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Abstract

The purpose of this paper is two folds: firstly, to analyze the short run and long run relationship between insurgency on the one hand and economic development and governance on the other and secondly, to determine the direction of causality between these three variables in Tripura, one of the conflict-ridden states in India during 1980-2005. With the application of auto-regressive distributed lag model (ARDL), an inverse relationship has been established which formalises the descriptive notions about the cointegration between insurgency on the one hand and economic development and governance on the other in the long run. No short run relationship was established between them. Going one step ahead, an endeavour has been made to capture both the economic development and governance as diagnostics for peace in our model. The study suggests that economic development brings down insurgency faster than that of governance. However, improvement in governance is more certain to scale down insurgency. Furthermore, the application of Granger Causality test suggests that there exists bidirectional causality between insurgency, economic development and governance taking 6 lag and onwards.

Keywords: insurgency, economic development, governance, ARDL Model, Granger causality test

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El Rol del Desarrollo Económico y de la Gobernanza en la Atenuación de la Insurgencia: Un Estudio de Caso de Tripura, India

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Resumen

Este artículo tiene un doble objetivo: en primer lugar, analizar la relación a corto y largo plazo de la insurgencia con el desarrollo económico y la gobernanza y, en segundo lugar, determinar la dirección de la causalidad entre estas tres variables en Tripura, uno de los estados indios asolados por el conflicto durante 1980-2005. A partir de la aplicación de un auto-regressive distributed lag model (ARDL), hemos podido establecer una relación inversa que formaliza las nociones descriptivas sobre la cointegración entre la insurgencia, el desarrollo económico y la gobernanza a largo plazo. No se consiguió relación a corto plazo entre ellas. Yendo un paso más allá, se he puesto empeño en captar el potencial del desarrollo económico y de la gobernanza como diagnósticos para la paz dentro del mismo modelo. El estudio sugiere que el desarrollo económico aplaca la insurgencia más rápido que la gobernanza. Sin embargo, una mejora de la gobernanza es más certera para desescalar la insurgencia. Aún más, el test de causalidad de Granger sugiere que existe una causalidad bidireccional entre insurgencia, desarrollo económico y gobernanza presentando seis lags y subiendo.

Palabras clave:insurgencia, desarrollo económico, gobernanza, modelo ARDL, test de causalidad de Granger

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Insurgency, economic development and governance are intricately related. Insurgency or militancy poses a threat to the internal security and stability of a region (Crain & Crain, 2006; Gaibulloev & Sandle, 2011). Once insurgency sets in, it negatively impacts overall development, long term public investment in development projects like education, health, transport and communication etc. in conflict zones (Collier & Hoeffler, 2004; Justino et al., 2012), destroys the accumulated physical, social and human capital leading to poverty-conflict traps (Kim & Conceicao, 2010; Bloomberg et al., 2006) which intensify the risks of outbreak of conflict and its recurrence and worsen the governments' fiscal balance (Das, 2012), as they have to shift resources from productive to unproductive activities like security enhancement and conduct of war, flight of capital in the face of heightened insecurity (Haynes, 2005; Upadhyay, 2006). In turn the quality of governance deteriorates over time due to poor delivery of basic public utility services like education, health, housing, transport, electrification, drinking water, sanitation and existential as well as livelihood security by the government (Koubi, 2005; Chen et al., 2008; Gates et al., 2012).

Initiatives for economic development can largely address social conflict (Blomberg & Hess, 2002; Gries et al., 2009; Meierrieks & Gries, 2013) by way of providing basic economic opportunities (Caruso & Schneider, 2011; Gunter, 2007); gainful employment (Berman et al., 2011); promoting regional development (Fielding & Shortland, 2010); facilitating the arrival of foreign investment (Bandyopadhya et al., 2010); promoting human development (Collier & Hoeffler, 2004; Kim & Conceicao, 2010); reducing poverty and strengthening social welfare (Burgoon, 2006).

Besides economic development, good governance also plays an important role in curving insurgency (Fitzsimmons, 2013; Keefer & Loayza, 2008). An effective and efficient government can defuse people's grievances by carrying out public sector reforms. Provision of public goods and services including basic infrastructure like roads, bridges, schools, hospitals, markets (Berman et al., 2011; Fitzsimmons, 2013); electricity and irrigation facilities (Jones, 2008); implementation of land ceiling (Paranzino, 1972); strengthening law and order (Jones, 2008) is found to have stabilized the political regime and reduced social conflict. If insurgency is the extreme manifestation of an interethnic competition for power or resources or privileges or cultural

domination, the resolution of such conflicts lies in the accommodative capacity of the state. The politics of accommodation that ensures perceived justice across social groups (Maiangwa et al., 2012; Metelits, 2004) is an act of good governance.

As the literature relating to inter-relationship between conflict and economic development as well as conflict and governance has largely remained narrative in nature (Collier & Hoeffler, 2004; Joshi & Mason, 2007; Vatikiotis, 2006; Heynes, 2005; Malik, 2009), rich in explaining the mechanisms of their interconnectedness, the novelty of our study lies in econometrically identifying the direction of violent conflict in Tripura. There is a lack of research that can analyze the short run and long-run relationship and direction of causation among insurgency, economic development and governance specifically for conflict prone regions of India as well as other conflict prone zones in the world. The present study fills up this gap and aims at establishing this co-integration between insurgency on the one hand and economic development and governance on the other using time series data relating to the state of Tripura which was one of the conflict-ridden states in India during 1980-2014 by way of using an auto-regressive distributed lag (ARDL) model taking a cue from Habibullah et al. (2016) who applied this model in the context of a study on crime and governance. Further the study also emphasized on direction of causation between insurgency, economic development and governance following the study of Ismail and Amjad (2014) and Meierrieks and Gries (2013). This study might be useful for designing appropriate policy response in other contexts across the globe in general and India in particular. The current paper enriches the literature of conflict studies in general and the domain of conflict, economic development and governance in particular. By way of expanding the field of enquiry considering both economic development and governance as drivers of conflict, the present study provides new insights in this domain and adds to our understanding.

Rest of the paper is organized as follows. Section 2 describes the background of the study. Section 3 discusses model specification and methodology. Results and discussion are presented in Section 4. Section 5 concludes.

Background of the Study

Tripura is a tiny princely state of India, merged with the Indian Union in 1949 and subsequently upgraded into a full-fledged state in 1972. It had a border with undivided Bengal Province and the state of Assam in India, ruled by the Manikya dynasty since the middle of the 15th century. The genesis of ethnic militancy in the state of Tripura, which lasted for three decades (1980-2014), is closely linked with the partition of India in 1947, in the wake of independence, and consequent immigration of Hindu Bengalis from the neighbouring areas (Mohanta, 2004; Bhawmik, 2015) of the then East Bengal, presently known as Bangladesh, encouraged by the rulers of Tripura since 15th century, which led to the marginalization of the autochthons (Bhattacharyya, 1990) and consequently triggered inter-ethnic conflict between the sons of the soil, i.e. tribals and Bengalis leading to the emergence of ethnic insurgency after 33 years of independence. About 6 lakhs partition victim Hindu Bengali immigrants entered in Tripura by 1971 from neighbouring areas of the then East Pakistan that had outnumbered the *tribals* who became minority in their own land (Vohra, 2011). Tribal population in the state reduced from 50.91 per cent in 1941 to 28.95 per cent in 1971 and then to 28.45 per cent in 1981 (Government of India, 1991)

This demographic infringement had put a tremendous pressure on land as the immigrants were mostly peasants who used to practice wet rice cultivation in the plains of undivided Bengal. As the tribals were habitual *jhumias*[1] and did not practice sedentary cultivation, initially there was no conflict of interest between the host and immigrant communities. However, with waves of immigration continued over three decades, tiny plains became overcrowded and the immigrants started settling along the foot hills and gradually moving up pushing the tribals to the interior of the hills (Bhawmik, 2008). With their living space squeezed, *jhum cycle*[2] reduced, productivity in *jhum* sharply declined and disrupted socio-economic conditions, tribals found their back against the wall. In spite of royal protective efforts by way of creation of 285 square kilometers in 1931, which was extended up to 1,950 square kilometres of tribal reserve in *1943*[3] (Mohanta, 2004; Paul, 2009), the process of transfer of land from tribal to non-tribal rather magnified following the partition of the country and consequent merger of Tripura into Indian Union. Besides land

alienation, large scale immigration has outnumbered the autochthons and marginalised them in the number based electoral democracy. As the political power is assumed by the immigrants, the state power slipped from the tribal monarchy to peoples' representatives, majority of who were *non-tribals*[4]. The coincidence of economic, political and cultural marginalization of the tribals had created a tremendous frustration in the minds of the tribal youths who sought to redress this situation by way of waging war against the state machinery as well as non-tribal population. In the wake of the initiation of a bill in the Tripura Legislative Assembly on March 25, 1979, in favour of the creation of Tripura Tribal Areas Autonomous District Council (TTAADC) under the *Sixth Schedule*[5] of the Constitution (Bhawmik, 2008) to protect the interest of the tribals, inter-ethnic clashes broke out in different parts of the state which had culminated into the shocking Mandai Massacre on June 8, 1980, and signalled the beginning of insurgency in Tripura (Chakraborty, 2004; Bhattacharjee, 1990; Paul, 2009). A total of 255 Bengalis were brutally killed by the xenophobic tribals in the village of Mandai. This brutal ethnic riot instantly spread across the state and add further toll in other areas like Amrendranagar, Maharani, Ompi, Amarpur at South Tripura district and Bishalgarh at West district of Tripura (Vohra, 2011). During the long 34 years of its existence (1980-2014), this ethnic insurgency cost 3256 lives, injured 1244 people and caused kidnapping of 3516 people that had shattered the state's economy (Department of CID, Government of Tripura; Global Terrorism Database). A painstaking state policy of persuasion, political and economic inclusion and cultural accommodation along with heightened securitization of development and skillful cross-border diplomacy had ultimately resulted in an en mass surrender of the insurgents except a few splinter groups and by early 2000 the intensity of insurgency had ebbed before coming to an end in 2014.

Model Specification and Methodology

The Model

As insurgency is influenced by both economic development and governance, the mathematical relationship among them, treating insurgency as dependent

variable and both economic development and governance as independent variables can be written as:

$$insurgency_t = \theta_0 + \theta_1 ecodevt_t + \theta_2 govern_t + \mu_t \qquad (1)$$

where, parameters θ_0, θ_1 and θ_2 are to be estimated. It is a priori that we expect both θ_1, $\theta_2 < 0$ suggesting a negative association between insurgency on the one hand and economic development and governance on the other. μ_t is the error term that captures the variation in insurgency due to other unknown factors. Estimation of equation 1 is done using time series data of all the variables (1983-84 to 2015-16). The log values of the variables are used in order to interpret the expected change in dependent variable due to the change in independent variables in percentage terms.

Variables and Index Construction

None of the concepts—insurgency, economic development and governance—can be captured using single indicating variables. Usually, researchers use a set of indicating variables in order to measure the conceptual variables. Following Fielding and Shortland (2010), Berman et al. (2011) and Meierrieks et al. (2013) we have used four indicating variables in order to measure insurgency. These are: Injuries (I), Killing (K), Kidnapping (KID) and Encounters (E). Although insurgency is a qualitative phenomenon, indicating variables are used to quantify it. The term "insurgency" is used to denote the actions of criminality which have been undertaken to achieve certain political goals with the tacit support of a sovereign across the border of the state of Tripura.

Following Berman (2011), Besley and Persson (2010) and Kennedy (2010) ten indicating variables relating to actualized and intended economic performance have been used to capture economic development. These are Gross State Domestic Product at constant price (GSDP), Per Capita Income (PCI), State Revenue (SR), Public Expenditure on Education (PEXPED), Public Expenditure on Transport and Communication (PEXPTC), Public Expenditure on Transport and Communication (PEXPTC), Public Expenditure on Mining, Manufacturing and Construction (PEXPMMC),

Public Expenditure on Electricity, Gas and Water supply (PEXPE), Public Expenditure on Health (PEXPH), Public Expenditure on Agriculture (PEXPA) and Public Expenditure on Community Services (PEXPCS).

In order to avoid collinearity between economic development and governance, a conceptual categorization is used in selecting the twelve indicating variables in capturing the latter which manifest the strength of the network of public utilities taking a cue from Kim and Conceicao (2010), Kennedy (2010), Mundle et al. (2012) and Coastalli et al. (2014). The twelve variables are Household Electricity Connections (HEC), Number of Police Stations (PS), Number of Schools (SC), Number of Tourist Spots (TS), Number of Health Centres (HC), Road Length per100 sq. k.m (RL), Students Enrolment at school level (SE), Number of Commercial Bank Branches (CBB), Number of Police Personnel (PP), Infant Mortality Rate (IMR), Crude Birth Rate (CBR) and Crude Death Rate (CDR).

The time series secondary data published by different state (Tripura) government departments and Global Terrorism Database for the period from 1983-84 to 2015-16 have been used for model estimation.

For estimating equation 1, indices of insurgency, economic development and governance have been constructed using Principal Component Analysis (PCA) throughout the 34 years from 1993-94 to 2015-16 to understand and capture the trend or intensity of the variables. However, the two diagnostic tests are adopted–Kaiser-Meyer-Olkin test and Bartlett's Test of Sphericity test for testing sample adequacy and reliability.

Auto Regressive Distributed Lag (ARDL) Model

Auto Regressive Distributed Lag (ARDL) model is used here for regression of equation 1 to examine the long run as well as short run relationship between insurgency on the one hand and economic development and governance on the other.

We consider the following ARDL unrestricted error-correction model (UECM):

$$\Delta insurgency_t = \alpha_0 + \sum_{i=1}^{p} \alpha_{1i} \Delta insurgency_{t-i} + \sum_{i=0}^{q} \alpha_{2i} \Delta ecodevt_{t-i} + \sum_{i=0}^{r} \alpha_{3i} \Delta govern_{t-i} + \beta_1 insurgency_{t-1} + \beta_2 ecodevt_{t-1} + \beta_3 govern_{t-1} + \vartheta_t \quad (2)$$

where, Δ is the difference operator. p, q and r are lag length chosen; α_0 is constant and υ_t is the disturbance term in the equation. The lag length depends upon the value of Akaika info Criterion (AIC). $\alpha_{1i,}$ α_{2i} and α_{3i} are short run coefficients and β1, β_2 and β_3 are long run coefficients of insurgency, economic development and governance respectively.

To find out the relationship between insurgency on the one hand and economic development and governance on the other, a cointegration test is done using an error correction mechanism (ECM). The null hypothesis for non-cointegration among the variables in equation 2 is H_0: $\beta_1 = \beta_2 = \beta_3 = 0$ against an alternative hypothesis H_1: $\beta_1 \neq \beta_2 \neq \beta_3 \neq 0$. Rejection of the null hypothesis suggests that there is long run cointegration between insurgency on the one hand and governance and economic development on the other. We have employed a Bound Test based on Wald-test (F-statistic) as suggested by Narayan (2005) as the sample size is small, i.e., less than 100, for identifying the existence of long-run relationship. If the F-statistics exceeds the upper bound value we can conclude that a long-run relationship exists. If it falls below the lower bound values, we can accept the null hypothesis, and if the F-statistics falls between the two bounds, the result is inconclusive.

To check whether the lag model has serial correlation or not, the serial correlation LM Test is conducted. There is no serial correlation, if *p-value › 5%*.

For finding out the coefficient values of economic development and governance, the coefficient value of error correction term (ECT) in equation 3 is estimated. ECT is the residuals (ϑ_t) in equation 2 that are obtained from cointegration. For this, the following Auto Regressive Distributed Lag-restricted error correction (ARDL-REC) equation is used:

$$\Delta insurgency_t = \alpha_0 + \sum_{i=0}^{p} \alpha_{1i} \Delta insurgency_{t-i} + \sum_{i=1}^{q} \alpha_{2i} \Delta ecodevt_{t-i} + \sum_{i=1}^{r} \alpha_{3i} \Delta govern_{t-i} + \lambda ECT_{t-i} + \eta_t \quad (3)$$

where, λ represents the speed of adjustment parameter.

After inclusion of ECT in the model it is required to check again whether the model has any serial correlation or not. It is also needed to check the stability of the model.

Finally, in order to test short run causality from economic development and governance to insurgency, the null hypothesis for non-causality among the variables is H_0: $\alpha_1 = \alpha_2 = \alpha_3 = 0$ against H_1: $\alpha_1 \neq \alpha_2 \neq \alpha_3 \neq 0$. A short run relationship would exist if the *prob.* (*F*-statistic) <5%.

Granger Causality Test

After establishing the existence of long run co-integration through ARDL model, we employ Granger Causality Test in order to determine the direction of causality between the variables. The Granger Causality Test is applied based on Augmented Level Vector Auto Regressive (VAR) Model developed by Toda and Yamamoto and Wald test is used for restrictions on the parameters of the Vector Autoregressive model following the study of Ismail and Amjad (2014).

The Toda and Yamamoto augmented Granger causality test will be applied to estimate the following three regression equations:

$$I_t = \pi + \sum_{i=1}^{k+d} \alpha_i ED_{t-i} + \sum_{j=1}^{k+d} \beta_j G_{t-j} + \sum_{n=1}^{k+d} \gamma_n I_{t-n} + \mu_{1t} \quad (4)$$

$$ED_t = \pi + \sum_{i=1}^{k+d} \delta_i ED_{t-i} + \sum_{j=1}^{k+d} \rho_j G_{t-j} + \sum_{n=1}^{k+d} \sigma_n I_{t-n} + \mu_{2t} \quad (5)$$

$$G_t = \pi + \sum_{i=1}^{k+d} \in_i ED_{t-i} + \sum_{j=1}^{k+d} \varphi_j G_{t-j} + \sum_{n=1}^{k+d} \tau_n I_{t-n} + \mu_{3t} \quad (6)$$

where, π is the intercept in the VAR (k + d-max) model. k is the lag length of I_t , ED_t and G_t. d is the maximal order of integration of the variables in the system, and the error terms (μ_{1t} , μ_{2t} and μ_{3t}**)** are uncorrelated and assumed to be white noise, ~ (0, σ^2), and no autocorrelation.

Equation (4) postulates that current period of insurgency (*I*) is related to past values of economic development (*ED*) and governance (*G*) as well as its own past values. Equation (5) indicates the same relationship where current period of *ED* is related to its past values as well as the past values of *I* and *G*. Equation (6) represents that current period of *G* is related to past values of *ED* and *I* as well as its own past values.

In the VAR framework, each variable is regressed on the first (*k+d-max*) order lags of its own and the other variable. Granger causality test is based on null hypothesis that the coefficients of the lagged variables are equal to 0

(zero). Wald test is a standard tool for testing zero restrictions on the coefficients of VAR processes. If the variables in the VAR system are stationary, then standard Wald test or modified Wald (MWALD) Test may be applied to make Granger causality inference using standard chi-square($\chi 2$) statistic with *q* degrees of freedom, where *q* is the number of restrictions under the null hypothesis.

In equation (4) H_0: $\sum_{i=1}^{k+d} \alpha_i = 0$, or ED_t and G_t do not granger cause I_t against H_1: $\sum_{i=1}^{k+d} \alpha_i \neq 0$, or ED_t and G_t granger cause I_t.If $P\ (\chi 2\ ) < 5\%$, H_0 will be rejected and unidirectional causality from *ED* and *G* to *I* will hold good.

If $P\ (\chi 2\ ) < 5\%$, H_0 in equation (5) will be rejected, i.e, $\sum_{i=1}^{k+d} \alpha_i = 0$, or ED_t and G_t do not granger cause I_t and H_1 will be accepted ,i.e, unidirectional causality from *I* to*ED* and *G* will hold good, i.e, $\sum_{j=1}^{k+d} \delta_j \neq 0$, or I_t granger causes ED_t and G_t .

For equation (6), H_0: $\sum_{i=1}^{k+d} \in_i = 0$, or ED_t and I_t do not granger cause G_t if $P\ (\chi 2\ ) > 5\%$, against H_1: $\sum_{i=1}^{k+d} \in_i \neq 0$, or ED_t and I_t granger cause G_t when $P\ (\chi 2\ ) < 5\%$. In that case unidirectional causality from *ED* and *I* to *G* will hold good.

For implementation of Granger causality test it is required to determine the lag length (*k*) and the maximum order of integration (*d*-max) of the variables in the VAR system. VAR can then be estimated with a total of *k+d-max* lags.

Unit Root Test

While investigating the cause and effect relationship using Granger causality test, Augmented Dickey and Fuller (ADF) unit root test is used to check stationary level of the variables, based on inclusion of intercept, linear time trend and without trend term. The following ADF test is performed by adding the lagged values of the dependent variable Δy_t:

Intercept only: $\Delta y_t = \beta_1 + z y_{t-1} + \varepsilon_t$ (7)

Trend and Intercept: $\Delta y_t = \beta_1 + \beta_2 t + z y_{t-1} + \varepsilon_t$ (8)

No Trend : $\Delta y_t = z y_{t-1} + \varepsilon_t$ (9)

where, $\boldsymbol{\varepsilon_t}$ refers to the error term and Δy_t is lagged difference term which is empirically determined. $\beta_1$represents intercept term. $\beta_2 t$ is the deterministic time trend. t is the time or trend variable. In each cases, the *null hypothesis* of ADF test states that z = 0; that is, there is a unit root— the time series is non-stationary against the *alternative hypothesis* that z < 0; that is, the time series is stationary. The null hypothesis will be rejected if the probability value of *t-statistic* is less than 5% level of significance.

Results and Discussion

Descriptive Statistics Analysis

Descriptive statistics are very important because if the raw data are simply presented it would be hard to visualize what the data was showing. Descriptive statistics thus allows precise interpretation of the data. Descriptive statistics about insurgency, economic development and governance are presented in table 1 for two consecutive periods, i.e., 1983-84 to 2005-06 and 2006-07 to 2015-16. The total time period of 34 years is divided into two consecutive periods on the basis of critical analysis of the data set. Followings are the highlights of descriptive statistics:

(i) As the t-values of all the indicators of insurgency (K, I, KID, E) were found to be statistically significant, we can safely infer that intensity of insurgency was different in period 1 and 2. Percentage change in the mean values of these two periods, shown in column 8 (table 1), indicates that the intensity of insurgency was substantially higher in period 1 compared to period 2.

(ii) Similarly, all the ten indicators of economic development (GSDP, PCI, SR, PEXPE, PEXPCS, PEXPTC, PEXPAG, PEXPMMC, PEXPED and PEXPH) are found to be statistically significant which points to the fact that the performance of and efforts towards development of Tripura economy were evidently stronger in period 2.

(iii) All the twelve governance indicators are also found to be statistically significant. While the values of indicators that move inversely with quality of governance (IMR, CBR and CDR) have declined, the same for positively related indicators (PS, HC, HEC, SC, SE, RL, PP, CBB, and TS) have increased in period 2.

(iv) An analysis of the data shows that while intensity of insurgency was higher during 1994-2004, the scores of both economic development and governance indices remained relatively lower; however, the trend was reversed during 2005-16. Descriptive statistics, thus, suggest that insurgency has an inverse relationship with both economic development and governance.

Index Result Analysis

Firstly, as the values of KMO test for insurgency, economic development and governance are greater than 0.6 (table 2), it indicates that the samplings are adequate in all the cases.

Secondly, the results of the Bartlett's Test of Sphericity show that the Chi-Squares ($\chi 2$) for the variables—insurgency, economic development and governance—are significant at one percent level meaning that the indicators under each variable are correlated with each other. Hence the data are suitable for constructing separate index for each of them.

Thirdly, indices of insurgency and economic development have been constructed by assigning loadings (table 3) to each indicators using PCA.

Results of ARDL Model

The results of the Auto-Regressive Distributed Lag (ARDL) Model, used to confirm the long-run relationship between insurgency on the one hand as dependent variable and economic development and governance on the other as independent variables, are given in table 4.

Followings are the highlights of the results obtained from the ARDL model:

First, lag length is found to be 5 years based on the values of Akaike info criterion (AIC) and Schwarz Bayesian criterion (SBC).

Second, as the Breusch-Godfrey Serial Correlation LM Test gives *p-value*> 5 per cent, hence the lag (5) ARDL model does not suffer from any serial correlation and as a result we can reject the H_0 and accept H_1, i.e, there is no autocorrelation.

Third, it is also found that the lag 5 model is stable as the cumulative sum (CUSUM) lies between the two bounds (figure 1) at 5 per cent level of significance.

Fourth, here the F statistic value is tested with the critical value provided by Narayan (2005) as the sample size is small, i.e (less than 100). Here the F statistic value (6.60) is significant at 5% level because the F value exceeds the upper bound value (4.63). So the null hypothesis $(H_0: \beta_1 = \beta_2 = \beta_3 = 0)$ gets rejected confirming that there is a long run cointegration between insurgency on the one hand and economic development and governance on the other.

Fifth, although both economic development and governance are inversely related with insurgency and the long run coefficient values of economic development and governance are statistically significant at 5 and 10 per cent level respectively, a comparison of the coefficient values of economic development (-5.87) and governance (-4.57) suggests that per unit of governance brings down insurgency faster than that of economic development. It is also observed that the current level of insurgency is inversely related with its previous level as the coefficient of lagged level of insurgency is found to be (-0.83) with one per cent level of significance.

Sixth, after taking error correction term (ECT) in the model, the coefficient value of error correction term (ECT) suggests that the whole system identified the sizable speed of adjustment by 15.60 percent of disequilibrium correction yearly for reaching long run equilibrium steady state position and the value of ECT is significant at 5% level. But the model was suffering from serial correlation as the probability value of chi-square is found 0.0065 which is less than 5% level according to Breusch-Godfrey Serial Correlation LM Test. Then after dropping the variable ($\Delta Insurgency_{t-1}$) the model is again tested and the coefficient value of error correction term (ECT) has changed to 11.45 percent and is found to be significant at 5% level. Now it is observed that there is no serial correlation as the probability value of chi-square is found 0.0896 which is greater than 5% level as per Breusch-Godfrey Serial Correlation LM Test.

Seventh, the model has also passed the test of stability as the cumulative sum (CUSUM) lies between the two bounds (figure 2) at 5 per cent level of significance after inclusion of ECT.

Eight, as the probability value of *F-statistic* (0.7575) after inclusion of ECT in the model is more than 5 percent level, the null hypothesis $(H_0: \alpha_1 = \alpha_2 = 0)$ gets accepted meaning that there is no short run causality running from economic development to insurgency.

Ninth, short run causality from governance to insurgency does not hold good in the model as the probability value of *F-statistic* (0.8576) after inclusion of ECT in the model is more than 5 percent level. It means that the null hypothesis *(H_0: $\alpha_1 = \alpha_3 = 0$)* is accepted.

Finally, in the long run, R-squared value represents that economic development and governance together can explain 80.29 percent the variation in insurgency in our model. On the other hand, R-square value in the short run suggests that 55.63 percent variation in present period of insurgency is jointly explained by the lag periods of insurgency itself, economic development and governance in our model.

Application of Unit Root Test

As has already been mentioned, the Augmented Dickey-Fuller (ADF) test is conducted in order to examine the order of integration of the data--a prior requirement for running the Granger Causality test. This is done with the null hypothesis that insurgency, economic development and governance are not stationary or have unit root. The alternative hypothesis assumes that these variables are stationary. The results are presented in table 5.

The results show that insurgency, economic development and governance are stationary at the first difference level as the probability value of t-statistic is less than 5% level of significance in each series and the maximal order of integration is identified as one or *I(1)*. Hence, the required condition for checking the order of integration is fulfilled.

The Selection of Lag Length

The selection of lag length is important in time series analysis that drastically affects the cointegration analysis. It explains how many lagged independent variables influence the present period dependent variable. Akaike Information Criterion (AIC), Schwarz Bayesian Criterion (SBC) and Hannan Quinn Information Criterion (HQIC) information criteria are employed to determine and select the optimum lag length before applying Granger causality inference. The aim is to choose the lag length in the model that minimizes

AIC, SBC and HQIC. Table 6 presents the results of the choice criteria. On the basis of the results, both the AIC, SBC and HQIC select six lags.

Granger Causality Test

As mentioned in the methods section, following the establishment of the existence of long run co-integration between insurgency (I) on the one hand and economic development (ED) and governance (G) on the other using ARDL model, we employ Granger Causality Test in order to determine the direction of causality between the variables. The result of Granger Causality test is presented in table 7.

First, our Granger Causality test results suggest that the lagged values of the variables–Governance (G) and Economic Development (ED) from lag 2 to lag 5 do not granger cause Insurgency (I) as the *p*-values of $\chi 2$ are greater than 5% level, indicating insignificant results. However, 6 lags and onwards, it is observed that there is a unidirectional causality from G and ED to I, i.e. G and ED jointly cause I.

Second, the Wald test results also show that the variables – insurgency (I) and governance (G) do not granger cause economic development till lag period 4, as the *p*-values are greater than 5% level. Unidirectional causality from insurgency (I) and governance (G) to economic development is found since 5 lag periods and onwards.

Third, taking three period lag and onwards it is found that insurgency (I) and economic development (ED) jointly cause governance as the probability value of $\chi 2$ statistic is less than 5%.

Finally, bidirectional causality between insurgency on the one hand and economic development and governance on the other is found to hold good at lag 6 and onwards as the p-values of $\chi 2$ statistic are less than 5% in all such cases.

Conclusion and Policy Implications

Our results from ARDL model estimation and Granger Causality Test have established a long-run inverse relationship between insurgency on the one hand and economic development and governance on the other in the context

of Tripura, one of the states in Indian Union, that has experienced a severe spell of inter-ethnic conflict and insurgency in a span of about 35 years since 1980. While both economic development and governance are inversely related with insurgency, an assessment of the reinforcing nature of these two needs to be explored. However, comparing slope coefficient of both economic development and governance our results suggest that governance brings down insurgency faster than that of economic development. This is plausibly due to the fact that good governance, besides ensuring economic development, creates space for federal accommodation of different groups—ethnic, racial, linguistic or religious—which in turn promote conflict resolution.

The causality analysis has established that there is a bidirectional causality between insurgency on the one hand and economic development and governance on the other at lag period 6 and onwards. This implies that current level of insurgency might be seen as a result of sustained economic underdevelopment and low quality of governance. Hence, a conflicting situation cannot be addressed using short term measures. Development initiatives along with good governance over a moderately long period can only reduce insurgency.

This empirical bidirectional causality analysis between insurgency on the one hand and economic development and governance on the other is in line with similar such studies done on other contexts like Ismail and Amjad (2013) in the context of Pakisthan; Meierrieks and Gries (2013) in the context of Egypt, Algeria, Iraq, Afghanistan, Somalia, Angola, and Mozambique and Gries et al. (2009) in the context of Spain, Germany and Portugal.

As the government of Tripura worked for the creation and restoration of public goods and services, basic infrastructure like schools, hospitals, primary health centres, banks, roads, markets, drinking water, electricity, etc., these enabled people to enhance their social and economic capability and improve upon their livelihood. Improvement in rural connectivity, expansion of agro-horticultural extension services, augmentation of rural marketing network, incentivization of plantation crops and social forestry activities helped to improve the standard of living and create new livelihood opportunities for the rural population. Alongside, securitization of development, political accommodation of the tribals by way of creation of Autonomous District Council under the sixth schedule of the Indian

constitution, cultural accommodation in terms of recognition of tribal language (*Kokborak),* and opening of a window for the insurgents to return and resettle—dovetailing of these measures for economic development and good governance have brought insurgency to a halt in Tripura since 2014 and onwards. This Tripura experience might be useful in designing conflict resolution strategy in conflict-ridden areas in other parts of the world.

Notes

[1]Jhum (slash and burn) cultivators are known as jhumias.
[2]Period during which a plot of land is kept as fallow land for natural regeneration between two successive cultivation is called jhum cycle.
[3] Vide Tribal Reserve Orders of 1931 and 1943 (Raatan, 2006).
[4] 20 out of 60 seats were reserved for Schedule Tribes in the House of Legislative Assembly in Tripura under Delimitation of Parliamentary and Assembly Constituencies *order, 1976, of Election Commission of India*.
[5] Sixth Schedule of the Constitution of India provides for autonomy in administering the tribal areas in four states viz. Assam, Meghalaya, Mizoram and Tripura.

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Appendix

Table 1.
Descriptive Statistics

Indicating Variables	1983-84 to 2005-06 (Period 1)		2006-07 to 2015-16 (Period 2)		|t-value|	Mean Difference	Percentage Change in Mean
	Mean	S.D	Mean	S.D			
1	2	3	4	5	6	7	8
Insurgency Indicators							
K	137.09	105.17	10.3	16.34	5.627***	-126.79	-92.49
I	52.83	44.21	2.90	4.07	5.364***	-49.93	-94.51
E	23.96	31.54	9.50	15.23	1.773*	-14.45	-60.35
KID	144.56	157.23	19.10	19.31	3.762***	-125.46	-86.79
Economic Development Indicators							
GSDP	225826.56	250048.35	1764843.40	625294.87	7.526***	1539016.83	681.50
PCI	7156.56	7295.38	47721.20	14937.98	8.174***	40564.63	566.82
SR	10714959.74	8151024.16	58561766.50	16395978.76	8.769***	47846806.76	446.54
PEXPH	4567.69	3180.72	41789.05	36600.74	3.211**	37221.36	814.88
PEXPE	2004.64	1197.75	15478.81	7609.77	5.569***	13474.16	672.15
PEXPCS	33300.40	22726.46	67961.44	16530.95	4.334***	34661.03	104.09
PEXPTC	4104.22	2097.86	46455.27	25822.57	5.179***	42351.05	1031.89
PEXPED	22594.61	17730.53	106438.30	41603.84	6.135***	83843.69	371.08
PEXPAG	3072.66	745.23	30210.72	24999.50	3.432**	27138.06-	883.21
PEXPMMC	1512.51	690.71	6465.59	2506.68	6.148***	4953.08	327.47
Governance Indicators							
IMR	51.70	13.26	29.50	5.56	6.744***	-22.09	-42.75
CBR	21.45	4.90	14.91	1.17	6.020***	-6.54	-30.49
CDR	7.14	1.57	5.20	0.57	5.205***	-1.95	-27.17
PS	43.78	6.06	66.90	3.35	11.272***	23.11	52.81
HC	538.26	145.82	947.00	233.69	5.115***	408.74	75.94
HEC	154610.43	61369.78	472798.80	80448.40	12.451***	318188.36	205.80
SC	2993.13	268.79	4407.30	316.98	13.163***	1414.17	47.25
SE	620628.13	151780.80	802885.60	20593.01	5.641***	182257.47	29.367
RL	75.69	42.05	177.12	17.96	9.709***	101.43	134.01
PP	4432.26	1066.54	5870.60	958.98	3.664***	1438.34	32.45
CBB	175.91	8.17	409.70	189.56	3.899***	233.78	132.90
TS	23.56	4.36	32.90	2.68	6.246***	9334	39.64
OBS	23		10				

Source: Authors' calculation
Note: First bracket shows the standard deviation ans second bracket shows the valure of standard error *, **, *** significant at 10, 5 and 1 per cent level respectively.

Table 2.
KMO and Bartlett's Test

KMO and Bartlett's Test		Insurgency	Economic Development	Governance
Kaiser-Meyer-Olkin Measure of Sampling Adequacy		0.765	0.829	0.873
Bartlett's Test of Sphericity	Chi-Square ($\chi 2$)	108.12	986.429	825.321
	df	6	45	66
	Sig.	0.000	0.000	0.000

Source: Authors' calculation

Table 3.
Principal Component Analysis of insurgency, economic development and governance indices

SL No.	Index	Variables	Loadings
1.	Insurgency Index	Injuries (I)	0.322
		Killing (K)	0.310
		Kidnapping (KID)	0.282
		Encounters (E)	0.086
2.	Economic Development index	State Revenue (SR)	0.116
		Gross State Domestic Product at constant price (GSDP)	0.115
		Per Capita Income (PCI)	0.115
		Public Expenditure on Community Services (PEXPCS)	0.115
		Public Expenditure on Mining, Manufacturing and Construction (PEXPMMC)	0.114
		Public Expenditure on Electricity (PEXPE)	0.114
		Public Expenditure on Agriculture (PEXPA)	0.114
		Public Expenditure on Transport and communication (PEXPTC)	0.113
		Public Expenditure on Health (PEXPH)	0.084
3.	Governance index	Household Electricity Connections (HEC)	0.183
		Number of Police Stations (PS)	0.182
		Number of Schools (SC)	0.106
		Number of Tourist Spots (TS)	0.104
		Number of Health Centres (HC)	0.100
		Road Length per100 sq. k.m (RL)	0.097
		Students Enrolment at school level (SE)	0.090
		Number of Commercial Bank Branches (CBB)	0.084
		Number of Police Personnel (PP)	0.079
		Infant Mortality Rate (IMR)	-0.009
		Crude Birth Rate (CBR)	-0.009
		Crude Death Rate (CDR)	-0.007

Source: Authors' calculation

Table 4.
Regression Results of Insurgency on Economic Development and Governance

Variable	Coefficient	Variable	Coefficient
Constant	*0.001374* *(0.001378)*	$\Delta Ecodevt_{t-5}$	-3.627213 (5.249161)
ECT(-1)	-1.145365 (0.0418)	$\Delta Govn_{-1}$	0.062555 (1.840202)
$\Delta Insurgency_{t-2}$	-0.202583 (0.305536)	$\Delta Govn_{t-2}$	-0.963767 (1.622857)
$\Delta Insrgency_{t-3}$	0.126715 (0.273603)	$\Delta Govn_{t-3}$	-1.418179 (1.400354)
$\Delta Insrgency_{t-4}$	0.178363 (0.274172)	$\Delta Govn_{t-4}$	-0.017565 (1.247788)
$\Delta Insrgency_{t-5}$	-0.248361 (0.333254)	$\Delta Govn_{t-5}$	-1.130167 (1.496985)
$\Delta Ecodevt_{t-1}$	-3.134955 (2.884604)	$Insurgency_{t-1}$	-0.826535*** (0.209199)
$\Delta Ecodevt_{t-2}$	3.595381 (3.633394)	$Ecodevt_{t-1}$	-5.870070** (3.320755)
$\Delta Ecodevt_{t-3}$	0.151956 (2.559602)	$Govn_{t-1}$	-4.568543* (2.079158)
$\Delta Ecodevt_{t-4}$	2.902615 (3.628845)	Akaike info criterion (AIC)	-9.590128
Optimal lag length	5 Years	Schwarz Bayesian Criterion (SBC)	-8.678243
R-square	0.556312	Adj R-square	-0.109221
Test for Serial Correlation: *Pre ECT: Prob(χ2)* *Post ECT:Prob(χ2)*	 0.1001 0.0896	***Long Run Relationship:*** H_0: $\beta_1 = \beta_2 = \beta_3 = 0$ H_1 : $\beta_1 \neq \beta_2 \neq \beta_3 \neq 0$ F-statistic (Wald test) R-square (Long–run) Adj R-square (Long-run)	 6.598747** 80.29 35.93
Short Run Relationship: H_0: $\alpha_1 = \alpha_2 = 0$ H_1 : $\alpha_1 \neq \alpha_2 \neq 0$ Prob. Value of F-statistic (Wald test)	 0.7575	***Short Run Relationship:*** H_0: $\alpha_1 = \alpha_3 = 0$ H_1 : $\alpha_1 \neq \alpha_3 \neq 0$ Prob. Value of F-statistic (Wald test)	 0.8576
R-square (Short-run)	0.556312	Adj R-square (Short-run)	-0.109221

Source: Author's calculation

Note: *, **,*** significant at 10, 5 and 1 per cent level respectively. Standard Errors are in parenthesis

Table 5.
ADF Unit Root Test on Insurgency, Economic Development and Governance

Variables	Level			Ist Difference		
	Constant (Critical Value)	Constant And Trend (Critical Value)	No Trend (Critical Value)	Constant (Critical Value)	Constant And Trend (Critical Value)	No Trend (Critical Value)
Insurgency	-1.296 (0.619)	-1.321 (0.864)	-0.076 (0.650)	-5.092* (0.000)	-5.194* (0.001)	-5.178* (0.000)
Governance	2.204876 (0.9999)	0.121351 (0.9961)	5.736098 (1.0000)	-4.400124* (0.0016)	-4.934787* (0.0022)	-1.197709* (0.0059)
Economic Development	0.0221 (0.954)	-3.843 (0.028)	1.507 (0.965)	-6.005* (0.000)	-5.981* (0.000)	-6.143* (0.000)

Source: Authors' calculation
Note: * denotes the rejection of null hypothesis of non-stationary variables in favour of alternative hypothesis of stationary variable and the first bracket shows the p-values of t-statistics .

Table 6.
Choice Criteria for choosing the order of VAR Model

Lags	AIC	SBC	HQIC
6	-35.593*	-32.857	-34.780*
5	-35.277	-32.994*	-34.579
4	-34.973	-33.134	-34.397
2	-21.686	-21.536	-34.155

Source: Authors' calculation
Note: * stand minimum values of AIC, SBC and HQIC

Table 7.
Granger Causality results for Insurgency, Economic Development and Governance

Direction of Causality	$\chi 2$ statistic	*p*- Value	Lag Period	Rejection of H_0	Outcome
G & ED → I (1985-2015)	1.831	0.767	2	No	G and ED do not causes I.
I & ED→ G (1985-2015)	6.650	0.156		No	I and ED do not causes G.
I & G→ ED (1985-2015)	3.484	0.480		No	I and G do not causes ED.
G & ED→ I (1986-2015)	5.396	0.494	3	No	G and ED do not causes I.
I & ED→ G (1986-2015)	**17.505**	**0.008**		**Yes**	**I and ED causes G.**
I & G→ ED (1986-2015)	5.812	0.445		No	I and G do not causes ED.
G & ED→ I (1987-2015)	7.971	0.436	4	No	G and ED do not causes I.
I & ED→ G (1987-2015)	**42.274**	**0.000**		**Yes**	**I and ED causes G.**
I & G→ ED (1987-2015)	12.669	0.124		No	I and G do not causes ED.
G & ED→ I (1988-2015)	11.706	0.305	5	No	G and ED do not causes I.
I & ED→ G (1988-2015)	**40.388**	**0.000**		**Yes**	**I and ED causes G.**
I & G→ ED (1988-2015)	**35.51**	**0.000**		**Yes**	**I and G causes ED.**
G & ED→ I (1989-2015)	**11.709**	**0.000**	6	**Yes**	**G and ED causes I.**
I & ED→ G (1989-2015)	**238.95**	**0.000**		**Yes**	**I and ED causes G.**
I & G→ ED (1989-2015)	**70.953**	**0.000**		**Yes**	**I and G causes ED.**

Source: Authors' calculation

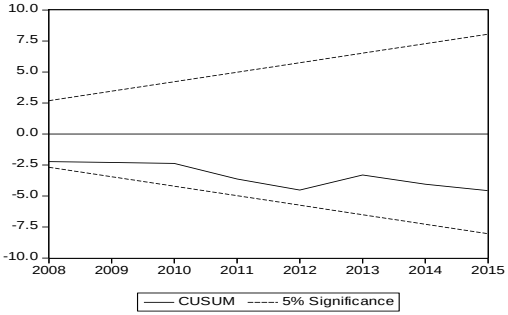

Figure 1. CUSUM Test for Stability Analysis

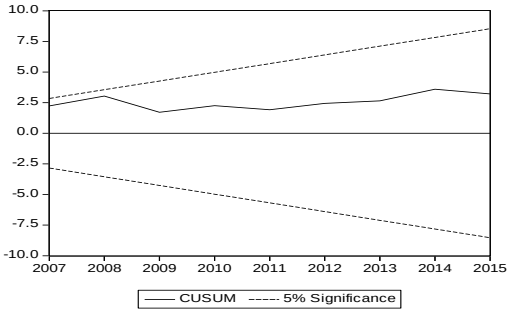

Figure 2. CUSUM Test for Stability Analysis