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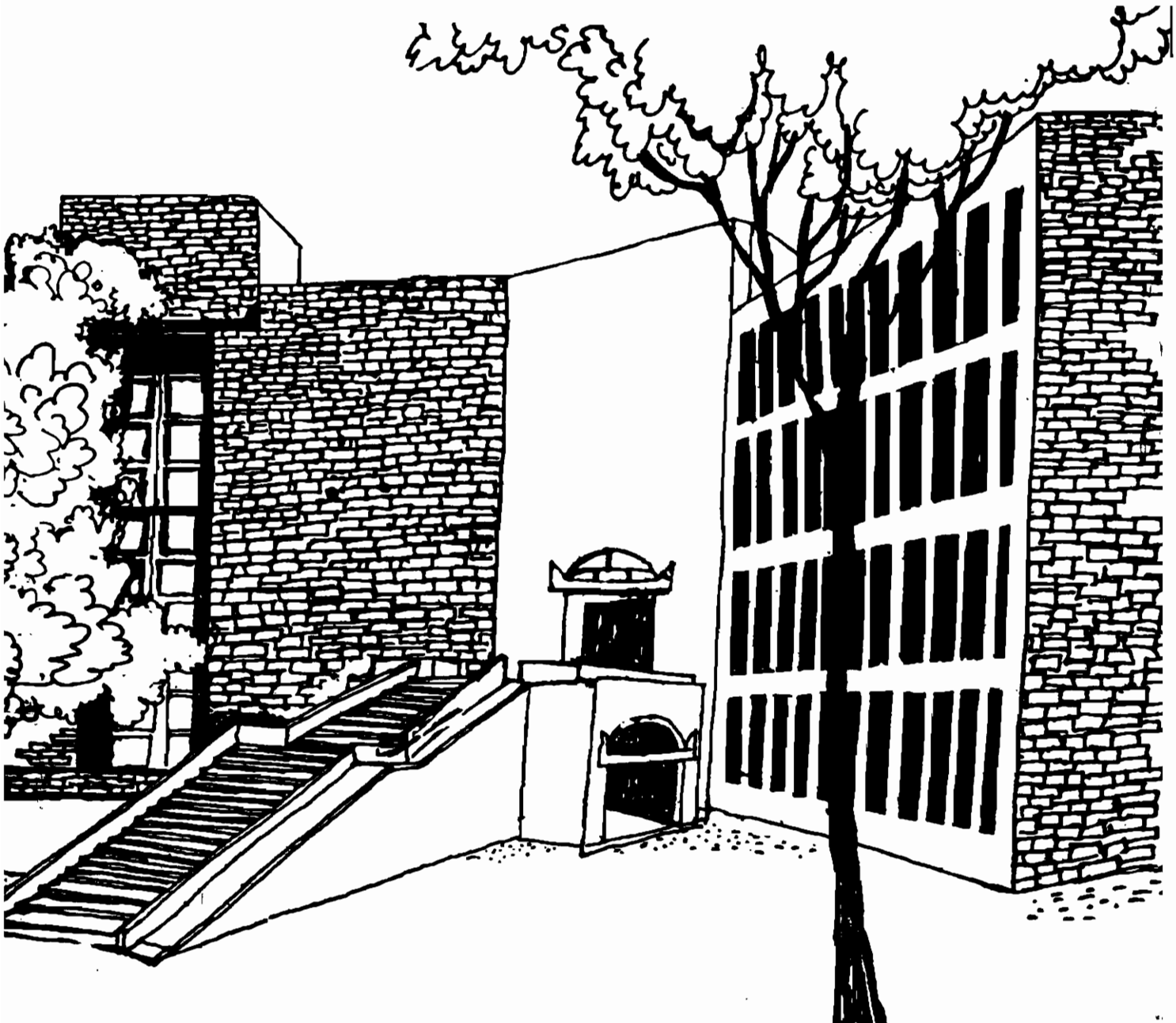

MACROECONOMIC PERFORMANCE AND TAX REVENUE - THE CASE OF GUJARAT STATE

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W.P.No.2000-01-07
January 2000 1577

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Abstract

It is hypothesised that the tax revenues of a state economy would be sensitive to the macroeconomic performance of the state economy measured in terms of inflation and the growth of real income. The case of Gujarat state over the period 1980-81 to 1997-98 is considered for examining this hypothesis. The time trends of the state's tax revenue, GSDP and implicit deflator are estimated and relatively high instability of the growth of income in the state is brought out. Major limitations of the methodology used by the Tenth Finance Commission to estimate the buoyancy of the tax revenues of the states are pointed out and corrected for Gujarat to get a more realistic, acceptable and analytically usable estimate. The Gujarat data seem to support the hypothesis of the same buoyancy of tax collection for inflation and real income growth. Very low tax buoyancy indicates serious problems with the tax administration and tax system in the state.

MACROECONOMIC PERFORMANCE AND TAX REVENUE - THE CASE OF GUJARAT STATE

- Archana R. Dholakia[#]
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I. Introduction:

Budget deficit is generally considered to be countercyclical because the revenues of the government are treated as directly dependent on the performance of the economy. The government expenditures, on the other hand, are taken to be exogenous unless some powerful adverse supply shock on account of the natural calamity strikes the economy which usually strengthens the countercyclical nature of the deficits. The revenues of the government are divided into: (a) Tax Revenue and (b) Non-Tax Revenue. The Non-Tax Revenues generally include fees, fines, penalties, administered prices of various services provided by the government, and the surpluses of the public sector undertakings. Most of these items under the Non-Tax Revenues of the government have fixed or invariant rates over time and they are so low that even major variation in the economic performance is not likely to make some difference to the rate of utilization of the facilities and services. Thus, it is the Tax Revenue of the government which is likely to show any sensitivity to the

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Authors would like to acknowledge with thanks a few questions raised by Shri K.V. Bhanujan, Additional Chief Secretary, Finance and Prof. Manu Shroff, Chairman of The State Public Finance Reform Committee of the Government of Gujarat on an earlier presentation of findings. Those questions are also addressed in the present paper. Authors would like to thank Mr. Ravindra Saradhi and Mr. Yogesh Yadav for computational assistance.

performance of the economy, if at all. In order to investigate this relationship, the case of Gujarat state is considered here.

At the state level, there is a predominance of sales tax over the rest of the taxes because around two-thirds of the state's own tax collection comes from the sales tax. There are hardly any direct taxes at the state level, the only ones being profession tax and land revenue tax which do not contribute any significant amount. The state tax revenues are, therefore, likely to be more directly related to the macroeconomic performance of the state economy measured in terms of the growth of output and inflation. Sales tax has always been on ad-valorem basis. The rate of inflation in the economy should, therefore, have a direct bearing on the sales tax collection. Similarly, if the growth of output is higher, the tax base is expanded and the tax revenue is likely to increase. Growth in the Gross State Domestic Product (GSDP) at current prices would capture both these effects of the real output growth and inflation and hence is likely to influence directly the tax revenues of the state government. These hypotheses are broadly tested in the present paper.

II. Time Trend of Tax Revenues:

Time series of various tax revenues of the Gujarat state from 1980-81 to 1997-98 are considered for estimating the exponential trend in each of them by fitting a log-linear equation. The trend rate so obtained along with the R-square is presented in *Table 1* below. It can be easily seen from the table that all the state taxes show statistically significant time trend. Moreover, most of the

equations have excellent statistical fit with R-square above 90%. It may noted here that tax collections considered here are "actuals" or realized and not "budgeted" or estimated receipts. Thus, there is a steady rate of growth of tax revenues in Gujarat. The State's Own Tax Collection (SOTC) is growing steadily at about 15% p.a., and so is the Total Sales Tax (TSTAX). Moreover, the SOTC and TSTAX also do not show any statistically significant regime-switch dummy indicating acceleration or deceleration in the growth after 1991 reforms:

III. Time Trend in GSDP and Inflation:

On the time series of GSDP at current prices and constant (1980-81) prices and the implicit GSDP deflator which measures the overall inflation in the state economy, log-linear time trends with regime-switch dummy were fitted. The estimated equations are as under: (t-values in parentheses and e_t represents error term)

1. $\ln (GSDP)_{current} = 13.4 + 0.1254t + 0.0470 (t-t^*) + e_t$
   (23.94) (3.98)

   R-square = 0.9942

2. $\ln (GSDP)_{constant} = 13.5 + 0.0462t + 0.0346 (t-t^*) + e_t$
   (7.99) (2.67)

   R-square = 0.9608

3. $\ln (Deflator) = 4.5 + 0.0792t + 0.0128 (t-t^*) + e_t$
   (27.35) (1.88)

   R-square = 0.9948

Note: (I) t^* = 1990-91 indicating the regime-switch
(ii) All t-values are statistically significant.

As it can be seen, all the three equations clearly show significant time-trend rates which are internally consistent. Moreover, the time trends in all these three aggregates are not smooth but show clear and significant break with acceleration after 1991 policy reforms. However, it is argued that output and income growth in Gujarat is highly unstable and shows considerable fluctuations over time. (See, Dholakia, R.H., 1999). This can be examined by considering the annual growth rates of GSDP at current and constant (1980-81) prices by sectors and calculating the coefficient of variation of the series. *Table 2* presents the arithmetic mean and coefficient of variation of GSDP in Gujarat by different sectors over the period 1980-81 to 1997-98. It can be seen from the table that growth in income and output shows considerable variation from year to year in Gujarat. The magnitude of the variations is higher in GSDP at constant prices (*i.e.* output) than in GSDP at current prices (*i.e.* expenditure) in most of the sectors. Thus, the variation in the inflation rate has a dampening effect. It tends to stabilize the economy to some extent. Very broadly, this can be interpreted to mean that the fluctuation in the real output in Gujarat is perhaps more due to the supply-side factors than the demand-side factors. If, therefore, the tax system and administration are efficient, it must show up on the tax collection by the state.

IV. Tax Revenue and Macroeconomic Performance:

The macroeconomic performance of any economy is measured in terms of the growth of real output (G_Y) and inflation (G_P). These are, therefore, the

explicit assumptions behind the budget making exercise because only on the basis of these numbers the revenue estimates are made and the expenditure targets are fixed. For instance, simple bivariate double-log regressions between tax revenues and nominal GSDP are used by the Tenth Finance Commission (1994) to estimate the buoyancy of the tax revenues of different states. There are obvious pitfalls of this simplistic exercise because it ignores the quantum and price components of the nominal income growth. When these alternatives are considered, the estimated regressions for Gujarat are:

5. $\ln(SOTC) = -26.27 + \underset{(16.77)}{2.42} \ln(GSDP)\ \text{constant} + e_t$

R-square = 0.9462

6. $\ln(SOTC) = -1.99 + \underset{(52.69)}{1.80} \ln(\text{Deflator}) + e_t$

R-square = 0.9943

7. $\ln(SOTC) = -7.85 + \underset{(40.26)}{1.05} \ln(GSDP)\ \text{current} + et$

R-square = 0.9902

All the t-values are highly significant statistically. It can be seen that the buoyancy estimates are substantial with the real output and implicit deflator of GSDP. However, the consistency is not found when they are compared to the buoyancy with respect to the income at current prices. This is suggestive of the fundamental problems of estimation in using the level variables to derive such relationships. As it is clearly observed earlier, all the variables involved, *viz.* tax revenues as well as the GSDP and the Deflator reveal statistically significant time trend during the period under consideration. Thus, when the levels of these

variables are regressed on one-another, their relationship gets dictated largely by their inherent trend and does not show their real co-variance and correlation. The observed correlation under such circumstances becomes spurious and should not be considered for any analytical interpretation. This is the major shortcoming of the methodology followed by the Tenth Finance Commission (1994, p. 167-8). It is necessary to test for the unit roots of time series involved by considering the Augmented Dickey-Fuller or Philips-Perron test. *Table 3* provides the results of these tests carried out on the time series of logarithms of the four variables for Gujarat. The results clearly show that all the four variables, *viz.* logarithms of the SOTC, nominal GSDP, GSDP Deflator and Real GSDP in Gujarat have unit root problem. Moreover, the Engle-Granger residual based cointegration test on the equations (5) to (7) clearly supports the hypothesis that these variables are not cointegrated. The results are reported in *Table 4*. Thus, the estimates of the slope parameter in equations (5) to (7) above are likely to be spurious and meaningless for any analytical use. It is regrettable that the Tenth Finance Commission (1994, p. 99-102) is making use of such estimates without testing for the unit roots or cointegration and taking any corrective measures. Generally, the way out under such conditions is to examine the relationship by considering the first difference in the variables. In a double-log regression on the levels of the variables, the slope coefficient shows the buoyancy, *i.e.*

8. $\ln Y_t = a + b \ln X_t$

Therefore, $\ln Y_t - \ln Y_{t-1} = b \ln X_t - \ln X_{t-1}$

i.e. $\ln (Y_t / Y_{t-1}) = b \ln (X_t / X_{t-1})$

Thus, taking first difference in the double-log form amounts to a linear regression on the annual rates of growth in the variables. This is likely to capture the real correlation between the variables and provide a more realistic estimate of the buoyancies. The following are the results:

9. $G_{SOTC} = 0.153 + 0.141\ G_Y + e_t$
(1.685)

R-Square = 0.1591

10. $G_{SOTC} = 0.157 + 0.060\ G_P + e_t$
(0.242)

R-square = 0.0039

11. $G_{STOC} = 0.129 + 0.210\ G_{YP} + e_t$
(2.267)

R-square = 0.2552

Out of these equations, only the last one, *i.e.* equation (11) is statistically significant at 5% level. The estimate of the buoyancy of the State's Own Tax Collection with respect to the GSDP at current prices seems to be hardly 0.21 which implies that a one percentage point increase/decrease in the growth of GSDP at current prices (G_{YP}) would lead to only 0.21 percentage point increase/decrease in the State's Own Tax Collection (SOTC). Although the other two regressions, *i.e.* equations (9) and (10), are statistically insignificant, they are internally consistent with equation (11).

It is useful to examine whether the buoyancy of the tax revenues is different for the growth of real output and inflation or it is essentially the same. This is because the state government when faced with the choice of achieving or relaxing one target at the cost of the other may find it useful to get some estimates of the implications of such a decision on their revenues. This is particularly relevant under the tremendous pressure building up on the states to achieve fiscal deficit targets. In order to test this hypothesis, equation (11) can be expanded to include growth of real output (G_Y) and inflation (G_P). the estimated unrestricted regression is:

12. $$G_{SOTC} = 0.095 + \underset{(2.012)}{0.560}\, G_P + \underset{(2.717)}{0.276}\, G_Y + e_t$$

R-Square = 0.3477

It can be seen that both the coefficients are statistically significant and the overall regression is also satisfactory. Equation (12) is an unrestricted form whereas equation (11) is the restricted form of the equation, the linear restriction being:

13. $G_{YP} = G_Y + G_P$

It is thus, possible to test the above-stated hypothesis of similar buoyancy against the alternative hypothesis of different buoyancies for G_Y and G_P. The standard F-test gives the value of only 1.9688 which is less than the table value not only at 5% but also at 10% level of significance. Thus, the Gujarat data do not provide sufficient evidence to reject the hypothesis of the same buoyancy of

the tax collection for inflation and growth in real output. Thus, internal, reshuffling of the two targets is likely to be revenue neutral in Gujarat. The lack of clarity in the explicit target setting for these two critical aggregates in the budget making exercise in Gujarat thus has not proved costly so far.

This is surprising because most of the state taxes are indirect and are by and large on ad-valorem basis. Inflation is, therefore, expected to exert a greater influence on the tax collection. But the very fact that the tax collection in Gujarat does not show differential buoyancy for inflation and real output growth coupled with a very low magnitude of the buoyancy indicates serious problems in the tax administration and the tax system. It appears that taxes are collected by setting targets and once the targets are fulfilled or nearly achieved, the tax administration has no further incentive to collect more for the state (!). It calls for serious reforms in the procedures, formalities and frequency of tax collection in the state.

Simultaneously, the malady could be in the tax system where ad hoc tax incentives are given in plenty with a view to attracting new industries and helping the existing ones in certain sectors. The tax collection, therefore, might typically be deficient because of the hidden subsidies which are not made explicit in the budget by first showing an entry as a tax collection and then as an expenditure in the form of the rebate. Low magnitude of the buoyancy could also be on account of such continuing hidden subsidies. If it is so, it would largely be corrected by the recent decision of the state finance ministers to stop all the tax

rebate incentives offered to industries. It can then be expected that the tax buoyancy would substantially improve in the near future. However, a question would still remain to be investigated whether the withdrawal of such hidden subsidies would result in the exodus of some of the existing industries from the state and diversion of the new industries to other states ultimately resulting in lower growth of output in the state. In the regression framework, this becomes the issue of reverse causality. However, the reverse causality in this case is only with a lag because sacrifice of the growth of tax revenue today would lead to higher growth of output tomorrow. This in itself is an interesting hypothesis to test here because there are several studies taking a more direct route of survey based methodologies which have shown that tax-based incentives are not very effective in altering the locational decisions of entrepreneurs particularly in Gujarat as compared to the provision of better quantity and quality of infrastructure. (See, Maravania, 1995; Lalitha, 1996, etc.). Thus, against the null hypothesis of no effect of the hidden subsidies and tax incentives on the future growth of output, the alternative hypothesis is the one predicting a positive effect on the future growth in the economy.

Based on the above logic, it is possible to formulate the model as follows:

14. $(G_{SOTC})_t = a_o + b_o (G_{YP})_t$

15. $(G_{YP})_t = a_1 - b_1 (G_{SOTC})_{t-1}$. Therefore,

16. $(G_{SOTC})_t = a_2 - b_2 (G_{SOTC})_{t-1}$

where a's and b's are positive parameters.

Equation (14) is already estimated directly and reported above as equation (11) which represents a statistically significant fit at 5% level of significance. If the hypothesis of the reverse causality with a lag as given in equation (15) were valid, the equation (16) should turn out to be statistically a good fit with a single-tail t-test on the slope parameter. In order to allow more time lag for the effect of the hidden subsidies or tax-rebates to be realized on the future growth, one more lag can also be considered. The results of the regressions are reported as follows:

17. $(G_{SOTC})_t = 0.128 + 0.211\ (G_{SOTC})_{t-1} + e_t$
(0.856)

R-Square = 0.0439

18. $(G_{SOTC})_t = 0.184 - 0.125\ (G_{SOTC})_{t-2} + e_t$
(-0.480)

R-Square = 0.0151

19. $(G_{SOTC})_t = 0.153 + 0.224\ (G_{SOTC})_{t-1} - 0.164\ (G_{SOTC})_{t-2} + e_t$
(0.828) (-0.612)

R-Square = 0.0612

The period covered for the above three regressions is 1978-79 to 1997-98. As it can be readily seen all of the three equations represent very poor statistical fit and single-tail t-test on the slope parameter also fails to reject the null hypothesis of no relationship. Thus, the data on tax revenues in Gujarat seem to be consistent with the null hypothesis of no effect of the hidden subsidies and tax rebates on the future growth of income and output in the state. Therefore, the earlier conclusion about the implication of a low buoyancy on the inefficiency

of the tax administration and tax system in Gujarat seems to be most plausible and acceptable

Table 1: Log-Linear Time Trends of Different Tax Revenues in Gujarat over the period 1980-81 to 1997-98

S.No.	Taxes	Constant	Slope	t-value	R-square
1.	Central Sales Tax	4.32	0.13	28.67	0.98
2.	State's Sales Tax	5.52	0.14	36.70	0.99
3.	Other Sales Tax	-4.07	0.68	7.12	0.76
4.	Total Sales Tax	5.73	0.15	59.84	1.00
5.	Profession Tax	2.20	0.11	12.42	0.91
6.	Land Revenue Tax	2.26	0.12	19.73	0.96
7.	Stamp & Registration Duty	3.05	0.17	27.06	0.98
8.	State Excise Duty	1.10	0.13	26.76	0.98
9.	Motor Vehicle Tax	2.88	0.17	25.28	0.98
10.	Goods & Passenger Tax	3.72	0.06	3.11	0.38
11.	Electricity Duty	3.51	0.19	23.67	0.97
12.	Entertainment Tax	3.28	0.04	3.70	0.46
13.	Miscellaneous Tax/Duty	2.34	0.11	7.68	0.79
14.	State's Own Tax Collection	6.14	0.15	89.82	1.00

Source: Govt. of Gujarat: *Budget in Brief*, Annual Publication.

Table 2: Arithmetic Mean (A.M.) and Coefficient of Variation (C.V.) of Annual Growth in GSDP in Gujarat, 1980-81 to 1997-98 (in %)

S.No.	Sectors	GSDP at Current Prices		GSDP at 1980-81 Prices	
		A.M.	C.V.	A.M.	C.V.
	(1)	(2)	(3)	(4)	(5)
1.	Agriculture & Animal Husbandry	16	216	9	532
2.	Forestry & Logging	15	218	1	571
3.	Fishing	19	68	8	132
4.	Mining & Quarrying	24	234	4	163
	Sub-Total: Primary Sector	15	180	7	538
5.	Registered Manufacturing	20	92	11	150
6.	Unregistered Manufacturing	18	84	8	186
7.	Electricity, Gas & Water Supply	20	51	10	60
8.	Construction	16	97	5	309
	Sub-Total: Secondary Sector	18	61	9	123
9.	Trade & Hotels	16	53	7	113
10.	Railways	18	70	3	231
11.	Transport by other means	20	59	10	120
12.	Storage	12	144	3	386
13.	Communication	24	130	9	60
14.	Banks & Insurance	22	47	14	64
15.	Real Estate & Business Services	7	34	3	9
16.	Community Services	15	24	6	67
17.	Public Administration	16	47	6	126
18.	Other Services	15	28	5	62
	Sub-Total: Tertiary Sector	16	23	7	45
	Total: GSDP	16	66	7	174

Source: Govt. of Gujarat: *State Domestic Product - Gujarat State, 1996-97 and Update on SDP* from Bureau of Economics and Statistics, Gandhinagar.

Table 3. Unit root test for the Level Variables

Variables	Augmented Dickey-Fuller		Philips-Perron	
	Statistic	P-Value	Statistic	P-Value
ln (SOTC)	-2.71292	0.23076	-8.66473	0.53205
ln (GSDP) Current	-1.89753	0.65595	-6.5981	0.69729
ln (Deflator)	-2.23404	0.47072	-8.05407	0.57948
ln (GSDP) Constant	1.0588	1	-13.8595	0.22874

Note: HO: Unit root is present.

Table 4: Engle-Ganger Residual based Cointegration Tests

Equation	Regressions	ADF-test statistic	P-Value
7	ln (SOTC) on ln (GSDP) Current	-2.32402	0.61626
6	ln (SOTC) on ln (Deflator)	-3.17681	0.19397
5	ln (SOTC) on ln (GSDP) Constant	-2.60076	0.46461

Note: 1. HO: Not Cointegrated.
2. Above regressions include constant and trend variables.

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