How Urbanization and Economic Growth affects the Health in East Asian Countries? Evidence from the VECM approach

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Abstract

The study targets to explore the answer to the question whether there exists any association between urban populations, GDP in East Asian countries and how does it affect the health of public. This research study analyses this concept using panel data of six East Asian countries China, Hong Kong Korea, Japan, Macao and Mongolia. The study has used World Bank indicators to fetch the data for the variables urban population and GDP for the time period 1990-2018. First of all, stationarity of the variables is checked by applying LLC, IP, ADF and PP unit root tests. Further, with the help of JFPC and VECM, the co-integration between these variables is checked. Hence, the results indicate that urban population and GDP in East Asian countries are related to each other in long run. The study could not found any short run co integration between variables. But increasing urbanization in these countries is also developing sustainable challenges in these countries. Thus, urbanization in East Asian countries is acting like a double edged sword. The relationship between urbanization and health varies for different levels of development. Thus the countries with high rate of urbanization need to develop such programs which can spur economic growth as well as environment sustainability in those countries.

Keywords: *Urban Population, GDP, Health, Johanson Fisher Panel Co-Integration, Vector error correction model, Panel Data*

Introduction

Urbanization is defined as the process of rural to urban migration and the concentration of people in urban areas. This process is playing a striking role in the expansion of the countries. Moreover, urbanization and economic development are considered as interdependent variables. Gallup et al (1999) in their study have mentioned that urbanization and economic development are inter-related. Both variables have cause and effect relationship with each other [(7)]. If we have a look at the global scenario of urbanization, in early nineteen's, only 10% population of the world was considered as urban. This percentage has now reached up to 55%. As per projections of UNDP, by the end of 2050, this ratio will be 68% of the total population of the world [(16)]. Asia and Africa are the two continents which are observing rapid urbanization. As per UNDP projections, it is expected that 90% of the total urbanization of the world will take place in these two regions.

In the Asian region, East Asia is the continent with the highest urban population as compared to the other regions of Asia. In 2000, this region was having a total population of 635 million and as per UNDP projections; this number will be 1075 million by 2020. In East Asian region, 80% of the total urban population is covered by China. The association between urban population and GDP varies from country to country. Fay and Opal (2000) in their study have shown a continuously increasing process of urbanization in Kenya without growth [(6)]. Collier (2006) in his study has shown that various low and middle-income countries have observed urbanization without economic growth [(4)]. On the basis of the views of different authors, it can be concluded that there exists doubt regarding the causal association between these variables.

Urbanization is a global phenomenon, but the level of urbanization is different in different continents. Alam et al (2007) mentioned that in the initial stages, urbanization positively influences economic growth. But later on, an inverse association between these two

factors can be seen. In the third stage, rapid urbanization can negatively impact the economy [1]. Turok (2013) argued that infrastructure and institutional settings also have their significant contribution in affecting the GDP of the economy. Thus, it is not always essential that urbanization alone is affecting economic growth [15]. Singh et al (2015) in their study has shown distinctive connection between urban population and growth of the economies in Pacific island economies. According to the results of their study, urban population pushes growth of the economies but there are various negative externalities which can actually undermine the effects of growth [13]. Liddle (2015) in his study has described about ladder effect of urbanization on growth of the economies. According to him, urbanization negatively affects growth of the economies in under developed countries; it has neutral effect on developing countries and positive impact on developed countries [11]. Sun et al (2019) in their study have described the specific association between urbanization and growth of the economies in developed countries. With the use of spatial econometric testing in their research study, they concluded that economic development of the developed countries is accelerating urban population [14]. The association between these two variables has become an extensive inquiry for economists as well as geographers these days. Various researchers have accepted this general consensus of influence of urban population on growth of the economies. But it is required to study urban population with ambivalence to discover the complex association between urban population and growth of the economies. Unplanned urban population in developing countries leads to socio economic challenges which negatively impact the growth of the economies through its negative externalities. Thus the study targets to explore this association between urbanization and GDP of the economies in Asian countries.

Methodology

The study is based on the analyses relationship between urban population and GDP of East Asian countries. Data for Urban population and GDP is fetched from World Bank indicators for the time period of 1991-2018. The variable urban population (% of the total population) is used as a proxy of urbanization and the dependent variable for this study is GDP of the selected countries. The research study has considered all the East Asian countries China, Hong Kong, Japan, Korea, Macao and Mongolia for this research analysis.

Following tables 1 and 2 are related to descriptive statistics of dependent and independent variables. We have used E-Views 10 for the analyses of the data.

Table 1: Descriptive statistics (Urban Population)

	China	Hong Kong	Japan	Korea	Macao	Mongolia
Mean	41.79	99.97	84.46	59.89	99.96	62.09
Median	41.14	100.00	84.64	59.72	100.00	61.44
Max.	59.15	100.00	91.61	61.89	100.00	68.84
Min.	26.44	99.51	77.33	58.38	99.76	56.62
Std dev	10.29	0.092	5.929	0.9729	0.0674	4.989
Skewness	0.1393	-4.4007	0.0164	0.4704	-1.8746	0.1381
Kurtosis	1.7149	21.571	1.2367	2.2530	5.1557	1.2690

Source: Calculated Using E-Views

Table 2: Descriptive statistics (GDP)

	China	Hong Kong	Japan	Korea	Macao	Mongolia
Mean	8.83	2.56	3.90	1.13	3.51	1.74
Median	5.77	2.24	3.88	1.10	2.48	1.23
Max.	2.54	4.80	5.48	2.09	8.14	4.35
Min.	1.12	9.99	2.42	3.55	9.01	6.31
Std dev	7.44	1.17	9.30	5.24	2.57	1.19
Skewness	0.812	0.402	0.080	0.171	0.638	0.888
Kurtosis	2.365	1.820	1.743	1.815	1.817	2.376

Source: Calculated Using E-Views

Econometric Modeling

In this study, econometric modeling is used to inspect the causal association between urbanization and GDP in East Asian countries. We have assumed a simple panel data models for urban population and GDP with standard auto regressive component as

$$urb_{it} = \phi_i urb_{i,t-1} + \alpha_i d_{i,t} + \varepsilon_{i,t} \quad (1)$$

$$gdp_{it} = \phi_i gdp_{i,t-1} + \alpha_i d_{i,t} + \varepsilon_{i,t} \quad (2)$$

Where i and t represents cross section dimensions and time dimensions respectively, $d_{i,t}$ presents panel specific terms, $\varepsilon_{i,t}$ represents error term.

There are several tests which can be used for the purpose of testing co-integration among the variables, but it is crucial to decide about the use of these tests in case of panel data. JFPC test is considered as the best test for panel data. Pedroni (1999) and Kao (2004) have also proved about the specific results given by their tests in case of panel data but their tests only focus on one way co- integration. JFPC test shows whole panel based co-integration. The study has used the following model for this co-integration analysis.

$$\Delta Y_{it} = \Pi_i y_{it-1} + \sum_{j=1} \Pi_{ij} \Delta y_{it-j} + \varphi_i z_{it} + \varepsilon_{it} \quad (3)$$

Y_{it} in the above model is p x 1 vector of endogenous variable, p represents the number of variables, Π stands for long run p x p matrix and rank of Π remains always between 1 and p. The results of JFPC test are always presented through fisher statistics from the trace test and from max Eigen test. The study has used panel based VECM to check causality between the variables.

$$\Delta Y_t = C_0 + \sum \beta_i \Delta Y_{t-i} + \sum \alpha_i \Delta x_{t-I} + p_i ECT_{t-I} + u_t \quad (4)$$

$$\Delta Y_t = C_0 + \sum y_i \Delta x_{t-i} + \sum \varphi_i \Delta y_{t-I} + n_i ECT_{t-I} + \varepsilon_t \quad (5)$$

Δ in the above equations is a change operator and p_i, β_i and α_i are used as parameters. Error term which is derived from long run co integrating variable is termed as $ECT_{t-i.}$ In this model, disequilibrium level of the previous periods is used to present the change in dependent variable.

Results

For checking the stationarity of the data through panel unit root tests (PURT), we have used LLC, IPS, ADF and PP tests. Table 3 shows the results for variable GDP and Table 4 shows the consequences of the variable urban population.

PURT

Table 3: PURT for variable GDP

Methods	I(0)	I(1)	I(2)
Levin, Lin and Chu t	1.0000	0.4042	0.0000
Im, Pesaran and Shin W-stat	1.0000	0.0181	0.0000
ADF – Fisher Chi Square	0.9999	0.0000	0.0000
PP- Fisher Chi Square	1.0000	0.0000	0.0000

Source: Calculated Using E-Views

Table 3 shows that our independent variable GDP is non stationary at their level for ADF test and it is stationary for other three tests LLC, IPS and PP. Thus, The study has checked it for first order difference. In this case, it was non stationary for PPURT. But at second order difference, it was stationary for all the tests.

Table 4: PURT for variable Urban Population

Methods	I(0)	I(1)	I(2)
Levin, Lin and Chu t*	0.6067	0.0000	0.0000
Im, Pesaran and Shin W-stat	0.6323	0.0000	0.0000
ADF – Fisher Chi Square	0.0033	0.0000	0.0000
PP- Fisher Chi Square	0.0189	0.4728	0.0000

Source: Calculated Using E-Views

Table 4 shows non-stationarity of our dependent variable urban population at level for all PURT i.e. LLC, IPS, ADF-Fisher Chi square and PP- Fisher Chi square. Thus, the study checked it for first order difference. In this case, it was non stationary for Phillips-Perron unit root test. But at second order difference, it was stationary for all the tests.

Results of Johanson Fisher Panel Co integration (JFPC)

Table 5: Johanson Fisher Panel Co integration

Hypothesized	**Fisher Statistics**		**Fisher Statistics**	
No. of CE(s)	(From trace test)	Probability	(From Max-Eigen test)	Probability
None	299.0	0.0000	56.76	0.0000
At most 1	28.63	0.0045	28.63	0.0045

Source: Calculated Using E-Views

Table 5 shows the results of JFPC. According to the results, it can be said that there exists at least one co integration in the variables used in this study. There are only two variables GDP and urban population. JFPC test indicates there exist co-integration between these variables.

Results of Vector Error Correction model

Table 6: Vector Error Correction model

	Coefficient	**Standard Error**	**t- statistic**	**Probability**	**Dependent variable**
Co integration Eq 1	-0.001111	(0.00057)	[-1.95135]	0.0000	Urb
Co integration Eq 2	-6.15E+08	(3.3E+08)	[-1.85749]	0.0642	Gdp

R-Squared	0.938876	Mean dependent var	0.383737
Adjusted R-squared	0.936839	S.D. dependent var	0.521785
S.E of regression	0.131134	Sum squared resid	2.579431
Durbin-Watson stat	2.010848		

Source: Calculated Using E-Views

VECM model is used for further analyses because of same order integration of variables in JFPC test. Table 6 shows the results of VECM. The first co-integration equation shows that value of C1 is negative and the value of probability is significant which is a symbol of long run association of the variables. Value of coefficients shows speed of adjustment of variables. Negative value of coefficient and the significant p value show causal association between urban population and GDP of the countries in the long run. From second variable, the value of coefficient is negative, but p value is not significant. Thus we can say that urban population and GDP have long run relationship.

Results of Wald test

Table 7: Wald Test

Test Statistics	Value	DF	Probability
Chi Square	0.281669	2	0.8686

Source: Calculated Using E-Views

Wald test is used to explore causal association between these variables in the short run. According to this model, no such association exists between these variables because of insignificant probability values.

Discussions

The results of PURT describe that at level and first difference, the variables urbanization and economic growth were not stationary. But these variables showed stationarity, when they were tested at second difference. Results of JPFC proved that there exists only one co integration equation for these variables. Further the results of VECM proved that urban population and GDP have long run relationship in East Asian countries and as per the results of Wald test there is no short run association between these variables. In short, urban population and GDP of East Asian countries are co-integrated in the long run. The study could not explore any short run association among urban population and GDP in same countries. The consequences of the study also show that there is no immediate influence of urban population on GDP in short run. But urban population of these countries significantly influences GDP in the long run. On the other hand, economic growth also influences urbanization in the long run. In East Asia, the countries with high rate of urbanization need to develop such programs which can spur economic growth in those countries. The governments of these economies need to focus on planned urbanization. Various researchers also focused on the influenced of economic development of the countries on urbanization (14). The VECM analyses of this study also shows that economic growth of the countries can accelerate urbanization only in long term. Moreover, in such countries, sustainable development programs are concentrated in cities. Thus, the governments need to develop such policies which can promote equitable benefits sustainable development programs in all the areas.

Conclusions

The research study concludes that in long run urbanization influences growth of economies positively in East Asian countries. In the short run, there exists no such association between these countries. As urbanization in East Asian countries is growing at higher rates, thus the government of the countries needs to design urbanization in such a way that it can spur economic growth of the economies. With the continuous urbanization of the world, concentration of negative effects on health due to increasing sustainable challenges in the countries is also increasing. This challenge becomes crucial in the regions such as East Asia where speed of urbanization is too high. Thus the government of the countries needs to adopt policies for ensuring equitable benefits of urbanization in the countries. To deal with the sustainable challenges in the countries, the governments must explore the forward and backward effects of urbanization. Analyses of forward condition of urbanization can be done on the basis of public services, non-farm activities in the countries and infrastructural facilities. Comprehensive analyses of these forward effects through social, economic and environmental aspects of urbanization can help in better analyses of its effect on the GDP of the countries. Policymakers in the countries should not only focus on acceleration of urbanization, but they should focus on the form of urbanization which can increase employment level, maintain environmental sustainability and can promote overall economic development of the countries.

Conflict of Interest: Nil

Source of Funding: Self-funding

Ethical Clearance: This paper is the original work and has not been published anywhere.

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