Studies in Economics and International Finance
ISSN: 2583-1526
Vol. 1, No. 2, 2021, pp. 73-86
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ARF INDIA
Academic Open Access Publishing
www.arfjournals.com

INTERNATIONAL REMITTANCES AND ECONOMIC GROWTH IN A SUBNATIONAL ECONOMY IN INDIA: A Dynamic Analysis

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ARTICLE HISTORY
Received : 19 August 2021
Revised : 12 September 2021
Accepted : 24 October 2021
Published : 30 December 2021

TO CITE THIS ARTICLE
Pushpangadan, K., & Murugan, G. (2021). International Remittances and Economic Growth in a Subnational Economy in India: A Dynamic Analysis. *Studies in Economics & International Finance*, Vol. 1, No. 2, pp. 73-86.

Abstract: Empirical evidence on remittance-led economic growth in a subnational economy - Kerala - is lacking since the spurt in migration in the seventies. Such a relationship between state domestic product (SDP) and international remittances requires an understanding of the data generating process (DGP) of the time series. Augmented Dickey Fuller test and F test for joint restriction confirm that the DGP of SDP is a random walk with positive drift and that of remittances a deterministic linear trend added to a first order auto-regression. Hence, conventional regression analysis is applied instead of co-integration analysis for establishing the relationship. Regression analysis is possible only if both series are stationary. Transformation of the two series in growth rate version makes both series stationary. A dynamic version of the growth equation in multivariate form is specified with time, T, as a proxy for all the omitted variables. Estimated equation shows that SDP growth rate depends on the growth rate of remittances and the proxy variable, T. Both variables are statistically significant and the standardised (beta) coefficients indicate remittances as the most influential factor in determining the economic growth of the regional economy.

Keywords: Feudal agrarian structure, SDP, Remittances, Data generating process, Migration-led growth.

JEL Classification: F22, F24, O40

I. INTRODUCTION

Kerala has the reputation of attaining social development indicators comparable to those of the developed nations especially in life expectancy, infant and maternal

mortality, literacy, demographic growth to its replacement level, and the sex-ratio favorable to females in the population unlike rest of India, despite its low level of per capita income among developing regions (Dreze and Sen 1995, Sen 1996, Ramachandran 1996). Moreover it has the highest human development Index (HDI) among the Indian states. This is possible only if the relative weights of health and education in the HDI compensate more than that of the lower weight of per capita income of Kerala, unlike other states. These unique growth processes have generated a healthy and educated labor force without enough opportunities for its absorption in the economy and is continuing to be so even now. As a result the economy experienced a high degree of structural unemployment arising from a mismatch between supply of and demand for educated man power. In a regional economy, the only option available for such unemployed persons is to hunt for opportunities elsewhere in the country or rest of the world. This is precisely what has happened in Kerala; first the unemployed migrated to rest of India in search of opportunities and later to rest of the world. After the spurt in migration, Kerala's GDP growth rate is higher than that of all India, reflecting its higher economic performance among the major states in India. But there is no attempt as yet to examine the impact of spurt in migration on economic growth analytically and provide empirical support for the migration-led growth in Kerala. The present paper makes an attempt in this direction for the subnational economy of Kerala.

The paper constitutes six sections. After introduction, Section 2 deals with literature review on the analytical part of the study. Section 3 briefly examines the data base for the study, followed by Dickey-Fuller test and F test for joint restriction for the identification of data generating process of the time series on State domestic product and remittances. The penultimate section deals with the specification of growth function and its estimation and interpretation. The final section provides summary and conclusions.

2. LITERATURE REVIEW

The research issue at hand is to conceptualize the leap frog growth of the regional economy, Kerala; to service sector without a modern agriculture and a manufacturing sector playing the role of 'engine of growth' as in Clark-Chenery-Kuznets–Syrquin version of structural transformation (Herrendorf, et al. 2013, 4). Analytically this will not be possible unless we examine the environmental and institutional (political, economic and social) factors during the growth process historically (North 2006, 11). The first factor in this direction is the geography of the region, which shapes the environment and institutions for the analysis. The territory now constituting Kerala belongs to three political entities: (1) 'Travancore, in the south, was a semi-autonomous native state rule by a Maharajah, as was (2) Cochin immediately contiguous to it in the north, (3) the district of Malabar, further north, were part of the Madras province of British India' (UN 2000, 53). All other

factors contributing to the present epoch of migration-based growth is therefore valid in the region as a single political entity only after 1956, the year of linguistic reorganization of state of Kerala by merging the above three political entities, though India became independent in 1947.

For understanding the process of economic change, a highly simplified model under structural transformation is considered, which has three broad phases before reaching developed status. In the first phase of this structural transformation, development process is concentrated on the modernization of the traditional agriculture for generating surplus resources needed for the second phase of growth. In the second phase, the manufacturing sector becomes the 'engine of growth' by the proper utilization of the surplus resources generated in the agricultural sector. The third phase is the growth of service sector induced by the demand from the sectoral growth in phase 1 and phase 2 and the autonomous demand arising from the cultural, institutional and social needs of the society. An essential component in the growth process in the last phase is the investment in the social sectors, mainly in health education and infrastructure, for the supply of healthy and educated labor force needed for the transformation of the economy to self-sustained growth. Full employment of the healthy and educated labor force is reached only if jobs are created from the growth of these three sectors - agriculture, manufacturing and services. If there is a mismatch in the supply of and demand for jobs, then unemployment coexists with labor shortages in the economy. In the case of an open economy, structural unemployment may be reduced by international migration. The foreign exchange earned from the remittances of the migrant labour force becomes the source of accelerated growth.

Let us examine first, the reason for the failure of the modernization of traditional agriculture. This is possible only if we examine the institutional factors during the pre-independent days. The agrarian structure in Kerala, KN Raj observes, '… is also one of the few areas of India where, for a long time, the relationship between landlords and those who functioned under them resembled (except for the differences introduced by the caste system) that prevalent under feudalism in Europe' (Varghese 1970, vii). Further he notes, 'the land reform introduced in Travancore in 1865 … the resemblance with the land reforms introduced in Japan after the Meiji Restoration is fairly close' (Varghese 1972, xi). Ideally, one should examine the history of the feudal system in Europe and land reforms after Meiji restoration in Japan; for understanding and identifying the economic and non-economic factors that had prevented the modernization of agriculture in Kerala. Much research effort in this direction is required to document the reasons probably extending the study by Varghese (1972). Such an effort is beyond the main objective of the present enquiry. Instead, let us examine the prevailing institutions' incentives for such a change. As observed by Raj earlier, the prevailing agrarian structure was feudal in nature and land ownership

determined by hierarchy in the caste system. Above all, the farmers as a class/ group in the social hierarchy was missing unlike in the Japanese case where the technical progress in rice varieties spearheaded by the veteran farmers, group of conscientious and wealthy farmers and landlords, using their traditional farming varieties and methods (Minami 1994, 61). They became the leaders in the community and took responsibility of dissemination voluntarily. Later they were instrumental for the adapted western farming technology suited to Japan's factor endowment in bringing about the success of this new policy in the 1880s (ibid., 62). In short, the share-cropping widely practiced in agriculture, the uncertainty in land-tenure relationship, presence of depressed castes and agrestic slaves in labor force, and the absence of a farming community for diffusing the best practices in farming technology together prevented modernization of the traditional agriculture in Kerala especially in the 1880s (Varghese 1972, 42; Ray 1999, Chapter 12). As a result there was not much agricultural surplus for social intermediation in the second phase of growth. The trading community, mostly concentrated in Bombay with local agents, did not become an entrepreneurial class in the Caste hierarchy. This may be the reason for the absence of 'Vaishyas', the commercial caste in the regional caste structure, although it was given third position in the conventional four-fold caste system existed in rest of India (Varghese1972, 15). Above all the ruling class has never taken any initiatives for creating such a linkage for industrial development. The other interesting observation is that the traders were reduced to the status of social untouchables and labeled them as 'mlechchas'(Varghese 1972,11), leaving very little social incentive for them to become entrepreneurs. During the same period, education and health were demanded through public action especially from Christian missionaries, socially deprived classes and political organizations. These were culminated in the provision of health and education facilities through social intermediation and facilitation from the ruling Rajas with the support of the British government (Kabir and Krishnan 1993, Salim and Gopinathan Nair 2002). Such an initiative on service sector growth received public support even after independence in 1947. The leap-frog growth in services produced a healthy and educated labor force but not enough opportunities for their absorption in the domestic sub-regional economy. Consequently, the economy experienced a high degree of structural unemployment. In an open economy, the only way to reduce unemployment is migration, when the real sectors are not providing enough opportunities. This is precisely what has happened in Kerala; first the unemployed migrated to rest of India and later rest of the world.

At the same time the oil boom in the Middle East opened up several opportunities for large scale migration and employment avenues resulted in international remittances to Kerala reaching as high as 30 % in 78-79, as estimated by Krishnan (1994). This external stimulus on the domestic economy has resulted in the increased consumption expenditure on time saving and labour saving

durables (Pushpangadan 2003, 2012) generally imported from outside the sub regional economy. It has also simultaneously generated and enhanced the demand for services in general and health and education in particular. This has also yielded a multiplier effect on the income generating process culminating in relatively higher growth in the services sector.

So far the relationship between income and remittances had been analysed only through indirect measures because of the unreliable estimates on remittances. The next section attempts to address this issue.

3. THE DATA

3.1. State Domestic Product

Two series of state domestic product (SDP) exist, one by the Central Statistical Organisation and the other by the respective State's **B**ureau of Economics and Statistics. These estimates differ between themselves significantly in the case of several years since there are differences in the approaches and definitions used (Krishnan 1994, Ramachandran 1996). While the former uses a rationale applicable for all states, the states themselves opt for methods that are found to be more realistic for individual states. In the present analysis we use the estimates of the state and the series is given in current prices. The trend in the 100 *Ln SDP for the period, 1973-2014, is given in Fig 1a and its growth rate in Fig.1b. While ln SDP shows an upward positive trend in Fig !a, its growth rate in Fig. 1b fluctuates. This data generating process (DGP) of such a series requires further statistical analysis, which is taken up in the next section.

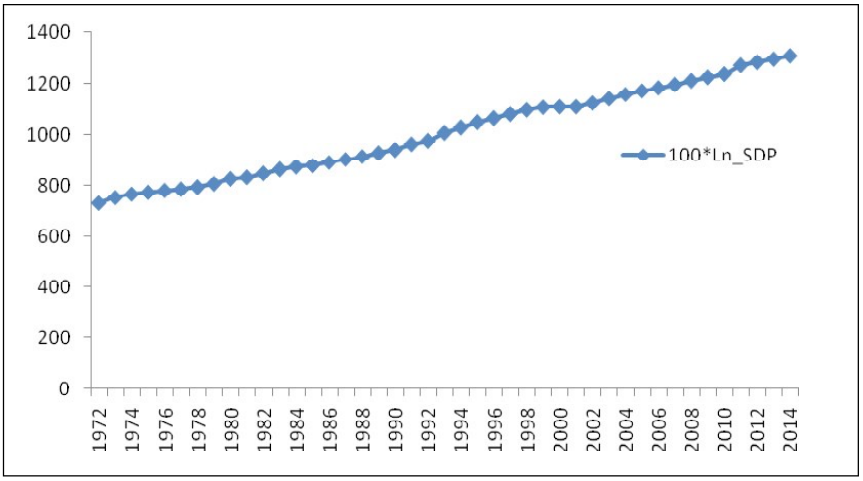

Figure 1a: Trend in State Domestic Product, 1972 to 2014

Source: Department of Economics and Statistics, Kerala

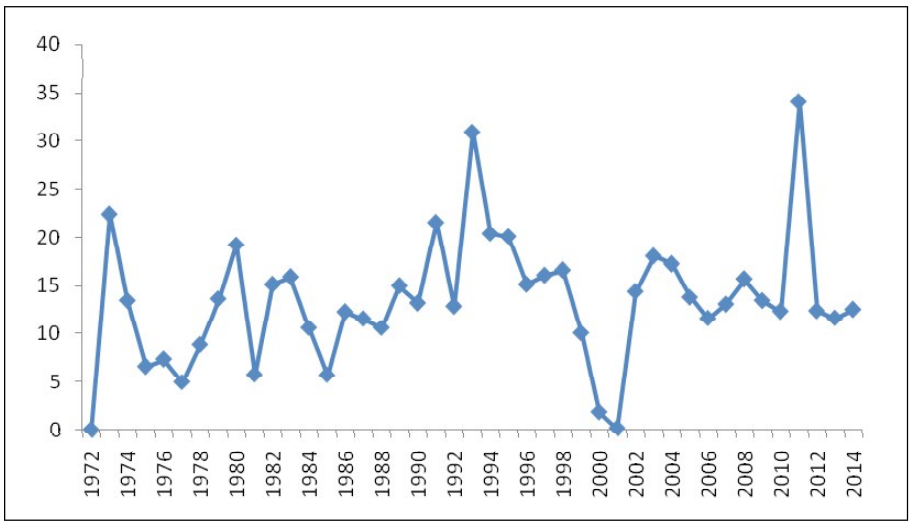

Figure 1b: Growth Rate (%) of State Domestic Product, 1972 to 2014

Source: Same as in Fig. 1a.

3.2. International Remittances (IR)

The data on remittances are easier to obtain at the national level but very difficult at subnational levels. Literature review shows that there were four attempts to estimate it for the subnational economy of Kerala; (1) Gulati and Mody (1983); (2) Krishnan (1994), (3) Issac (1997), and (4) Kannan and Hari (2002). Gulati and Mody developed a simple rule for estimating remittances to Kerala. The rule is that the share of remittances to Kerala in total Indian remittances is same as the share of migrants from Kerala in the Total Indian Migrants. At the time of the estimation, they had the share of migrants from Kerala only for two years, 1976-77 and 1980-81. As a result, their estimates are only for the period 1976/7 – 1980/81. Using the same method, Isaac (1997) had updated the remittances up to 1989-90.

Krishnan's study (1994) was the first analytical attempt to estimate impact of remittances using Keynesian income determination model. More specifically he estimates the consumption function and obtains income generated from the remittance-multiplier. In the absence of reliable time series data on remittances, he uses year-end bank-deposit as a proxy for the analysis. The significant contribution of the study is the methodological innovation in the estimation of income from remittances, so that it generates state national product (SNP). The series on SNP will be more accurate once the bank deposit ratio is replaced by actual remittances. Kannan and Hari (2002) are concerned with the estimation of major components of remittances so that a consistent time series is available for the period, 1971-2000. In the estimation, they have included four components; (1)

Remittances from Middle East, (2) Remittances from countries other than Middle East; (3) Non-resident external deposits in banks located in Kerala, and (4) Money equivalent of remittances in kind to Kerala. The first two components were estimated by applying Gulati-Mody method. The third component, annual change in the net inflow of external deposits, is the more refined version of the proxy used by Krishnan. Finally the fourth component is based on migration surveys by Zachariah et.al (2001, 219-20). The series is updated to 2014 and reported in Murugan and Hari (2018). As a result, the period of analysis is restricted to 1972-2014. The trend and growth rate of IR is shown in Fig 2a and 2b. Fig 2a indicates positive trend in remittances but not in its growth rate. The series looks like a random series in Fig 2b.

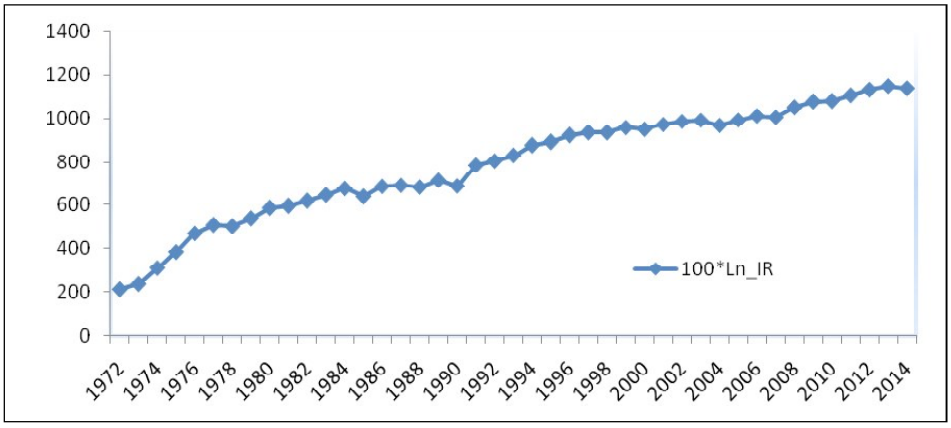

Figure 2a: Trend in Remittances, 1972 to 2014

Source: Kannan and Hari (2002), Murugan and Hari (2018)

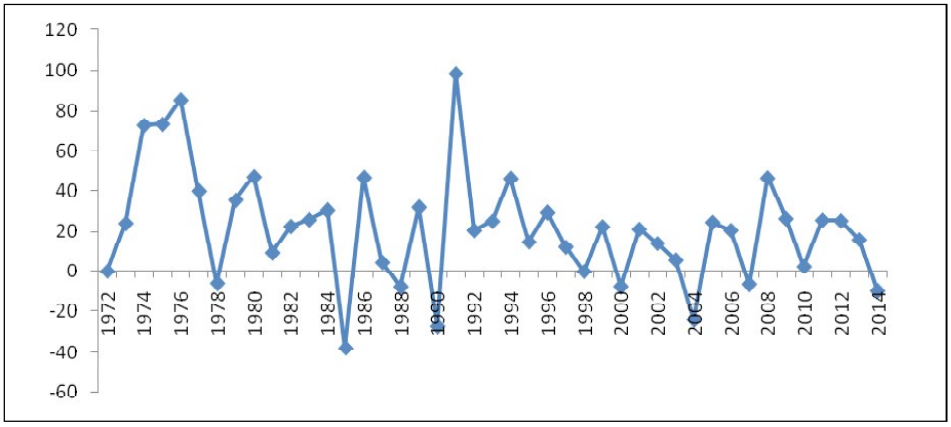

Figure 2b: Growth Rate of Remittances, 1972 to 2014

Source: Same as in Fig.2a

The DGP of this series also warrants a statistical analysis. In the next section, an examination of the Data Generating Process of the two series is undertaken.

4. DATA GENERATING PROCESS OF THE TIME SERIES

The data generating process of SDP and Remittances are essential for selection of the methodology for estimating the growth equation specified in Section v. Among the several tests available, we apply the Augmented Dickey-Fuller test and F test for joint restriction as summarised in Hamilton (2012, Chapter 17).

4.1. State Domestic Product

As evident from Fig 1a, the SDP series has a positive trend. This positive trend could be due to either a random walk with drift or a deterministic time trend added to a stationary first-order auto-regression {AR(1)} (Hamilton 2012, 501). The first step in hypothesis testing is the specification of null (H_o) and alternative (H_a) hypotheses. The null hypothesis, Ho, DGP is a random walk with positive drift and the alternate hypothesis, H_a, is a deterministic time trend added to a stationary first order auto regression. In other words,

H_o: $\ln SDP_t = \alpha + \rho \ln SDP_{t-1} + u_t$ $\quad \alpha > 0$

H_a: $\ln SDP_t = \alpha + \delta t + \rho \ln SDP_{t-1} + u_t$ $\quad |\rho| < 1$

In order to test this hypothesis, OLS regression under H_a is estimated using 42 observations (N = 42) assuming no serial correlation,

$$\underset{\quad (52.3)\quad (1.04)\quad (0.075)}{\ln SDP_t = 102.49 + 1.8872\, t + 0.8704 \ln SDP_{t-1}} \qquad (1)$$

$R^2 = 0.9987$, Adj $R^2 = 0.9987$; D.W. = 1.42; F(2,39) = 15186.30, Prob > F : 0.000

Three tests are administered in equation 1 to arrive at the DGP:

(i) Dickey-Fuller ρ - test; (ii) Dickey-Fuller t test, and (iii) Joint F test

(i) Dickey Fuller ρ - test

The statistics for D-F ρ - test = N (ρ^ - 1). = 42(0.8704 – 1) = - 5.44 (from equation 1)

Critical value of the statistics at 5% level (Hamilton, 2012, case 4, Table B5, 762) is - 19.2.

Since the calculated value is less than the critical value, unit root is accepted. That is to say, the DGP is non-stationary with integration of order one I(1).

(ii) Dickey-Fuller t- test

The test statistic = (ρ^ - 1)/Std. Error of ρ^ = (0.8704-1)/ (0.075) = -0.1296/ 0.075 = -1.73 (from eq.1).

The critical value at 5% level is -3.5 (Hamilton 2012, Table B6, Case 4, 763)

Since the calculated value is less than the critical value, unit root is accepted by this test as well.

(iii) F – test for joint restriction

Finally the F-test for the validity of the joint restriction, $\delta = 0$ and $\rho = 1$.

The statistic: the F-distribution defined as

$$F(m, N-k) = \{(R^2_{UR} - R^2_R)/m\} \div \{(1-R^2_{UR})/N-k\}$$

Where R^2_{UR} is the R^2 value of the un restricted regression and R^2_R is that of the restricted, k, the number of parameters, m, the number of restrictions and N, the total number of observations (Gujarati 1988, 231). The calculated value of the statistic is 2.03 and the critical value of F (2, 39) at 5 % is 3.23. The joint restriction is accepted since the calculated value is less than the critical value. The summary of the three tests are given in Table 1.From Table 1, the integrated order of SDP series is unity or the SDP is random walk with unit root.

Table 1: Data Generating Process of State Domestic Product, Kerala

Variable	*Name of the Test*	*Null Hypothesis*	*Test Statistics*	*Calculated Value of*	*Critical Value of*	*Decision*
SDP	D-F ρ – test	$\rho = 1$	N (ρ^-1)	-5.44	-19.2	Accept unit Root
	D-F t– test	$\rho = 1$	(ρ^-1)/SE of ρ^	-1.73	-3.5	Accept unit root
	F – test for joint restriction	$\delta = 0$ and $\rho = 1$	$F_{(m, N-k)} = [(R^2_{ur} - R^2_R)/m] \div [(1-R^2_{ur})/N-k]$	2.03	3.23	Accept the joint restriction

Now we move on the DGP of remittances.

4.2. Remittances

As evident from Fig. 2a there exists a positive trend in the remittances too. This positive trend could be due to either a random walk with drift or deterministic trend added to a stationary auto regression of order 1 {AR(1)}. The data generating process of remittances is decided by administering the same test procedure as in SDP. The null (H_o) and alternate hypothesis (H_a) for the test:

H_o: $\ln IR_t = \alpha + \rho \ln IR_{t-1} + u_t$ $\quad \alpha > 0$

H_a : $\ln IR_t = \alpha + \delta t + \rho \ln IR_{t-1} + u_t$ $\quad |\alpha| < 1$

In order to decide the DGP, the OLS regression in H_a is estimated using 42 observations (N = 42) and the estimated equation is:

$$\ln IR_t = 113.62 + 3.43t + 0.788 \ln IR_{t-1} \quad (2)$$
$$(25.31) \quad (1.398) \quad (0.069)$$

R^2: 0.99, Adj R^2= 0.99; D.W = 2.26; F(2,39) = 1951.93, Prob > F : 0.000

Three tests are administered on Equation (2) like in SDP:

(i) Dickey Fuller ρ – test; (ii) Dickey Fuller t - test, and (iii) F - test for joint restriction

(i) Dickey Fuller ρ - test

The test statics is N (ρ^ – 1) = 42(0.788 – 1) = – 8.9

Critical value of the statistics -19.2 {(Hamilton 2012, Table B5, Case 4, 762).

Since the calculated value is less than the critical value unit root is accepted.

(ii) Dickey Fuller t - test

The test statistics is (ρ^ – 1)/Std. Error of ρ^ = (-0.212)/ (0.075) = –3

The critical value at 5% level (Hamilton 2012, Table B5, case 4,763) is -3.5.

Since the calculated value is less than the critical value unit root is accepted by this test as well.

(iii) F – test for joint restriction

Finally the F- test of the joint restriction is δ = 0 and ρ = 1. The calculated value of the test statistic is 5.28 and the critical value at 5% is 3.23.

Since calculated value is greater than the 5% critical value of 3.23, the restriction is rejected. The results are summarised in Table 2. From Table 2, it is clear that the DGP of remittances is trend stationary. This means that the series is I (0) after eliminating the deterministic trend.

Table 2: Data Generating Process of Remittances, Kerala

Variable	*Name of the Test*	*Null Hypothesis*	*Test Statistics (TS)*	*Calculated Value of TS*	*Critical Value of TS (5%)*	*Decision*
Remittances	DF ρ – test	ρ = 1	N(ρ^ -1)	-8.9	-19.2	Accept unit Root
	DF t– test	ρ = 1	(ρ^-1)/SE of ρ^	-3.0	-3.5	Accept unit root
	F – Test for joint restriction	δ = 0 and ρ = 1	$F_{(m, N-k)}$ = $[(R^2_{ur} - R^2_R)/m] \div [(1-R^2_{ur})/N-k]$	5.3	3.2	Reject the joint restriction

From the above empirical analysis, the DGP of SDP is random walk with unit root and of IR is trend stationary. As the series are not I (1), co-integration analysis for establishing any long run relationship is inappropriate (Hamilton 2012, 571). However, classical linear regression analysis is possible if both series are made stationary. In order to proceed with the conventional method, both series were transformed to stationary series.

Growth rate of SDP becomes stationary since it a random walk with positive drift. In the case of IR, it becomes stationary once we subtract the trend from the series (Hamilton 2012, 435). Since the SDP is in growth rate, the remittances are also transformed to growth rate, so that the relationship becomes dynamic. The following transformation is makes IR in growth rate version:

Differentiating equation 2 with respect to t,

$$d(\ln IR_t))/dt = 0 + d(3.43t)/dt + d(0.788\ IR_{t-1}) / dt \quad (3)$$

Equation (3) becomes, Growth rate of IR = $GIR_t = 3.43 + 0.788\ GIR_{t-1}$

The residual growth rate of IR= $RGIRt = GIR_t - (3.43 + 0.788\ GIR_{t-1})$ (4)

The trend free residual growth rate of remittances is given in Figure 3.

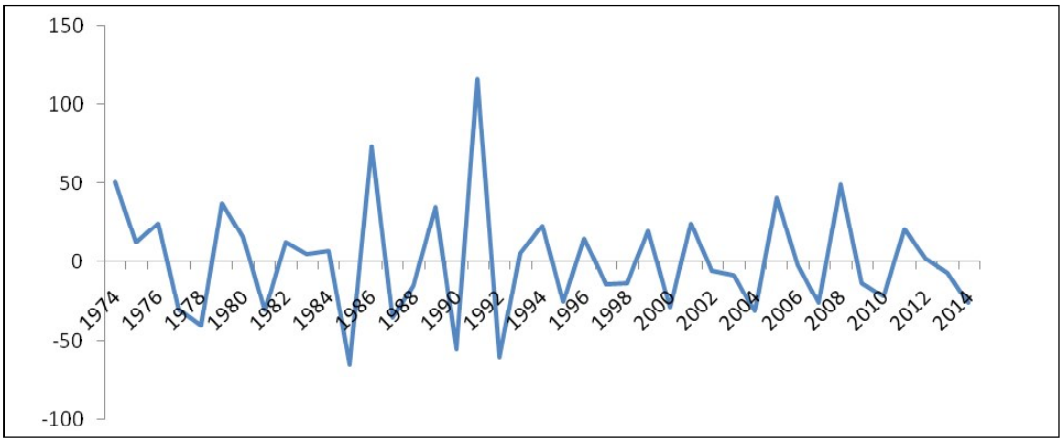

Figure 3: Residual Growth Rate (%) of Remittances

Source: Computed from the data in Fig. 2a

Having generated stationary series, standard regression analysis is applied to estimate the relationship between state domestic product and remittances.

5. SPECIFICATION AND ESTIMATION OF GROWTH EQUATION

Co-integration analysis is one way of testing the relationship between two or more time series variables. According to Hamilton (2012, 571) a vector of time series

variables "....is said to be cointegrated if each of the series taken individually is I(1), that is non stationary with a unit root, while some linear combination of the series .. is stationary, or I(0) ...". But our statistical analysis (Table 1 and Table 2) clearly indicates that they are not of the same order of integration. That is to say, the two series do not meet the necessary condition of integration of order unity for co integration analysis. But the series on growth rates of the variables are stationary. Hence, the series can be used for testing the empirical validity of remittance-led growth of the regional economy using regression analysis. The simplest specification of the model is:

$$GSDP_t = f(RGIR_t, T) \quad (4)$$

Where $GSDP_t$= growth rate of SDP at t^{th} year,

$RGIR_t$, the trend adjusted growth of remittances, and T, time, a composite index of all omitted variable in the specification. The explicit form of our growth equation from (4) in linear form is:

$$GSDPt = \beta 0 + \beta 1\ RGIR_t + \beta 2\ T + \psi \quad (5)$$

Where, ψ, the composite error term with autocorrelation and heteroscedasticity. The robust estimate of this regression is:

$$GSDP_t = 10.58 + 0.053\ RGIRt + 0.140\ T \quad (6)$$
$$(1.47)^{***} \qquad (0.018)^{**} \qquad (0.075)^{*}$$

N=41, F(2, 38) = 4.3 ** R2 = 0.14

Figures in parenthesis are standard errors

*** significant at 1% level; ** significant at 5% level; * significant at 7% Level.

The result in eq.6 shows that the relationship between growth rate of remittances and that of state domestic product is statistically significant at 5% level. The proxy variable for all other factors, T, is significant at 7% level. The relative importance of the two variables is given by the standardised (beta) coefficients in eq. 6. The beta coefficients are 0.30 for remittances and 0.26 for the composite proxy variable T. Since the calculated coefficient of the composite index T, is less than that of remittances, it can be concluded that the most influential factor in the growth of the economy during the period is remittances. This provides, for the first time, a direct link between remittances and economic growth and validates the indirect econometric evidence provided by Pushpangadan (2012).

Future research effort should direct to the decomposition of the proxy variable, T, within the regional growth theory fame work so that policy measures can be initiated for any reduction in the remittances arising from the ongoing return migration.

6. SUMMARY AND CONCLUSIONS

The relationship between economic growth and remittances since 1970 is examined using modern time series econometrics for empirical support. Augmented Dickey- Fuller test and F-test for joint restriction shows that the data generating process of State Domestic Product is random walk with positive drift and that of remittances trend stationary. Co-integration analysis is not applicable for establishing the relationship, since both are not integrated order of unity. Hence one can fall back to the conventional methods of establishing the multivariate relationship, which calls for stationarity of the series. Since SDP is a random walk with positive drift, the transformation of the series to growth rate; becomes stationary. In the case of remittances the trend adjusted growth rate form of the series follows stationarity. A dynamic version of the growth equation is specified along with time variable T, a composite index of all omitted variables. The estimated equation shows that both variables are statistically significant in explaining the economic growth of the state. Further the standardised regression coefficient of remittances is higher than that of the composite proxy for all omitted variables. In other words the single most factor influencing economic growth in the sub national economy is proved to be remittances. Future research effort is to decompose the proxy variable so that appropriate policy directions can be initiated, compensating for any reduction in remittances owing to return migration.

Notes

[*Paper prepared for the seminar on 'Budgets and Economic Development of Kerala' held at Centre for Budget Studies, Cochin University of Science and Technology on 7-8 March, 2019. The revised version has incorporated the comments of the seminar participants wherever possible. We are thankful to Ashwin Kurien and Krishna Kumar for the computational assistance. Of course, the limitations are purely ours.]

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