

UNDER STRUCTURAL ADJUSTMENT PROGRAMME IN INDIA WHAT HAPPENED TO SOCIAL DEVELOPMENT AND ECONOMIC GROWTH: AN APPLICATION OF TODA YAMOMOTO TEST.

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ABSTRACT

An alarming issue concerning development economics is whether a government should endeavor to improve the human well-being of the populace or focus entirely on the country's economic upliftment. The review of the existing literature reveals a variety of points of view in this regard. In order to answer this question, the current study employs the Toda Yamamoto test with seemingly unrelated regression (SURE). It seeks to determine the “causal relation between human well-being and per capita gross real product” (a measure of a country's economic accomplishment). It employs a set of 23 variables in this context to create five sub-indices: demographic, education, quality of life, health, and women empowerment. Making use of Principal Component Analysis, these five indexes are then translated to the Social Development Index. The social development index is utilized as a measure of human well-being, and the “causal relationship between Economic Growth and Social Development” is then established.

Key Words: Social Development, Economic growth, Principal Component Analysis, Toda and Yamamoto Causality Test.

1. Introduction

Economic growth is essential to a nation's development, however its eventual achievement will be assessed by how it affects Social Development, and hence the welfare and progress of a nation's people. It is well acknowledged that in contemporary modern times, most emerging countries place a premium on social development, especially for the welfare of the population. As a result, their policymakers have the challenge of increasing social development that benefits the population while without impeding the country's economic growth. This begs the fundamental question of whether a country ought to put economic growth over meeting basic human needs and instead work to enhance social development as shown by social indices. This subject become significantly important when a government implements the Brettonwood Twins' Structural Adjustment Programme (popularly known as SP).

A Structural Adjustment Programme or SAP¹ as it is popularly known; may simply be “defined as the process of market oriented reforms in policies and institutions, intended to improve the incentive structure, the trade regime, allocation of resources, and efficiency in the use of resources” to stimulate growth and enhance impulses in the economy.

The SAP came into being as a response to economic crisis of late 70s’ and during 80s’ and many developing countries were compelled to adopt it due to a combination of external and internal factors. External factors included; debt crisis in the developing countries (a result to the oil shock of 1973 and 1979), failure of centrally planned economies, the high real interest rates, along with the tightening of international credit, low demand for exports from the developing countries due to general slowdown in the world economy and severe foreign exchange constraints leading to protracted economic stagnation. The principal internal factors included inappropriate macroeconomic policies leading to weak domestic policy management, distorted prices, a bloated and inefficient public sector and poor public finance allocation and management.

SAP essentially consists of two components: Stabilization and Adjustment. The orthodox distinction is that while Stabilization consists of short term policy interventions to restore sustainable balance of payments with the help of demand management policies, in contradistinction; Adjustment seeks to bring in efficiencies and stimulate the economy to achieve higher medium term and long-term Growth through change in relative prices and incentives by using supply management policies. In theory, Stabilization should be followed by Adjustment, but in fact, this is difficult to do, and they are usually implemented concurrently.

SAP had been criticized by individual researchers, NGOs, different agencies like ILO, UNICEF, UNDP etc. for its failure to properly account for the social cost of Adjustment. A lot of studies have been done in this regard and as a result of it; the social cost of adjustment was duly factored in their economic policies by IMF and World Bank from mid 90’s onwards.

It was only in late 1990s’ that a specific ‘Poverty Reduction Growth Facility’, (PRGF) was introduced by the IMF and World Bank to identify and prioritize social and sectoral programmes and structural reforms directed at poverty reduction, which would assist in the “Social Development” of a nation.

This paper is organized in ten sections. Section 1 contains the Introduction to the paper; Section 2 outlines the Objectives; Section 3 briefly reviews the existing literature on “Causality between Growth and Social Development”; Section 4 mentions the econometric techniques used as methodology to formulate the “Social Development Index”; Section 5 goes over the technique used to formulate the Social Development Index; Section 6 refers to the Data Sources; Section 7 discusses the Social Development Index; Section 8 examines the “relationship between social development and growth”; Section 9 contains the empirical analysis of Causality between “Social Development and Growth” in India. The conclusion and policy implications for India are discussed in Section 10.

2. Objectives of the Paper

2.1. To reduce chosen variables of social development into five sub- indices namely:

a. Demographic Index

¹ There is a lot of literature exists on the conceptual issue. Some of the studies are Balassa, B. (1982); Bruno, M. (1979); Balassa, B. (1989); Hugon, 1990; Bruno, Michael (1992); Conway, P. (1994); Dornbusch. R. (1982); Khan, M. S. and M. D. Knight. (1981); Taylor, L. (1988); Khan, M. S. and D. Villanueva (1991); David Dunham and Saman Kelegama, (1997).

- b. Education Index
 - c. Health Index,
 - d. Quality of Life Index
 - e. Women Empowerment Index
- 2.2. Reduce above mentioned five sub-indices into “**Social Development Index (SDI)**”.
- 2.3. To explore the “causal relationship between Social Development and Economic Growth” under SAP and to ascertain the policy directions for the future.

The aforementioned objectives are tested for India, as it is, perhaps, one of the most developing economies of the world and has already finished nearly two decades with reform process. India had started the liberalisation process in different facets of the economy in the early 80s’, and adopted SAP given by Brettonwoods Twins in 1991². The present study is conducted over the period of 1970-2007, which in the opinion of the researcher, is long enough for evaluating the “impact of SAP on the casual relationship between Social Development and Economic Growth”.

3. Literature Review

According to the available literature on “development economics, the relationship between social development and economic growth has taken at least four” major directions: (i) that “social development” is a byproduct of economic growth”; (ii) that “economic growth and social development” are non-related; (iii) that “neither social development nor economic growth is the crucial cause of the other”, but that they are mutually dependent; and (iv) that “social development comes before economic growth”.

The “**first approach** may also be called as “**Trickle Down Approach**” i.e. a higher growth will ultimately trickle down to lower rungs of population. Under this approach, government policies typically give economic programs a lot of weight, with the expectation that economic success will lead to social development. The United States pursued this strategy toward “third-world development” in the early postwar period, and it is implicitly based on the “Rostovian model”, in which economic expansion serves as an incentive for progress through the stages stages of development, eventually leading to a developed society (Rostow, 1960). This position was not disputed until the early 1970s, when MacNamara (1971) claimed that "Development has for too long been expressed simply in terms of growth of output. There is now emerging the awareness that the availability of work, the distribution of income, and the quality of life are equally important measures of development."

Despite criticism that the **Trickle Down Approach** is insufficient to meet fundamental necessities since 1970, research like those by Hagen (1980), Ram (1985), and Goldstein (1985) keep coming out.

Zuvekas (1979) illustrates the “**Second Approach** where “Social Development and Economic Progress” are unrelated. He believes that economic growth may occur without the development of social welfare, and he believes that countries should limit the allocation of the benefits of growth to the privileged elite at the price of general social welfare development. He claims that “if the poorer sectors of the population are not expressly targeted for aid in meeting fundamental necessities, economic expansion would result in an increasing gap between the rich and the poor”.

² Structural Adjustment Programme consists of both Stabilization and Adjustment. India took its first Structural Adjustment Facility in 1991 sanctioned by International Monetary Fund followed by other high conditionality loans during this period. This all is well documented in many books and articles e.g. Vijay Joshi and Ian M.D. Little, *India's Economic Reforms 1991-2001* (Clarendon Press,Oxford, 1996)

The "**third approach**, which holds that “social and economic development” are closely related, is expressed in several economic development studies. For example, Srinivasan (1977) highlighted the close “relationship between policies for the development of basic necessities and plans for economic growth”. According to him, prioritizing necessities too much may hinder economic growth in the short term and impede future advancements in meeting fundamental needs.

Streeten (1977, 1981) has taken the “**fourth approach** that “economic growth is the result of social development”. He has been a vocal supporter of the basic needs approach. He challenges the income-based strategy for reducing poverty by highlighting the fact that additional money is not always spent on things that are necessary for a person's basic needs. Additionally, he notes that many basic needs—like having access to safe drinking water, schools, and healthcare—can be satisfied more successfully by public services and not by individual income. In fact, Streeten (1961) talked about a “trickle-up effects” when he states basic needs is not primarily a welfare concept; improved education and health can make a major contribution to increased productivity.

Though there exists vast literature on the impact of economic reforms adopted under SAP on “Growth and Social Development”, the findings are somewhat mixed. The Liberals hold out that countries which are highly engaged in economic reforms process are likely to experience higher economic growth, development, greater affluence thereby improving socioeconomic conditions leading to enhancement of social development levels. They believed in trickle down impact of the Growth achieved during economic reforms process thus leading to the overall social development of the adopting country.

Other on the contrary, Conservatives, holds out that high level of “economic reforms processes” adopted under SAP tend to generate greater economic and social inequalities. It is further argued that reforms are helpful for only certain sections and not the entire society. The “economic growth generated from the reforms process” also tends to remain exclusive to the better ones in the society (Gupta, 1999). It is therefore perceived that reforms in fact increase poverty.

Several studies have drawn a rather grim and bleak picture about the effects of the “Adjustment Programme” on the Social Development. It has been observed during the “Adjustment Process, the poor, the young, the aged and women” suffer more than others (Casperz 1992). UNICEF also supported this, in its pioneering study entitled ‘Adjustment with Human Face’. By 1990s’ there was substantial theoretical and empirical consistency in support of the view that whatever be the long run benefits, SAP tends to worsen income distribution and poverty (Berry, 1996). In the economy of Nigeria, the unequal distribution of the pains of adjustments became the cause of two attempted coups d’ et al, six, major religious riots, three serious nationwide protest and several riots and demonstration by workers, farmers, the unemployed students, traders and other disadvantages groups (Ihonvbere, 1993).

Many experts like Boswell and Dixon (1990); Barbieri (1996); Rodrik (1997); Rodriguez and Rodrik (2000); Blinder (2006); Summers (2006) and Krugman (2007) have argued that reforms lead to greater economic insecurity and social unrest in the society, thereby paving the way for risk of political instability and outbreak of conflicts. Even the Bretton Wood institutions have acknowledged the adverse social impact of SAP.

Though it cannot be denied that there are supporting research about the positive impact of economic reforms on social development, reality is the that they are negative impact studies outnumbered them.

As per the survey, there is a lack of a clear and coherent response from the literature about the “causal priority under SAP” between social development and economic growth. In fact, “the lag-lead relationship between social development and economic growth” becomes not only of academic interest but also of vital importance for the policy makers of the SAP adopting countries for incorporating suitable modifications in contents and direction of SAP to “ensure success of economic reforms and political stability” of the government.

4. Econometric Techniques

The econometric techniques used in the paper are:

1. Principal Component Analysis to formulate the Social Development Index.
2. Toda-Yamamoto version of Granger Causality test.

5. Methodology for Formulation of Social Development Index

It is difficult to define social development as it as complicated as defining human being themselves. **Social development** may be defined as the process which results in the transformation of social structures so as to improve the capacity of the society to fulfill its aspirations. It contributes to “economic Growth through improvement in the quality of human capital” which is one of the most important factors of production. A better social development results in reduction of socio-economic inequalities leading to conditions of socio economic and political stability in a nation.

Many composite (multidimensional) indices have been developed internationally covering a host of different issues like environment, sustainable development, globalization, human development, quality of life information technology and many more to measure progress or achievements between countries. e.g. *Human Development Index* (HDI), developed by the United Nations; *Environmental Sustainability Index* by the World Economic Forum; *Composite of Leading Indicators* by OECD; and *Overall Health System Index* by the World Health Organisation; *The Growth Competitiveness Index* by Harvard University. A review of these studies is reported by John *et al.*, (2001), Saisana and Tarantola (2002) and Andrew (2004).

The Social Development Index formulated in this study is much more elaborate than Human Development Index and perhaps the first attempt to study Social Development issues using “Social Development Index” for the period under study in India.

5.1 Steps involved in the formulation of Social development Index

The major steps used for constructing an index, including formulation of the sub indexes - as already detailed above - and the Social Development Index are:

1. Finding the appropriate variables,
2. Normalising, i.e. Standardising the variables,
3. Assigning weights to the variables, and
4. Combining the chosen indicators into SDI by using different techniques.

5.1.1 Choice of Variables

The first and the most important and very first step in the formulation of an index is the choice of relevant variables.

Social development is a multi faceted concept with many dimensions. It has many constituent variables, the study of all of which will be a constraint not only because it will be “beyond the scope of this Paper” to cover all the variables, but also due to the fact that for many of them, data available is scanty, unstructured and unsystematic.

The choice of component factors for the “composite Social Development Index” appears to be guided by two opposing principles: broad coverage of various aspects of “Social Development and parsimony in terms of the number of variables”. Selected variables for “**Social Development Index**” in this research paper are restricted to a few important and relevant ones for which properly structured data covering the period 1970-2008 is available. The chosen variables are related to demographic, health, education, quality of life and women empowerment.

Demographic variables are very important for the “social development” of a nation as they reflect the dependents and workers in an economy. The distribution of demographics will also demonstrate the amount of capital and other resources needed to effectively employ the current workforce. Variables chosen are old and young age dependency ratio, birth and death rate “per 1000 of population” and population growth rate.

Health and education forms the backbone of a nation as expenditure in both these sectors generate a lot of externalities for enhancing Growth as also Social Development. Governments, having realized this, have been increasingly giving emphasis on investment in the social sector, especially on education and health, which form the basis for human and thus social development. The “variables chosen for health are public health expenditure, infant mortality rate, life expectancy at birth, physician per thousand of population, hospital beds per thousand of population”. The “variables for education include public education expenditure, literacy Rates, primary and secondary enrollment ratios” (Gross).

Quality of life in a country “reflects and gets reflected in the Social Development” of a nation. There can be many indicators to this variable and “the indicators considered” in this paper are: growth in real GDP per capita, telephone mainlines per thousands of population, households with television, electric power consumption (kWh per capita), energy use (kg of oil equivalent per capita), civil rights and political rights.

Women empowerment is one of the most significant facets of any society. They are “more vulnerable” than men, to the effects of SAP due to the reasons discussed earlier in this research. It is well known that impact of women on “social development” of a nation is very crucial and indicators chosen for this are: fertility rate, female labor out of total labor force, female life expectancy at birth.

5.1.2 Normalisation of Variables

Normalisation of the values of indicators “before they are integrated” into the SDI constitutes the next step in the formulation of composite index. The “variables chosen for the construction of the composite index are measured in different units and hence, in general, are not additive. Therefore, it is necessary to convert the variables into some standard units of measurement” to be able to add them together. This is to be followed by

the issue of directionality, for instance, increase in some variables such as literacy; correspond to increase in overall well-being, whereas increase in other variables e.g. unemployment; correspond to decrease in overall well-being. In order to solve this issue, “variables are required to be standardized”, so that a rise in the standardized score corresponds to increase in overall well-being. There are “many techniques used to normalize the indicators, and each has its advantages and disadvantages. The available techniques are:

1. No Standardization
2. Normalization to base year
3. Z-Score or Gaussian normalization
4. Ordinal Response
5. Linear scaling

In the present paper Z-score and Linear scaling is used for normalization. “Z-score is calculated subtracting the mean of a data set and then dividing by its standard deviation”. This technique; as given in Eq. 1, is commonly applied in multivariate methods (e.g. principal components).

$$\text{Normalisation} = \frac{(\text{Actual value} - \text{Mean value})}{(\text{Standard deviation})} * 100 \quad \dots \text{Eq. 1}$$

This “technique has been used in the Environmental Sustainability” Index (OECD, 2002).

Linear Scaling Technique (LST) is a “technique used to standardize” the variable’s range. This is the most commonly used method in international indices wherein an estimate is made for the “high and low values which represent the possible range of a variable for all time periods and for all countries, and denoted Minimum and Maximum”, respectively. The data is then scaled according to these values. If a “variable increase corresponds to an increase in overall welfare, the variable, VALUE”, is scaled as given in the formula given in Eq. 2:

$$\text{Normalisation} = \frac{(\text{Value} - \text{Minimum})}{(\text{Maximum} - \text{Minimum})} * 100 \quad \dots \text{Eq. 2}$$

In the present case, the increases in the VALUE correspond to increases in scaled VALUE.

However, if an “increase in VALUE” corresponds to decrease in total welfare, the VALUE is scaled according to the “complementary formula” given in Eq. 3,

$$\text{Normalisation} = \frac{(\text{Value} - \text{Minimum})}{(\text{Maximum} - \text{Minimum})} * 100 \quad \dots \text{Eq. 3}$$

In this case, rise in the VALUE corresponds to decreases in the scaled VALUE. In both cases, values of 0-1 and 0 corresponds to the lowest level of welfare; whereas 1 corresponds to the highest. This technique is used to scale all variables in many indices, e.g. the “Human Development Index” produced by the UNDP, An Index of “Social Health” by Human Resources Development Canada (HRDC), “the Index of Economic Freedom” by the Heritage Institute and Economic Freedom produced by the Cato Institute.

5.1.3 Assigning Weights

Assigning Weights (a measure of relative importance) to the Variables is important before aggregating all the chosen variables into an index (SDI). The choice of weights can change relative performance of a country before and after the adoption of SAP. In addition the change of approach (methodology, system) in calculating the index will change the weights and the final results of the index. The different methods available for assigning weights may be grouped as follows:

Objective Methods

1. Simple Equal Average
2. Power Averaging
3. Principle Component Analysis

Subjective methods

1. Assessment technique from expert's opinion
2. Assessment technique from literature and theory review

In this Study, the researcher has attempted a method of "Normal or Single Stage as well as Multi Stage Principal Component Analysis"³. Principal Component Analysis⁴ is a "multivariate technique used to find a combination of indicators". It describes the variation of the original data by means of a smaller set of dimensions (termed Principal Components) than the original number of indicators (data reduction technique). The PCA transforms the original indicators into new and uncorrelated components, which means that the "Principal Components" are measuring new and different indicators with different weights.

The adjusted data is transformed into a new set of uncorrelated "Principal Components" using the Covariance Matrix (or its correlation matrix direct when the indicators have same patterns of units). PCA finds and calculates the eigenvalues and eigenvectors for the covariance matrix. The eigenvalues describe the variance and the sum of the eigenvalues is equal to the total number of indicators being analysed. Each indicator contributes to a proportion of the variance. The sum of variance of the PCs is equal to the sum of the variance of the original values. The coefficients (loadings or weights) for each PC are the *eigenvector* and each "Principal Component is a linear combination" of the original n indicators, where the first Principal Component Z_1 explains the maximum amount of variance, while the next Principal Component Z_2 explains the remaining variance of the original data or the next largest proportion of variance and so on. It may be noted that all the components are set in decreasing order of importance so that $\text{var}(Z_1) \geq \text{var}(Z_2) \geq \dots \geq \text{var}(Z_n)$. Together, all the "principal components" account for 100% of the variation and each eigenvalue is the percentage of total variance for each component.

The general forms for the created "Principal Components in the linear combination" of the indicators are (Manly, 1994):

$$Z_1 = a_{11}X_1 + a_{12}X_2 + \dots + a_{1n}X_n$$

$$Z_2 = a_{21}X_1 + a_{22}X_2 + \dots + a_{2n}X_n$$

....

..... Eq. 4

³ PCA is a very "promising technique that is widely used in many fields of science" and has also been used in the construction of some of the composite indices for instance the Internal Market Index for EU countries (Tarantoal, 2002).

⁴ The methodology of "Principal Component Analysis" is discussed in detail by Theil (1971)

$$Z_n = a_{n1}X_1 + a_{n2}X_2 + \dots + a_{nn}X_n$$

Where a_i are the regression coefficients (eigenvectors) that satisfy the formula:

$$\sum_{i=1}^n a_i^2 = 1$$

In the case of multi-stage Principal Component Analysis, the chosen variables are divided into well-defined sub-groups depending on the nature of the indicators. Within a sub - group, “variables are highly correlated”, while the canonical correlation between pairs of sub-groups is low on an average. The “Principal Component Analysis has then been applied to each of these sub-groups of variables. The first ‘Principal Components’ obtained from different sub-groups have been treated as a set of new variables and combined at a second stage to obtain the Final Composite Index. It has been argued that this method overcomes the necessity of taking more than one “Principal Component in the analysis, since the correlation among the variables” in a subgroup are generally high and consequently, the first “Principal Component explains an adequate proportion of the variation” in the data matrix.

$$SDI = \frac{\sum_{i=1}^n w_i X_i}{\sum_{i=1}^n w_i}$$

Finally the “Composite Social Development Index” takes the form of:

Where: w_i : the weights of the X_i

X_i : normalized indicators for country i

In most approaches $\sum w_i = 1$ and ranges from 0 to 1

6. Data Sources

The main sources of data for the index in this research include international organizations such as the “World Bank, United Nations Agencies, World Health Organization (WHO), Asian Development Bank, International Labour Organisation, UNESCO” and various other country sources. World Bank Compiled World Development Indicators 2007, 2008 and 2009 has also been extensively used.

Time series data, wherever found missing in the form of gaps, has been estimated and extrapolated through use of appropriate statistical and econometric techniques.

7. Construction of Social Development Index

Table 6.1 summarizes all the variables used in the formulation of Social Development Index (SDI)⁵. Owing to the unavailability of time series data for pertinent variables in India, sometimes “both input and output variables have been used” in the **COMPOSITE SDI**⁶.

All the above mentioned 23 variables were converted into five sub-indices with the help of above mentioned methodology. Since eigenvalues of the first component were more than unity (1.00), only first ‘Principal Component’ accounted for 85%-95% of total variance.

⁵ Ideally the ‘variables chosen in an index should be either input or output but in the present study we included both input as well as output variables due to the problem of time series data’ availability for many variables. But there is nothing wrong in doing so and this method is adopted in many studies at international level.

⁶ SDI is calculated on the basis both single and multi stage PCA. “Results obtained from all techniques” are almost same.

After formulating five sub-indices namely demographic, health, education, quality of life and women empowerment, they were used as five dimensions (variables) to formulate the ‘Social Development Index’ (SDI) using Z-score. SDI is also formulated by assigning equal weight to earlier mentioned ‘five sub-indices as they are equally important’ for the ‘Social Development’ of India.

Table no 2

SUMMARY OF VARIABLES IN SOCIAL DEVELOPMENT INDEX

Demographic Index (DI)	Education Index (EI)	Quality of Life Index (QLI)	Health Index (HI)	Women Development Index (WDI)
Population Growth	Public Expenditure % of GDP	Electric power consumption (kWh per capita)	Public Health expenditure, total (% of GDP)	Life expectancy at birth, female (years)
Birth Rate	Primary School Enrollment Ratio(Gross)	Energy use (kg of oil equivalent per capita)	Hospital beds (per 1,000 people)	Labor force, female (% of total labor force)
Death Rate	Secondary School Enrollment Ratio(Gross)	Telephone mainlines (per 1,000 people)	Life expectancy at birth, total (years)	Fertility rate, total (births per woman)
Child Dependency Ratio	Adult Literacy Rate	Households with television (%)	Mortality rate, infant (per 1,000 live births)	
Adult Dependency Ratio		GDP per capita growth (annual %)	Physician in Public sector(Per 10000) People	
		Dummy for Political and Civil Liberties		

8. Methodology for Relationships between Social Development and Growth

The “lag-lead relation between Social Development and Economic Growth may be found by application of the Toda-Yamamoto version of Granger causality test”. The concept of “causality in the Granger sense” is based on the basic assumptions:

- (i) It is the past and present which cause the future. But the future cannot cause the past and
- (ii) Detection of causality is only possible between two stochastic variables.

The test is based on the regressions as given in Eq 5 and Eq. 6:

$$Y_t = \beta_0 + \sum_{k=1}^M \beta_k Y_{t-k} + \sum_{k=1}^N \alpha_k X_{t-1} + \mu_t \quad \dots \dots \text{Eq. 5}$$

$$X_t = \gamma_0 + \sum_{k=1}^M \gamma_k X_{t-k} + \sum_{k=1}^N \delta_k Y_{t-1} + v_t \quad \dots \dots \text{Eq. 6}$$

In Eq. 5 and Eq. 6; Y_t and X_t are the variables to be tested, and μ_t and v_t are “mutually uncorrelated

white noise errors, and t denotes the time period and ‘ k ’ and ‘ l ’ are number of lags”. The ‘null hypothesis’ is $\alpha_l = \delta_l = 0$ for all l ’s versus the ‘alternative hypothesis’ that $\alpha_l \neq 0$ and $\delta_l \neq 0$ for at least some l ’s. If the coefficient α_l ’s are “statistically significant but δ_l ’s are not, then X causes Y and vice versa”. But if both α_l and δ_l are “significant then causality runs both” ways.

Although traditional pair-wise “Granger causality tests” are more informative than basic correlation coefficients, but by only requiring temporal precedence and predictive content as requirements for “one variable to Granger cause” another, the Granger test abstracts from philosophical questions surrounding causality. Another limitation of the “test is that it is based on asymptotic theory, so critical values are only meaningful for stable variables” that are not linked in the long run by a cointegrating connection (Granger, 1988). As a result, the “causality test results are rather shaky and are dependent on the absence of cointegration between the relevant variables”.

In cointegrated systems, such ‘tests are more complex’, since the existence of unit roots gives various complications in statistical inference (for detailed exposition see “Toda and Phillips (1993), Toda and Yamamoto (1995), and Dufour and Renault (1998)”).

T-Y procedure was developed by “Toda and Yamamoto (1995) and extended by Rambaldi and Doran (1996) and Zapata and Rambaldi (1997) to test” for the Granger no-causality. The proposed method is simple and gives an “asymptotic chi-square (χ^2) null distribution for the Wald Granger no-Causality test statistic in a VAR model”, irrespective of the system’s integration or cointegration properties {(Giles and Mirza (1999), Toda and Yamamoto (1995), and independently, Dolado and Lütkepohl (1996)}.

The T-Y procedure basically involves the estimation of an “augmented VAR($k+dmax$) model, ‘where k is the optimal lag length in the original VAR system, and $dmax$ is the maximal order of integration of the variables’ in the VAR” system. The “Granger no-causality test utilises a modified Wald ($MWald$) test for zero restrictions on the parameters of the original VAR(k) model”. The remaining $dmax$ “autoregressive parameters” are regarded as zeros and ignored in the VAR(k) model. This test has an asymptotic χ^2 distribution when the “augmented VAR ($k + dmax$)” is estimated. Rambaldi and Doran (1996) have shown that “the $MWald$ tests for

testing Granger no-causality experience efficiency improvement when Seemingly Unrelated Regression (SUR) models are used in the estimation". Also, "the *MWald* test" statistic is also easily computed in the SUR system.

To illustrate the principle, consider the basic example of a bivariate model., with one lag (k=1) given in Eq. 7.

$$X_t = A_0 + A_1 X_{t-1} + e_t \quad \dots \dots \text{Eq. 7}$$

or more fully in Eq. 8,

$$\begin{bmatrix} x_{1t} \\ x_{2t} \end{bmatrix} = \begin{bmatrix} \alpha_{10} \\ \alpha_{20} \end{bmatrix} + \begin{bmatrix} \alpha_{11}^{(1)} & \alpha_{12}^{(1)} \\ \alpha_{21}^{(1)} & \alpha_{22}^{(1)} \end{bmatrix} \begin{bmatrix} x_{1,t-1} \\ x_{2,t-1} \end{bmatrix} + \begin{bmatrix} e_{1t} \\ e_{2t} \end{bmatrix} \quad \dots \dots \text{Eq. 8}$$

$$\text{where } E(e_t) = E \begin{bmatrix} e_{1t} \\ e_{2t} \end{bmatrix} = 0 \quad \text{and } E(e_t e_t') = \Sigma$$

To test "that x_2 does not Granger cause x_1 , the parameter restriction $\alpha_{12}^{(1)} = 0$ has been tested". If it is assumed that x_{1t} and x_{2t} are I (1), a standard t-test is not valid. Following 'Dolado and Lutkepohl (1996), $\alpha_{12}^{(1)} = 0$ was tested by constructing the "usual Wald test based on least squares" estimates in the augmented model given below:

$$\begin{bmatrix} x_{1t} \\ x_{2t} \end{bmatrix} = \begin{bmatrix} \alpha_{10} \\ \alpha_{20} \end{bmatrix} + \begin{bmatrix} \alpha_{11}^{(1)} & \alpha_{12}^{(1)} \\ \alpha_{21}^{(1)} & \alpha_{22}^{(1)} \end{bmatrix} \begin{bmatrix} x_{1,t-1} \\ x_{2,t-1} \end{bmatrix} + \begin{bmatrix} \alpha_{11}^{(2)} & \alpha_{12}^{(2)} \\ \alpha_{21}^{(2)} & \alpha_{22}^{(2)} \end{bmatrix} \begin{bmatrix} x_{1,t-2} \\ x_{2,t-2} \end{bmatrix} + \begin{bmatrix} e_{1t} \\ e_{2t} \end{bmatrix}$$

The "Wald statistic is asymptotically distributed as a Chi Square (χ^2), with degrees of freedom equal to the number of zero restrictions", irrespective of "whether x_{1t} and x_{2t} are I (0), I (1) or I (2), non-cointegrated or cointegrated of an arbitrary" order. According to recent literature Toda and Yamamoto method is simple and able to overcome many drawbacks of alternative econometric methods. Therefore, applied Toda-Yamamoto version of "granger non causality test in seemingly unrelated regression (SURE) framework" has been applied.

9. Empirical Analysis of Causality between Social Development and Growth in India

The "Causal relationship between social development and economic growth" is tested for the sample as a whole (1970-2008), as well as for the period before (1970-1991) and after SAP (1992-2008) using following system of VAR:

$$\begin{bmatrix} Y_t \\ SD_t \end{bmatrix} = A_0 + A_1 \begin{bmatrix} Y_{t-1} \\ SD_{t-1} \end{bmatrix} + A_2 \begin{bmatrix} Y_{t-2} \\ SD_{t-2} \end{bmatrix} + A_3 \begin{bmatrix} Y_{t-3} \\ SD_{t-3} \end{bmatrix} + \begin{bmatrix} \varepsilon_{1t} \\ \varepsilon_{2t} \end{bmatrix}$$

GDP per capita is regarded as the standard measure of economic growth and is commonly used to assess a country's economic performance. It has also been utilized to signify growth in the current study. The "Social Development Index" is used to define social development. In the preceding paradigm, Y represents income (GDP per capita) and SD represents social development (Social Development Index).

Results of long run “Causality test between Growth and Social Development” have been presented in the Table 2. The conclusion is that the “null hypothesis of *Granger non-causality* from social development to economic growth” for the period of 1970-2007 is rejected at 5% level of significance. Even before (1970-1990) and after (10991-2007) the adoption of SAP also the “null hypothesis of *Granger non-causality* from Social Development to Economic Growth” is rejected at 5% level of significance. This means that “**Social Development leads Economic Growth**” in India.

Table no 2

**GROWTH VS SOCIAL DEVELOPMENT
LONG RUN CAUSALITY DUE TO TODA-YAMAMOTO TEST BASED ON SUR ESTIMATION**

NULL HYPOTHESIS	MWALD STATICS	P-Value	Result
GROWTH VS SOCIAL DEVELOPMENT⁷			
Growth does not granger causes Social development	.064553	(.968)	<i>Cannot Reject H₀</i>
Social development does not granger cause Growth	8.4885*	(.014)	<i>Reject H₀</i>
BEFORE SAP			
GROWTH VS SOCIAL DEVELOPMENT⁸			
Growth does not granger causes Social development	.34526	(.557)	<i>Cannot Reject H₀</i>
Social development does not granger cause Growth	5.7755*	(016)	<i>Reject H₀</i>
AFTER SAP			
GROWTH VS SOCIAL DEVELOPMENT⁹			
Growth does not granger causes Social development	.90142	(.342)	<i>Cannot Reject H₀</i>
Social development does not granger cause Growth	3.3461*	(.067)	<i>Reject H₀</i>

Note: * indicates significance at 5% and above level. p-values of MWALD statistics are given in parentheses.

Source: Researcher's Calculation

⁷Two lags are chosen by AIC and SBC for the total model and one lag is chosen for before and after SAP period. With maximum order of integration being one added to them for working out models.

⁸Two lags are chosen by AIC and SBC for the total model and one lag is chosen for before and after SAP period. With maximum order of integration being one added to them for working out models.

⁹Two lags are chosen by AIC and SBC for the total model and one lag is chosen for before and after SAP period. With maximum order of integration being one added to them for working out models.

10. Conclusion and Implications for Policy:

In light of the Structural Adjustment Program (SAP), this research aims to investigate the causal relationship between “**Social Development and Economic Growth**” in India. Apart from entire period of study 1970-2008, study has attempted to observe such relationship “before and after” implementation of SAP. Results of this study are only suggestive and should thus be interpreted cautiously due to the brevity of the annual sample period, in addition to the well-known caveats associated with the Granger concept of causality.

Social Development has been defined in terms of “Social Development Index” (SDI). “Principal Component Analysis” has been used to formulate five sub-indices namely demographic, health, education, quality of life and women empowerment using 23 variables. These indices have then been converted to SDI which perhaps has been attempted for the first time for such a long time period in India.

The results of the “Causality tests in India, suggests that Social Development is the engine of Economic Growth rather than the other way round” and theory of ‘trickle down’ advocated by their policy makers at the “time of independence” failed to achieve its objective. The conclusion remains the same for before and after adoption of SAP.

The results thus suggest direct intervention of policy makers and government in the area’s of social development necessary for the further development of nation. However, it is necessary to point that Economic Growth, *per se, on its own* is necessary but may not be sufficient to guarantee improvements in Social Development and thus the resources made available by economic Growth need to be specifically directed towards human welfare and ultimately to the Social Development of the country. This also suggest that Governments need not be compelled to accept the ‘diktat’ to withdraw subsidies being given to fulfill the basic social needs, as advocated by the proponents of SAP and need to adopt a gradualist approach to SAP policies in the areas of Social Development.

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