Japanese banks that lending by "city" banks (large Japanese banks) was constrained by the BIS capital ratio requirement. Woo (1999) finds support for the BIS-induced capital crunch only for 1977. Ogawa and Kitasaka (1998, chapter 4) assert that the decline in asset prices shifted both the demand curve and supply curve of bank loans, which resulted in a fall in investment without noticeable change in lending rates. Motonishi and Yoshikawa (1999), while generally disagreeing with the view that investment was constrained by bank lending, find evidence for a credit crunch for 1997 and 1998.

large and small firms found ways to finance investments.

We then proceed to examine the Japanese economy through the perspective of the neoclassical growth model. We begin by calibrating the model to Japanese data for the 1984-88 period, which was characterized by steady-state growth behavior. We then use this model economy to predict what will happen in the 1990s taking the paths of total factor productivity, workweek lengths, and government purchases share of product as exogenous. The reason why the workweek length is treated as exogenous is that there was a revision in the Labor Standards Law in 1988 that called for a reduction in hours per week from the then 44 hours to 44 hours.

The main findings are that the deepening of capital and declining returns on capital are what this theory predicts. The only puzzle is why the TFP growth rate was so low subsequent to 1991. In the concluding section of the paper we discuss possible reasons for this decline.

2. A Credit Crunch?

In the credit crunch hypothesis, the main cause of the stagnation in the 1990s is the reduced ability of banks to finance corporate investment. In this section, we confront this hypothesis with data from various sources.

2.1. Evidence from the SNA

To see whether investment expenditure was constrained by availability of funds, we examine the investment flow-of-funds identity:

investment = funds from open markets (corporate bonds, commercial paper, and stocks)
+ change in bank loan balances
+ decrease in financial assets (including foreign direct investment)
+ sale of land
+ retention (i.e., corporate gross saving).

The identity here is on a cash basis. That is, investment here excludes inventory investment. Accordingly, retention is defined as sales (rather than output) minus the sum of costs, net interest payments, and dividends. So retention or gross saving here equals the usual retention less inventory investment. The Japanese System of National Accounts (SNA) has accounts for the nonfinancial corporate sector that allow us to calculate each of the flow-of-funds items (up to fiscal year 1998 (April 1998 to March 1999) at the time of this writing).

Figure 2 shows investment (excluding inventory investment) and the first two sources of finance, open-market funds and bank loans, which are external funds. This figure, coupled with Figure 1 above, form a basis for the credit crunch hypothesis. Both the prolonged recession (shown in Figure 1) and the collapse of external funding (shown in Figure 2 for the 1990s) occurred in the 1990s.[2] Furthermore, movements in bank loans more or less mirror the year-to-year fluctuations in

[2] Bank loans here include loans made by public financial institutions. If loans from public financial

the 90s for investment share of GDP and the GDP growth rate, particularly for fiscal year 1998 when GDP growth was about -2%. This observation, coupled with the proposition that banks were constrained by the BIS capital ratio due to the collapse of land prices in the early 90s, is the basis for the view that the prolonged recession in the 90s (particularly the latter half of it) was caused by problems with financial intermediation.

However, this argument misses the fact that there are other means of investment finance. The other sources of investment finance --- decreases in financial assets, sales of land, and retention --- are shown in Figure 3 along with external funds (open-market funds plus bank loans). This figure shows that, until around 1990, external funds were used (together with retention) to finance not only investment but also acquisition of financial assets and land. In contrast, in the early 1990s, financial assets and land are sources of funds. This point --- that firms started drawing down financial assets that they had been accumulated until around 1990 --- can be seen more clearly in Figure 4, where the ratios of liquid assets (defined as cash, deposits, corporate and public bonds) and bank loan balances to the (reproduction cost of the) capital stock are plotted.[3] The liquid asset-to-capital stock ratio since the mid 90s is close to the pre-bubble level of about 0.4. The comparable U.S. ratio is about 0.2, according to the U.S. flow of funds accounts. Japanese firms may wish to maintain a high ratio as a protection against unexpected shortfalls in external funding. If so, with open-market funding more readily available to Japanese corporations thanks to the liberalization of capital markets in the 80s,[4] there is room for further reduction of the ratio from the current level. The same holds true with more force for the loan-to-capital stock ratio; with more firms having access to bond and commercial paper markets, firms may wish to reduce loan balances further.

These facts lead us to the view that the collapse of lending was caused by demand factors.

---

institutions are not included, the decline in bank lending in the 1990s is more pronounced.

[3] Equity is excluded from financial assets because much of it may be mutual shareholdings.

[4] See, e.g., Hoshi and Kashyap (1999) for a description of the liberalization of Japanese capital markets.

During the bubble years (from the late 1980s to very early 90s), firms increased the capital stock and financial assets on borrowed funds, on the optimistic and incorrect expectation of high growth in the 90s. As it became clear that investment opportunities were not as abundant as expected, firms started to reduce the (growth rate of) capital stock as well as the level of financial assets and loan balance. Reducing the loan balance took a good part of the 1990s because of the contractual nature of bank loans. In this view, investment in the 90s was unconstrained by bank loans in two senses. First, there was no shortage of bank loans. Second, the weak balance-sheet problem that might have reduced the demand for loans was less important in the 90s.

As will be mentioned below, the sharp reduction in bank loans that took place during fiscal year 1998 (April 1998 to March 1999) may have been a credit crunch due to a shortage of bank capital. However, there was an increase in retention in 1998, which is more than enough to finance a normal level of investment (of about 15% of GDP). Investment may have been unconstrained even for this year. This is consistent with the fact that firms in this year *increased* financial assets (see Figure 3)[5] and raised a *negative* amount of funds through open markets (see Figure 2).

2.2. Evidence from Survey Data on Private Nonfinancial Corporations

The preceding discussion, based on the SNA data, ignores distributional aspects. For example, large corporations may not have been constrained while small ones were. Moreover, the nonfinancial corporate sector in the SNA includes public nonfinancial corporations (such as corporations managing subways and airports), which get funding from the Postal Saving System through a multitude of government accounts collectively called the Fiscal Investment and Loan Program (FILP).

The most comprehensive survey of private nonfinancial corporations in Japan is *Hojin*

[5] The bulk of the increase in retention in fiscal year 1998 is not due to cuts in dividends. There is very little variation in dividends.

Kigyo Tokei Kiho (*Quarterly Report of Incorporated Enterprise Statistics*) compiled by the Ministry of Finance (MOF).[6] It is a large sample of corporations from the population of about 1.2 million (as of the first quarter of 2000) listed and unlisted corporations excluding only very tiny firms (those with less than 10 million yen in the book value of equity capital). Although the MOF does not allow outside researchers to have access to data on individual firms, it does publish a variety of statistics by firm size. Here we call those corporations whose book value of equity is greater than 1 billion yen "large firms" (estimated number in the population: 5,400 as of the first quarter of 2000), and the rest "small firms". As is well known, as a result of the liberalization of capital markets, large Japanese firms scaled back their bank borrowing, and the shift away from bank loans is complete by 1990. This fact is illustrated in Table 1. It also shows that for small firms the only source of external funding is still bank loans. Therefore, if there existed firms whose investment expenditures were constrained, they were small firms.

Figure 5 combines Figures 2 and 3 for small firms.[7] If anything, data about small firms reinforce the loan irrelevance hypothesis advanced above for the SNA nonfinancial corporations. In the 1990s, there was a sharp decline in bank loans. Until around 1990, bank loans helped small firms to acquire financial assets. The unwinding of those ill-advised financial investments took place in the 1990s. In the late 1990s, the period where problems in financial intermediation are said to have occurred, retention was more than enough to finance investment. In particular, in fiscal year 1998, small firms managed to increase their financial asset holdings. Figure 6 shows the ratio of liquid assets (defined as before as cash, deposits, and holdings of marketable securities (except for stocks)) to the (book value of) capital stock. With liquid assets worth about 40% of the capital stock, even small firms would be well positioned to shield investment from fluctuations in bank loans.

---

[6] See, e.g., Hoshi and Kashyap (p, 144, 1999) for a brief description of the survey.

[7] It is not possible from published tabulations of *Hojin Kigyo Tokei Kiho* to separate retention from new share issues. Retention here is defined as the change in the book value equity capital (which is the sum of net profits

2.3 Evidence from Cross-Section Regressions

Some further evidence on the link between bank loans and growth can be obtained from prefecture and city-level data. The Japan Bank Association collects data on bank loans made by branch offices of domestically chartered banks. From this, loan balance by prefecture and city at the end of fiscal years (up to fiscal year 1999) can be constructed. Prefecture-level data on GDP for fiscal years are available (up to fiscal year 1997) from the Economic Planning Agency (EPA) of the Japanese government. From an establishment survey done by the MITI, prefecture-level and city-level employment data at the end of *calendar* years (up to 1998) are available.

Following Bernanke and Lown (1991), we examine the relation between loan growth and economic growth measured by employment and GDP growth during recessions. According to the official dating of business cycles (published by the EPA), there are five recessions since 1975: from March 1977 to October 1977, from February 1980 to February 1983, from June 1985 to November 1986, from February 1991 to October 1993, and from March 1997 to April 1999. Without monthly data, it is not possible to align these dates with our data on bank loans, GDP, and employment. We therefore focus on the three longer recessions. For each of these recessions, we regress employment or GDP growth on a constant and loan growth. In regression #1, the dependent variable is GDP growth at prefecture level, while in regressions #2 the dependent variable is employment growth. Regression #3 is the employment growth regression at city-level. In all regressions, log GDP or log employment at the base year is used as the weight. Regression #2 is comparable to the state-level regression in Bernanke and Lown (1991) for the U.S. states. For 1990-91, they find that employment in each state is related to contemporaneous growth in bank loans, with the bank loan coefficient of 0.207. This positive link between economic growth and bank loans is not surprising because it can be due to shifts in loan demand as well as in loan supply.

---

and new share issues) plus accounting depreciation. New share issues, however, would be a tiny part of investment finance for small firms.

Our results are reported in Table 2. The strength of the link measured by the loan growth coefficient is much weaker here than in Bernanke and Lown (1991). If the city-level regression is to be taken most seriously, the link got weaker in the 1990s. The weak link for the 1990-93 recession can be explained by the prolonged reduction in bank loans mentioned above. The weak link for the 1996-98 recession is consistent with the view that there was a credit crunch: bank loans were sharply cut back due to the bank capital constraint, but it didn't matter because firms had other means of investment finance (which were retentions and liquid assets).

2.4 Evidence from Miscellaneous Sources

BOJ's *Tankan* Survey. A part of the *Tankan* survey (a quarterly survey on corporations conducted by the Bank of Japan (BOJ) survey) asks corporate managers whether managing fund was easy during the quarter. The diffusion index (DI)[8] based on this question is shown in Figure 7. The index declines sharply during fiscal year 1997 and stayed low during fiscal year 1998. This is precisely the period when Japanese banks had to pay premium for the interest rate on CDs they issued. There may have been a credit crunch during this period. However, as argued above, even small corporations seems to have had enough funds to finance investment, and there is no cross-section evidence supporting the view that the credit crunch caused a decline in economic growth.

Behavior of Foreign Banks. If domestic banks were capital-constrained during fiscal years 1997 and 1998, foreign banks should be in a position to step in to meet loan demand. Figure 8, based on monthly statistics published by the BOJ, shows that foreign banks did increase their loans, with some time lag. The figure also indicates that government banks increased loans as soon as domestic banks started cutting back on loans.

[8] A diffusion index is the percentage of respondents who answered positively less the percentage of respondents whose answer is negative.

3.1. The 1990s Japanese Economy from the Perspective of Growth Theory

We begin with an examination of the empirical data for the 1984-99 period. Figure 9 plots the Japanese per capita GDP in the 1970-1999 period relative to the U.S. The performance of the Japanese economy was excellent in the 1970-91 period per capita GDP going from only 58 percent in 1970 to 86 percent in 1991. However, this catching up trend reversed itself subsequent to 1991 and the Japanese economy, rather than catching up to or surpassing that of the United States, lost ground on the U.S. economy. By 1999, per capita GDP was back to 74 percent of the U.S. level. The question is why the 1990s were economically a lost decade for Japan.

Production side

Given one of the central concepts of growth theory is the aggregate production function, we first examine the behavior of the variables in this relationship. We define the working age population to be those in the 20-69 age group as employment rates are low for those outside this age range. In doing this, we are implicitly assuming that the potential working population is roughly proportional to this number, and not equal to this number. We let k denote capital per (working age) person, h the number of hours production units are operated, e the fraction of the working age population employed, A total factor productivity (TFP), and y per person aggregate output. The aggregate per person production relation is

$$y = A\,h\,F(k,e).$$

TFP growth falls subsequent to 1991

TFP growth in the 1984-91 period averaged 2.0 percent per year. This is significantly higher than the U.S. average growth rate of 1.2 percent in the twentieth century. Subsequent to 1991 the average Japanese TFP growth rate was only 0.3 percent. Unlike the 1970s, the drop in the TFP growth rate is specific to Japan. Neither the United States nor Western Europe experienced a productivity growth rate decline in the 1990s. Indeed, TFP growth in the United States was above

average in the 1990s averaging close to two percent.

The workweek falls in the 1989-92 period

Another fact is that the workweek declined from 44 hours in 1998 to 40 hours in 1993 as depicted in Figure 10. The employment rate, that is the fraction of the working age population that is employed, changed little.

Capital deepens and returns fall after 1991

Figure 11 plots the non-government capital-output ratio for the period and the after-tax return on capital in the corporate sector. The finding is that subsequent to 1992 there was significant capital deepening with the capital-output ratio increasing from 1.7 in the 1991 to 2.2 in 1998. Associated with this capital deepening there was a decline in the after-tax return on capital in the corporate sector. This return declined from six percent in the late 1980s and early 1990s to less than 3 % in the late 1990s.

The Product Side

The composition of output changed in the 1990s. Before describing the nature of this change, it is necessary to specify the accounting conventions that we are following. Investment x is the sum of domestic investment and foreign investment and is equal to saving. Theory dictates the use of this system, which is the one that the United States used until recently. With this system

$$y = c + x + g$$

where x is the sum of domestic investment and net foreign investment.

Government share increase and net domestic investment share decrease in the 1990s

The composition of output changed in the 1990s as depicted in Figure 12. The government share of product increased from an average share of 13.7 percent in the 1984-90 period to 15.2 percent in the 1994-99 period. Another change is the decline in the average share of domestic net

investment from 4.3 percent to 3.7 percent in these periods[9].

Rapid balanced growth in the 1984-89 period

The observations for the 1984-89 are roughly consistent with steady-state behavior of the growth model. More or less constant are the capital-output ratio, the return on capital, the workweek length, the employment rate, investment share of product, government purchases share of product, and factor shares of product. TFP grew at an average rate of 1.9 percent and per person output at approximately 3.7 percent.

Slow unbalanced growth 1991-98

A number of observations for the 1990s are not consistent with steady-state growth. The workweek length decreased 10 percent between 1990-93. There was capital deepening with the capital-output ratio increasing 20 percent and the after-tax return on corporate capital decreasing 2 percentage points. Government expenditure share of product increased 2.5 percentage points. Net domestic investment share decreased from ** percent to less than 4 percent.

3.2. The Model

In using the neoclassical growth theory to view the Japanese economy in the 1990s, we are using a theory that students of business cycles use to study business cycles and students of public finance use to evaluate tax policies. The standard growth model, however, must be modified in one important way to take into account the consequences of a policy change that lead to a reduction in the average workweek in Japan in the 1989-94 period. Given the fall in the workweek length, the fall in the TFP growth rate, and the increase in government purchases share of product in the 1990s, we use the theory to predict the path of the Japanese economy after 1991. The model that we use is as follows.

---

[9] Savings are higher than net domestic investment by the net exports plus net factor payments receipts from the rest of the world. With the accounting system that we are following, total investment x, which is the sum of domestic investment and foreign investment, equals savings. Theory dictated the use of this system, which is the one that the United States used until recently.

Preferences

An important policy change occurred at the end of the 1980s. In 1988, the Labor Standards Law was revised. The revisions called for the reduction of hours per week from 44 hours to 40 hours by 1997. The law had no penalty for employers failing to meet this target, but the government did provide financial incentives for firms to meet this goal. There were subsidies for organizing labor-management meetings and for purchases of labor saving capital equipment. During the 1989-1994 period, the workweek did decline from approximately 44 hours per week to 40 hours per week, a ten-percent reduction. This has importance consequence for TFP when measured in the conventional way, as will be seen below, and consequences for steady-state income.

For this reason we model workweek length h as being exogenous and follow Hansen (1985) with labor indivisibility. There is a stand-in household with N_t working-age members at date t. The size of the household evolves over time exogenously. The number of adults that work at date t is $E_t \leq N_t$ and they work h_t hours. Preference over consumption-leisure streams are ordered by

$$(1) \qquad \sum_{t=0}^{\infty} \beta^t N_t \left(\log(C_t / N_t) + \alpha_1 \log(1 - h_t / \alpha_2)\,(E_t / N_t) \right),$$

where C ≥ 0 is aggregate consumption and $h \in [0, \alpha_2]$ is the workweek length. Note that the disutility of working is greater if the workweek is longer and that the probability an adult works in a given week is $e = E / N$

Technology

In dealing with the workweek, we must begin at the production unit and aggregate. A production unit has density one of workers. The output of a unit that is operated h hours and uses k units of capital is

$$(2) \qquad A\, h\, k^{\theta}.$$

Any measure of units can be operated.

Equilibrium requires z to be equated across operated units. Given this, the aggregate production function is

(3) $$Y = E\,A\,h\,(K/E)^{\theta} = A\,h\,K^{\theta}E^{1-\theta}\ ,$$

where K is capital and E is employment. Aggregate output is divided between consumption C, public purchases of goods and services G, and investment X [10]. Thus

(4) $$C + X + G = Y$$

Capital depreciates geometrically so

(5) $$K_{t+1} = (1-\delta_k)\,K_t + X_t$$

An Important Point

An important point is that h enters multiplicatively in the aggregate production function. On the technology side, a reduction in workweek h is equivalent to a reduction in TFP. On the preference side, the reduction decreases the disutility of employment. These too effects work in opposite directions. The first lowers steady-state output and lowers it a large amount. The second increases steady-state output but not by as much. Thus, on net the consequence of a policy that reduces h is to lower the steady-state output level.

Initial Conditions and Exogenous Variables

The assumption is that the Japanese economy was a little below the steady state growth path associated with a steady growth in TFP of 1.9 percent per year in 1989 with h equal to 44 hours per week. We pick this year because this was the last year before workweek h began to decline and the first after the revision of the Labor Standards Law.

We selected the government purchases of goods and services, G_t so that the G_t/Y_t are

[10] We do not make a distinction between government consumption and investment and do not have a stock of government capital. The reasons we choose this approach are that we did not want to take a position on what rental price to use for government capital and that the approach chosen matters little for our conclusions. This approach is the one used in the U.S. NIPA prior to 1995.

equal to what they were in the 1990s. For the period after 1999, this ratio is set equal to its ratio in the 1994-99 period.

In 1992 there was a fall in the TFP *growth* rate from about 1.9 percent a year to 0.3 percent a year. Subsequent to 2000, we assume the growth rate of TFP will be 0.5 percent, and population N_t will be constant. Also assumed is that h will remain at its 40 hours value subsequent to the year 2000. The variables $\{h_t, A_t, N_t, G_t / Y_t\}$ for $t \geq 1990$ are exogenous and known in 1990.

The issue of what TFP growth expectations to assign to the economic agents is problematic. We do not maintain that the decline in the growth rate of TFP was forecasted even though we treat it as if it were. One justification for using a deterministic model is that free parameters are not needed. The other justification is that a deterministic model is simple and suffices for answering our question of why the 1990s was a lost decade for the Japanese economy. If there were surprises and learning required a few years, the key predictions of the model would be essentially the same. In particular the magnitudes of the increase in the capital-output ratio, the fall in the return on capital, and the fall in net investment share of GDP would be the same.

Taxes

We examine the after-tax return on capital. Therefore, we must introduce taxes on capital income into our model. We proceed in a simple way and simply tax the income of the business sector at rate τ. The resulting household period-budget constraint of the household, which owns the capital and rents it to the business sector, is

$$(6) \qquad C_t + X \leq w_t E_t + r_t K_t - \tau\,(r_t - \delta) K_t - \pi_t .$$

Here the π_t are lump sum taxes, w_t is the real wage, and r_t the rental price of capital. The after-tax interest rates equal

$$(7) \qquad i_t = (1-\tau)\,(r_{t+1} - \delta_k) .$$

The reason that we introduce a capital income tax is that a key variable in our analysis is the return on capital in the corporate sector and this return is taxed at a high rate in Japan, even higher than in the United States.

3.3. Calibration

We abstract from business cycle fluctuations due to randomness in TFP fluctuating about its trend path. We are concerned with a decade long trend, not with business cycle fluctuations. We calibrate the model to the 1984-89 averages of the following statistics: capital cost share, capital-output ratio, the workweek length, output growth rate, working age population growth rate, capital investment share of product, and corporate taxes as a share of corporate surplus. We assume the 1990 capital stock is a little less than its steady-state value as the capital-ratio was increasing slowly as can be seen in Figure 11. The beginning of year 1990 capital stock is 1.781 GNPs[11].

The tax rate on capital is large in Japan. The number we use is $\tau = 0.5$ and was obtained as follows. We summed the capital taxes, namely corporate income taxes and property tax and divided this sum by the operating surplus of the corporate sector[12].

In assigning income to capital and labor we assign all wage income to labor, 50 percent of indirect taxes, and 80 percent of the non-housing, non-corporate operating surplus. The remainder of gross national product is assigned to capital. The average income share of product determines θ, the capital share parameter in the production function.

3.4. Findings

Figures 13 report the behavior of the model and actual outcome. As can be seen the actual output in the 1990-99 period is close to the predictions of neoclassical growth theory. The observed deepening of capital also is what the theory predicts. The difference in the precise paths of the model and actual

[11] The steady state capital stock if for the 44 hour workweek and 1984-89 TFP growth rate is 2.15 GNPs.

[12] There was a tiny correction for capital in the non-housing non-corporate sector. We estimated that 20 percent of this income is capital income and 80 percent labor income. We assumed a 20 percent tax rate for the capital

path of the capital-output ratio is not bothersome given the model's assumption that the future path of TFP is predictable when in fact it is not.

4. Concluding Comments

The problem is not a breakdown of the financial system as corporations large and small were able to find financing for investments. There is no evidence of profitable investment opportunities not being exploited because of lack of access to capital markets. Those projects that are funded are on average receiving a low rate of return.

The problem is a low TFP growth. If TFF growth remains level in Japan and high in the other advanced industrial countries, Japan will fall behind. We are not predicting that this will happen and would not be surprised if Japanese TFP growth returned to its level in the 1984-91 period. We do think that research effort should be focused on what policy change will restore TFP growth.

We can only conjecture on what the needed policy change is. Perhaps the low TFP growth is the result of a policy that subsidizes inefficient firms and declining industries. This policy results in lower productivity because the inefficient producers produce a greater share of the output. This also discourages investments that increase productivity. Some not very strong empirical support for this subsidizing hypothesis is provided by the experience of the Japanese economy in the 1978-83 period. During that five-year period that the 1978 "Temporary Measures for Stabilization of Specific Depressed Industries" law was in effect (see Peck et al., 1988), TFP growth was a dismal 0.35 percent. In the three years prior the TFP growth rate averaged 1.64 percent and in 7-year period after it averaged slightly over two percent.

References

Bayoumi, T. (1999), "The Morning After: Explaining the Slowdown in Japanese Growth in the

---

income part.

1990s", NBER W.P. No. 7350.

Bernanke, B. and C. Lown (1991), "The Credit Crunch", *BPEA*, 205-239.

Cochrane, J. H. (1994), "Shocks," *Carnegie-Rochester Conference Series on Public Policy, 41*, 295-364.

Hansen, G., D. (1985), "Indivisible Labor and the Business Cycle," *Journal of Monetary Economics, 16*, 309-27.

Hayashi, F. (1997), *Understanding savings: Evidence from the United States and Japan*, Cambridge: MIT Press.

Hoshi, T. and A. Kashyap (1999), "The Japanese Banking Crisis: Where Did It Come From and How Will It End?" *NBER Macro Annual*, pp. 129-201.

Hornstein, A. and E. C. Prescott, "The Plant and the Firm in General Equilibrium Theory," in Robert Becker, Michele Boldrin, Ronald Jones, and William Thomson, eds., *General Equilibrium, Growth, and Trade II: The Legacy of Lionel McKenzie,* Academic Press, 393-410.

Kwon, E. (1998), "Monetary Policy, Land Prices, and Collateral Effects on Economic Fluctuations: Evidence from Japan", *Jour. of Japanese and International Economies*, 12, pp. 175-203.

Kydland, F. E. and E. C. Prescott (1991), "Hours and Employment Variations in Business Cycle Theory," *Economic Theory* 1, 63-82.

Motonishi, T. and H. Yoshikawa (1999), "Causes of the Long Stagnation of Japan during the 1990s", *Jour. of Japanese and International Economies,* pp. 181-200.

Ogawa, K. and K. Suzuki (1998), "Land Value and Corporate Investment: Evidence from Japanese Panel Data", *Jour. of Japanese and International Economies*, pp. 232-249.

Ogawa, K. and S. Kitasaka (1998), *Asset Markets and Business Cycles* (in Japanese), Nihon Keizai Shinbunsha.

Peck, M. J., R. C. Levin, and A. Goto (1988), "Picking Losers: Public Policy Toward Declining Industries in Japan," in *Government Policy Towards Industry in the United States and Japan*, edited by J. B. Shoven, Cambridge: Cambridge University Press, 165-239.

Rogerson, R. (1988), "Indivisible Labor Lotteries and Equilibrium," *Journal of Monetary Economics*, *21*, 3-16.

Rotemberg, J. J. (1994), "Shocks: A Comment," *Carnegie-Rochester Conference Series on Public Policy*, *41*, 365-71.

Sasaki, Y. (2000), "Prudential Policy for Private Financial Institutions", mimeo, Japanese Postal Savings Research Institute.

Woo, D. (1999), "In Search of 'Capital Crunch': Supply Factors behind the Credit Slowdown in Japan", IMF Working Paper No. 99/3.

Table 1: The Importance of Bank Loans

	bank loans/(bank loans + corporate bonds)	
	large firms	small firms
1976 - 1979	0.890	0.999
1980 - 1984	0.865	0.999
1985 - 1989	0.792	0.998
1990 - 1994	0.754	0.994
1995 - 1999	0.748	0.994

Table 2: Cross-Section Regression of Economic Growth on Loan Growth During Recessions

	Coefficient of loan growth		
	regression #1	regression #2	regression #3
	prefecture data sample size = 47	prefecture data sample size = 47	city-level data sample size = 666
Period	dependent variable is GDP growth over indicated fiscal years	dependent variable is employment growth between the ends of indicated calendar years	dependent variable is employment growth between the ends of indicated calendar years
1979 – 1982	0.045 (0.3)	-0.098 (-0.8)	0.046 (2.2)
1990 - 1993	0.032 (0.4)	0.053 (0.7)	0.031 (1.0)
1996 - 1997	0.091 (0.9)	0.28 (3.2)	0.058 (1.5)
1996 - 1998	-----	0.018 (0.3)	0.018 (0.5)

Note: *t* values in parentheses. In all regressions, the regressor is the growth of bank loans over the period between the ends of indicated fiscal years.

FIGURE 1: Real Percapita GDP Growth

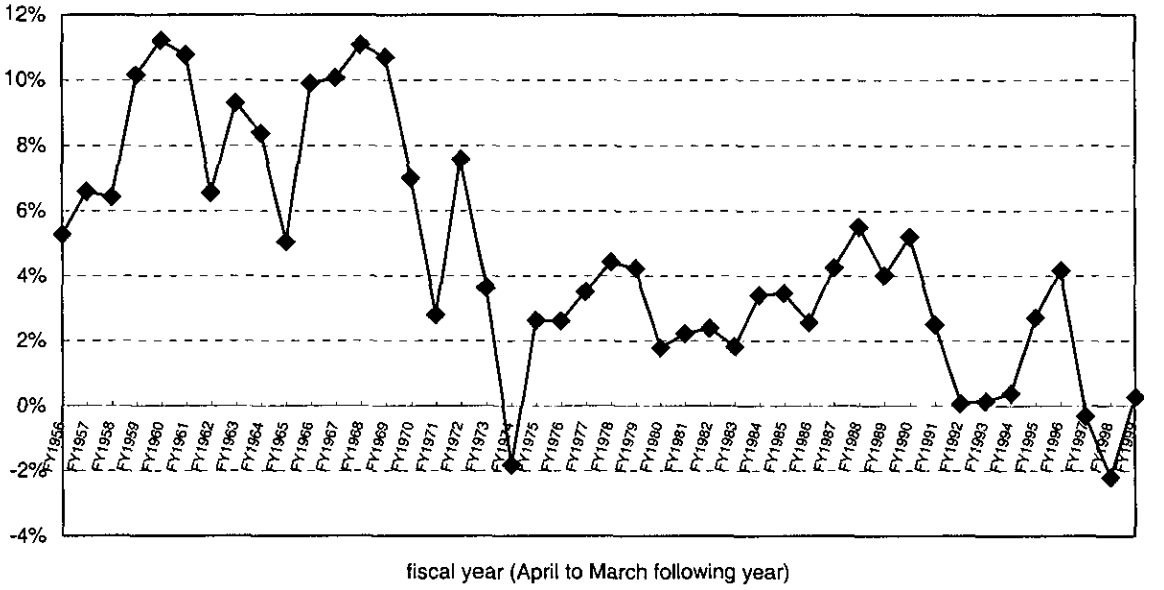


FIGURE 2: Collapse of External Finance, Nonfinancial Corporate Sector

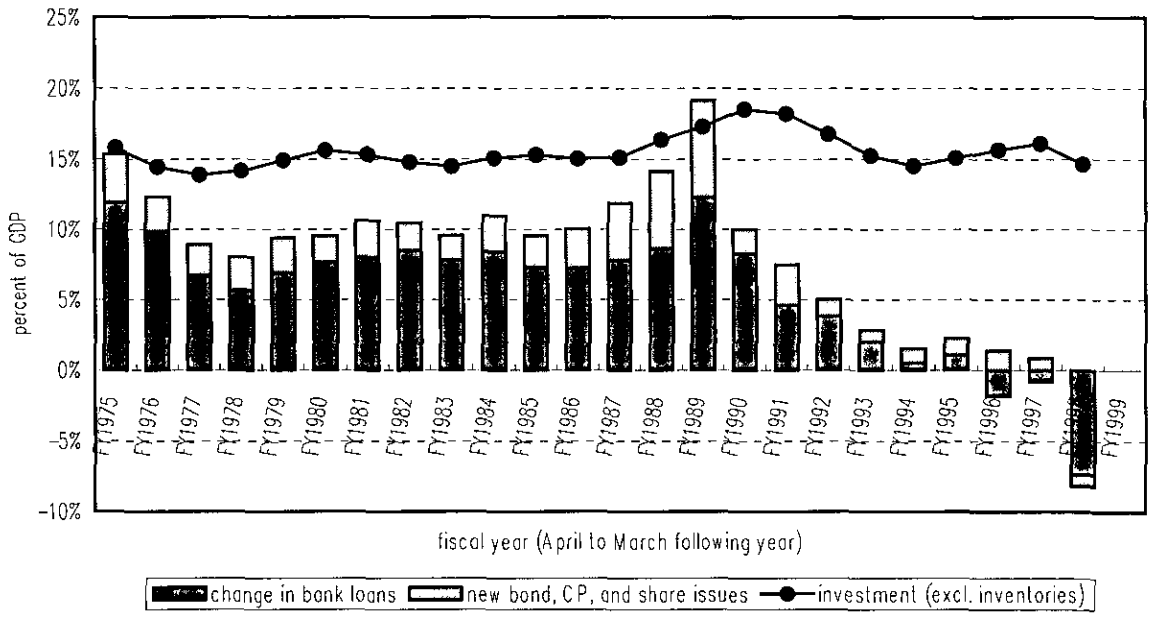


FIGURE 3: Investment Finance, Nonfinancial Corporate Sector

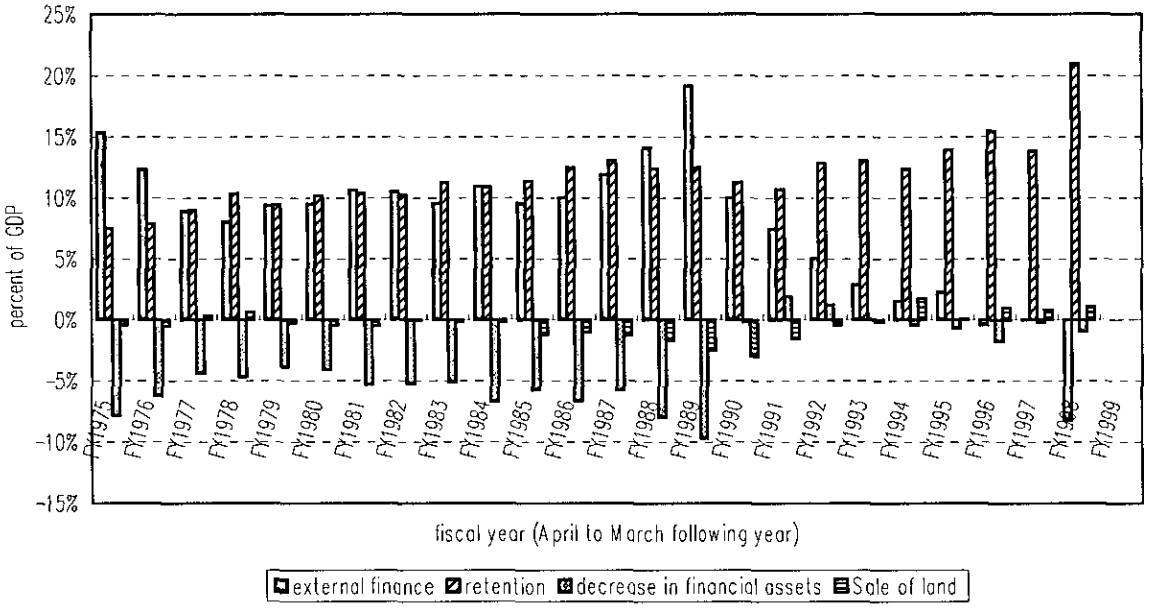


FIGURE 4: Liquid Assets and Loans, Nonfinancial Corporate Sector

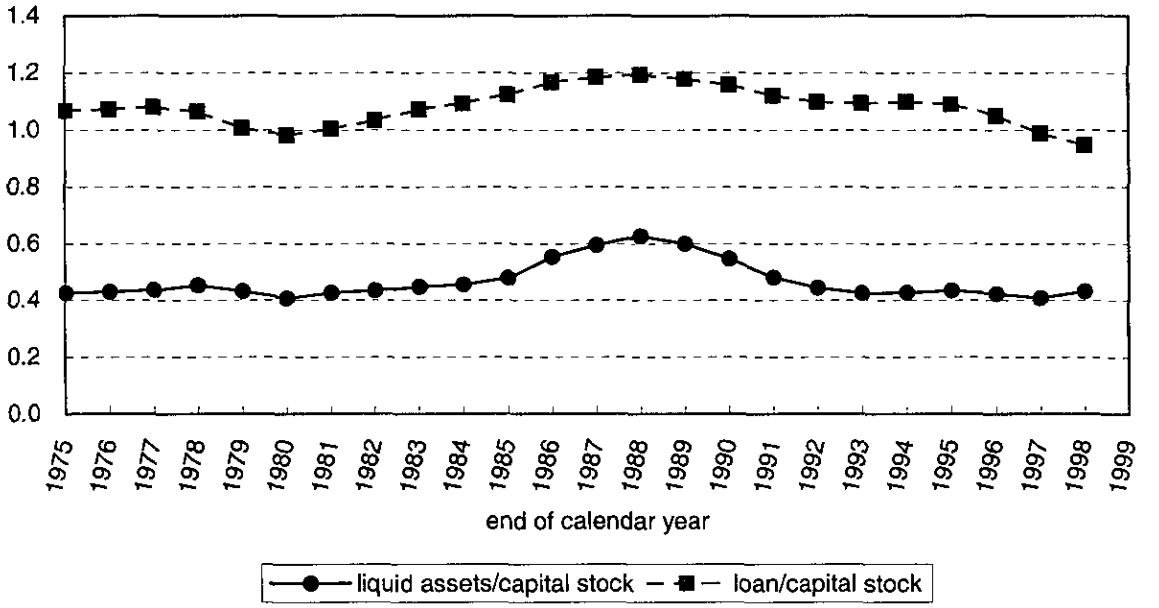


FIGURE 5: Investment Finance, Small Firms

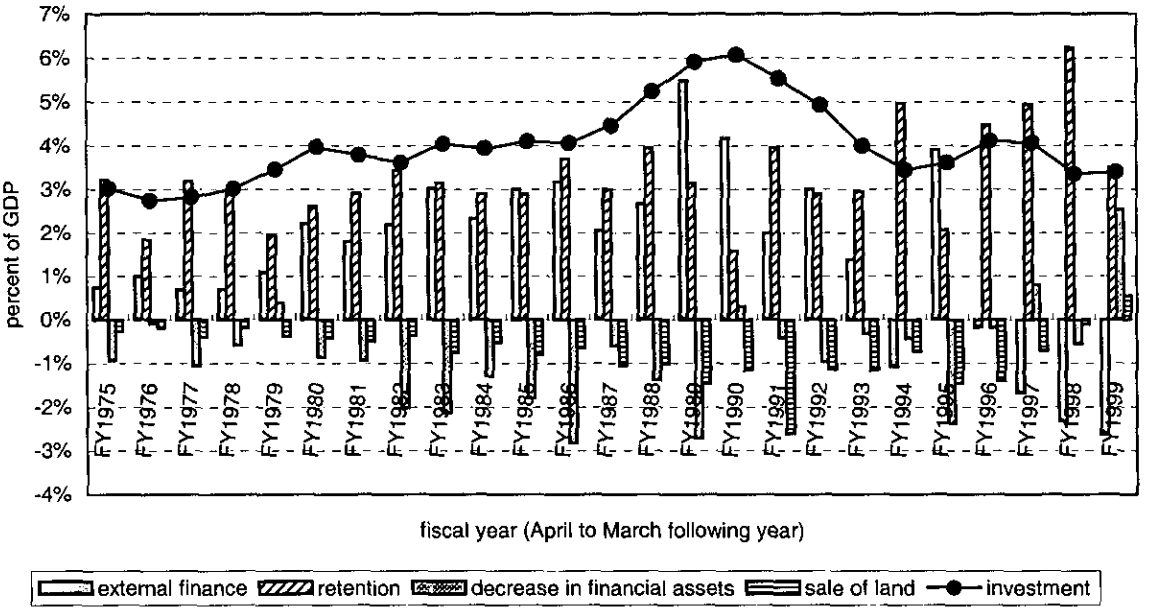


FIGURE 6: Liquid Assets and Loans, Small Firms

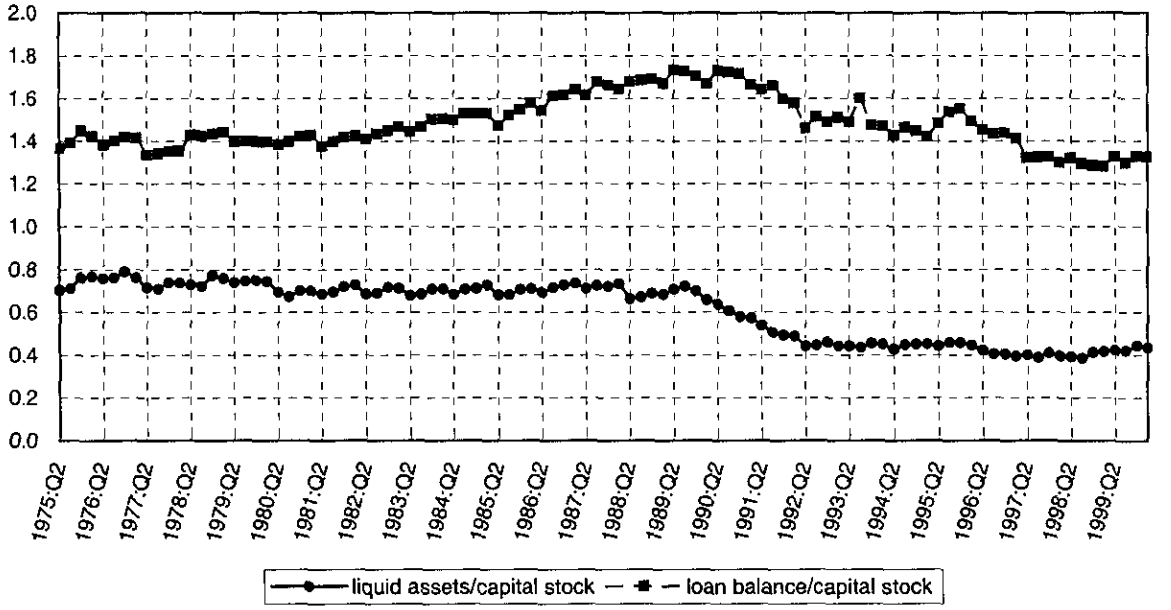


Figure 7: *Tankan* Diffusion Index, Fund Position

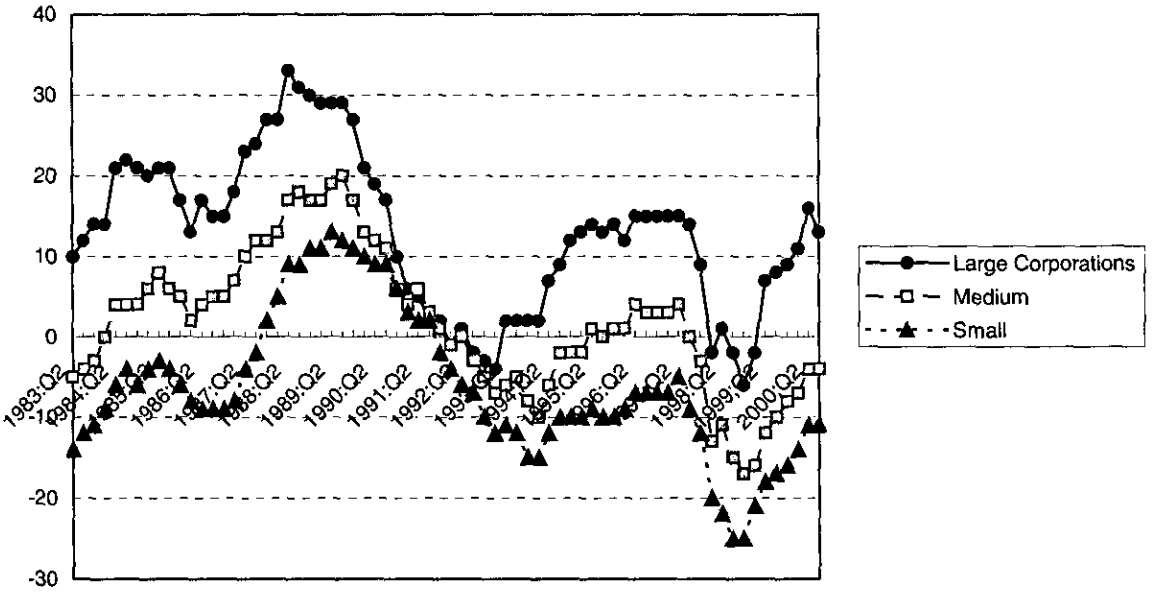


Figure 8: Breakdown of Loan Supply

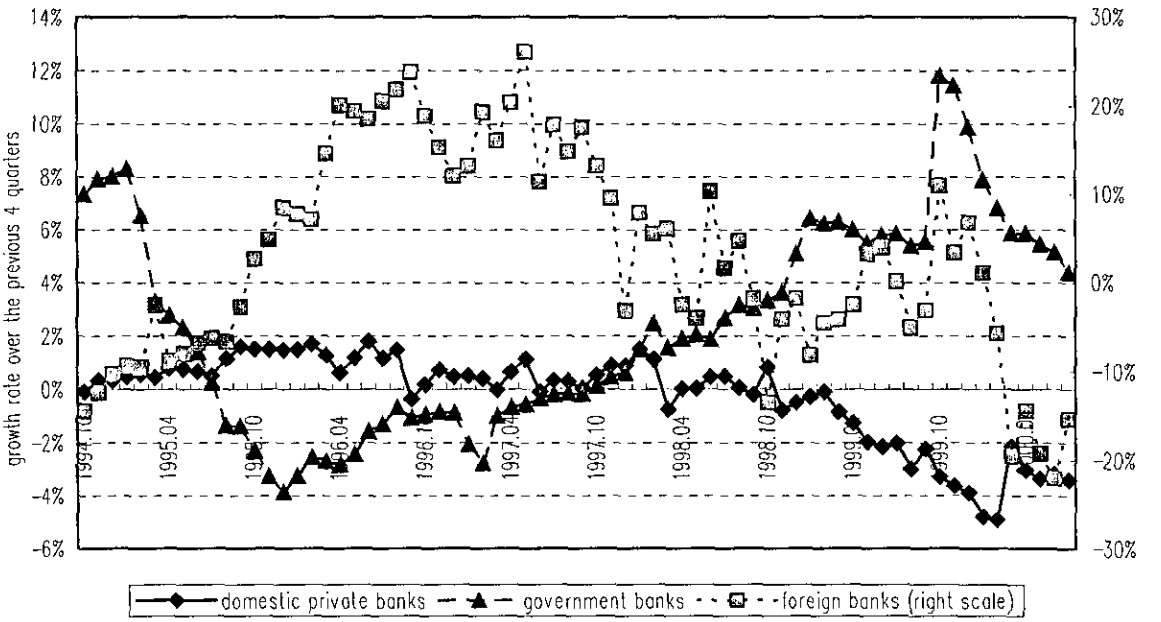


Figure 9: Per Capita GDP relative to U.S. (U.S. =100)

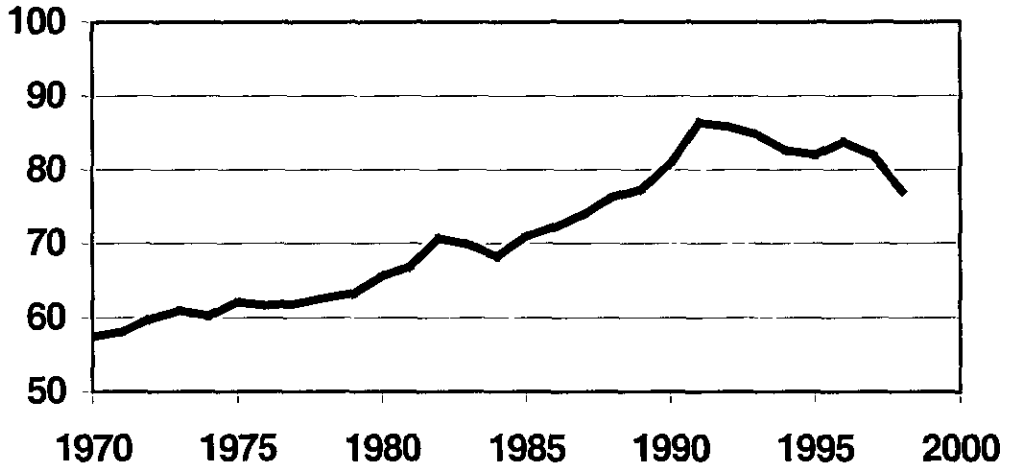


Figure 10: Monthly Hours per Worker

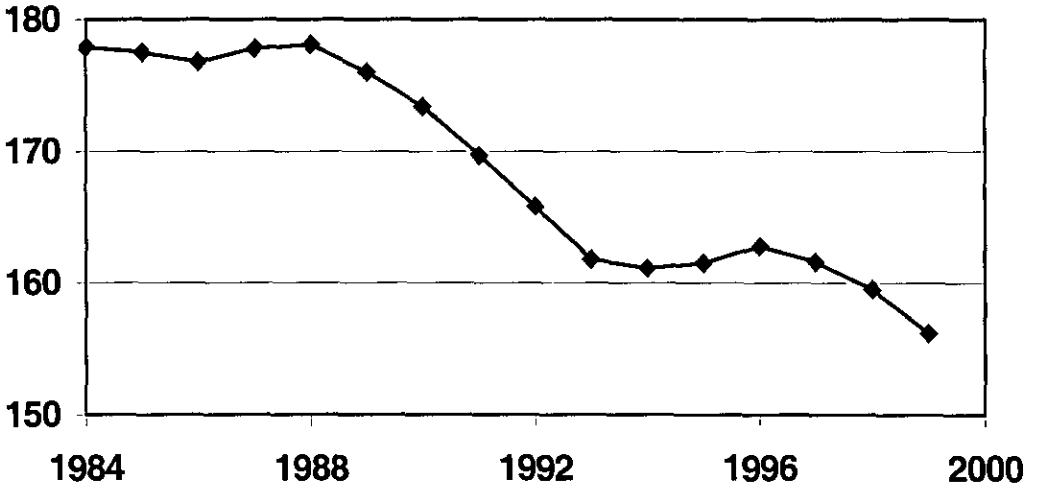
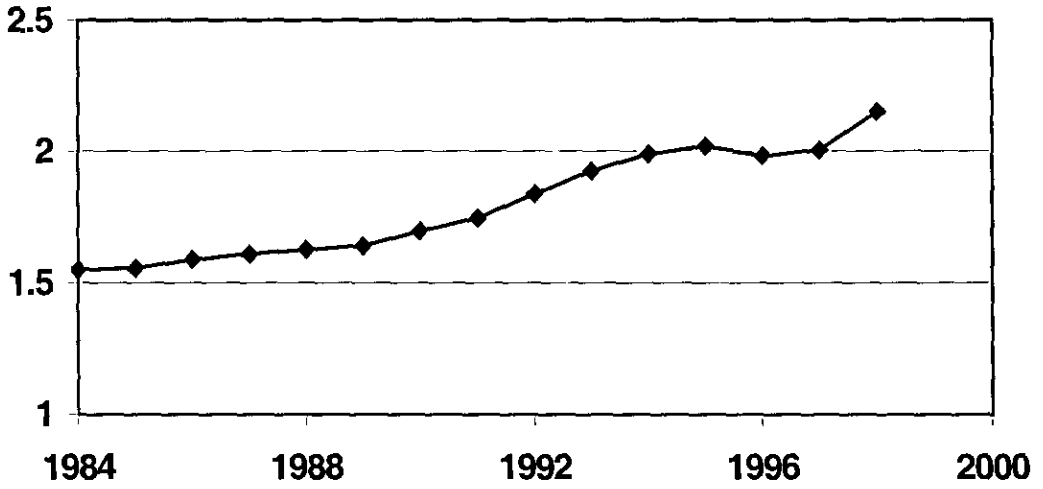


Figure 11:

Capital-output ratio



After-tax return on corporate capital

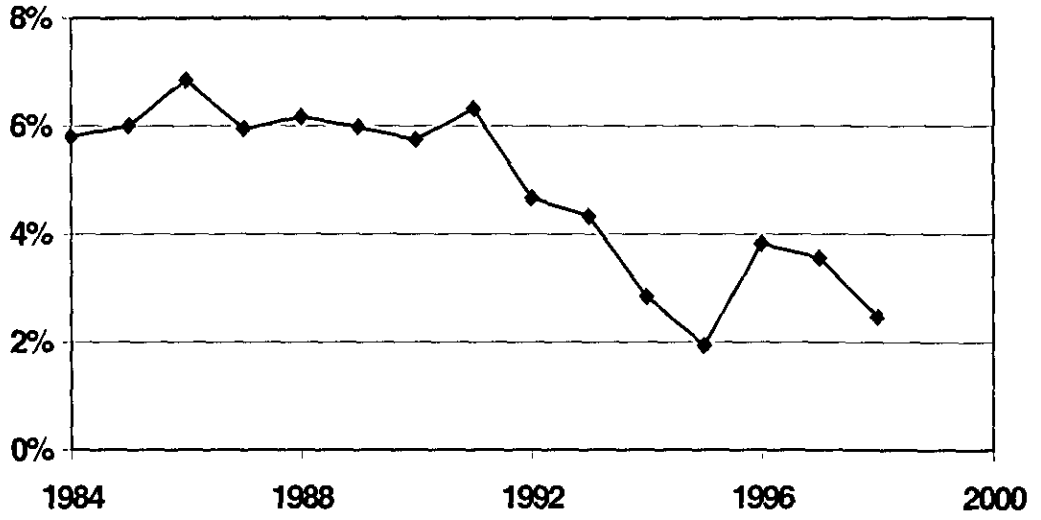
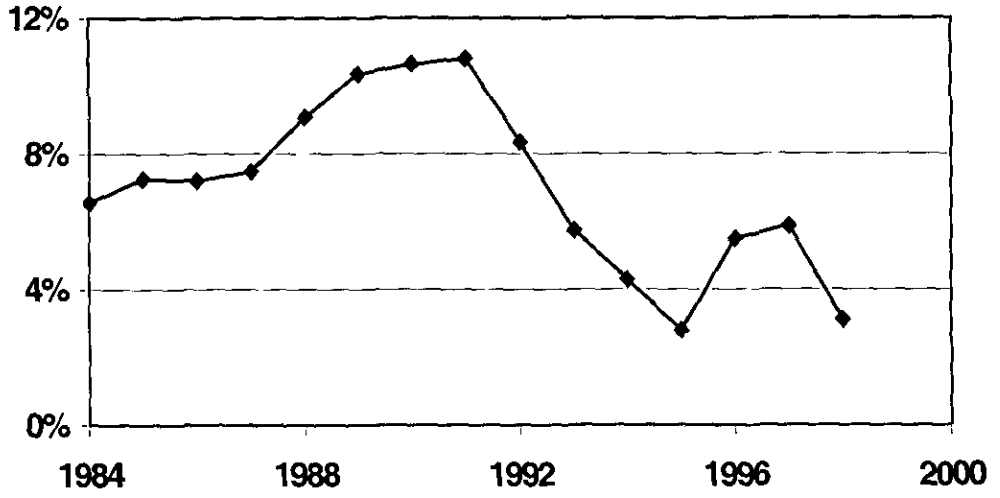


Figure 12:

Net domestic investment as share of product



Government purchases as share of product

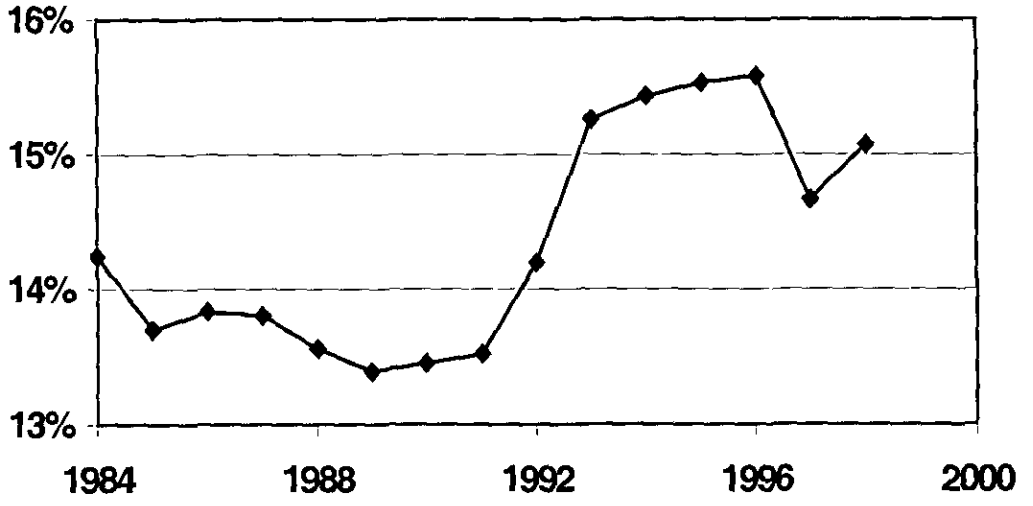
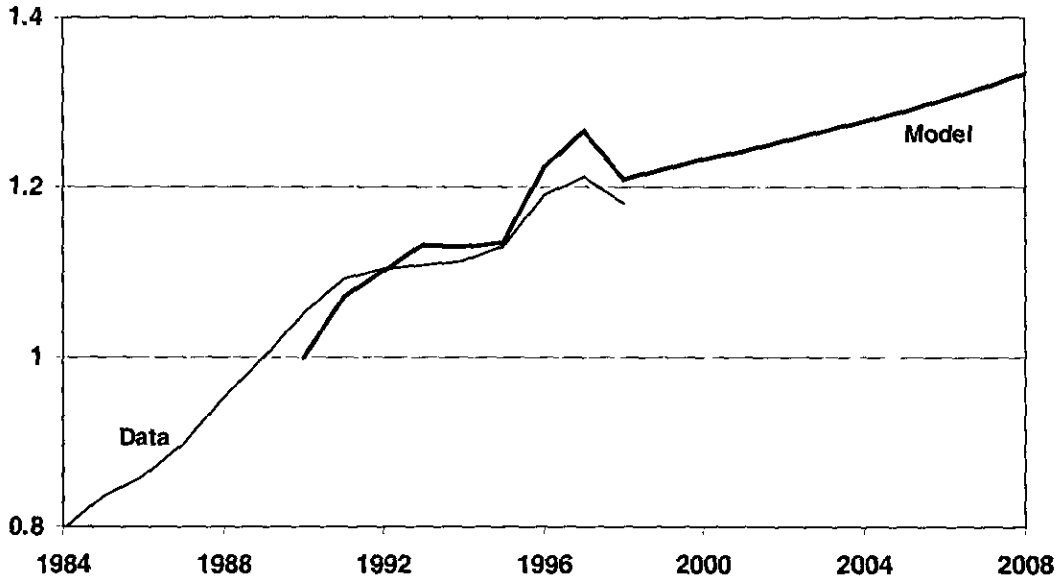
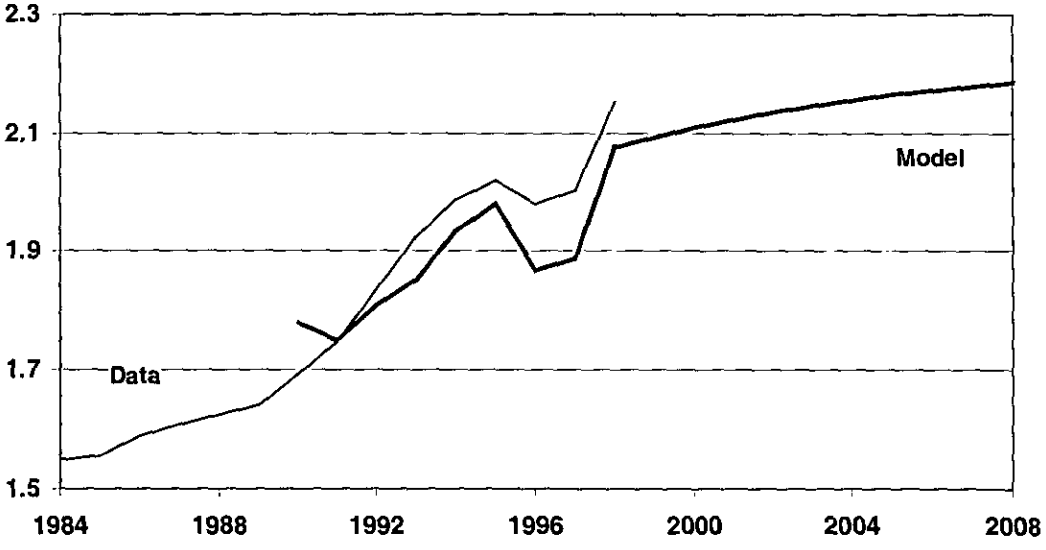


Figure 13: Predicted and Actual Outcomes

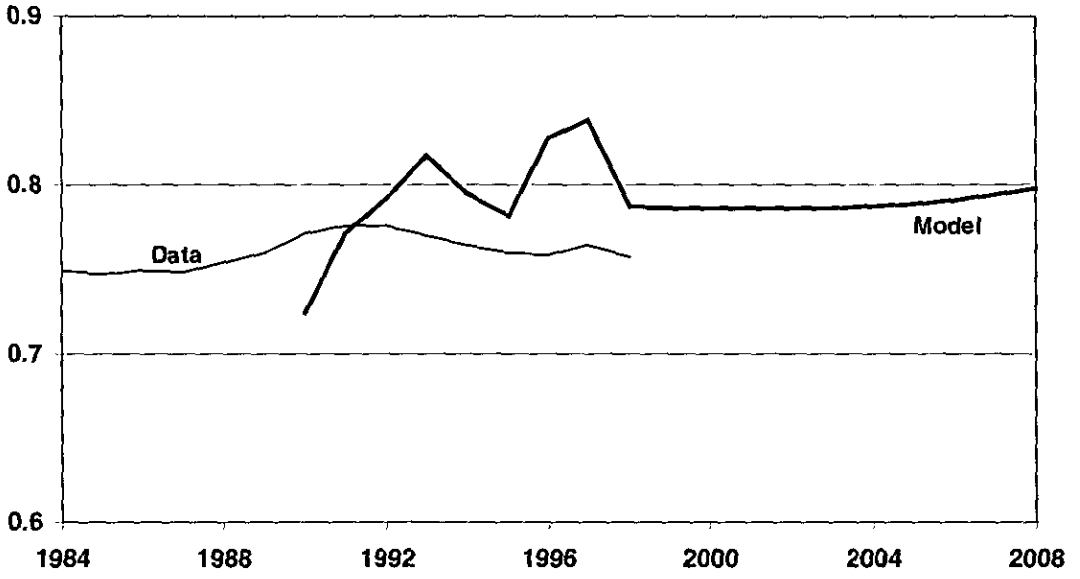
Output



Capital-output ratio



Employment ratio



Rate of return on capital