Consumption and Recessions: Japan in the 1990s and U.S. during the Great Depression

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Abstract

This paper characterizes Japanese recession in the 1990s from the statistical point of view by comparing it to U.S. Great Depression in the 1930s. Descriptive statistics suggests that while U.S. Great Depression is much more severe, current Japanese recession has been more persistent. However, the variance decomposition of output fluctuations, based on the framework of Cochrane (1994), suggests Japanese output fluctuations in 1990s contain relatively small permanent components or, at least, Japanese households have been considering the situation in that way. This result suggests the welfare loss in Japan in the 1990s has not been so large. On the other hand, U.S. output decline in the early 1930 seems to contain significantly large permanent components, implying devastating households welfare loss in this period.

JEL Classification: C22, E20, E23, N12.

Keywords: Japanese recession in the 1990s; the Great Depression; variance decomposition; the life cycle-permanent income hypothes.

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1 Introduction

Japanese prolonged recession in the 1990s is now considered as one of most disastrous events in its modern economic history. In popular discussions, it is often called "the lost decade." This is partly an exaggeration and partly true. Average real GDP growth in Japan from 1990 to 1999 is around 1.5-1.7%. This figure is significantly lower than Japan's own past, but not so outrageous when it is compared with U.S. Great Depression in the 1930s or European stagnation during 1970s-80s. It is true that the stock market bubble crashed in 1990, but the real economy did not get into serious recession until late 1992. So describing the entire 1990s as "the lost decade" is little misleading.

This paper tries to characterize the Japanese recession in the 1990s by comparing it to the U.S. during the Great Depression in the 1930s. I mostly concentrate to the statistical aspect of the problem and I will not try to compare the economic mechanism behind these two historical recessions: the later is the task of my paper with Bordo and Ito (Bordo, Ito, and Iwaisako, 1999) and this paper is a derivative from that work with coauthors.

The remaining of this paper is organized as follows. In section 2, today's Japan and U.S. during the Great Depression are compared using basic descriptive statistics. In section 3, the variance of output is decomposed into permanent and transitory components based on the correlation between consumption and output, following the framework of Cochrane (1994). It is shown that Japanese output fluctuation during the 1990s contains relatively small permanent component or, at least, Japanese households have been considering so. Section 4 makes some final remarks.

2 Comparison by Basic Statistics

First, we compare the Japanese recession in the 1990s and U.S. Great Depression in the 1930s based on descriptive statistics. In Table 1, basic statistics of output fluctuations of two events are reported in three different ways. Panel 1 presents average output growth rates for five year windows before and after the last peak preceding the recessions. Differences between before and in recession are 3.2 % for Japan and 11.4% for U.S. Panel 2 presents mean deviations from trend outputs during recessions. Roughly speaking, they can be interpreted as the deviations from potential outputs. U.S. trend is taken from Gordon and Blake (1986). In calculating Japanese trend GDP, I simply extrapolated GDP in 1986 by assuming constant growth rate at the average of between 1975-1985. Using either average growth rate or deviation from trend output, decline in the U.S. during the Great Depression is at least

three times larger than Japan in the 1990s. These statistics clearly suggest that U.S. Great Depression was far more severe than the Japanese recession today.

However, average output growth rates at the beginning and the subsequent periods in recessions, reported in Panel 3, suggest that things are little more complicated. While the initial decline in Japan was much milder than U.S., slow down in output growth has persisted longer. In contrast, U.S. experienced the sharp initial decline followed by strong rebound. But, the initial output decline was so large that overall output loss during the recession is still much larger in the U.S. Figure 1 graphically shows these points.

From the observations from descriptive statistics in Table 1, we can safely say U.S. Great Depression was far more severe than Japanese current recession. But, since a permanent decline in output is far more damaging to the welfare of households than a transitory decline, the fact that Japanese recession has been so persistent makes us worry. The negative effects of Japanese recession in the 1990s might have been larger than people have believed and not so different from U. S. during the Great Depression. Hence, investigating relative importance of permanent and transitory components in output fluctuations is our next task.

3 Permanent and Transitory Components in Output Fluctuations

3.1 Some Theory

In this section, we try to evaluate how much of the output fluctuations can be attributed between their permanent and transitory components. An obvious motivation behind this decomposition is that permanent decline in output is more damaging to the welfare of households since transitory decline in income can be spread out over time by consumption-smoothing.

There are some different strategies for identifying permanent and transitory components in output fluctuations. In this paper, we adopt the bivariate VAR framework of Cochrane (1994) , which is based on of the life cycle-permanent income hypothesis of consumption[1]. Hall's version of the life cycle-permanent income hypothesis (1978) suggests that if consumption

[1]An alternative (and perhaps more popular) strategy for identifying permanent and transitory components in output is to use long-run multipliers, proposed by Blachard and Quah (1989). However, since the lengths of sample periods we are interested in are relatively short, using correlation between consumption and output is more plausible than imposing long-run restriction.

does not respond to the change in current income, consumers think that the change in income is transitory. So Cochrane suggested estimating the following bivariate VAR system of output and consumption.

$$\Delta y_t = \alpha_{y0} + \alpha_{y1}(c_{t-1} - y_{t-1}) + \beta_{y1}\Delta y_{t-1} + ... + \gamma_{y1}\Delta c_{t-1} + ... \qquad (1a)$$

$$\Delta c_t = \alpha_{c0} + \alpha_{c1}(c_{t-1} - y_{t-1}) + \beta_{c1}\Delta y_{t-1} + ... + \gamma_{c1}\Delta c_{t-1} + ... \qquad (1b)$$

where y_t and c_t denotes natural logarithms of output and consumption respectively. Hence, the second terms on the right-hand sides of (1A) and (1B), $(c_{t-1}-y_{t-1})$, are the log of consumption-output ratio in previous period. They are error correction terms and including them implies that consumption and output are cointegrated. Cochrane used this VAR system to decompose the variance of Δy_t into the share of consumption (permanent) shocks and income (temporary) shocks. In computing variance decompositions, the VAR errors are orthogonalized so that consumption does not respond contemporaneously to output shock. Blanchard (1993) employed the similar empirical framework to investigate the role of the autonomous decline in consumption expenditure as the source of the U.S. recession in the early 1990s.

It should be noted that this type of framework is making some implicit assumptions. First, the consumption-income or the consumption-output ratio is assumed to be stable in the long-run. If there was a shift in the long-run marginal propensity to consume within the sample period, the assumption behind this framework is violated. However, there is no particular economic reason that we have to worry about a structural shift in consumption function in our samples and the stability of the long-run consumption-output ratio will not be a serious problem in this context.

Second, even if the long-run consumption/income ratio is stable, it will not assure us that the simple error-correction type model successfully captures short-run dynamics consumption-income relation[2]. In addition, both

[2]Recent empirical and theoretical developments in consumption function suggest particular types of deviation from Hall's version of permanent income is important in practice. For example, if the precautionary motive in saving is important, not just expectations of future income but also uncertainty about income affects consumption (Carroll, 1998; Hubbard, Skinner, and Zeldes, 1994). In such a case, the short-run dynamics of the consumption-income relation might not be appropriately captured by Cochrane's framework.

in Cochrane (1994) and in this paper, y_t is aggregate output (GDP) rather than household disposable income. We referred to the life cycle-permanent income hypothesis to motivate the use of consumption-output correlation for the identification in variance decomposition. But, we are not clamming that the simple version of permanent income hypothesis is an excellent description of the aggregate consumption behavior.

As far as I have explored, no previous study focused on output fluctuations in the particular sample periods of this paper using permanent/transitory component decomposition. However, some previous studies about consumption empirics are wroth to be mentioned. About Japanese consumption behavior in the 1990s, Kazuo Ogawa and his coauthors studied it in the series of papers mainly from the macroeconomic point of view emblazing the effect of asset prices. See, for example, Ogawa etal. (1996). Muto (1999) provides microeconomic and less formal account of the stagnation of Japanese consumption in the 1990s.

About the behavior the consumption-output relation during the Great Depression in the U.S., there are some important previous studies to be noted. First, Temin (1976) argued for shifts of the consumption function in explaining the contraction from 1929 to 1933 which is known as his "spending hypothesis."[3] Hall (1986) also found the evidence supporting the autonomous decline in consumption in the early 1930s. However, the sources of "consumption shocks" are not so clear in these studies. They can be considered as random shifts in consumption function, but they can be interpreted as the changes of consumer expectation regarding the future path of output, permanent income, too. Possible interpretations of the consumption shocks during the Great Depression are provided by Mishkin (1978) and by Christina Romer (1990). They both emphasized the impacts of financial panics on consumption in this period through the effect of financial crises on household wealth. Mishkin focused on the direct effects of financial panics on the household balance sheets and Romer emphasized the great uncertainty generated by the stock market crash in 1929. Their approaches are of Keynesian in character since they emphasize (aggregate) demand shift(s) in the household sector like Temin. However, they also have much in common with the monetarist approach of Friedman and Shwartz (1963) in that they view financial problems as critical to the understanding of the Great Depression. In the end, further evidence and careful interpretation will be required to determine the cause of "consumption shocks" in the 1930s.

[3]See, also, Temin (1989, 1993).

3.2 Empirical Results

Table 2 reports the basic VAR estimations for the interwar U.S. data and the Japanese data in 1980s and 90s. In estimating VAR system described by (1a) and (1b), y_t is log real GDP for Japan and log real GNP for the U.S. Otherwise noted, consumption series c_t is log real consumption expenditure on for non-durable goods and services. The result using the postwar U.S. data from Cochrane (1994) is also reproduced in Table 2 as the benchmark. A point should be noted about the Japanese estimation results is the treatment of the consumption tax hike in April 1997. Because of this raise of the consumption tax rate, from 3% to 5%, even consumption expenditure on non-durables and services had increased in the first quarter and sharply declined in the second quarter of 1997. To take care of this issue, I reported two different VAR result estimates. In the full sample estimate, I simply excluded all observations that have to use the first and the second quarter of 1997, either as dependent and/or independent variables. This strategy removes observations from the first quarter of 1997 to the first quarter of 1998. The sub sample estimation ends at the fourth quarter of 1996. Essentially, two estimates yield very similar results[4], so I will focus on the full sample estimate in the following. But, in either way, the information about the relation between consumption and output in 1997 is not reflected to in these results.

Table 3 report the results of variance decompositions using the VAR system in Table 2. In explaining the fluctuations in output (Δy_t), consumption (permanent) shocks were much more dominant in the U.S. in 1920s-30s. Consumption shocks explain nearly 60% of output fluctuations for the U.S. during Great Depression. In the Japanese system, consumption shocks explain around 40% of output fluctuations. This comes in between U.S. interwar data (59%) and postwar data (30%), but closer to the postwar U.S.. In contrast to the results for output fluctuations, for sources of consumption fluctuations (Δc_t), the relative importance of consumption (permanent) shocks and income (transitory) shocks are very similar in all three cases.

In Table 3, Panel D, the sub sample calculations of variance decomposition ending at before most severe recessions are reported. The sizes of sub samples are too small to say anything very conclusive, but the contrast between today's Japan and the interwar U.S. is very clear. In the interwar U.S. data ending at the fourth quarter of 1930 (Panel D-2), before getting into the last and most severe waves of banking panics, consumption shocks

[4]I also estimated the VAR system using the dummy variables and it yields almost identical result for variance decomposition. But, parameter estimates in VAR became very different since the dummy variables cannot fix the problem when the observations in the first half of 1997 are used as independent variable(s).

explain only 27% of output fluctuations which is even lower than the postwar value. So the full sample result that permanent shocks dominating output fluctuations is mostly due to the observations in the 1930s. This result is consistent with Hall's result (1986). On the other hand, in the Japanese data, the contribution of consumption shocks is higher than the full sample. This suggests that the share of transitory components in output fluctuations has increased after the recession began. In other word, Japanese households has considered that the large part of output decline in 1999s is not permanent.

In Figure 2, the log consumption/GDP ratio using both "non-durables plus services" and total consumption expenditure series are shown. In the second half of the 1980s and the early 1990s, the ratio of "non-durables plus services" relative to GDP exhibits v-shape, while total consumption/GDP ratio is much flatter. The v-shape is even more distinct for the ratio of "non-durables plus services" relative to total consumption, which is shown in Figure 3. These graphs suggest that Japanese households spent (unexpected) income increases during the Bubble economy period mostly on durable goods purchases. So the subsequent income decline in the 1990s was absorbed by the cut in expenditure on durables too. As the result, the correlation between Japanese output and non-durable consumption has been low in this period, even though up and in GDP were very large.

However, the share of "non-durables plus services" in total consumption in Figure 3 suggests another story is going on at the same time. In the second half of 1980s, the share of "non-durables plus services" had sharply declined, but it has never bounced back to the level of before 1985 during the recession of the 1990s. This fact can be interpreted in several ways. First, it is conceivable that there was a structural change in the shares of consumption expenditure in the second half of 1980s. It is equally conceivable that there is a downward trend in the share of "non-durables plus services." Finally, we can argue that there exists habit formation in durable good consumption. In anyway, we cannot tell which story contains more truth from aggregate data alone. Perhaps we have to wait for the full recovery of the Japanese economy to say anything conclusive about this problem.

4 Concluding Remarks

In this paper, I used the VAR system of aggregate non-durable consumption and output data to characterize the current Japanese recession in the 1990s and during the US Great Depression in the 1930s. The comovement of between consumption and output is found to be limited in today's Japan. This result suggests that Japanese households have been considering the current

recession as the deviation from the long-run trend rather than a permanent shock. On the other hand, U.S. consumers considered the recession in the early 1930s as the permanent shift in the long-run trend. An alternative interpretation of U.S. results is that households had no choice but reducing consumption because of the substantial damage sustained on the balance sheet of the household due to the waves of banking panics.

The results about Japan in this paper can be interpreted in a different way. Suppose we considered the household consumption as the source of output fluctuation — like Temin (1976), Mishkin (1978), and Hall (1986) did about the Great Depression. Then, the low share of consumption shocks in the variance of output fluctuation suggests it is highly unlikely that the decline of consumption expenditure caused the Japanese recession in the 1990s. So despite the emphasis in popular discussions, the stagnating consumption in the 1990s is more likely to be a result than the source of the recession.

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Table 1

Output before and during Recessions

Panel A: Output and inflation before and after the preceding Business cycle peaks

JAPAN	1986:2Q-1991:2Q	1991:2Q-1996:2Q	Difference
GDP Growth	4.8%	1.6%	-3.2%
Inflation (CPI)	1.74%	0.8%	-0.95%

Interwar US	1924:3Q-1929:3Q	1929:3Q-1934:3Q	Difference
GNP Growth	5.2%	-6.2%	-11.4%
Inflation (CPI)	0.37%	-5.2%	-5.55%

Note: Average output growth rates and inflation rates for the five year windows before and after the last peak preceding the recessions.

Panel B: Mean deviations from the trend output during the recessions

$$\text{Deviation from Trend Output} = 100 \times (\frac{\text{Actual Output}}{\text{Trend Output}} - 1)$$

JAPAN	-7.6% (1991:2Q-1998:3Q)

Interwar US	-28% (1929:3Q-1937:3Q)

Panel C: Average output growth rates in the first and the next four years in the recessions

JAPAN	1991:2Q-1995:2Q	1995:2Q-1998:3Q
GDP Growth	0.8%	0.9%

Interwar US	1929:3Q-1933:3Q	1933:2Q-1937:3Q
GNP Growth	-7.6%	7.1%

Table 2: VAR estimations

(A) JAPAN

(1) Full sample: 1981:1Q-1999:1Q
(excluding the first and second quarters in 1997)

Dependent variable — Right-hand variables

		$c_{t-1} - y_{t-1}$	Δy_{t-1}	Δy_{t-2}	Δy_{t-3}	Δc_{t-1}	Δc_{t-2}	Δc_{t-3}	$\overline{R}^2$
Δy_t	Coeff.	0.046	0.309	0.221	0.252	-0.488	-0.166	0.008	0.21
	t-stat.	2.18	2.34	1.36	1.99	-3.68	-1.04	0.05	
Δc_t	Coeff.	0.025	0.135	-0.060	0.333	-0.367	-0.028	-0.136	0.08
	t-stat.	1.01	0.78	-0.53	2.28	-2.80	-0.24	-0.88	

(2) Sample period: 1981:1Q-1996:4Q

Dependent variable — Right-hand variables

		$c_{t-1} - y_{t-1}$	Δy_{t-1}	Δy_{t-2}	Δy_{t-3}	Δc_{t-1}	Δc_{t-2}	Δc_{t-3}	$\overline{R}^2$
Δy_t	Coeff.	0.044	0.294	0.168	0.167	-0.471	-0.056	0.103	0.17
	t-stat.	2.09	2.20	1.06	1.12	-3.63	-0.39	0.56	
Δc_t	Coeff.	0.023	0.094	-0.125	0.228	-0.398	-0.016	-0.081	0.05
	t-stat.	0.93	0.55	-0.81	1.50	-3.23	-0.12	-0.45	

Table 2 (continued)

(B) Interwar US (Sample Period: 1920:2Q-1939:4Q)

Dependent variable		Right-hand variable							
		$c_{t-1} - y_{t-1}$	Δy_{t-1}	Δy_{t-2}	Δy_{t-3}	Δc_{t-1}	Δc_{t-2}	Δc_{t-3}	$\overline{R}^2$
Δy_t	Coeff.	0.165	0.453	-0.133	0.281	-0.091	-0.162	0.449	0.31
	t-stat.	2.64	3.26	-0.87	1.92	-0.41	-0.73	2.14	
Δc_t	Coeff.	0.023	-0.140	0.142	0.036	0.355	-0.178	0.127	0.03
	t-stat.	0.50	-1.38	1.27	0.33	2.21	-1.10	0.82	

(C) Postwar US

(Sample Period: 1975:1Q-1997:1Q, from Cochrane [1994])

Dependent variable		Right-hand variable					
		$c_{t-1} - y_{t-1}$	Δy_{t-1}	Δy_{t-2}	Δc_{t-1}	Δc_{t-2}	$\overline{R}^2$
Δy_t	Coeff.	0.08	0.22	0.14	0.52	0.16	0.27
	t-stat.	3.45	2.74	1.89	3.81	1.12	
Δc_t	Coeff.	-0.02	0.09	-0.02	0.07	-0.02	0.06
	t-stat.	-1.23	1.91	-0.40	0.90	-0.91	

Table 3: Variance Decomposition

(A) Japan

	1981:1Q-Δy_t	1999:1Q Δc_t	1981:1Q-Δy_t	1996:4Q Δc_t
Consumption shock	39.7 (%)	96.0	42.7	95.4
Income shock	60.3	4.0	57.3	4.6

(B) Interwar U.S.

Due to	1920:2Q-Δy_t	1939:4Q Δc_t
Consumption shock	58.5 (%)	96.9
Income shock	41.2	3.1

(C) Postwar U.S.

Due to	Δy_t	Δc_t
Consumption shock	30 (%)	97
Income shock	70	3

(D) Samples ending before serious recessions

(1) Japan ending at 1991

	1981:1Q-Δy_t	1991:4Q Δc_t
Consumption shock	47.8 (%)	93.7
Income shock	52.2	6.3

(2) U.S. ending at 1930

Due to	1920:2Q-Δy_t	1930:4Q Δc_t
Consumption shock	26.5	89.5
Income shock	73.4	10.5

Figure 1
Real Japanese GDP in the 1980s and the 1990s

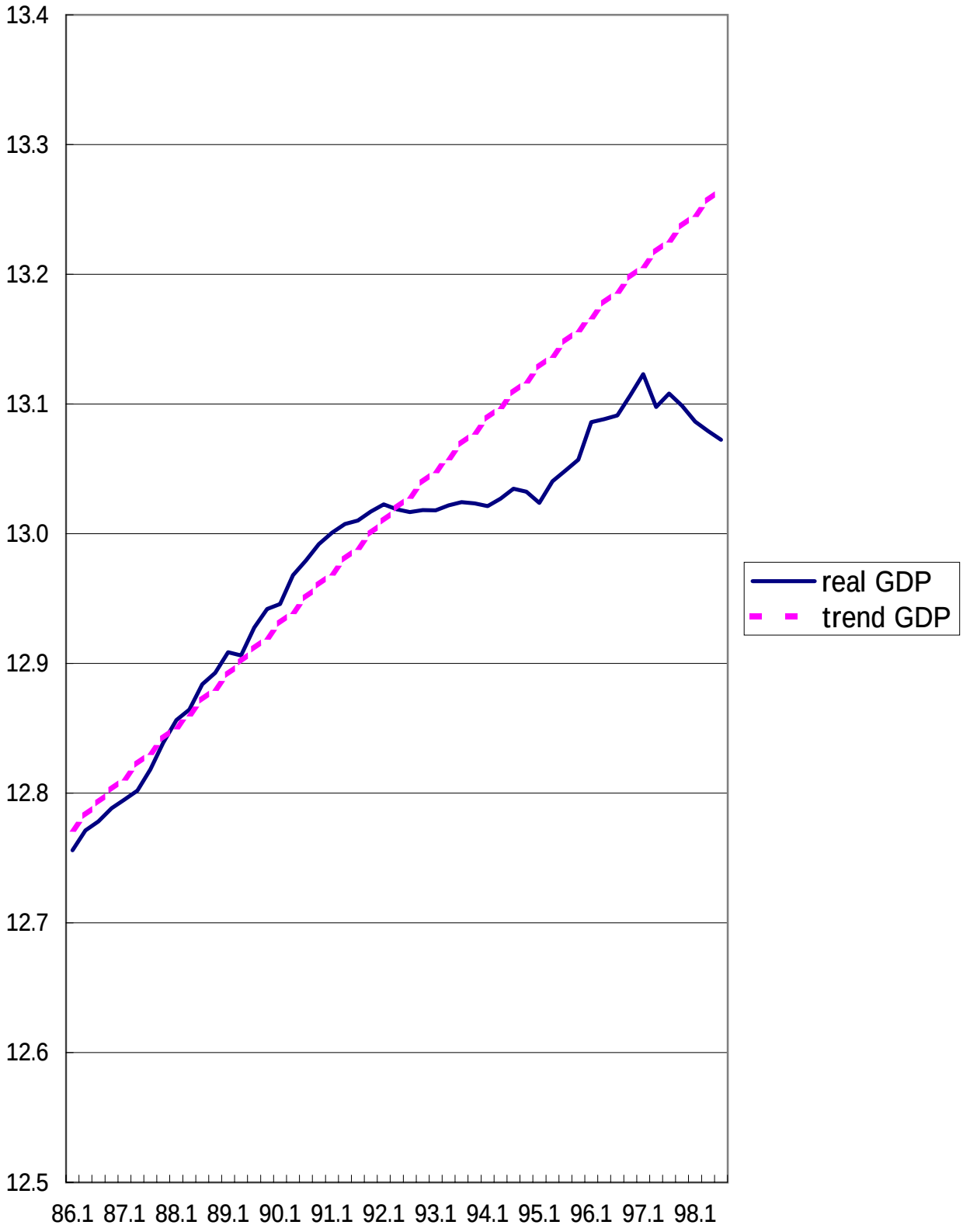

Figure 1
(continued)
Real U.S. GNP in the 1920s and the 1930s

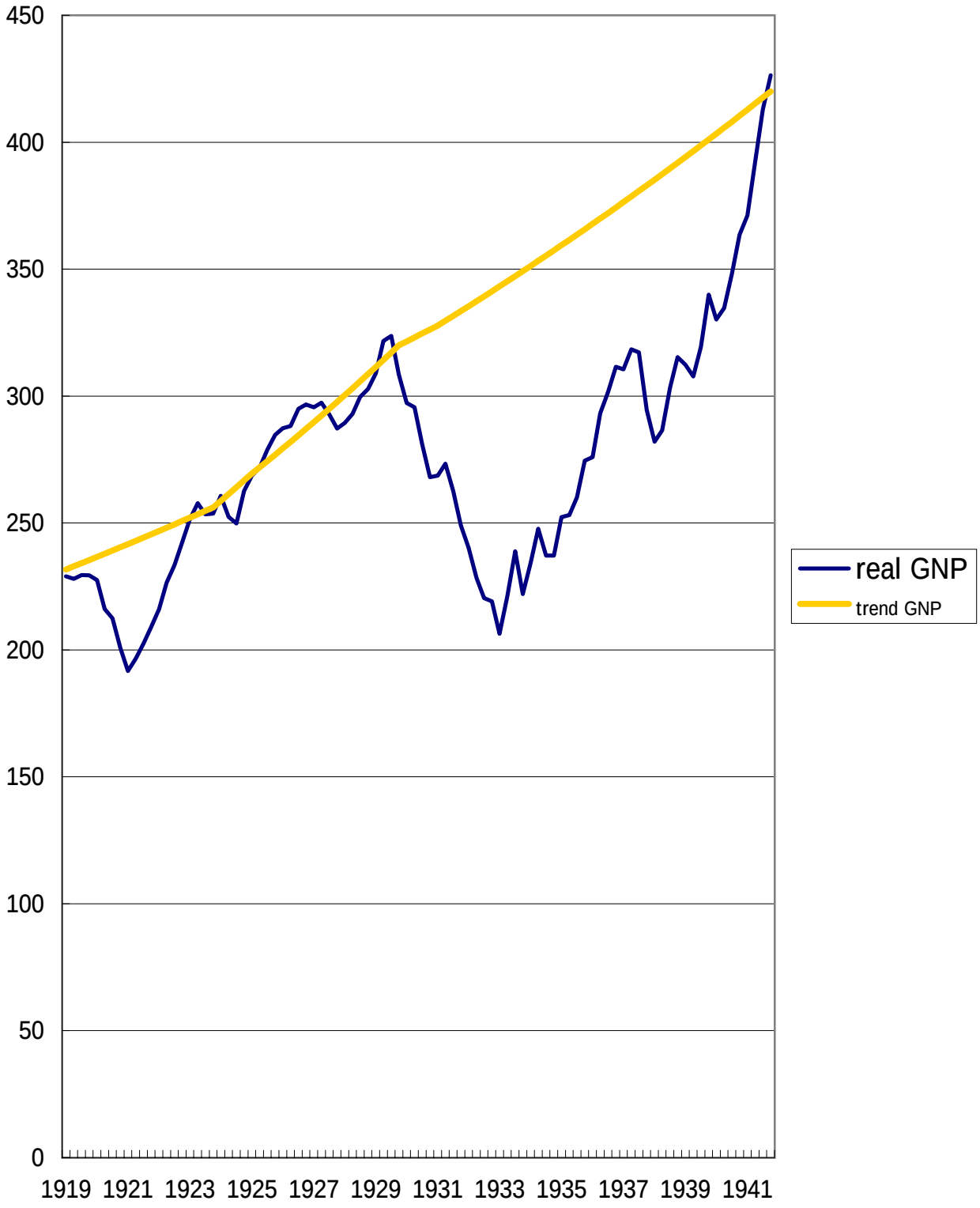

Figure 2

Log of Consumption/Output Ratio

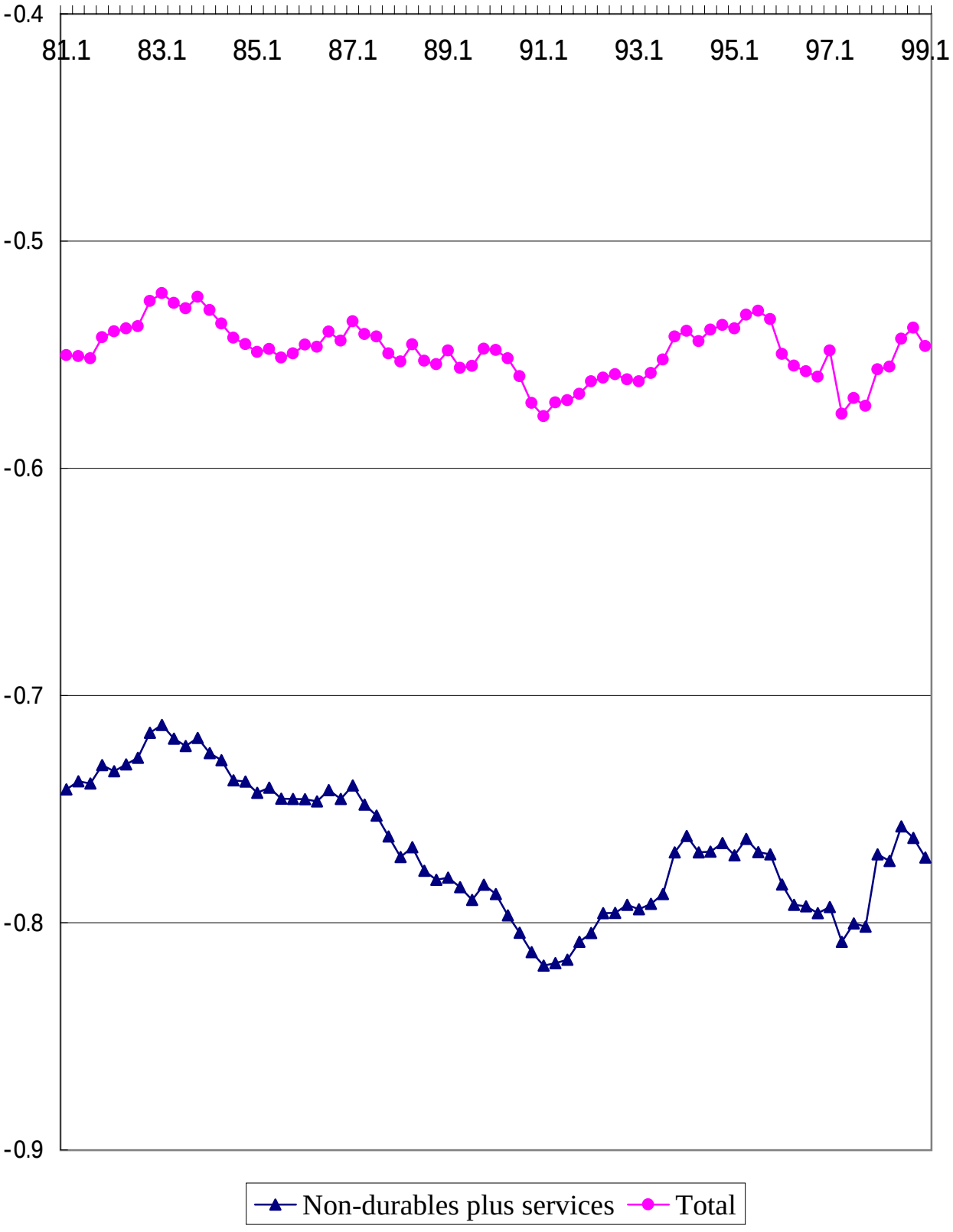

Figure 3
Ratio of Non-durables plus Services to Total Consumption