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SLOWDOWNS AND MELTDOWNS:

POSTWAR GROWTH EVIDENCE FROM 74 COUNTRIES*

Dan Ben-David

Tel Aviv University,
NBER, and CEPR

and

David H. Papell

University of Houston

ABSTRACT

This paper proposes an explicit test for determining the significance and the timing of slowdowns in economic growth. We examine a large sample of countries and find that a majority – though not all – exhibit a significant structural break in their postwar growth rates. We find that (a) most industrialized countries experienced postwar growth slowdowns in the early 1970s, though (b) the United States, Canada and the United Kingdom did not, and (c) developing countries (and in particular, Latin American countries) tended to experience much more severe slowdowns which, in contrast with the more developed countries, began nearly a decade later.

JEL classifications: C22, O1, O5, O47
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Correspondence:

Berglas School of Economics
Tel Aviv University
Ramat Aviv, Tel Aviv 69978
ISRAEL

Tel: 972 3 640-9912
Fax: 972 3 640-9908
BenDavid@econ.tau.ac.il

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I. INTRODUCTION

Much has been written in recent decades about the slowdown in growth that appears to characterize many of the world's industrialized countries since the early-1970s, and many explanations for this phenomenon have been given.[1] In his summary of a 1992 symposium devoted to the issue of long-run economic growth, Kahn (1992) wrote that "the potential rate of economic growth in the industrialized countries is now only half of what it was in the 1960s".

The poor growth performance of developing countries has also attracted much attention. The role of the debt crisis of the late 1970s and early 1980s, which slowed the flow of investment to developing countries and reduced their productivity growth, has been widely discussed. Low growth of developing countries has contributed to the lack of convergence between industrialized and developing countries.[2]

This paper provides evidence on the extent of the growth slowdown by examining the postwar growth of both developing countries and industrialized countries. What is meant by a growth slowdown? A general definition would be a decrease in economic growth over time, but that concept is too vague to identify when, or even if, a slowdown occurred. We propose a precise definition: A *slowdown* is a statistically significant negative break in the trend function of the growth process. We determine the time of the break, providing one exists, in the postwar growth trend of real per capita GDP of 74 countries for the years 1950 through 1990, and document the scale of the phenomenon.

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[1] These explanations include Griliches (1980), Nordhaus (1982), Bruno (1984), Darby (1984), Romer (1987), Baumol, Blackman, and Wolff (1989), and De Long and Summers (1992).

[2] This has been documented by, among others, Azariadis and Drazen (1990), Baumol (1986), Baumol, Blackman and Wolff (1989), Ben-David (1994) and Quah (1993).

We utilize recent research on structural change in time series econometrics that enables us to be explicit about the timing and the significance of the purported breaks. While earlier work imposed restrictive assumptions such as iid, non-trending, and/or stationary data, these restrictions have been successfully relaxed. The breaks in this study are determined using tests for detecting shifts in the trend function of a dynamic time series developed by Vogelsang (1997). These tests, which allow for serial correlation and have good finite sample power, remain valid whether or not the series is characterized by a unit root. We also use tests, developed by Bai, Lumsdaine, and Stock (1997) which detect breaks in a multivariate context.

It is commonly asserted that the United States, as well as other developed countries, has experienced a growth slowdown beginning in the late 1960s or early 1970s. Shigehara (1992), for example, divides the postwar years into several periods and calculates the average growth rates of the OECD countries. He finds that nearly all of the OECD countries experienced a slowdown that occurred between 1968 and 1975, and concludes that the slowdown began at approximately the same time as the first oil embargo in 1973.

The methodology employed here focuses on annual behavior rather than period averages, with the break in the growth trend determined endogenously for each country. The usefulness of this methodology (as opposed to the common approach of exogenously choosing a date and examining average growth prior to, and after, the chosen date) in the analysis of postwar slowdowns can be highlighted by an examination of the United States between 1950 and 1990. An interesting experiment of the common approach would be to examine average growth between 1950 and year *i* and compare this to average growth between year *i* and 1990. As noted above, most analysts agree that the U.S. slowdown began sometime between 1965 and 1975. So, let *i* equal 1965, 1970 and 1975, as well as the two additional dates most commonly associated with

the onset of the U.S. slowdown: 1968 and 1973. The pre-*i* and post-*i* average annual growth rates of U.S. real per capita income are given in Table 1. On the basis of the years 1968 and 1973, there would appear to be very strong evidence of a U.S. slowdown. However, a slight shift of the year *i* to 1965 or 1970 reduces this evidence considerably – and moving it to 1975 eliminates it altogether.

Therefore, it is most useful to know if such a break year *i* even exists, and to the extent that it does, to determine when it occurs. This is done here for each of the 74 countries in the sample. The determination of such a date then facilitates a more accurate appraisal of the prevalence and the severity of the postwar slowdowns.

We do not, in fact, find evidence of a U.S. slowdown, nor of a slowdown in Canada or the U.K. For a large number of other OECD countries, however, the endogenously determined break dates tend to coincide with Shigehara's. Most of the breaks occur between 1970 and 1975, with half in either 1973 or 1974. The major continental countries, France, Germany, and Italy, as well as Japan, experienced slowdowns beginning between 1970 and 1973.

Our conclusions regarding the developing countries are quite different. While the early 1970s is the important turning point for many of the industrialized countries, the years 1978 through 1983 appear to have been the major turning point for a host of lesser developed countries. Furthermore, the impact of the latter break period appears to have been more severe than that of the earlier period. A number of developing countries switch from positive growth rates before the break to negative growth rates after the break, exhibiting what might be described as a growth *meltdown*. The evidence of growth meltdowns is particularly striking for Latin American countries. The combination of growth slowdowns for developed countries and growth

meltdowns for developing countries is consistent with the many findings of postwar divergence in income *levels* between developed and developing countries.

This paper is organized as follows. Section two details the univariate methodology that is used to endogenously determine the year representing the turning point for each of the countries. Section three then focuses on the per capita GDP growth behavior of the countries and provides a comparative analysis of their postbreak to prebreak growth rates. The analysis is extended to multivariate tests in the fourth section and the results are compared with the earlier univariate findings. Section five reviews a number of possible explanations for the timing of the breaks and the extent of their severity. Section six concludes.

II. DETERMINATION OF THE BREAK YEARS

The first objective of this paper is to determine if, and when, a statistically significant structural break occurs in the growth process. Real per capita GDP are used for the 74 countries in the Summers and Heston (1993) sample for which data are available beginning in 1955 or earlier. For 59 of these countries, the data begins in 1950.[3]

We begin by examining output (in levels), which we define as the logarithm of real per capita GDP. Since output is clearly trending, structural change involves a break in the linear deterministic trend. The Vogelsang (1997) tests, which will be used to determine the existence and timing of the trend breaks, are valid whether or not a unit root is present in a series. The

[3] We chose not to include those countries for which data are available beginning after 1955 to avoid problems arising from very short time spans and low quality data.

critical values, however, depend on whether the series is stationary or contains a unit root. Therefore, the unit root question must be resolved first and then the focus can shift to an investigation of trend breaks.

It is by now well-known that non-rejection of the unit root hypothesis can be caused by misspecification of the deterministic trend. Perron (1989) developed tests for unit roots which extend the standard Dickey-Fuller procedure by adding dummy variables for different intercepts and slopes, assuming that the break dates are known *a priori*. These tests were extended by Banerjee, Lumsdaine, and Stock (1992) and Zivot and Andrews (1992) to the case of unknown break dates.

We use a variant of these tests developed in Perron (1994). The sequential trend break tests involve regressions of the following form,

$$\Delta y_t = \mu + \theta DU_t + \beta t + \gamma DT_t + \delta D(T_b)_t + \alpha y_{t-1} + \sum_{j=1}^{k} c_j \Delta y_{t-j} + \varepsilon_t \ , \qquad \textbf{(1)}$$

where y is the log of output per capita and Δy is the first difference. The period at which the change in the parameters of the trend function occurs will be referred to as the time of break, or T_B. The break dummy variables have the following values: $DU_t = 1$ if $t > T_B$, 0 otherwise, $DT_t = t - T_B$ if $t > T_B$, 0 otherwise, and $D(T_b)_t = 1$ if $t = T_B + 1$, 0 otherwise. Equation (1) is estimated sequentially for $T_B = 2,...,T-1$, where T is the number of observations after adjusting for those "lost" by first-differencing and incorporating the lag length k.

The time of break for each series is selected by choosing the value of T_B for which the Dickey-Fuller t-statistic (the absolute value of the t-statistic for α) is maximized. The null hypothesis, that the series $\{y_t\}$ is an integrated process, is tested against the alternative hypothesis

that $\{y_t\}$ is trend stationary with a one-time break in the trend function which occurs at an unknown time.

There is considerable evidence suggesting that data dependent methods for selecting the value of the lag length k are superior to making an *a priori* choice of a fixed k. We follow the procedure suggested by Campbell and Perron (1991) and Ng and Perron (1995) by starting with an upper bound of k_{max} on k. If the last lag included in Equation (1) is significant, then the choice of k is k_{max}. If the lag is not significant, then k is reduced by one. This process continues until the last lag becomes significant and k is determined. If no lags are significant, then k is set to 0. k_{max} is initially set at 8 and the 10 percent value of the asymptotic normal distribution (1.6) is used to assess the significance of the last lag.[4]

The null hypothesis of a unit root is rejected if the t-statistic for α is greater (in absolute value) than the appropriate critical value. Perron (1994) provides finite sample critical values for the lag length selection method described above. The unit root null can be rejected in 6, 18, and 20 of the 74 series at the 1, 5, and 10 percent levels, respectively. The significance level for which the unit root null can be rejected for each country is reported in the first column of Table 2.

We now proceed to test for structural change. While Vogelsang (1997) develops several tests, only the Sup Wald (or SupF_t) test provides estimates of the break date. The test for trending data consists of estimating the following equation:[5]

[4] Ng and Perron (1995) use simulations to show that these sequential tests have an advantage over information-based methods since the former produces tests with more robust size properties without much loss of power.

[5] Vogelsang (1997) extends the Sup Wald test of Andrews (1993) and the Mean and Exponential Wald tests of Andrews and Ploberger (1994) to permit trending regressors and unit root errors. Bai, Lumsdaine, and Stock (1997) consider Sup and Exponential Wald tests for a mean break in both univariate and multivariate contexts .

$$y_t = \mu + \theta DU_t + \beta t + \gamma DT_t + \sum_{j=1}^{k} c_j y_{t-j} + \epsilon_t \ . \qquad \textbf{(2)}$$

Equation (2) is estimated sequentially for each break year with 15 percent trimming, i.e., for $0.15T<T_B<0.85T$, where T is the number of observations.[6] SupF_t is the maximum, over all possible trend breaks, of two times the standard F-statistic for testing $\theta=\gamma=0$. It is important to understand that the break years are determined endogenously, with no *ex ante* preference given to any particular year.[7]

The results of the SupF_t tests are summarized in Table 2. As indicated above, Vogelsang tabulates critical values for both stationary and unit root series. We use the stationary critical values for those countries for which the unit root null can be rejected at the 10 percent level by the Perron (1994) tests, and the unit root critical values otherwise. The no-trend-break null hypothesis is rejected in favor of the broken trend alternative for 21, 28, and 34 of the 74 countries at the 1, 5, and 10 percent significance levels, respectively.[8]

Vogelsang (1997) shows that, if a series contains a unit root, power can be improved by conducting tests in first differences. We therefore proceed to examine output growth (the first difference of the logarithm of real per capita GDP), for the 54 series for which the unit root null

[6] Vogelsang reports critical values for both 1 and 15 percent trimming. The 15 percent trimming was used here because it has greater power to detect breaks near the middle of the sample.

[7] These tests allow for only one break. While it would be desirable to use the methods developed by Bai and Perron (1995) to investigate multiple structural changes, the short time span of data makes this problematic. In addition, their tests are restricted to stationary and non-trending data.

[8] An alternative procedure, which avoids the pretest for a unit root, would have been to use the unit root critical values for all countries. Under this procedure, we would not have found significant breaks for Pakistan, Turkey, and the United Kingdom.

cannot be rejected by the Perron (1994) tests.[9] Since output growth is non-trending, structural change involves a break in the mean of the growth rate. This is done by using the SupF_t test for non-trending data, which consists of estimating the following equation:

$$\Delta y_t = \mu + \theta DU_t + \sum_{j=1}^{k} c_j \Delta y_{t-j} + \epsilon_t \quad . \tag{3}$$

Equation (3) is estimated sequentially for each break year with 15 percent trimming and SupF_t is the maximum, over all possible trend breaks, of the standard F-statistic for testing $\theta=0$.

The results of the SupF_t tests are summarized in Table 3. Assuming that output contains at most one unit root, output growth will not contain a unit root and stationary critical values can be used. The no-trend-break null hypothesis is rejected in favor of the broken trend alternative for 11, 25, and 32 of the 54 countries at the 1, 5, and 10 percent significance levels, respectively.

The countries with significant breaks represent a mix of developed and developing countries from various regions. The parameter θ is negative for almost all of the countries with significant breaks, confirming evidence of a worldwide growth slowdown. The break years, as will be more fully explained below, cluster around the early 1970s and early 1980s.

[9] We do not perform structural change tests in growth rates on those series for which the unit root null is rejected because, if a series is trend stationary with a break in trend, the tests for structural change have no local asymptotic power.

III. THE EXTENT AND TIMING OF THE GROWTH SLOWDOWNS

The focus of the analysis now shifts to the growth implications of the trend break evidence. Three dimensions in particular will be examined in an attempt to locate some common features. These include: (i) the timing of the breaks; (ii) regional characteristics; and (iii) severity of the slowdowns.

As specified in the introduction to this paper, a growth slowdown is defined here as a statistically significant negative break in the trend function of the growth process. The implication of this is that the average prebreak growth rates exceed the average postbreak rates. A growth meltdown is defined as a severe slowdown for which the prebreak growth rate is positive and the postbreak growth rate is negative.

Of the 74 countries examined, 54 exhibited significant trend breaks (at the 10 percent level) in their trend functions. Among the major countries that were not found to have exhibited a significant trend break (negative or positive) are the United States and Canada. Table 4 reports the average prebreak and postbreak growth rates for the countries with significant breaks.[10] 8 of the 54 countries had average postbreak growth rates that exceeded their prebreak averages, while 46 countries (which comprise 62% of the entire sample) exhibited lower postbreak growth.

These 46 countries are divided into two groups. Twenty-five countries are characterized by slowdowns where their postbreak rates of growth, while lower than their prebreak rates, remain positive. This group includes all of the relatively developed countries experiencing slower postbreak growth. Twenty-one countries are characterized by meltdowns, where the average

[10] In those cases where the no-trend-break null could be rejected in both levels and in first-differences, we picked the most significant rejection.

prebreak growth rates are positive and the average postbreak growth rates are negative. These include most of the African and Latin American countries, as well as a few Asian countries.[11]

Table 5 summarizes and highlights some of the important results. Two primary break periods characterize 43 of the 46 countries that underwent a postwar slowdown, with the countries fairly evenly split among the two periods. Twenty-four countries experienced their growth breaks during the years surrounding the collapse of the Bretton Woods system and the imposition of the first oil embargo, while nineteen countries had their breaks during the period that is commonly associated with the second oil embargo and the onset of the debt crisis.

If postbreak growth rates are any indication of severity, the countries for whom the breaks occurred in the latter period appear to have suffered more. As reported in the top panel of Table 5, while only 6 of the 24 countries that slowed down during the years 1970-1976 went from positive average growth prior to the break to negative average growth following it, 15 of the 19 countries that slowed down during the years 1977-1983 experienced a growth meltdown.

The bottom panel of Table 5 provides some insight regarding the relationship between the division of countries by region and the timing of the breaks. The 14 (non-Eastern) European countries together with 2 Asian countries (Japan and Israel) and 2 South Pacific countries (Australia and New Zealand) are among the more industrialized of the group of 54 countries experiencing a trend break. Of these 18 countries, 14 experienced a negative break in their GDP growth between 1970 and 1976. This accords with the popular conception that the first oil shock represented the primary turnaround for most of the developed world (following the Second World War).

[11] For simplification purposes, Latin American countries here are very broadly defined as all North and South American countries except the United States and Canada.

However, as noted above, not all of the developed world experienced significant breaks – and not all of those that did, had their breaks between 1970 and 1976. A look at the G7 countries (in Figures 1 and 2) provides a visual illustration of the findings – and non-findings, as the case may be – of significant breaks and subsequent slowdowns. Recall that out of the 7 countries, only 5 (France, Germany, Italy, Japan and the United Kingdom) experienced significant breaks. The first four countries are highlighted in Figure 1 by an extrapolation of their respective prebreak growth paths using the results from the estimations in Section 2. The actual postbreak paths are clearly different from the prebreak extrapolations. In the case of France, Germany, and Italy, the breaks came between 1970 and 1974, while in the case of Japan, the break came in 1967. Japan initially grew along a path slightly above the extrapolated prebreak path. However, the new path fell below the old one by 1973.

The growth paths of the three remaining break countries are plotted in Figure 2 for comparison purposes. In the case of the United Kingdom, 1979 – the year that Margaret Thatcher came to power – turns out to be the significant break year. In contrast with the countries in Figure 1, the UK is characterized by what appears to be primarily a drop in levels followed by a gradual return to, and eventual eclipse of, the prebreak growth path. The difference between the postwar growth paths of the U.S. and Canada and the growth paths of the other G7 countries is also readily apparent in these figures.

What appears to be a relatively strong finding (as far as the timing of the breaks is concerned) for the majority of the remaining industrialized countries experiencing significant breaks, is not nearly as strong elsewhere in the world. This is particularly true among the 16 Latin American countries that experienced a negative trend break. 11 of these experienced their turnaround between 1977 and 1983, years that coincided with the second oil shock, and possibly

more important for these countries, the beginning of the debt crisis. As a result, 9 of these 11 experienced a growth meltdown.

The African countries experiencing meltdowns were fairly evenly split between the two periods, with three countries beginning their meltdowns during 1970-76 and the remaining four between 1977 and 1983. On the other hand, three other African countries, Kenya, Mauritius and Uganda, went from zero growth (in the case of Kenya), or from negative growth (in the case of the latter two countries), to positive postbreak growth.

As was the case with the African countries, the Asian countries were also not very homogeneous in terms of the timing and severity of their breaks. Of the 9 countries other than Japan and Israel, a third grew *faster* after their breaks (South Korea, Taiwan and Sri Lanka). Two of the remaining countries, Iran (1977) and Iraq (1978), experienced a slowdown in the years following the Khomeni revolution and the start of the Iran-Iraq war.

IV. MULTIVARIATE TESTS AND CONFIDENCE INTERVALS

We have presented evidence of a growth slowdown, beginning in the early 1970s, for most developed countries, and a growth meltdown, starting in the late 1970s or early 1980s, for most developing countries. This evidence comes from estimation of a structural break with univariate tests. Since these breaks cluster for the two groups of countries, we now examine additional evidence from testing for common breaks in multivariate series. We also calculate confidence intervals for both the univariate and multivariate models in order to provide a more precise characterization of the break dates for the slowdowns and meltdowns. The multivariate

evidence both strengthens the case for structural breaks and sharpens the estimate of the break dates.

Multivariate tests for common breaks in integrated and cointegrated time series have been developed by Bai, Lumsdaine, and Stock (1997). The system of equations considered by Bai, Lumsdaine, and Stock (BLS) for n series which are not cointegrated is:

$$\Delta \mathbf{y}_t = \boldsymbol{\mu} + \boldsymbol{\theta} DU_t + \sum_{j=1}^{k} \mathbf{C}_j \Delta \mathbf{y}_{t-j} + \boldsymbol{\epsilon}_t , \qquad \textbf{(4)}$$

where $\Delta \mathbf{y}_t$, $\boldsymbol{\mu}$, $\boldsymbol{\theta}$, and $\boldsymbol{\epsilon}_t$ are n x 1 vectors and $\{\mathbf{C}_j\}$ are n x n matrices for each j. Equation (4) is estimated sequentially for each break year with 15 percent trimming and SupF_t is the maximum, over all possible trend breaks, of n times the standard F-statistic for testing $\theta_1 = ... = \theta_n = 0$. The lag length k is chosen by the BIC, with a maximum lag of 4 and a minimum lag of 1. Asymptotic critical values for the SupF_t statistic are tabulated by Bai, Lumsdaine, and Stock (1991).

We focus on two groups of three countries: Continental European (France, Germany, and Italy) and Latin American (Brazil, Mexico, and Venezuela). The first group represents the members of the Group of 7 for which the unit root null in (the level of) output cannot be rejected (eliminating Japan and the United Kingdom) and which display evidence of structural change in the univariate tests (eliminating Canada and the United States). While, in principle, multivariate tests have the potential to detect breaks for Canada and the United States that cannot be found by univariate methods, this did not occur in practice. Applying the same criteria to major Latin

American countries, we eliminate Argentina and Chile because the unit root null in output can be rejected.[12]

The results of the multivariate trend break tests are reported in Table 6. For the trivariate system of France, Germany, and Italy, the no-trend-break null is rejected in favor of the broken trend alternative at the 1 percent significance level with a break in 1973. This result, using annual data from 1950 to 1990, accords with the findings of BLS who, using quarterly data from 1964 to 1982, find a structural break in 1973:4 for the same three countries. The no-trend-break null is also rejected at the 1 percent level with a break in 1973 for the bivariate systems of France–Germany and France–Italy, and at the 5 percent level with a break in 1970 for Germany–Italy.

These methods can also be used to construct univariate structural change tests. They differ from the Vogelsang tests only in the criterion used to select the lag length k. The results of these tests are reported in Table 6. The rejections of the no-trend-break null are weaker than reported in Table 2 and, in the case of Germany, is insignificant. Using the BIC, k is equal to 1 for all three countries while, with the recursive method, $k = 5$ for Italy and 0 for France and Germany.

We proceed to consider three major Latin American countries: Brazil, Mexico, and Venezuela, and report the results in Table 6. For the trivariate system, the no-trend-break null is rejected in favor of the broken trend alternative at the 5 percent significance level with a break in 1980. The pattern continues with the bivariate systems: the null is always rejected (at the 5 percent level) but the set of break years expands to include 1979, 1980, and 1981. For the

[12] We restrict attention to those countries for which we cannot reject unit roots (in levels) in order to ensure against over-differencing. Using Engle-Granger tests, we cannot reject the null hypothesis of no cointegration for either group of countries. As above, we assume that output growth is stationary.

univariate tests, selection of *k* by the BIC does not substantially change the results for the Latin American countries. Both the break years and rejection levels are comparable to the results of the Vogelsang tests reported above.

An important motivation for using the multivariate tests is that, as shown by BLS, the width of the asymptotic confidence interval is inversely related to the number of series with a common break date. Using the methods described by Bai (1997), who shows how to construct confidence intervals for a wide range of univariate models, and BLS, who extend the analysis to multivariate models, we report 90 percent asymptotic confidence intervals for the European and Latin American countries in Table 6.

The results for France, Germany, and Italy illustrate the gains from using the multivariate tests. The confidence intervals for the three countries in the univariate cases range from 8 to 16 years. The confidence intervals become smaller for the bivariate models, and further narrow with the trivariate model. The 90 percent confidence interval for France, Germany, and Italy, 1971-1975, is not much larger than the interval, 1972:2-1975:2, reported by BLS with quarterly data. For Brazil, Mexico, and Venezuela, the 90 percent confidence interval is 1977-1983. There are gains from multivariate inference for Brazil and Venezuela, where the univariate intervals are at least a decade wide, but not for Mexico.

V. SOME POSSIBLE EXPLANATIONS

In the case of the more developed countries, who also happened to be the primary parties affected by the Second World War, it is perhaps not surprising that the years following the War

were characterized by relatively fast growth. The neoclassical growth model predicts that such negative shocks be followed by a transitional period of faster growth. Similarly, the model also predicts that the high post-shock growth rates should gradually decline to the long run rate of growth.

Baumol, Blackman and Wolff (1989) state that the "worldwide explosion of productivity growth [following the war], probably represented a catch-up in the utilization of accumulated technological ideas – inventions whose utilization was held up by the Depression and the war, as well as a backlog of savings that had previously gone uninvested in productive capacity" (page 70). The relatively high postwar growth also coincided with a sustained movement by the more developed countries towards the liberalization of trade and the creation of institutions such as Bretton-Woods and GATT whose goal was to promote the flow of goods across international boundaries.

To the extent that the high postwar growth reflected the high growth transitional period described by the neoclassical growth model, then it should not be too surprising that these rates of growth could not be sustained indefinitely. The collapse of the Bretton-Woods accord in 1971 and the jump in energy prices following the OPEC oil embargo in 1973 may have been enough of a catalyst to have prompted the eventual trend breaks and the subsequent growth slowdowns reported above for the majority of developed countries.[13]

While the neoclassical growth model suggests that evidence of the growth slowdowns should have been expected, the finding of meltdowns, primarily among Latin American countries**,** requires further elaboration. Lindert (1989) reports some evidence of a drop in Latin American

[13] In his summary of the appraisals by Dale Jorgenson, Mancur Olson, Zvi Griliches and Michael Boskin at a *Journal of Economic Perspectives* symposium devoted to the postwar productivity growth slowdowns, Fischer (1988) concludes that, "to the extent that any one explanation is favored, it is that the oil price shock is to blame" (pg 4).

countries' terms of trade in the late seventies and early eighties which coincided with a relatively sharp increase in real interest rates between 1979 and 1982. Among the primary sources of the debt crisis, Cardoso and Dornbusch (1989) cite the high interest rates, the extremely low real prices of commodities and the strong dollar that were prevalent in the years leading up to the crisis. According to Cardoso and Dornbusch, these external forces, combined with relatively uniform domestic mismanagement – in the form of overvalued exchange rates, large and persistent budget deficits, and extensive capital outflows – took their toll on the foreign exchange reserves of the individual countries and hampered their ability to service their debts.

In their review of the debt crisis in the early 1980s, Dornbusch and Fischer (1987) note that this crisis was on a different scale than other postwar debt problems. According to Dornbusch and Fischer (DF),

> "the debt difficulties of the early 1980s ... resemble the 1930s when most LDCs incurred debt service difficulties and many defaulted, at least partially, on their external debt. Every country in Latin America, except Argentina, failed to service the debt on the terms contracted. The magnitude of the debt problem, as measured by the debt-export ratio of Latin America, was much the same as today." (page 911)

DF note significant differences in the debt-export ratios of different countries. In 1975, they find that Argentina and Korea had relatively similar debt-export ratios of 171.3 and 171.9, respectively. By 1983, this rose to 452.0 for Argentina – compared to a fall to 125.0 for Korea. Brazil's debt-export ratio went from 236.6 in 1975 to 364.9 in 1983. Korea appears in Table 4

as a country that experienced a significant break followed by higher postbreak growth, while the two Latin American countries suffered postwar meltdowns.

Mexico, which also experienced a meltdown (in 1981), displayed a combination of capital flight, flight into importables and extremely large government deficits. The positive impact of oil discoveries in the early 1970s was more than offset by the subsequent fall in oil prices combined with poor policies in 1980-82 which together led to the suspension of debt services by Mexico in 1982. The large public sector deficit led to inflation and to an overvalued currency, which in turn led to substantial private capital outflows in anticipation of depreciation. The devaluation finally occurred in 1982, but only after the large external debt had already accumulated.

Dornbusch and Fischer provide an interesting comparison between the Latin American debtors and Korea which are both heavy importers of oil, and major debtors – and hence, are subject to similar shocks. However, their response to the oil shocks was quite different. In particular, while Korea did have budget deficits and a rising debt, its falling dollar-denominated labor costs provided the country with external competitiveness and allowed it to maintain high growth and rising shares of exports to GDP in the presence of the external shocks.

Korea and the Latin American countries are differentiated also in terms of their import and export compositions which reflect their differing economic structures. The Korean emphasis on importing materials and exporting manufactured goods, contrasts with the Latin American emphasis on commodity exports. Hence, the subsequent terms of trade deterioration between 1978 and 1982 was 16% for Korea – compared to nearly 50% for Brazil during the same period.

This comparison also provides some insight as to why the severe external shocks experienced by the more developed countries during the early seventies as a result of the higher

energy prices manifested themselves into growth slowdowns rather than the more severe meltdowns experienced by the less developed countries. The composition of trade in the more developed countries (and its smaller output share in the larger of these countries), combined with less mismanagement and capital flight, and helped to contain the impact of the oil shocks.

VI. CONCLUSION

This paper focused on the postwar growth slowdown that appears to have affected a sizeable number of countries. Vogelsang's (1997) SupF_t tests were used to endogenously determine the timing of the breaks for each of 74 countries between 1955 and 1990. Fifty-four of the countries exhibited a significant break in their postwar growth rates, while twenty countries did not. In all but 8 of the 54 instances of significant breaks, the breaks were followed by a growth slowdown. Contrary to the common perception, the United States is *not* among the countries that exhibited growth slowdowns.

Although most of the remaining developed countries did experience a slowdown, it was the developing countries that were hit particularly hard (a finding corroborated by evidence from other studies that points to a divergence in income levels between the two groups). The majority of the latter group, which had exhibited positive average growth rates prior to their respective breaks, moved to negative average growth rates after the breaks, hence the term growth meltdown is used to emphasize the severity of the turnarounds. While the slowdown for the developed countries began at around the time of the collapse of the Bretton Woods system and the first oil

embargo, the meltdown for the developing countries commenced with the second oil shock and the start of the debt crisis.

It is necessary to put these results in the proper perspective. While they corroborate the common perception that the postwar slowdown was fairly widespread, they also document some clear regional as well as developmental characteristics. Furthermore, they provide an indication of where these slowdowns are taking the respective countries, as long as nothing intervenes to derail this process. We provide evidence that 54 of the 74 countries have already experienced one significant break in their trend function. There is no reason to assume that other breaks will not follow.

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Table 1. – Comparison of U.S. Postwar Growth Rates in Real Per Capita GDP: 1950-1990

Year *i*	Average Annual Growth Between 1950 and Year *i* (A)	Average Annual Growth Between Year *i* and 1990 (B)	Ratio (C=B/A)
1965	1.93%	1.90%	0.98
1968	2.11%	1.75%	0.83
1970	1.96%	1.86%	0.95
1973	2.20%	1.52%	0.69
1975	1.80%	2.10%	1.16

Table 2. – Sequential Trend Break Tests - Levels

$$y_t = \mu + \theta DU_t + \beta t + \gamma DT_t + \sum_{j=1}^{k} c_j y_{t-j} + \epsilon_t$$

Country	Unit Root	Break Year	SupF_T	Country	Unit Root	Break Year	SupF_T
ARGENTINA	5%	1980	34.80 ***	LUXEMBOURG		1967	8.62
AUSTRALIA		1973	16.84	MALAWI	5%	1979	40.77 ***
AUSTRIA		1974	16.92	MALAYSIA		1984	14.75
BELGIUM		1980	21.60	MALTA		1964	14.13
BOLIVIA		1979	15.08	MAURITIUS	1%	1968	54.35 ***
BRAZIL		1970	21.40	MEXICO		1981	51.36 ***
CANADA		1979	16.79	MOROCCO		1960	22.08
CHILE	5%	1974	38.06 ***	MYANMAR		1970	12.13
COLOMBIA		1968	18.15	NETHERLANDS		1977	20.95
COSTA RICA	5%	1980	41.44 ***	NEW ZEALAND		1974	22.87 *
CYPRUS		1973	8.53	NICARAGUA		1977	24.30 *
DENMARK		1963	23.43 *	NIGERIA		1975	9.74
DOMINICAN REP.		1970	21.20	NORWAY		1982	11.18
ECUADOR		1972	42.42 ***	PAKISTAN	5%	1970	17.02 **
EGYPT		1982	10.23	PANAMA		1981	18.58
EL SALVADOR	5%	1978	57.93 ***	PARAGUAY		1982	65.88 ***
ETHIOPIA		1970	18.17	PERU		1974	26.72 **
FINLAND	1%	1971	63.44 ***	PHILIPPINES	5%	1983	50.52 ***
FRANCE		1968	24.73 *	PORTUGAL		1974	19.16
GERMANY		1979	9.55	PUERTO RICO		1968	13.55
GHANA	10%	1977	26.32 **	SOUTH AFRICA		1969	16.16
GREECE		1968	28.43 **	SPAIN		1974	21.55
GUATAMALA		1975	59.70 ***	SRI LANKA	5%	1971	26.64 ***
GUYANA		1974	21.60	SWEDEN		1972	21.42
HONDURAS		1976	29.27 **	SWITZERLAND	1%	1974	46.24 ***
ICELAND		1975	19.74	TAIWAN	10%	1963	9.07
INDIA		1964	33.22 ***	THAILAND		1985	12.28
IRAN	1%	1977	75.71 ***	TRIN. & TOBAGO		1982	13.71
IRAQ	5%	1978	41.74 ***	TURKEY	1%	1973	21.36 ***
IRELAND		1980	9.43	UGANDA		1983	18.32
ISRAEL	5%	1973	35.58 ***	URUGUAY		1981	13.56
ITALY		1972	15.09	UNITED KINGDOM	5%	1979	15.36 **
JAMAICA		1984	14.00	UNITED STATES		1981	10.95
JAPAN	5%	1967	35.89 ***	VENEZUELA		1978	15.31
JORDAN		1975	27.35 **	ZAIRE		1974	22.69 *
KENYA		1970	23.88 *	ZAMBIA	1%	1975	48.14 ***
KOREA		1979	13.78	ZIMBABWE		1970	11.65

Note: ***, **, and * denote statistical significance either using stationary critical values at the 1 percent (17.51), 5 percent (13.29), and 10 percent (11.25) levels or using unit root critical values at the 1 percent (30.36), 5 percent (25.10), and 10 percent (22.29) levels.

Table 3. – Sequential Trend Break Tests - First Differences

$$\Delta y_t = \mu + \theta DU_t + \sum_{j=1}^{k} c_j \Delta y_{t-j} + \epsilon_t$$

Country	Break Year	SupF_T	Country	Break Year	SupF_T
AUSTRALIA	1973	8.69 *	LUXEMBOURG	1967	2.37
AUSTRIA	1976	11.31 **	MALAYSIA	1984	3.42
BELGIUM	1974	4.35	MALTA	1967	3.67
BOLIVIA	1978	6.09	MEXICO	1981	34.98 ***
BRAZIL	1979	9.83 **	MOROCCO	1980	3.22
CANADA	1963	3.97	MYANMAR	1963	3.34
COLOMBIA	1980	5.50	NETHERLANDS	1974	13.09 ***
CYPRUS	1964	2.75	NEW ZEALAND	1974	13.41 ***
DENMARK	1965	9.32 **	NICARAGUA	1977	14.14 ***
DOMINICAN REP.	1981	7.31	NIGERIA	1980	7.41 *
ECUADOR	1980	11.21 **	NORWAY	1985	6.31
EGYPT	1984	2.21	PANAMA	1982	6.32
ETHIOPIA	1983	7.38 *	PARAGUAY	1981	4.62
FRANCE	1973	23.40 ***	PERU	1977	14.22 ***
GERMANY	1970	13.95 ***	PORTUGAL	1973	7.13
GHANA	1978	9.09 **	PUERTO RICO	1971	7.98 *
GREECE	1973	20.98 ***	SOUTH AFRICA	1974	10.80 **
GUATAMALA	1981	19.16 ***	SPAIN	1974	11.32 **
GUYANA	1981	7.74 *	SWEDEN	1975	9.86 **
HONDURAS	1979	8.34 *	TAIWAN	1963	8.58 *
ICELAND	1982	9.89 **	THAILAND	1965	4.08
INDIA	1981	3.20	TRIN. & TOBAGO	1981	10.02 **
IRELAND	1966	1.31	UGANDA	1980	12.58 **
ITALY	1974	27.77 ***	URUGUAY	1967	2.08
JAMAICA	1972	20.60 ***	UNITED STATES	1982	1.32
JORDAN	1982	5.86	VENEZUELA	1978	10.78 **
KENYA	1970	1.73	ZAIRE	1974	10.62 **
KOREA	1966	9.88 **	ZIMBABWE	1974	1.74

Note: ***, **, and * denote statistical significance using stationary critical values at the 1 percent (13.02), 5 percent (9.00), and 10 percent (7.32) levels.

Table 4. – Countries with a Significant Postwar Break in their GDP Trend Between 1950 and 1990

	Country	Region	Break Year	Average Growth Rates	
				Prebreak	Postbreak
Countries with Postbreak Growth Rates that Exceeded Prebreak Rates					
1	TAIWAN	Asia	1963	4.11%	6.46%
2	KOREA	Asia	1966	2.94%	7.68%
3	MAURITIUS	Africa	1968	-0.35%	3.71%
4	KENYA	Africa	1970	0.04%	1.15%
5	SRI LANKA	Asia	1971	0.92%	3.45%
6	CHILE	Latin Amer.	1974	1.61%	2.14%
7	UNITED KINGDOM	Europe	1979	2.36%	2.68%
8	UGANDA	Africa	1980	-0.65%	2.97%
Slowdown Countries (with *Positive* Postbreak Growth Rates)					
1	INDIA	Asia	1964	2.28%	2.04%
2	DENMARK	Europe	1965	3.20%	2.01%
3	JAPAN	Asia	1967	8.03%	4.03%
4	GERMANY	Europe	1970	5.20%	2.14%
5	PAKISTAN	Asia	1970	2.74%	1.95%
6	PUERTO RICO	Latin Amer.	1971	6.01%	2.13%
7	FINLAND	Europe	1971	4.13%	2.66%
8	ECUADOR	Latin Amer.	1972	2.28%	1.37%
9	TURKEY	Europe	1973	3.74%	2.14%
10	AUSTRALIA	S.Pacific	1973	2.40%	1.36%
11	GREECE	Europe	1973	5.87%	1.86%
12	ISRAEL	Asia	1973	5.69%	1.30%
13	FRANCE	Europe	1973	4.13%	1.62%
14	NETHERLANDS	Europe	1974	3.49%	1.50%
15	SWITZERLAND	Europe	1974	3.07%	1.69%
16	SPAIN	Europe	1974	5.74%	1.81%
17	ITALY	Europe	1974	4.88%	2.75%
18	NEW ZEALAND	S.Pacific	1974	2.20%	0.65%
19	SWEDEN	Europe	1975	2.93%	1.44%
20	JORDAN	Asia	1975	3.38%	1.56%
21	AUSTRIA	Europe	1976	4.54%	2.07%
22	COSTA RICA	Latin Amer.	1980	3.27%	0.66%
23	PARAGUAY	Latin Amer.	1982	2.10%	0.39%
24	ICELAND	Europe	1982	3.59%	1.85%
25	PHILIPPINES	Asia	1983	2.74%	1.01%
Meltdown Countries (with *Negative* Postbreak Growth Rates)					
1	JAMAICA	Latin Amer.	1972	5.25%	-1.07%
2	ZAIRE	Africa	1974	3.14%	-2.84%
3	SOUTH AFRICA	Africa	1974	2.69%	-0.60%
4	ZAMBIA	Africa	1975	1.73%	-3.33%
5	GUATAMALA	Latin Amer.	1975	1.54%	-0.94%
6	HONDURAS	Latin Amer.	1976	1.32%	-0.74%
7	IRAN	Asia	1977	5.49%	-3.73%
8	GHANA	Africa	1977	0.15%	-1.55%
9	PERU	Latin Amer.	1977	2.59%	-2.35%
10	NICARAGUA	Latin Amer.	1977	3.33%	-4.51%
11	IRAQ	Asia	1978	3.63%	-11.87%
12	EL SALVADOR	Latin Amer.	1978	2.38%	-1.86%
13	VENEZUELA	Latin Amer.	1978	2.06%	-2.91%
14	MALAWI	Africa	1979	2.13%	-0.86%
15	BRAZIL	Latin Amer.	1979	4.13%	-0.85%
16	NIGERIA	Africa	1980	3.28%	-4.99%
17	ARGENTINA	Latin Amer.	1980	1.50%	-2.47%
18	MEXICO	Latin Amer.	1981	3.38%	-0.50%
19	TRIN. & TOBAGO	Latin Amer.	1981	4.46%	-3.51%
20	GUYANA	Latin Amer.	1981	0.32%	-3.13%
21	ETHIOPIA	Africa	1983	0.92%	-0.67%

Table 5. – Comparison of Postbreak Growth Rates to Prebreak Rates* By Region and Break Period

	Break Period			
	1963-68	1970-76	1977-83	Total
Totals				
Postbreak Rates > Prebreak Rates	3 (38%)	3 (38%)	2 (25%)	8 (100%)
Postbreak Rates < Prebreak Rates				
Slowdown Countries (postbreak rates > 0)	3 (12%)	18 (72%)	4 (16%)	25 (100%)
Meltdown Countries (postbreak rates < 0)	0 (0%)	6 (29%)	15 (71%)	21 (100%)
Breakdown By Region				
Postbreak Rates > Prebreak Rates				
Latin America		1		1
Europe			1	1
South Pacific				
Asia	2	1		3
Africa	1	1	1	3
Postbreak Rates < Prebreak Rates				
Slowdown Countries (postbreak rates > 0)				
Latin America		2	2	4
Europe	1	11	1	13
South Pacific		2		2
Asia	2	3	1	6
Africa				
Meltdown Countries (postbreak rates < 0)				
Latin America		3	9	12
Europe				
South Pacific				
Asia			2	2
Africa		3	4	7

* Only countries with significant breaks.

Table 6. – Multivariate Trend Break Tests

$$\Delta \mathbf{y}_t = \boldsymbol{\mu} + \boldsymbol{\theta} DU_t + \sum_{j=1}^{k} \mathbf{C}_j \Delta \mathbf{y}_{t-j} + \boldsymbol{\epsilon}_t$$

Countries	Break Year	SupF_T	90 Percent Confidence Interval
FRANCE, GERMANY, ITALY	1973	20.82 ***	1971 - 1975
FRANCE, GERMANY	1973	21.83 ***	1971 - 1975
FRANCE, ITALY	1973	17.77 ***	1970 - 1976
GERMANY, ITALY	1970	12.29 **	1970 - 1976
FRANCE	1973	13.55 ***	1969 - 1977
GERMANY	1965	5.64	1957 - 1973
ITALY	1970	9.33 **	1964 - 1976
BRAZIL, MEXICO, VENEZUELA	1980	16.07 **	1977 - 1983
BRAZIL, MEXICO	1980	13.44 **	1977 - 1983
BRAZIL, VENEZUELA	1979	12.27 **	1975 - 1983
MEXICO, VENEZUELA	1981	11.75 **	1977 - 1985
BRAZIL	1980	8.86 **	1975 - 1985
MEXICO	1981	17.78 ***	1979 - 1983
VENEZUELA	1978	8.16 *	1972 - 1984

Critical Values

Number of Countries	1 Percent	5 Percent	10 Percent
1	12.33	8.76	7.18
2	15.40	11.65	10.02
3	18.01	14.23	12.22

Note: ***, **, and, * denote statistical significance at the 1 percent, 5 percent, and 10 percent levels. The critical values are from Bai, Lumsdaine, and Stock (1991). Following BLS, we choose *k* by the BIC, with a maximum lag of 4. The lag length equals 1 in all cases except for the univariate model for Mexico, for which *k* equals 2.

Figure 1. – G7 Slowdown Countries

Figure 1a. – France: 1950-1990

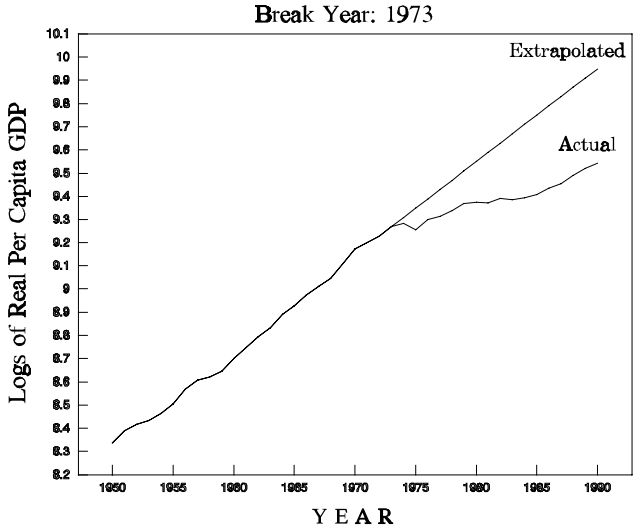

Figure 1b. – Japan: 1950-1990

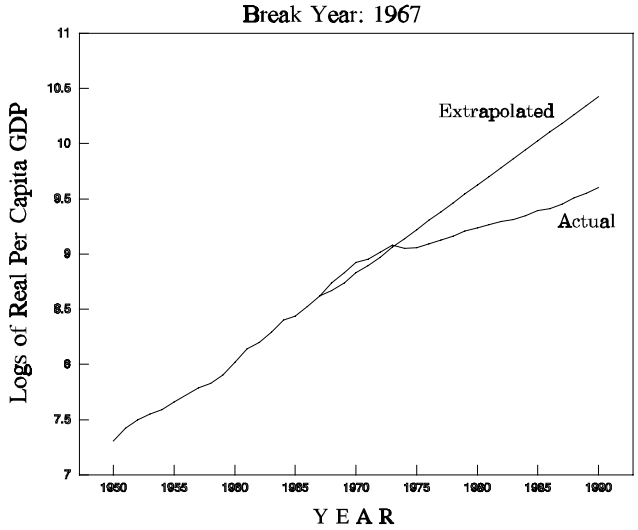

Figure 1c. – Italy: 1950-1990

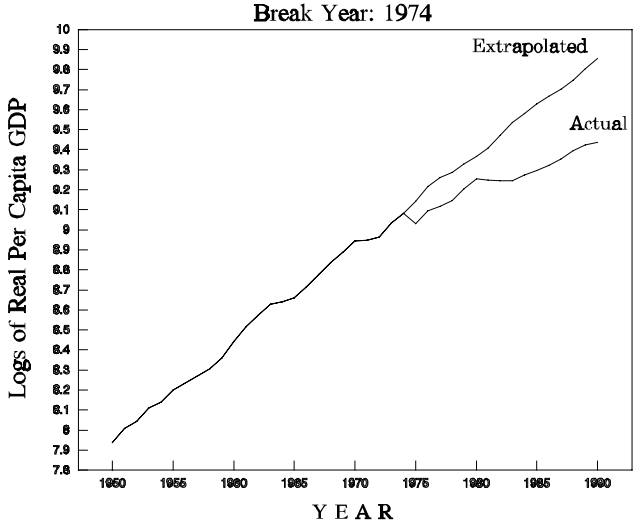

Figure 1d. – Germany: 1950-1990

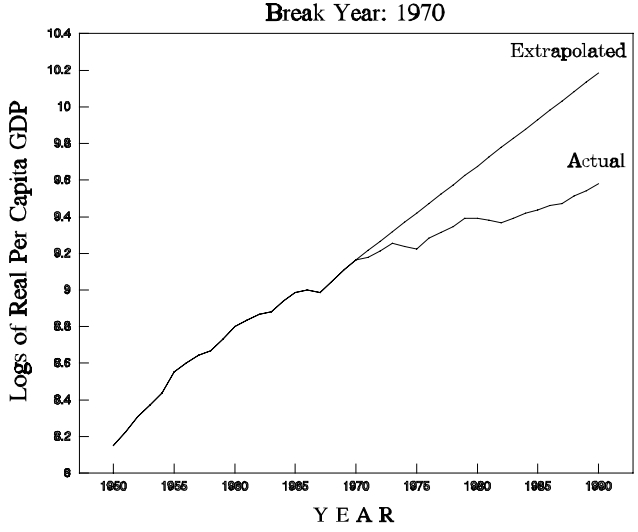

Figure 2. – Other G7 Countries

Figure 2a. – United States: 1950-1990

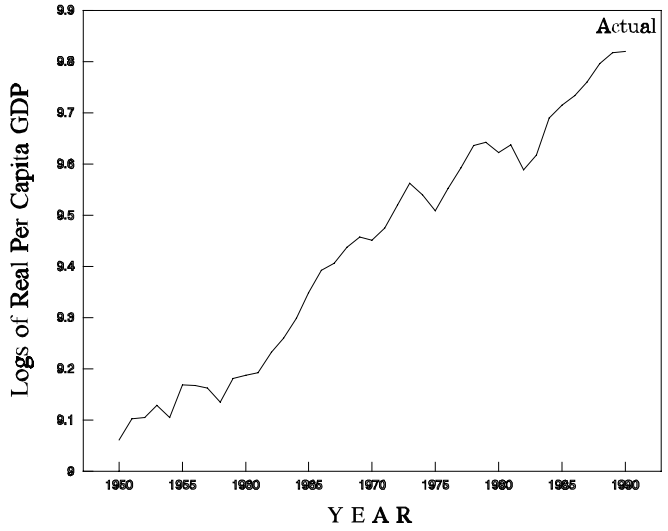

Figure 2b. – Canada: 1950-1990

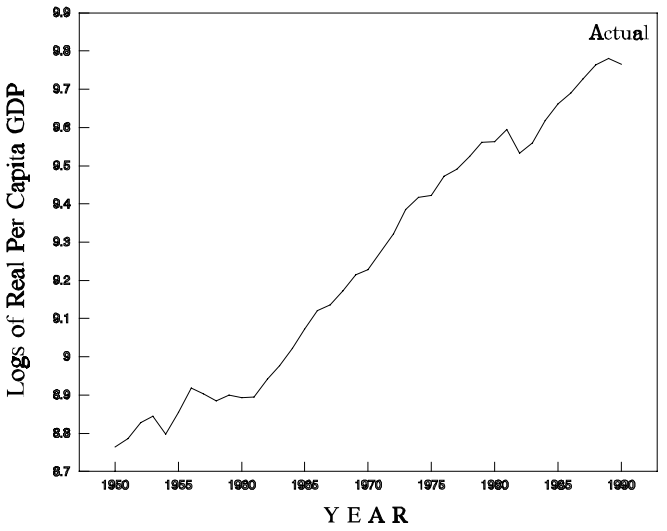

Figure 2c. – United Kingdom: 1950-1990