Structural Break in India's Growth

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Revisiting the Debate with a Longer Perspective

How significant was the shift in the economic growth performance that occurred in the 1950s, relative to the shift that is supposed to have occurred in the 1980s? If one were to identify the single most significant break date in India's growth performance, does it turn out to be 1951-52 or 1980-81 or some such year in the post-1980s? The hypothesis in this paper is that the single most important trend break in GDP growth is to be found not in the 1980s, as the existing literature claims, but in the early 1950s. This is not because the performance of the post-1950s period was exceptional in any way, but because the performance before the 1950s was exceptionally poor. Nehruvian socialism looks dismal if seen only in the context of opportunities that were missed. If seen in the context of the actual economic performance preceding the years 1950-1980, the achievements do not seem so bleak.

Neeraj Hatekar, Ambresh Dongre

Recently, there has been much discussion about the trend break in India’s growth rate of GDP [DeLong 2001; Wallack 2003; Rodrick and Subramanian 2004; Virmani 2004; Sinha and Tejani 2004]. DeLong argued that the growth rate accelerated from the traditional ‘Hindu’ growth rate during the rule of the Rajiv Gandhi-led Congress government in the mid-1980s. This, he associated with the economic reforms that took place during Rajiv Gandhi’s tenure. Wallack (2003) makes an attempt to econometrically determine the dates on which shifts in the growth rate could have taken place. As far as GDP growth is concerned, she finds that 1980 was the most significant date for the break, whereas the break in GNP growth took place in 1987. She finds a significant break in the trade, transport, storage and communication growth rate in 1992, but fails to find statistically significant break dates for the primary and secondary sectors as well as public administration, defence and other services. Pangariya (2004), countering DeLong, argues that the growth in the 1980s was fragile and unsustainable. On the other hand, the more systematic and systemic reforms of the 1990s gave rise to more sustainable and stable growth. Sinha and Tejani (2004) argue that the period around 1980-81 marked the break in growth in India’s GDP. They argue that the major factor behind the growth in the 1980s was improvements in labour productivity, propelled by imports of higher quality machinery and capital goods.

All the above papers implicitly contain an evaluation of economic policy from independence to the onset of economic reforms at some date, even though authors differ about the specific dates. Some, like Pangariya, would like to place the beginning of reforms in the 1990s, while others like Sinha and Tejani would extend it backwards to the early 1980s. The general evaluation of economic policy between 1951 and the author-specific trend break date is overall pessimistic, with the possible exception of DeLong (2001).

Re-evaluation

This paper attempts to re-evaluate economic performance between 1950 and 1980. First, we argue that it might not be very correct to take the data series starting in 1951 in order to empirically find a statistically significant break date in India’s growth performance. The year 1951 was a very significant one in India’s economic history. Planning began in 1951. An apparatus, at least ideologically committed to national economic development, was put in place for the first time. A shift in economic policy of this magnitude could surely be expected to increase the growth rate of the economy in the long-term. Indeed, the average growth rate of GDP for 1901-02 to 1946-47 works out to 0.93 per cent per year for undivided India, when GDP is measured in 1948-49 prices. If one ignores the particularly bad year of 1946-47, when growth was -17.2 per cent which was the effect of partition, the average growth rate of undivided India works out to be 1.15 per cent [Sivasubramonian 2000]. Per capita GDP was nearly stagnant between 1901 and 1946-47. In 1901, per capita GDP stood at Rs 224 (1948-49 prices) while it was Rs 233 in 1946-47. However, there were phases of growth and decline in this period. During 1901-1916, per capita GDP grew at a trend rate of growth of 0.9 per cent per annum. This was a period of relatively lower population growth. However, the rate of growth of per capita GDP suddenly dropped by 15 per cent in 1918-19, following a massive drought. There was another phase of steady expansion when it increased by 1.1 per cent per annum till 1929-30. After this, growth declined to about 0.5 per cent per annum. Agricultural production remained sluggish and food production actually lagged behind population growth. The average per capita growth rate of agricultural output during 1901-1947 was 0.1 per cent in 1948-49 prices. The progress of the manufacturing sector was somewhat better, even if only because it started from a rather low level. Between 1901 and 1946, manufacturing grew at an average rate of 3.6 per cent in per capita terms. But this growth was on a very small base. The share of manufacturing in the national product saw an increase from an average value of 2.4 per cent (at current prices) in 1901-1910 to an average value of 10.6 per cent in the period 1940-47. The literacy rate increased from 6.1 per cent in 1901 to 15.1 per cent in 1941, an increase of more than 147 per cent over 40 years. The death rate declined from 37 per thousand in 1900 to 19 in...
1946. Between 1911 and 1946, the infant mortality rate declined from 205 to 136. Between the beginning of the century and 1951, the expectation of life increased from 23.8 years to 32.1 years. This indicated
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The classical test for structural change attributed to Chow (1960). His test-procedure involves splitting the sample into two sub-periods, estimating the parameters for each of the sub-periods and testing for the equality of the two sets of parameters using the F statistic. But, as noted in Hansen (2001), the procedure is based on the critical assumption that the break date is known a priori. If that is not the case, the Chow test involves two problems. First, the test turns out to be uninformative because one needs to pick up an arbitrary candidate break date to perform the test and in the process, might miss the true break date. The other way is to select a date based on some feature of the data. But in this case, the test might be misleading, as the candidate break date is endogenous, i.e., it is correlated with the data and the test is likely to falsely indicate a break when no such break exists. Further, since the results can be highly sensitive to these arbitrary choices, different researchers can reach quite different conclusions. The solution to this problem, attributed to Quandt (1960), is to treat the break date as unknown, carry out the procedure for all the possible years and then select the largest Chow statistic over all possible break dates. The question then is about the critical values to be used because the chi-square critical values are inappropriate, if the break date is a priori unknown. The solution to the problem was provided by Andrews (1993) and Andrews and Ploberger (1994), who provided the tables of critical values. These critical values are larger than the corresponding chi-square critical values. Vogelsang (1997) has also provided critical values, which are robust to autocorrelation.

I
The Econometric Methodology
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Suppose we have found one structural break using the above procedure. Now, the question arises, could there be more than one structural break? Bai and Perron (1998) have developed tests for multiple structural changes. Their method is as follows: The first step is to test for a single structural break taking the entire sample. If the test rejects the null hypothesis that there is no structural break, the corresponding year is taken as the candidate break date and the sample is split into two sub-periods around that year. The test is reapplied to each sub-sample. If we find a break date in any of the samples, the entire sample is split around this new candidate break-date and two new sub-samples are tested for structural breaks. This sequence continues until each subsample test fails to find evidence for a break [Hansen 2001].

It is important that the model used for estimation be correctly specified. We use the following specification, which is a
slight modification of the model given in Ben-David and Papell (1998):

\[ \Delta y_t = \mu + \beta DT_t + \gamma DT_t + \varepsilon_t \]

\[ + \sum_{j=1}^{k} c_j \Delta y_{t-j} \] ... (1)

Where, \( y_t \) is the log of variable of interest (in our case, the levels of GDP) and \( \Delta y_t \) is the first difference. The period at which the changes 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;

The above equation is estimated sequentially for \( T_b = 2, 3, ..., T-1 \), where \( T \) is the number of observations after adjusting for those ‘lost’ by first-differencing and incorporating the lag length \( k \).

Our null hypothesis is that there is no structural break in the GDP series. It implies the following:

\[ H_0: \theta = \gamma = 0 \] ... (2)

Thus, the above specification includes not only the auto-regressive component but also the trend component. In order to check whether the data exhibits any upward or downward trend, we regress the variable, i.e., growth rate, on time. Since the ‘t’ ratio corresponding to the variable time is positive and significant, we conclude that, there is an upward trend in the growth rate of GDP over the entire sample period. This is important because depending on this result, the model specification will change and it might lead to difference in the conclusions regarding the break dates, Wallack (2003) has considered the model without taking into account the possibility of a trend, as the article neither includes testing for a trend nor does her specification involve any variable representing the trend. We also determine the lag length to be taken in the above equation using the Akaike Information Criterion (AIC). Since the value of AIC is lowest for AR(5), we select the lag length to be 5.

II Data Issues

We have a time series of GDP (at 1948-49 prices) for the time period 1900 to 2000, i.e., 100 observations available from Sivasubramonian (2000). However, the series cannot be used for pre- and post-independence comparisons because the pre-1947 data that Sivasubramonian presents are for undivided India, which includes Pakistan and Bangladesh whereas the post-independence data is for only India. In addition, there are some definitional differences in the pre- and post-independence India. It is difficult to separate out the data relating to Pakistan. To overcome the problem of geographical coverage, we have assumed that the pre-independence Pakistan (Pakistan and Bangladesh) and the Indian union grew at the same rate, so that the share of what eventually became Pakistan, after 1947, in the GDP of undivided India remained constant. Under this assumption, the rate of growth of GDP of undivided India will turn out to be the same as the rate of growth of the Indian union. We are constrained to make this rather arbitrary assumption because we lack a reliable time series on the rate of growth of the regions which eventually became Pakistan and Bangladesh. However, this assumption is actually too strong for our purpose. For a trend break in the 1950-51 to have not been caused by the exclusion of Pakistan and Bangladesh from the post-partition time series, it is enough that the pre-partition average growth rates of the two regions were not so low that their exclusion, after allowing for their weight in the time series, would raise the rate of growth of post-independence Indian GDP merely because of the exclusion of Pakistan and Bangladesh. In any case, if the change in geographical coverage were to affect the growth rate of post-independence India vis-à-vis that of pre-independence India, it should have happened in 1947, and not in 1951.

There are some important definitional differences in the pre- and post-independence series of national income accounts in the Sivasubramonian data series. ‘Agriculture’ and ‘Livestock’ have been combined into ‘Agriculture’. ‘Construction’ which was earlier included in the ‘Small-Scale and Cottage Industries’ is now shown as a separate category. There is a separate category for ‘Electricity, Gas and Water Supply’. Rather than ‘Manufacturing’ and ‘Small-Scale Industries’, now we have ‘Registered Manufacturing’ and ‘Unregistered Manufacturing’. The earlier category of ‘Income from House Property’ has been now expanded into ‘Real Estate and Business Services’, which takes into account the activities of real estate developers, brokers and contractors. The categories, ‘Professions and Liberal Arts’ and ‘Domestic Services’ have been combined into ‘Other Services’. The category ‘Railways and Communications’ has been split and ‘Railways’ and ‘Communications’ appear as separate categories. ‘Banking and Insurance’ is a new addition in the tertiary sector. In effect, the net additions consist of ‘Real Estate and Business Services’ minus what was earlier ‘Income from House Property’, consisting of rental income derived and ‘Banking and Insurance’. Though ‘Banking and Insurance’ as a category expanded rapidly after independence, in 1980-81, its share in GDP continued to be less than 3 per cent. It is fair to argue that the mere addition of this magnitude would not be able to raise the rate of growth of GDP for the entire period 1950-1980 significantly over the growth rate of the first half of the century. The same thing could be said about real estate and business services. Thus, the finding that the period 1950-1980 constitutes a major break from the past as far as the growth rate is concerned, is not likely to be a statistical artefact under reasonable assumptions articulated above.

In the next section, we use the empirical methodology outlined in Section II to test for the most significant trend break in the growth rate of GDP over 1901-2000.

III Empirical Findings

As shown in Section I, testing for a break date in GDP growth involves running equation 1 and testing the null hypothesis in equation 2. This is a Wald type test of joint significance. The first step is to determine the length of k in equation 1. We determine k using the Aikake Information Criterion (AIC). Since the value of AIC is lowest for AR(5), we select the lag length to be 5.

Using the Vogelsang critical values for the joint hypothesis mentioned above, we find the initial (the most significant) break date is 1952, using data for the whole sample, i.e., 1901-2000. The calculated value of the Wald statistic turns out to be 14.96, whereas the critical value at 5 per cent level of significance is 13.29. Splitting the sample around 1952, we find 1947 and 1965 as the significant break dates, both of which were significant at 5 per cent. (The calculated values are 17.07 and 21.16 respectively.) Splitting around 1947, we do not find any statistically significant break dates before and after 1947. The results of the similar exercise performed by splitting the sample around 1965 are presented in Table 1.

From the above exercise, it is clear that the statistically most significant break date for the growth rate of the Indian GDP is 1952, provided we take the appropriate sample. The important implication of this result is that the break, which occurred around 1952 was larger and more significant compared to the one which occurred in the 1980s as claimed by others. As noted
earlier, partition of undivided India had a huge one-time impact on the level of GDP, consequently, even the growth rate of the GDP in 1946-47 declined by almost 17.5 per cent. We can omit this particular value and again repeat the procedure. Now the sample will consist of 98 observations. The results of this exercise are given in Table 2.

The conclusion in this case is no different from that of the previous case. Again, 1952 turns out to be the most significant break date at 5 per cent level of significance, as far as the whole sample is concerned. In the sub-sample post-1952, we find 1965 as a significant break date. Between 1951 and 1965, the average growth rate of GDP works out to be 3.5 per cent, whereas between 1965 and 1980, the average growth rate works out to be 4 per cent and between 1965 and 2000, the average growth rate works out to be 5 per cent.

As mentioned earlier, Wallack (2003) has worked out break dates using data from 1951 to 2001. Our methodology differs from the one used by Wallack. She assumes a specification where growth rates have no trends. We have established that growth rates do have a trend and hence, Wallack’s specification is inappropriate. Nevertheless, it might be instructive to report the results using her specification, but on the longer time series 1901-2000.

The results in Table 3 clearly indicate that, even if we use Wallack’s specification, 1952 comes out as the single most significant break date. For the sample 1901-1983, we get 1953 rather than 1952, but the early 1950s still remain the important dates. Using Wallack’s specification, 1985 also appears as a break date.

### Table 1

<table>
<thead>
<tr>
<th>Sample Length (Years)</th>
<th>Corresponding Date</th>
<th>Wald Statistic</th>
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<tbody>
<tr>
<td>1901-65</td>
<td>1946</td>
<td>15.7536***</td>
</tr>
<tr>
<td>1965-00</td>
<td>1972</td>
<td>4.7</td>
</tr>
<tr>
<td>1901-72</td>
<td>1952</td>
<td>10.3794</td>
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<tr>
<td>1972-00</td>
<td>1979</td>
<td>6.26</td>
</tr>
<tr>
<td>1901-79</td>
<td>1952</td>
<td>11.555*</td>
</tr>
<tr>
<td>1979-00</td>
<td>1991</td>
<td>6.546</td>
</tr>
<tr>
<td>1901-91</td>
<td>1952</td>
<td>13.216*</td>
</tr>
</tbody>
</table>

*** significant at 5 per cent significance level. 
* significant at 10 per cent significance level.

### Table 2

<table>
<thead>
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<th>Sample Length (Years)</th>
<th>Corresponding Date</th>
<th>Wald Statistic</th>
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<tbody>
<tr>
<td>1901-00</td>
<td>1952</td>
<td>14.1151***</td>
</tr>
<tr>
<td>1901-52</td>
<td>1920</td>
<td>7.0465</td>
</tr>
<tr>
<td>1952-00</td>
<td>1965</td>
<td>21.16***</td>
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<tr>
<td>1901-85</td>
<td>1952</td>
<td>11.22</td>
</tr>
<tr>
<td>1965-00</td>
<td>1972</td>
<td>4.7</td>
</tr>
</tbody>
</table>

*** significant at 5 per cent significance level. 
* significant at 10 per cent significance level.

### Table 3

<table>
<thead>
<tr>
<th>Sample Length (Years)</th>
<th>Corresponding Date</th>
<th>Wald Statistic</th>
</tr>
</thead>
<tbody>
<tr>
<td>1901-00</td>
<td>1952</td>
<td>18.70***</td>
</tr>
<tr>
<td>1901-52</td>
<td>1945</td>
<td>2.47</td>
</tr>
<tr>
<td>1952-00</td>
<td>1985</td>
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<td>1901-83</td>
<td>1953</td>
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<tr>
<td>1953-00</td>
<td>1985</td>
<td>18.57***</td>
</tr>
</tbody>
</table>

*** significant at 5 per cent significance level.

### IV Conclusion

This paper has shown that the heydays of illiberal economic policy, 1950-1980, were not without their achievements, when evaluated from the point of view of the period preceding this. Any assessment of this period should keep this in mind. The policy structure put in place during the period 1950-1980 was not necessarily the best that possible. However, it still remains the single most important break-period as far as economic growth was concerned.

This paper is certainly not arguing that economic reforms do not matter. It is impossible to deny that reforms were necessary. During the period 1950-1980, the state was in too many places where it should not have been, and its presence in areas where it was warranted, i.e., social infrastructure, health, education, etc., was far less than optimal. This created too many incentive problems like rent-seeking. Hence, any process where the state gets out of where it should not be and increases its presence in where it should be is to be welcomed, irrespective of its immediate effect on growth. In fact, the temporality between reform and economic growth need not be instantaneous. For example, assume a state that has made heavy investments in manufacturing consumer durables, say watches, but has too little investment in education. Suppose now the state gets out of making consumer durables and starts to run primary schools. Initially, output will perhaps drop if private investment does not come into watch-making. On the other hand, it might take a long time for the investment in primary schooling to transfer into growth. Thus, reforms will typically have a lagged effect on growth and the lags can be long. Eventually, when longer data sets accumulate, the post-1990s might even replace the early 1950s as the single most significant trend break in growth. However, the significance of the early 1950s will still remain as having put in place a structure that was actually growth enhancing, though not necessarily growth maximising. The policy structure during these years mattered, as has been shown in this paper. Any assessment of this period then should keep this in mind.

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### References


