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Abstract

This study discusses the sustanability of the Bretton Woods system from the standpoint of the purchasing power parity. We use price levels of G7 countries and examine when the persistent disparity of the price levels among the countries occurred by applying the panel unit root tests. We find that the price levels had tended to diverge since the beginning of the 1960s. Despite that inflation rates stayed at a low level throughout the world until the mid-1960s, it would appear that the price levels inform the signal of breakdown of the Bretton Woods system before then.

Keywords: Bretton Woods; Convergence; Panel Unit Root Test; Price level
JEL classification: E30; F42; N10

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1. Introduction

Many previous studies analyzed why the Bretton Woods system ended from various evidences. Two reasons are generally accepted. One is the decline of the US gold reserve ratio. The US was the sole country linking its currency to gold and the US was obliged to keep up the value of dollar for gold under International Monetary Fund (IMF) agreement. However, as the result that the US had a chronic external payments deficit, the US short-term foreign liabilities had increased and US gold holdings had decreased since around 1960. It was given rise to fears that the convertibility of the dollar into gold for foreign monetary authorities was not sustainable and that the US depreciated the dollar for the gold.[1] Therefore, the first gold rush took place in 1960 in London Bullion Market, some gold rushes subsequently brought pressure upon the Bretton woods system, and some countries requested the US to exchange dollar with gold, [2] The US external payments deficit did not improve although the US tried the measures such as the capital-exporting control, the interest equalization tax, London gold pool, Roosa bonds, and the swap arrangements with foreign central banks in order to defend the dollar. In fact, the ultimate reforms for the problems by international cooperation did not go forward because of the policy differences between countries although the external payments surplus countries as well as the US would need to exert an effort to get over these hurdles.[3] After all, they only played for time enforcing a variety of the regulations.

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[1] See Triffin (1960).

[2] The US short liabilities to foreign monetary authorities first exceeded its gold reserves in 1964.

[3] Some researchers discuss the relationship between the US and the external payments

Therefore, the participants of the foreign exchange markets expected the parity adjustments. In consequence, the two-tier gold price system was adopted in 1968, the gold window was closed in 1971, and the Bretton Woods system collapsed. Focusing attention on the US gold holdings, it would appear that the sustainability of the Bretton Woods system began to decline in the beginning of the 1960s.

Another is the global inflation through the US.[4] During the Bretton Woods system, the countries other than the US were obliged to peg their currencies to the dollar, and these countries unilaterally must intervene to stabilize the dollar parity in the foreign exchange market.[5] It meant the asymmetry between the US and other countries and the fixed exchange rate system centering on the US because the US shall not be required to keep up the dollar to other currencies.[6] The price level of the US was benchmark for other

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surplus countries during the Bretton Woods system with reference to the recent situation of global imbalances between the US and Asian countries. See Dooley, Folkerts-Landau, and Garber (2004, 2005) and Eichengreen (2007) for comparative studies.

[4] See Bordo and Eichengreen (1993) and Darby, Lothian, Gandolfi, Schwartz and Stockman (1983).

[5] Fourth paragraph of Article 4 of the IMF agreement.

[6] McKinnon (1993) insisted that the Bretton Woods system since 1950s was de facto dollar standard. Mundell (1968) also insisted that the Bretton Woods system was dollar standard; In the first half of the Bretton Woods, no one doubted the strength of the dollar, and dollars were accumulated by central banks as being more useful than gold because of the interest that could be earned and because the dollar was the currency of intervention in the exchange market. In the latter half, although the US balance-of-payments deficit expanded, many central banks held dollars merely because they did not want to embarrass the US until 1965 that France began converting its entire surplus into gold. Mundell (1968), p.143.

countries under the system and it was hoped that the US acted as the anchor in price stabilization. However, the US continued expansionary fiscal and monetary policies, so that the US had boosted inflation and had made its inflation transmit throughout the world since the latter half of the 1960s.[7] Therefore, participating countries of the Bretton Woods system which disfavored inflation lost their trust toward the US and doubted the gold convertibility. In consequence, the gold buying in London Bullion Market heated up, some countries requested the US to exchange dollar with gold, and the Bretton Woods system collapsed. Focusing attention on the US inflation, it would appear that the sustainability of the Bretton Woods system began to decline in the latter half of the 1960s. Solomon (1982) concludes that, had it not been for the Vietnam-caused inflation after1965, the Bretton Woods system might have gone on for quite a while.

These two reasons would be important but might not necessarily be sufficient for the sustainability of the Bretton Woods system. The decline of the US gold reserve ratio could induce the doubt of the linkage between the dollar and gold and the gold rush in London Bullion Market. However, the speculative attacks targeted not only gold in London Bullion Market but also individual currency of the participating countries of the Bretton Woods system in foreign exchange market. The US inflation would have a serious impact on the Bretton Woods system through transmission of US inflation and the speculative attacks. However, it must be noted that international transmission channel of US

[7] Many countries tried to catch up on the US economy and experienced the additional price growth by Blassa-Samuelson effect. Blassa-Samuelson effect means that the differences of price levels among countries including the non-tradable goods would occur in the case that the productivity of the trade goods were different by each countries.

inflation is mainly international trades of goods and services. Although countries which had a current account surplus with the US were forced to importation of the US inflation, all countries did not have a current account surplus with the US. That is, the inflation that some countries suffered from might not attribute to the US inflation but homemade inflation. In addition, it must also be noted that speculative attacks occurred before the time when the inflation rate of the US rose.

This study focuses on the problem to the uphold of dollar parity from the standpoint of the purchasing power parity in order to gain additional insight although previous studies were exclusively concerned with the problem to the uphold of gold parity. The persistent differences between the price levels of the US and the other countries would be important measures for the change in the exchange rates between the dollar and the other currencies. The temporary price differences which disappear through arbitrage of international trade do not induce parity adjustment.

The international price differences could occur persistently when each country gave preference to the domestic affairs over the international issues and followed a unique policy operation under capital control and sterilization. The deviations of exchange rates from purchasing power parity would be expected future change in the exchange rates.[8]

[8] While this idea stands on the purchasing power parity, the interest parity theory also typical benchmark for the grasp of a good level of exchange rates. However, the exchange controls were strictly imposed and it was difficult to operate the funds on the basis of the international interest rate spread during the Bretton Woods system. Therefore, it makes no sense at all that exchange rates was adjusted by the interest rate spread. In addition, the international capital movement mainly occupied by the international trade and the international capital transactions accounted for only a small fraction of the international

Therefore, the persistent differences exert pressure on the Bretton Woods system through speculative international transactions even if the Bretton Woods system did not collapse immediately because of restricted trade and capital mobility.[9] The price levels need to synchronize each other in the long run in order to carry on the Bretton Woods system.[10] [11]

The main contribution of this paper is to examine when the continuing disparity of the price levels of the US and the other countries occurred under the Bretton Woods system. Because world inflation which the US inflation bred was focused as the factor of the end of the Bretton Woods system with regard to the price levels, the price movements might not be observed cautiously until the inflation rate of the US rose. Considering international price differences, we could not exclude the possibility that the price levels inform the signal of breakdown of the Bretton Woods system before world inflation of the latter half of the 1960s. Differing from the movements of the US gold reserve ratio and the US inflation which can judge on some level from statistics, it is difficult to examine when prices came to disagree persistently and internationally by only looking at the

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capital movement at the time. See Marston (1993) for details.

[9] Einzig (1968) insisted the disguised capital flows such as *leads and lags* in trade credit played a key role in currency speculation. See Einzig (1968) for details.

[10] Many major countries had gradually reduced the restriction of the capital mobility since the convertible period. Then, the loophole of the capital mobility expanded and capital flow had been speculative. However, the scale of the capital mobility was still much less than the classical gold standard and recent globalization periods. See Marston (1993), Hogendorn and College (1998), and Obstfeld and Taylor (2004).

[11] Theoretical model of Flood and Garber (1984) assumes free capital mobility, and therefore, the collapse of fixed exchange rate regime can instantaneously happen without the time-lag.

episodes and statistics regarding political and economic situations among countries without formal investigation.[12] We apply the panel unit root tests in order to get the Bretton Woods system in perspective based on the concept of the convergence and test when wholesale price index (WPI) and consumer price index (CPI) among G7 countries began to diverge if that was the case. We find that both WPI and CPI among G7 countries began to diverge in 1961 or 1962. The results show that the Bretton Woods system already got hurt through the international price differences although inflations had been at a low level in the world until the mid-1960s.

The rest of this paper is organized as follows. Section 2 describes the international price trends and the disparities of economic situation and management among countries of the Bretton Woods period from the aspect of our examination. Section 3 presents the methods of panel unit root tests used in our empirical analyses. Section 4 discusses international price differences from data. In Section 5, we try to examine when prices among countries began to diverge by panel unit root tests. Section 6 draws the conclusions of this study.

2. The international price trends and their backgrounds

Inflation rates are considerable fundamentals for the stability of the exchange rate. The statistics show that inflation stayed at a low level during the convertible period since the end of 1950s when many major countries had restored the convertibility of the

[12] Each country could have a certain degree of autonomy in the monetary policy and deviate from *the rule of game* in the short term by the restriction of the capital flow. See McKinnon (1993) for the rule of game of Bretton Woods system.

currencies compared to other period. It was the latter half of the 1960s that the US boosted inflation although it would appear that the US inflation had a key role in the worldwide inflation. Then, the economic priorities of the US had paid increasing attention to full employment and the US intervention to the Vietnam War since the latter half of the 1960s made the budget deficit expand.[13] In addition, the US dramatically changed monetary policy in 1961. The rate of Federal Reserve credit expansion increased about sevenfold and the shift was not only large and abrupt but also lasting, so that it raised inflationary expectations.[14] These events caused the acceleration of worldwide inflation as well as US inflation in the latter half of the 1960s.

However, we doubt that the signal of breakdown of the Bretton Woods system did not appear the price levels until the eve of the end. It would be necessary for the keeping of currency value and parity that the inflation rates were not only low levels but also linked internationally during the Bretton Woods system. We reexamine the stability of the price levels before the latter half of the 1960s in order not to pass over on important information of the price levels.

The price level differences among the countries could occur when the economic condition, priority, the adopted monetary and financial policy of each country went in different directions. In fact, some events which caused international price differences

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[13] The policy change is called benign neglect, which means the US tended to ignore the problems of the dollar and the balance of payments to some extent.

[14] Niehans (1976) insisted that the change of US monetary policy was the essence of the breakdown of the Bretton Woods system because the US monetary authorities could control the volume of Federal Reserve credit. See Niehans (1976), p.177.

occurred from the first half of the 1960s.[15] Then, many western European countries and Japan experienced remarkable economic development after World War II. The influence of the US economy gradually weakened in the world and it made the US difficult to be responsible for maintaining the Bretton Woods system. In the US, Kennedy won presidential election in 1960 with commitments of 5% economic growth. In the UK, both the Conservative and Labour Party promised 4% economic growth on the nationwide election in 1962. These cases mean that expansionary economic policies were implemented. Meanwhile, Germany took a firm line against inflation because Germany experienced hyperinflation in the past and was sensitized to the dangers of inflation. Paul Adolph Volcker, who was the Chairman of the Board of Governors of the Federal Reserve, insisted that the growing strength and confidence of European countries made them more assertive partners for the US in discussions and decisions about the monetary and economic system at the time.[16] Therefore, each country tended to give preference to the domestic affairs over the international issues and followed a unique policy operation regardless that the adjustable peg did not operate effectively.[17] It would appear that

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[15] For example, see Solomon (1982), ch.3.

[16] Volcker and Gyouten (1992), p.19. What is more, Germany rebuffed the offer of the US such as the assumption of a share of the costs of stationing US troops on Germany at the time. Volcker and Gyouten (1992), p.22.

[17] Differing from the classical gold standard period from the end of the 19th century to World War I, the speculation which proposed parity adjustment became conspicuous during the Bretton Woods system. Therefore, growing capital mobility precluded the adjustable peg system even if basic imbalance occurred among countries. For example, see Bordo (1993), p.80. Additionally, see Polak (1994), p.22.

these differences of economic situation among countries could cause the persistent international price disagreement.

3. Application to our analysis of methods of panel unit root tests

Recently, the examinations of the convergence by the panel unit root tests have been adopted on many fields of economics. The approach can be applied to examine whether the economy of the leader country or area affects that of the periphery countries or areas in the long run. It is consistent with our motivation to examine the movement of the price levels of the US and the other countries during the Bretton Woods period comprehensively.

Let $A_{i,t}$ represent a price index in country i, i=1,2,…,N, at time t, t=1,2,…T. The country i consists of G7 countries other than the US. Let $A_{US,t}$ represent a price index of the benchmark country, the US, at time t. The price indices in country i and the US at time t are expressed in the following equations.

$$\ln A_{i,t} = \ln \gamma_i + \lambda_i \ln\left(\frac{A_{US,t-1}}{A_{i,t-1}}\right) + \ln A_{i,t-1} + \varepsilon_{i,t}, \quad (1)$$

$$\ln A_{US,t} = \ln \gamma_{US} + \ln A_{US,t-1} + \varepsilon_{US,t}, \quad (2)$$

where $\ln\gamma_i$ ($\ln\gamma_{US}$) represents constant price increases based on the original economic conditions such as the productivity growth of the country i (the US). $\varepsilon_{i,t}$ ($\varepsilon_{US,t}$) represent the shocks occurred in the country i (the US) individually or universally at time t.[18] λ_i represents the speed of convergence. Equation (1) means that the price level of each country i got close to the US price level and that the price difference would be adjusted in

[18] We suppose the effect of a variety of the economic and political policy as the shocks.

order to defend the stabilization of exchange rate. Equation (2) supposes that the price level of the US followed random walk process and it was not influenced by the other countries. From equations (1) and (2),

$$\Delta \ln X_{i,t} = (\ln \gamma_i - \ln \gamma_{US}) + \rho_i \ln X_{i,t-1} + u_{i,t}, \quad X_{i,t} = A_{i,t} / A_{US,t}, \quad \rho_i = -\lambda_i . \qquad (3)$$

$\ln X_{i,t}$ represent the gaps between the price levels of the country i and the US. If $\rho_i = 0$, $\ln X_{i,t}$ do not diminish as time passes because $\ln X_{i,t}$ has a unit root. In this case, the price levels of country i and the US tended to diverge. If $\rho_i < 0$, $\ln X_{i,t}$ is considered to be stationary variable. In this case, the price levels of country i and the US tended to converge. The differences of $\ln \gamma_i - \ln \gamma_{US}$ would not necessarily vanish because the economic growth varied by each country.[19]

We do not apply the individual unit root test of the price difference between the US and each G7 country other than the US but the panel unit root test for equation (3) in order to get the Bretton Woods system in perspective as well as to increase the number of observations. Considering that ρ_i is the individual convergence speed, we investigate whether the gaps between country i and the US were stationary by using three kinds of panel unit root tests: Im, Pesaran, and Shin (IPS) test; Fisher augmented Dickey-Fuller (Fisher-ADF) test; and Fisher Philips-Perron (Fisher-PP) test.[20]

IPS test and Fisher-ADF test construct a parametric correction for higher-order

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[19] We regard $\ln \gamma_i - \ln \gamma_{US}$ as Blassa-Samuelson effect. Blassa-Samuelson effect means that the differences of price levels among countries including the non-tradable goods occur in the case that the productivity of the trade goods were different by each countries.

[20] IPS test is suggested by Im, Pesaran, and Shin (2003). Fisher–ADF and Fisher–PP tests are suggested by Maddala and Wu (1999) and Choi (2001).

correlation like augmented Dickey-Fuller test, and Fisher-PP test construct a nonparametric method of controlling for serial correction like Philips-Perron test. The null hypothesis (H_0) and the alternative hypothesis (H_1) of these three tests are:

$$H_0 : \rho_i = 0 \quad \text{for all i,}$$

$$H_1 : \rho_i = 0 \quad \text{for} \quad i = 1,2,...,N_1 \quad \text{and} \quad \rho_i < 0 \quad \text{for} \quad i = N_1 + 1, N_1 + 2,..., N.$$

The i may be reordered as necessary. Null hypothesis means that $\ln X_{i,t}$ is non-stationary at any i, and the alternative hypothesis means that $\ln X_{i,t}$ is stationary for at least one i. Therefore, we determine that the Bretton Woods system became unsustainable from the aspect of international price differences if null hypothesis is accepted. The test statistics of IPS test follow an asymptotic normal distribution, and the test statistics of Fisher-ADF and Fisher-PP tests follow an asymptotic χ^2_{2N} distribution.

4. Data descriptions

We use the annual data of WPI and CPI for G7 countries during the Bretton Woods period. WPI and CPI data are from various issues of the Monthly Bulletin of Statistics of the United Nations.[21] WPI is available from 1950 to 1971 and CPI is available from 1951 to 1971. We peg WPI in 1950 and CPI in 1951 of raw data at 100 for all countries as a benchmark in advance, and adjust WPI and CPI according to the benchmark. Figures 1 and 2 present the logged WPI from 1951 to 1971 and the logged CPI from 1952 to 1971, respectively. Figures 1 and 2 show that the price levels of all countries progressively increased. It is interesting to note that the price level of the US was stable on the low

[21] Although the WPI data of the countries other than the UK are the general goods', that of the UK is the finished goods' because of the data restriction.

level compared with those of other countries. The rest countries might put in an effort to come close to the lower inflation of the US because the deviations of exchange rates from purchasing power parity influence the uphold of the dollar parities. In addition, we can confirm that the increase of US price level tend to accelerate since the latter half of the 1960s. Some previous studies regard the fact as the signal of the end of the Bretton Woods system induced by international transmission of the US inflation.

We set $\ln X_{i,t}$ based on the discussion in Section 3 in order to examine the process of divergence. $\ln X_{i,t}$ is the logged difference between the price level in country i and the US, and each $\ln X_{i,t}$ in 1950 for WPI and $\ln X_{i,t}$ in 1951 for CPI is 0 by using the logged WPI and CPI as initial values. Figure 3 presents $\ln X_{i,t}$ for WPI from 1951 to 1971 and Figure 4 presents $\ln X_{i,t}$ for CPI from 1952 to 1971. Figure 3 and Figure 4 show that the differences of many countries progressively increased. It is possible that the gaps diverged because they did not diminish as time passed.

However, it is difficult for us to examine whether the WPI and/or CPI among G7 countries converged, diverged, or diverged on the way from Figures 3 and 4. The other countries tended to grow faster than the US by the come-back story after World War II. Therefore, it is no wonder that such gaps occurred by the Blassa-Samuelson effect because WPI and CPI do not only include tradable goods but also nontradable goods on some level. What is important is not whether the gaps occurred but whether the price levels of the other G7 countries were affected by that of the US. We try to examine when the international price convergence did not work out by the statistic method.

5. Empirical Results

We analyze the convergence of the price levels of the US and the other G7 countries by panel unit root tests. The null hypothesis of the panel unit root tests is that the price differences between the US and the other G7 countries are not converging at all. We conclude that the persistent international price divergences occurred if the null hypothesis is not rejected at 5% significant level. The whole sample periods are from 1951 to 1971 for WPI and from 1952 to 1971 for CPI. We conduct the tests with the whole sample, and with eleven sub-samples changing the end of sample period from 1960 to 1970 in order to examine whether the price levels of the US and the other countries were converging, diverging, or diverging on the way. It is possible that the price levels inform the signal of breakdown of the Bretton Woods system before the worldwide inflation if the divergence was observed by the mid-1960s.

Table 1 presents the results of three kinds of panel unit root tests for WPI. IPS and Fisher-ADF tests (Fisher-PP test) reject(s) the null hypothesis with any sub-sample before 1962 (1961), and do(es) not reject the null hypothesis when we set the end of sample period after 1963 (1962). Table 2 presents the results of panel unit root tests for CPI. Fisher-ADF and Fisher-PP tests (IPS test) reject(s) the null hypothesis with any sub-sample before 1960 (1961), and do(es) not reject the null hypothesis when we set the end of sample period after 1961 (1962).

These results show that both WPI and CPI had tended to diverge among G7 countries since the beginning of the 1960s. Our results obtained coincide with the inconsistency of the international economic situations that could cause the persistent

international price divergences in the first half of the 1960s. The structural VAR analysis dealing with G7 countries by Bayoumi and Eichengreen (1994) provide valuable intelligence for the international business cycle during the Bretton Woods system. Their results show that the international dispersion of aggregate supply disturbances decreased until the end of the 1950s and had increased progressively since the beginning of the 1960s while the dispersion of aggregate demand disturbances increased after 1965. Considering the results of Bayoumi and Eichengreen (1994), it is possible that the price differences since the beginning of the 1960s were based on the inconsistency of the international aggregate supply disturbances. Therefore, it is doubtful that 1960s was the heyday of the Bretton Woods system judging from the sustainability the system.[22] [23]

Here, we conduct two additional investigations in order to see the robustness of the results. Firstly, we examine if the gaps between the price levels of the US and the other G7 countries in the sub-sample periods from 1961 to 1968 and from 1961 to 1971 were stationary. It is possible that the constant term and/or the parameters of the coefficient of $\ln X_{i,t}$ in equation (3) shifted in the latter half of sample periods. In this case, the panel unit root tests do not tend to reject the null hypothesis even if the price levels converged

[22] Some economists suspected that the excellent performance of the latter half period of the Bretton Woods system called the heyday was a statistical illusion. For example, see Solomon (1982), p.46 and Bordo (1993), p.4.

[23] The growth rate of income per capita had achieved stable growth during 1960s, so that the fact also regards the period as the heyday of the Bretton Woods system. However, the prosperity might be based on the results of domestic-oriented economic policy taking no account of the external equilibrium. In the case, it would be difficult to sustain the Bretton Woods system over the long term.

in the first half and the latter half period, respectively. Therefore, we analyze the convergence of the price levels of the US and the other G7 countries only in the latter half of the Bretton Woods era. Panel unit root tests for two kinds of sub-sample periods do not reject the null hypothesis and support the findings of Tables 1 and 2 in the case of both WPI and CPI.

Secondly, we conduct the panel unit root test by Levin, Lin and Chu (LLC).[24] It is possible that the results of IPS test, Fisher-ADF and Fisher-PP tests send mixed signal. In these tests, while the null hypothesis is that the differences of the price levels of the US and the other G7 countries are not converging at all, the alternative hypothesis is that they are converging for at least one. Meanwhile, in LLC test, the null hypothesis is that the price levels of the US and the other G7 countries are not converging at all and the alternative hypothesis is they are converging. That is, LLC test can clearly judge when the international price convergences ended and when the international price divergences began. However, it must be noted that LLC test assumes a common unit root process.[25] Therefore, we use LLC test as the auxiliary studies because the assumption might be unrealistic. LLC tests show that the price levels among countries began to diverge in the beginning of the 1960s and that the results of Tables 1 and 2 have robustness.

6. Conclusions

During the Bretton Woods system, the statistics show that inflation rates had

[24] LLC test is suggested by Levin, Lin and Chu (2002).

[25] That is, LLC test means that the convergence speeds of all countries are the same.

stabilized at a low level in the world until the mid-1960s, and it was the eve of the end that the movement of the price levels began to impress as the factor of breakdown of the Bretton Woods system. However, the linkage of price levels of the US and the other G7 countries would have important information in addition to the scale or fluctuation of inflation in each country, considering the sustainability of the system from standpoint of the purchasing power parity. We use WPI and CPI of G7 countries during the Bretton Woods system and examine when the persistent disparity of the price levels among the countries occurred by applying the panel unit root tests if that was the case.

Both WPI and CPI had tended to diverge since the beginning of the 1960s. We confirmed that the results were supported regardless of the models' variation in some panel unit root tests and sample periods. The results show that international price divergence began around the same time when a chronic external payments deficit in the US and the international disagreement of the adopted economic policies were observed. Our results are not necessarily inconsistent in the previous studies that the worldwide inflation affected the collapse of the Bretton Woods system. Many facts showed that inflation from the US transmitted throughout world, and therefore, no one disputes that it gave the coup de grace to the Bretton Woods system. What we point out is that the concern about the sustainability of the Bretton Woods system appeared in the price levels before the worldwide inflation of the latter half of the 1960s.

In addition, our discussion would have the implication for the collapse of the Smithsonian Agreement in 1973. Generally, the US inflation is regarded as the main reason of the collapse. However, there is little evidence that a current account surplus

with the US were piled up in the external asset of Western European countries in the last few years. Therefore, the international price differences might serve an important role although the US inflation could partially explain the end of the Smithsonian. Further investigation is hoped in regard to this matter.

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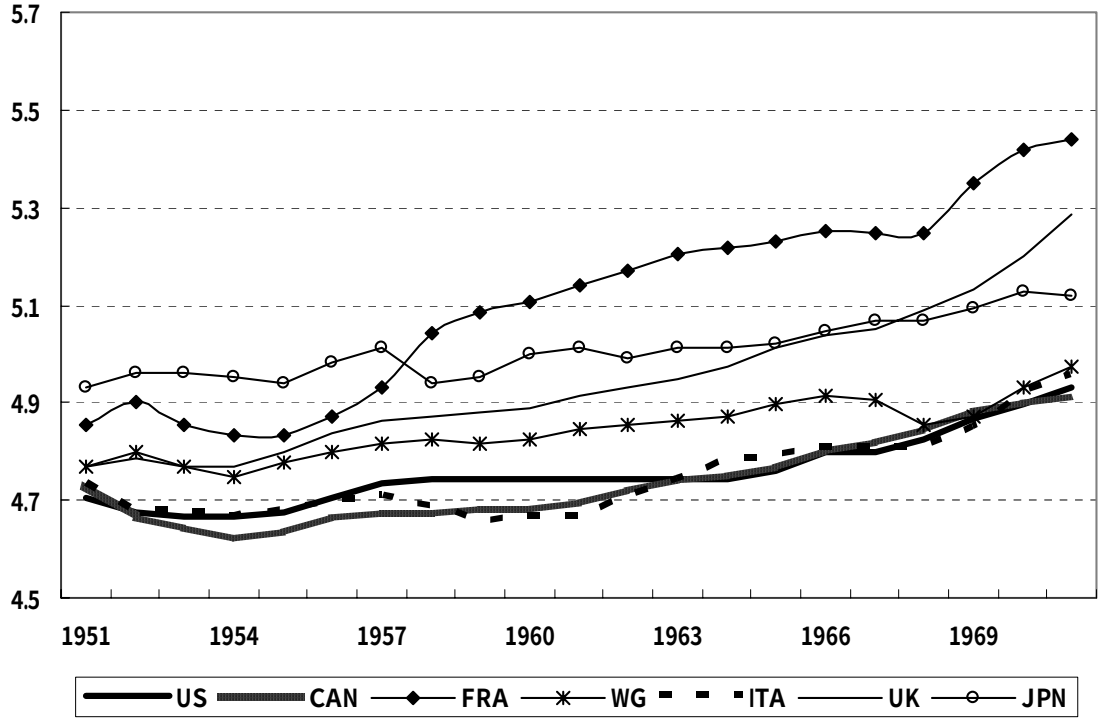
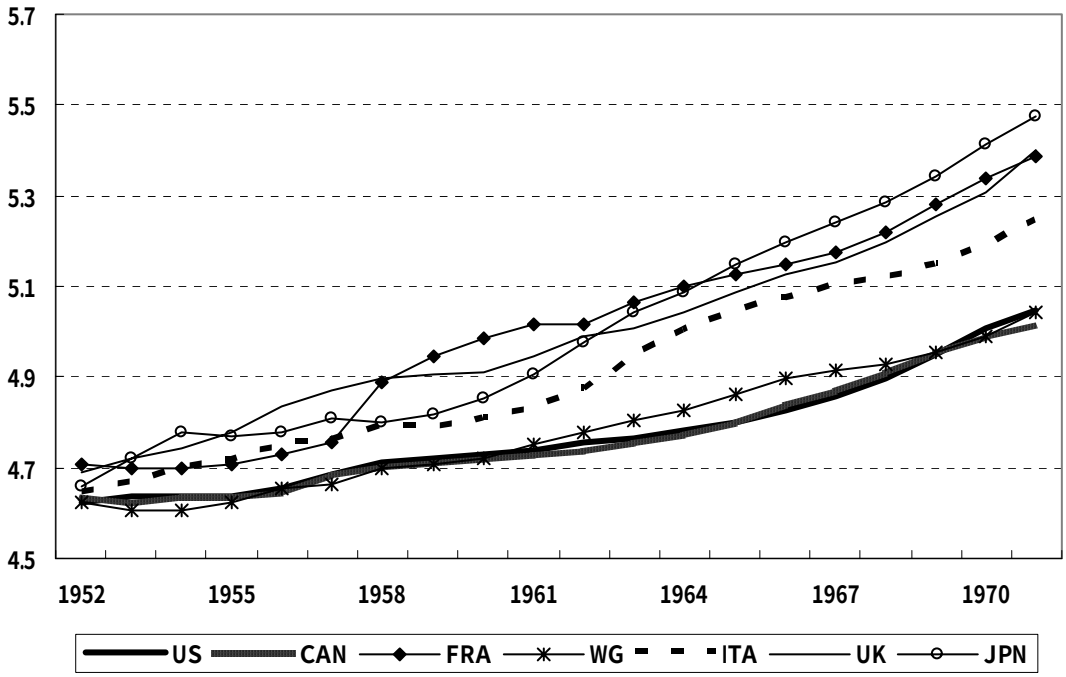
Figure 1. Wholesale price indices in G7 countries



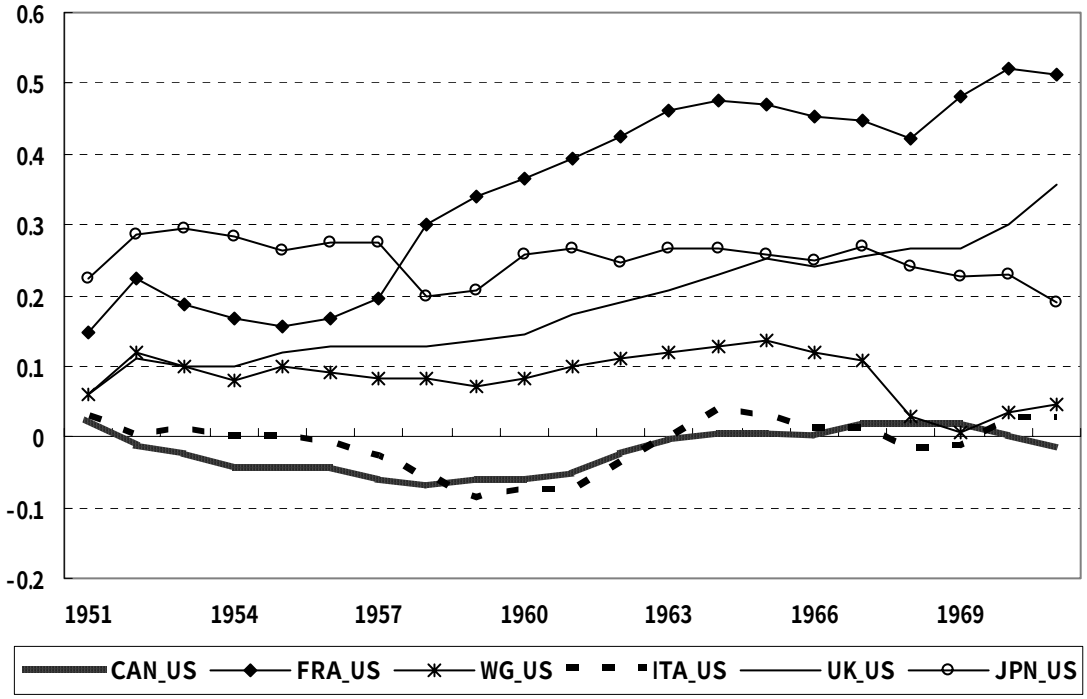
Note: US is the USA, CAN is Canada, FRA is France, WG is West Germany, ITA is Italy, UK is the UK, and JPN is Japan.

Figure 2. Consumer price indices in G7 countries



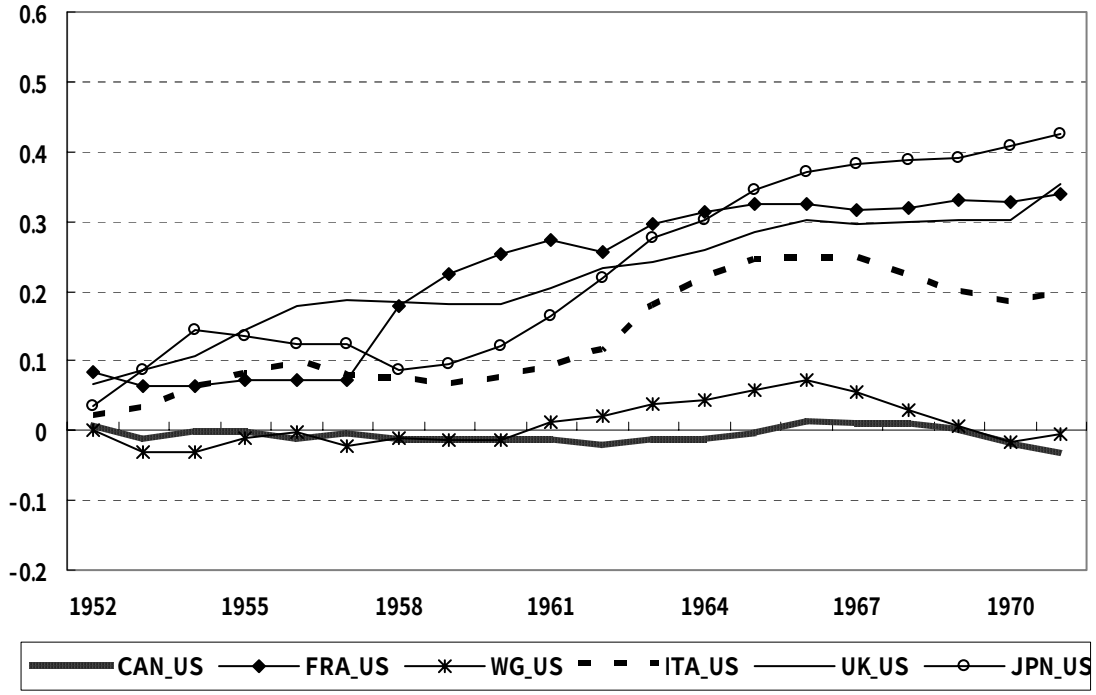
Note: See the note of Figure 1.

Figure 3. Logged differences of WPI between the US and the Other G7 countries



Note: CAN_US is the difference of the USA and Canada, US_FRA is the difference of the USA and France, US_WG is the difference of the USA and West Germany, US_ITA is the difference of the USA and Italy, US_UK is the difference of the USA and the UK, and US_JPN is the difference of the USA and Japan.

Figure 4. Logged differences of CPI between the US and the Other G7 countries



Note: See the note of Figure 3.

Table 1. Panel Unit Root Test for WPI

	End of Sample Period											
	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971
IPS Test												
Statistics	-2.125	-2.359	-1.784	-0.757	0.478	1.480	-1.336	-0.503	-0.923	-0.840	-0.432	0.249
P-value	0.017	0.009	0.037	0.225	0.684	0.931	0.091	0.308	0.178	0.201	0.333	0.599
Fisher-ADF Test												
Statistics	28.761	28.971	24.874	18.295	16.254	14.144	19.668	14.357	16.898	16.514	15.256	11.821
P-value	0.004	0.004	0.015	0.107	0.180	0.292	0.074	0.279	0.154	0.169	0.228	0.460
Fisher-PP Test												
Statistics	33.471	30.175	19.629	15.336	12.744	11.760	13.918	14.284	14.026	11.476	11.893	10.359
P-value	0.001	0.003	0.074	0.224	0.388	0.465	0.306	0.283	0.299	0.489	0.454	0.585

Note: The beginning of the sample period is 1951 for all estimates. Probabilities for Fisher tests are computed using an asymptotic Chi-square distribution. IPS test assume asymptotic normality.

Table 2. Panel Unit Root Test for CPI

	End of Sample Period											
	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971
IPS Test												
Statistics	-2.436	-1.486	0.789	1.951	1.775	2.202	2.337	1.790	1.147	0.694	0.342	0.846
P-value	0.007	0.069	0.785	0.975	0.962	0.986	0.990	0.963	0.874	0.756	0.634	0.801
Fisher-ADF Test												
Statistics	32.119	23.242	6.437	3.985	5.560	5.432	2.928	2.879	4.512	6.076	7.921	6.275
P-value	0.001	0.026	0.893	0.984	0.937	0.942	0.996	0.996	0.972	0.912	0.791	0.902
Fisher-PP Test												
Statistics	25.295	23.659	11.061	10.466	10.682	10.585	5.198	4.894	5.414	7.521	9.985	5.930
P-value	0.014	0.023	0.524	0.575	0.556	0.565	0.951	0.961	0.943	0.821	0.617	0.920

Note: The beginning of the sample period is 1952 for all estimates. See also the note of Table 1.