Dynamic Econometric Relationship between Migration and Urbanization in India

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Abstract

Migration and urbanization are straight representation of the process of economic development, particularly in the contemporary point of globalization. The 21st century is witnessing a continuation of the interrelated processes of rapid urban expansion and massive migration taking place in the developing countries like India. Rural Urban Migration continues to be one of the major components of urban growth, socioeconomic transformation, and a central mechanism for population redistribution, in these countries. The study limelight’s on dynamic quantitative relationship between Migration and Urbanization. The data has been incorporated from Census of India for the period of 1951-2011. The annual data for the variable is interpolated from census decadal data by using Newton’s forward difference method. The study used Augmented Dickey-Fuller (ADF) test, Co-integration; Auto Regressive Distributed Lag bounds testing approach for analyzing the long run relationship whereas Error Correction Mechanism (ECM) was applied for analyzing the short run link and Granger Causality to find dependencies between the two variables. The results suggest that there exist a positive stable relationship between them and Urbanization appear to be a granger-cause for rural urban migration in India, while the opposite holds good for all the lag periods

Keywords: Causality, Migration, Urbanization, Co-integration etc,
1. INTRODUCTION

Migration of population has been a continuous social phenomenon since the sunrise of human history. Moreover, in recent times with significant changes in economic activities, its volume and impact has undergone a substantial transformation.

Migration is the driving force in the rise of urbanization and transforming cities into much more diverse places to live. The world’s top 20 largest cities accommodated one third of migrant population in precise nearly one in five in all migrants’ lives in these cities and other cities have seen a remarkable growth in migration in recent years. In Asia and Africa, rapidly growing small cities are expected to absorb almost all the future urban population growth of the world and this mobility pattern to cities and urban areas is characterized by the temporality and circularity of the internal migration process. 50 per cent of the projected increase in world’s urban population would be from rural to urban migration. (IOM, 2015)

This reveals that there is a strong tendency to migrate from rural to urban areas. Apart from the International Organization of Migration, the United Nations also enlightens the similar picture about the Rural-urban migration. According to United Nations (2014), 54 per cent of the world’s population lives in urban areas, a proportion that is expected to increase to 66 per cent by 2050. Projections show that urbanization combined with the overall growth of the world’s population could add another 2.5 billion people to urban populations by 2050 and 90 per cent of the increase concentrated in Asia and Africa.

The largest urban growth will take place in India, China and Nigeria. These three countries will account for 37 per cent of the projected growth of the world’s urban population between 2014 and 2050. By 2050, India is projected to add 404 million urban dwellers, China 292 million and Nigeria 212 million (UN, 2014).

India as a nation has seen a high migration rate in recent years. Over 5.5 Per cent growth rate is observed from previous decade to this in terms of Rural Urban Migration, the highest for any decade since independence according to the 2001 census. However in 1970s migration was slowing down due to predominance of agriculture, rigidity of the caste system, the role of joint families, the diversity of language and culture, food habits and lack of education (Chaterjee and Bose, 1997; Nair and Narain, 1985; Zachariah, 1964). The number of migrants during 1991-2001 increased by about 22% over the previous decade an increase since 1951 as shown in Fig 1.
Urbanization is taking place at a faster rate and following linear trend in India. It began to accelerate after independence and 17.3% population residing in urban areas according to 1951 census. This count increased to 28.53% according to 2001 census, and crossing 30% as per 2011 census, standing at 31.16%. The total population in the year of 2011 was 83.3 million in rural areas and 37.7 million in urban population which is very close to America’s total population.

Being one of the largest countries, India is an interesting case study as it faces high intensity of Rural Urban migration on Urbanization. This study aims to understand the short and long run effects with stable relationships and dependencies on Migration and Urbanization. The rest of the paper is structured as follows: Section 2 presents the literature review while section 3 briefs about methods and materials used. Section 4 deals with estimation techniques and empirical analysis and section 5 conclude the study with few recommendations.

2. REVIEW OF LITERATURE

As early as Ravenstein(1889), Migration has been understood as a means to better oneself economically. In exploring rural urban migration in developing countries, Lewis (1955) and Fei and Ranis (1961) showed that it is a natural process in which
surplus labor is gradually withdraws from the rural sector to provide needed manpower to urban industrial growth process. This is deemed socially beneficial because human resources are being shifted from locations where marginal product of labour was assumed to be zero to places where this marginal product is not only positive but also rapidly growing as a result of capital accumulation and technological progress. Todaro (1969) further established that expected economic gains are important considerations in migration decisions.

Urbanization thus augments national income through short-run efficiency gains due to shifts of labor from low to high marginal productivity employment and long-run growth effects due to higher accumulation rates in urban sectors. Therefore, output growth, trend acceleration, and rising migration and urbanization are likely outcomes of the labor surplus model.

The most influential model of the rural–urban migration was suggested by Todaro(1969), which was extended made by Corden and Findlay (1975), Harris and Todaro(1970). Migrants consider the various labor market opportunities available to them in the rural and urban sectors and choose one that maximizes their expected gains from migration. The link between rural-urban migration and urbanization however goes far beyond the supply of additional population to urban centers, indeed as a component of urbanization process, and its prerequisite as well, migration and urbanization are both the consequence of modernization of an economy, connected historically with industrialization, and economic growth (Bhattacharya, 1993).

From the above literature point of view, it is clear that most of the empirical studies have mainly attempted to explain the process of migration through various behavioral parameters by formulating and applying different types of migration models. Number of the models is derived from points focusing on economic gains in the urban or problems associated in rural. But very few studies are focused on association and long and short run effects between these two in India. The present study attempts to investigate the impact of Migration on Urbanization in India using the Autoregressive Distributed Lag Bounds testing approach and also find the casual relationship between both the time series data.

3. METHODS AND MATERIALS

The data for this study are collected from Census of India over a period of 1951-2011. The variables understudy viz. Migration and Urbanization is census wise recorded at every ten years where data is collectively insufficient for econometric study. Accordingly, we interpolated in between years from 1951-2011 using Newton’s
Forward Difference method and stochastic term is added to make complete time series dataset to get consistent results.

This study applies a linear dynamic model based on Pesaran et al (2001), with Autoregressive Distributed Lag (ARDL) modeling technique to analyze the long run and short run dynamics of Migration and Urbanization in India. Further focused on the direction of casual relationship between two variables Granger Causality Test developed by Granger (1969).

4. ESTIMATION TECHNIQUES AND EMPIRICAL ANALYSIS

4.1 Unit Root Test

In this study, we test for the stationary status of the selected time series data to determine their order of integration. This is to ensure that the variables should not be stationary at an order of I(2) because the computed F-statistics provided by Pesaran, Shin and Smith (2001) are valid only when the variables are I(0) or I(1). Therefore, we conducted the Augmented Dickey-Fuller (ADF) test and its result is presented in Table 1. The unit root test results reveal that the Migration and Urbanization series are found to be integrated at an order of I(0) and I(1), respectively.

<table>
<thead>
<tr>
<th>Variables</th>
<th>ADF Test Statistic</th>
<th>Critical ADF Value</th>
<th>Order of Integration</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>MR-Ut</td>
<td>-3.4097**</td>
<td>-2.91</td>
<td>I(0)</td>
<td>Stationary</td>
</tr>
<tr>
<td>Ut</td>
<td>-5.2436*</td>
<td>-3.55</td>
<td>I(1)</td>
<td>Stationary</td>
</tr>
</tbody>
</table>

Source: Authors’ Computations Note: *1% and ** 5%, Level of Significance

4.2 ARDL Bounds Testing

To examine the impact of Rural-Urban Migration on Urbanization in India we employed the Autoregressive Distributed Lag (ARDL) bounds testing approach in this paper.

The ARDL modeling approach was originally introduced by Pesaran and Shin (1999) and further extended by Pesaran, Shin and Smith (2001). This approach is based on the estimation of an Unrestricted Error Correction Model (UECM) which enjoys several advantages over the conservative type of cointegration methods. Unlike other
cointegration techniques, the ARDL does not impose a restrictive assumption that all the variables under study must be integrated of the same order. In other words, the ARDL approach can estimates the short- and long-run components of the model simultaneously, removing problems associated with omitted variables and autocorrelation. Besides, it uses the standard Wald or F-statistic in the bounds test has a nonstandard distribution under the null hypothesis of no-cointegration relationship between the examined variables, irrespective of whether the underlying variables are I(0), I(1) or fractionally integrated. While other cointegration techniques are sensitive to the size of the sample, the ARDL test is suitable even if the sample size is small. The ARDL-technique generally provides unbiased estimates of the long-run model and valid t-statistic even when some of the regressors are endogenous (Harris and Sollis, 2003).

In view of the above advantages, ARDL-UECM used in this study can be expressed as follows:

$$
\Delta U_t = a_0 + \sum_{i=1}^{n} b_i \Delta U_{t-i} + \sum_{i=0}^{m} b_2 \Delta M_{RU/-i} + c_1 U_{t-i} + c_2 M_{RU/-i} + \varepsilon_t
$$

Where, $U_t$ is the Degree of Urbanization in the year $t$; $M_{RU}$ is the Percentage of Migration from Rural to Urban in the year $t$; $\Delta$ denotes a first difference operator; $a_0$ are constant and $\varepsilon_t$ are disturbance terms which follows normal distribution with mean zero and finite variance.

In order to test the existence of a long-run relationship among the variables, i.e., $H_0$: $\beta_1 = \beta_2 = 0$ against the alternative $H_1$: $\beta_1 \neq \beta_2 \neq 0$. We employed ARDL bounds testing approach where the equations are estimated by ordinary least squares by conducting an F-test for the joint significance of the coefficients of the lagged level variables.

Two sets of critical value bounds for the F-statistic are generated by Pesaran, et al. (2001). If the computed F-statistic falls below the lower bound critical value, the null hypothesis of no-cointegration cannot be rejected. On the contrary, if the computed F-statistic lies above the upper bound critical value; the null hypothesis is rejected, implying that there is a long-run cointegration relationship amongst the variables in the model. Nevertheless, if the calculated value falls within the bounds, inference is inconclusive.
Table 2. Result of bound F-testing

<table>
<thead>
<tr>
<th>Critical Values</th>
<th>Lower bound I(0)</th>
<th>Upper bound I(1)</th>
<th>F-Calculated</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level of significance</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1%</td>
<td>5.15</td>
<td>6.36</td>
<td>10.0712</td>
</tr>
<tr>
<td>5%</td>
<td>3.79</td>
<td>4.85</td>
<td></td>
</tr>
<tr>
<td>10%</td>
<td>3.17</td>
<td>4.14</td>
<td></td>
</tr>
</tbody>
</table>

The Bounds critical values are obtained from Pesaran, et al. (2001, pp. 300), Table: CI (iii) Case III:
Unrestricted intercept and no trend (k=2).

Table 2 presents the result of ARDL bounds test for the cointegration. The appropriate lag length was selected on the basis of Schwarz Bayesian criterion (SBC) for the conditional ARDL-UECM. The result reveals that the computed F-statistic is obviously greater than the upper bound critical value of 10.972 at the one per cent significant level. Thus, the null hypothesis of no cointegration is rejected, indicating that there is a stable long-run cointegration relationship among Migration and Urbanization in India.

Once the cointegration is established, the conditional ARDL long-run model for $U_t$ can be estimated as in Table 3.

Table 3. Estimated Long-Run Coefficients

<table>
<thead>
<tr>
<th>Variables</th>
<th>Coefficients</th>
<th>Std. Error</th>
<th>t-statistic</th>
<th>Prob. values</th>
</tr>
</thead>
<tbody>
<tr>
<td>$c$</td>
<td>6.7518*</td>
<td>1.1578</td>
<td>5.8311</td>
<td>0.0000</td>
</tr>
<tr>
<td>$M_{RUt}$</td>
<td>0.9923*</td>
<td>0.0680</td>
<td>14.5760</td>
<td>0.0000</td>
</tr>
</tbody>
</table>

Source: Authors’ Computations Note: * 1%, Level of Significance

The result reveals that the estimated coefficient of Rural-Urban Migration is positive and significant at one per cent level. It shows that in the long run, one percent increase in the Rural-Urban Migration leads to approximately 0.99 percent increase in the Urbanization. This empirical evidence confirms that the Rural-Urban Migration has a positive impact on Urbanization in India in the long-run supporting the previous studies.
There is rural-to-urban migration as long as the expected urban real wage is higher than the rural real wage (Harris & Todaro, 1970). This wage gap could be the result of a rural push or an urban pull. If the country experiences an Industrial Revolution, the urban wage increases, which attract workers from the countryside (Lewis, 1954; Alvarez-Cuadrado & Poschke, 2011). In India the rural urban migration for employment shows a gradual increment trend that has been noticed (27.7%, 41.6% and 51.0% respectively in 1981, 1991 and 2001, Census of India). In India more than the rural push there exist a strong urban pull.

The tenth and eleventh five year plans may be the major factors for urban pull, attracting more migrants to cities in India where these plans focused on the economic liberalization and strengthening of urban local bodies through capacity building, increasing the efficiency and productivity of the cities, dismantling the monopoly of public sector over urban infrastructure, using technology as a tool for rapid urbanization.

We obtain the short-run dynamic parameters by estimating an error correction model associated with the long-run estimates. This is specified as follows:

\[
\Delta U_t = c_0 + \sum_{i=1}^n d_1 \Delta U_{t-i} + \sum_{i=0}^m d_2 \Delta M_{RU_{t-i}} + \theta ECM_{t-1} + \epsilon_t \quad \text{……………..(2)}
\]

where, \(d_1\) and \(d_2\) are the short-run dynamic coefficients of the model’s convergence to equilibrium and \(\theta\) is the speed of adjustment parameter and ECM is the error correction term that is derived from the estimated equilibrium relationship of Equation (1).

The results of short-run dynamic coefficients associated with the long run relationships obtained from the ARDL-ECM equation (2) are presented in Table 4. It indicates the speed of adjustment which restores equilibrium in the dynamic model. The optimal lag length for the selected error correction representation is determined by the Schwarz Bayesian Criterion (SBC).
### Table 4. Estimated Short-Run Coefficients using Error Correction Representation

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>Std. Error</th>
<th>t-Statistic</th>
<th>Prob. values</th>
</tr>
</thead>
<tbody>
<tr>
<td>$C$</td>
<td>0.0608*</td>
<td>0.01246</td>
<td>4.879</td>
<td>0.000</td>
</tr>
<tr>
<td>$\Delta M_{Ru,t}$</td>
<td>0.0475**</td>
<td>0.0858</td>
<td>0.5538</td>
<td>0.5828</td>
</tr>
<tr>
<td>ECT(-1)</td>
<td>-0.0206*</td>
<td>0.00591</td>
<td>-3.4935</td>
<td>0.0012</td>
</tr>
</tbody>
</table>

**R-squared** = 0.9681  
**Durbin-Watson statistic** = 2.1891

Source: Authors’ Computations  
Note: * 1% & ** 5%, Level of Significance

**Short-run Diagnostic Tests**

- Serial Correlation LM Test = 4.2142(0.0056)
- Heteroscedasticity Test = 0.7638(0.6992)
- Normality Test = 6.9265(0.0313)
- Ramsey RESET Test = 8.2647(0.0056)

Table 4 results reveal that the estimated error correction coefficient is negative and significant at one per cent level ensuring that the adjustment process from the short-run deviation is quite slow. More precisely, it indicates that only 2 per cent of converges in short run to long run within a year with a change of rural urban migration. In short run, the rural urban migration impacts urbanization positively in India but it shows statistically insignificant.

**4.3 Granger Causality Test**

As shown in Table 2, there is a long-term equilibrium relationship between Rural-Urban Migration and urbanization. However, the causal relationships between these variables are unclear. Therefore, to study the relationship between Rural-Urban Migration and Urbanization, there is need to establish that Urbanization in causally
affect Rural-Urban Migration or vice versa. First the prototype model of Granger (1969) is used because it is not only the simplest and most straight forward, but also the existence of causal ordering in Granger’s sense points to a low causation and implies predictability and exogeneity.

The Granger’s four definitions of causality are considered using the following Bivariate Vector Auto Regressive model.

\[ M_{RU} = b_0 + \sum_{j=1}^{k} \alpha_i M_{RU,i-j} + \sum_{j=1}^{k} \beta_j U_{t-j} + \epsilon_{1t}, \quad \ldots \quad (3) \]

\[ U_t = b_1 + \sum_{i=1}^{k} \delta_i U_{t-i} + \sum_{j=1}^{k} \gamma_j M_{RU,j} + \epsilon_{2t}, \quad \ldots \quad (4) \]

Where, all the variables are previously defined.

\( k \) is suitably chosen positive integer; \( \alpha_i, \beta_j, \delta_i \) and \( \gamma_j \), \( i, j = 0,1,2, \ldots k \) are parameter and b’s are constants and \( \epsilon_1 \) and \( \epsilon_2 \) are disturbance terms with normal mean zero and finite variance.

Granger (1969) offered four definitions of causality which comprise unidirectional causality from \( M_{RU} \) to \( U \); unidirectional causality from \( U_t \) to \( M_{RU} \); Bidirectional causality between \( M_{RU} \) and \( U \); and independence between \( M_{RU} \) and \( U \). In this paper we used standard F test for testing the above two equations. Unidirectional causality from \( U \) to \( M_{RU} \) is indicated if the estimated coefficients on the lagged \( U \) in eqn. (1) are statistically different from zero as a group (i.e., \( \sum \beta_j \neq 0 \) ) and the set of estimated coefficients on the lagged \( M_{RU} \) in eqn. (2) is not statistically different from zero (i.e., \( \sum \delta_j = 0 \) ). Conversely, unidirectional casualty from \( M_{RU} \) to \( U \) exists if the set of lagged \( U \) coefficients in eqn. (2) is not significantly different from zero (i.e., \( \sum \beta_j = 0 \) ) and the set of the lagged \( M_{RU} \) coefficients in eqn. (3) is statistically different from zero (i.e., \( \sum \delta_j \neq 0 \) ). Since the Granger test results are sensitive to the lag length of the variables, an important preliminary step in the test is to select the lag length of the variables. Five different lag lengths are selected considering the length of the time series. The results of the Granger causality tests are displayed in Table 5.
Table 5. Results of Granger causality test

<table>
<thead>
<tr>
<th>Null Hypothesis</th>
<th>Lag Length</th>
<th>F-Statistic</th>
<th>P-Value</th>
<th>Decision</th>
<th>Type of Causality</th>
</tr>
</thead>
<tbody>
<tr>
<td>$M_{R1t} \rightarrow U_t$</td>
<td>2</td>
<td>3.3048</td>
<td>0.0056</td>
<td>Reject</td>
<td>Bi-directional causality</td>
</tr>
<tr>
<td>$U_t \rightarrow M_{R1t}$</td>
<td>2</td>
<td>11.3359</td>
<td>0.0000</td>
<td>Reject</td>
<td>Bi-directional causality</td>
</tr>
<tr>
<td>$M_{R1t} \rightarrow U_t$</td>
<td>3</td>
<td>11.4792</td>
<td>0.0000</td>
<td>Reject</td>
<td>Bi-directional causality</td>
</tr>
<tr>
<td>$U_t \rightarrow M_{R1t}$</td>
<td>3</td>
<td>6.7233</td>
<td>0.0007</td>
<td>Reject</td>
<td>Bi-directional causality</td>
</tr>
<tr>
<td>$M_{R1t} \rightarrow U_t$</td>
<td>4</td>
<td>11.0468</td>
<td>0.0000</td>
<td>Reject</td>
<td>Bi-directional causality</td>
</tr>
<tr>
<td>$U_t \rightarrow M_{R1t}$</td>
<td>4</td>
<td>4.5109</td>
<td>0.0036</td>
<td>Reject</td>
<td>Bi-directional causality</td>
</tr>
<tr>
<td>$M_{R1t} \rightarrow U_t$</td>
<td>5</td>
<td>8.7023</td>
<td>0.0000</td>
<td>Reject</td>
<td>Bi-directional causality</td>
</tr>
<tr>
<td>$U_t \rightarrow M_{R1t}$</td>
<td>5</td>
<td>3.7242</td>
<td>0.0066</td>
<td>Reject</td>
<td>Bi-directional causality</td>
</tr>
<tr>
<td>$M_{R1t} \rightarrow U_t$</td>
<td>6</td>
<td>4.5077</td>
<td>0.0013</td>
<td>Reject</td>
<td>Bi-directional causality</td>
</tr>
<tr>
<td>$U_t \rightarrow M_{R1t}$</td>
<td>6</td>
<td>5.5771</td>
<td>0.0003</td>
<td>Reject</td>
<td>Bi-directional causality</td>
</tr>
</tbody>
</table>

$\rightarrow$ = does not Granger cause, Decision rule: Reject $H_0$ if p-value $< 0.05$.

Table 5 indicates that there is a bi-directional causality relationship between Rural Urban Migration and Urbanization in all the lag phases. This implies that it is a mutual process where Rural Urban Migration Granger causing Urbanization providing support for the above empirical evidence and reverse also holds good due to various schemes implemented by government of India for the development of Urban local bodies and part is also true with current phase of globalization.

**CONCLUSION**

Auto Regressive Distributed Lag (ARDL) bounds testing approach was employed to examine the impact of migration on urbanization in India. By and large, this analysis reveals that the migration has positive impact on urbanization in India both in Short and long run. However the study results suggest that positive impact of migration was extremely lower in the short run compare to long run. The Granger Causality Test reveals that there is bidirectional causality among migration and urbanization which implies that migration Granger cause for Urbanization and vice-versa also holds good. In the initial stages of development the process may be started as unidirectional process but later it turned to mutual process supporting previous empirical studies.

Rural Urban Migration is making a significant contribution for the growth of urbanization and both have long and stable relationship in India. This implies that there will be vast growth in large and medium city’s economic development of the country. In spite of its much constructive aspects, urbanization from migration is not without its harms. Large cities, in particular, are horizontal to suffer from...
environmental contamination stemming from traffic congestion, the concentration of industry, and inadequate waste disposal systems. The direct effect of poor living conditions is poor health.

Proper initiatives should be taken by the government in reducing the worse effects of urbanization and redeveloping of settlements by concentrating on secondary settlements which are tending to develop as cities or towns to accommodate the rush of migration.

REFERENCES


