Impact of Urban Agglomeration on Economic Growth of Cities

[1]Zahid Ullah Khan, [2]Masood Sarwar Awan

[1]Lecturer, Department of Economics, University of Sargodha, Pakistan, ask2khattak@hotmail.com
[2]Chairman, Department of Economics, University of Sargodha, Pakistan, awan811@hotmail.com

ARTICLE DETAILS	ABSTRACT
History *Revised format: Nov 2017* *Available Online: Dec 2017* **Keywords** *Economic Growth,* *Urban* **JEL Classification:** *P25, O4*	**Purpose:** Current study attempts to identify the impact of urban agglomerations on economic growth of cities in Punjab, Pakistan. Additionally the study attempted to identify the non-linearity of urban system in Punjab. The study utilized the district level data collected from secondary sources. For the purpose of estimations the study utilized recursive econometric technique. The results of the study showed that market size, district land area and Govt. policy for agglomeration has a positive and significant impact on urban agglomeration. While district vehicle density and district urbanization level negatively and significantly affect urban agglomeration. Results for urban economic growth regression showed that urban agglomeration positively and significantly affect urban economic growth. The study also supported the ∽ shaped non-linearity of the core-periphery (CP) model in Punjab's urban system.

1. Introduction

In the words of Theodore Parker *"Cities have always been the fireplaces of civilization, whence light and heat radiated into the dark"* (O'Sullivan & Irwin, 2007 p.1).

Some cities are more developed than others despite of their same initial levels. Some cities become successful while others fail to develop. Henderson et al. (2007) argued that most of the success of cities development is devoted to the factors that are either out of the immediate control of the cities (such as location, being a port in a period of national trade growth, growth in market potential, national level decentralization and improved governance) or policies and politics of individual cities. A significant but less well known is the urban transition in which countries shift from chiefly rural and agriculture to urban. In developing countries such transition is achieved in much shorter time as compared with the case of industrialized countries, despite having much greater population volumes than industrialized nations. It took few decades for many Latin American countries to achieve this transition, even though they were experiencing their fastest population growth ever (Martine, 2008).

In past mostly highly developed countries were the host of large cities however this trend is now changing and most of the large cities of the world are found in developing countries (Tripathi, 2013). There were two (one) urban agglomerations having population of one to five million in Japan (Pakistan) in 1950. The

number of urban agglomerations having million plus population increased to six (six) in Japan (Pakistan) in 2010 (World Urbanization Prospects, 2011 Revision). According to United Nations (UN) projections the number of cities that have million plus population will remain at six in Japan while it will increase to 10 in Pakistan by 2025. Similarly in 1950 12 (16) percent of the urban population of Japan (Pakistan) was residing in the size class of urban settlements of one to five million population while percentage of urban population residing in the size class of urban settlements of one to five million population increased to 13 (19) percent of the urban population of Japan (Pakistan) in 2010.

Cities and towns are the engines of economic development and they maintain development and growth in their closest surrounding areas. They are an important part of the national spatial economic system. According to Coetzee (2008) "Cities and towns thus do matter because it is where economic activity occurs, i.e., production and consumption and the allocation of resources predominantly takes place in towns and cities". It can also be argued that most innovations and technological progress are made in cities. Towns and cities are thus very important in the modern economy and therefore the factors that determine the economic growth of a city are equivalently important (Coetzee, 2008). Just to work in a city would be no reason behind individuals to pay high rents without the opportunities, to learn from others and enhance one's own productivity, that are made by urban areas (Glaeser et al., 1992). Glaeser et al. (1992) suggested that the survival of cities, despite the high rents, might be best explained by the easy flow of ideas in cities. Krugman (1991) and Fujita et al. (1999) studied the urban agglomeration, economic growth and the relationship between these two so that the relevant factors that are thought to be the reason for concentrated economic activities in cities could be found. Tripathi (2013) used New Economic Geography (NEG) framework in his study which showed that resources were shifted from rural agriculture areas or surrounding regions to core region or urban areas because of the difference in productivity.
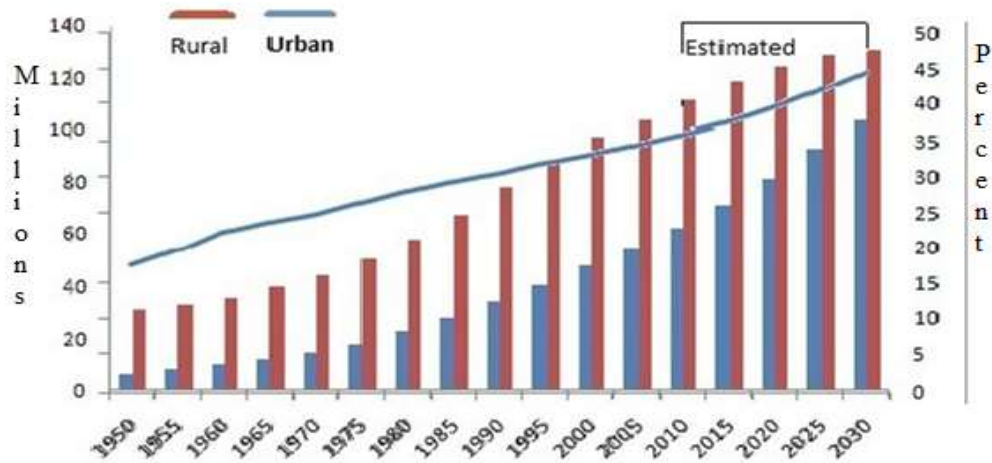
Determinants of city growth can be divided into two types of factors (Krugman, 1991). Krugman (1991) noted that factors which are mainly related with the geography (climate, costal location or access to natural resources), are termed as first nature and they use to influence city growth in the early stages. And on the other hand the factors which are associated to agglomeration economies and the increasing returns of scale are termed as second nature ones.

Major urban agglomerations in Pakistan include Faisalabad, Gujranwala, Hyderabad, Islamabad, Karachi, Lahore, Multan, Peshawar, Quetta and Rawalpindi. In Pakistan agglomerations having ten million or more population is only one, agglomerations having population between five to ten million are two, agglomerations having population between one to five million are eight, there are approximately 75 cities with population between 100,000 and a million and agglomerations having population fewer than 50,000 are numerous (World Urbanization Prospects, 2011 Revision).

From the discussion above it is evident that urbanization and urban agglomerations are very much important and play very significant role in the development and growth of economies all around the world. So there is a need to look this scenario in Pakistan.

Following graph shows the distribution of urban and rural population as well as urban population as percentage of total population in Pakistan.
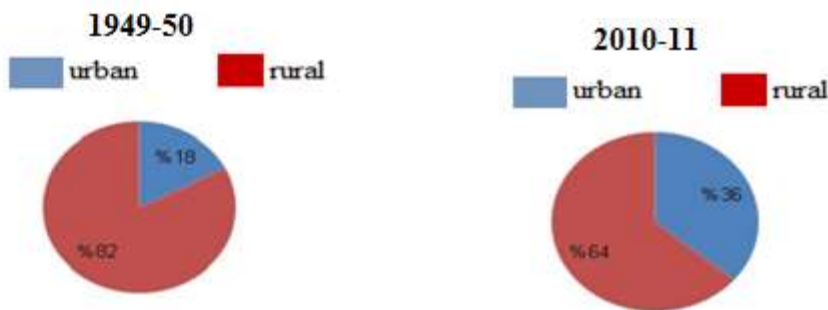
Figure 2 Distribution of Urban and Rural Population

It can be seen very clearly that from 1949-50 to 2010-11 the share of urban population in total population is growing very rapidly. It grew from only 18 per cent in 1949-50 to 36 per cent in 2010-11, doubling only in 61 years and it is likely to pass 50 per cent by the year 2040.

Figure 3 Urban and Rural Percentages of Population in Pakistan

We can see that urbanization is fast in Pakistan so there is a need to study the effects of urban population on economic growth of the cities.

1.1 Objectives of the Study
- To identify the determinants of city population growth in the Punjab (Pakistan)
- To identify the determinants of city economic growth (output) in the Punjab (Pakistan)
- To capture the impact of urban agglomeration on urban economic growth
- To suggest some suitable policy options

2. Methodology
Following basic model is used in the study for estimating the determinants of urban agglomeration.

$$UA = a_1x_1 + a_2x_2 + a_3x_3 + a_4x_4 + a_5x_5 + a_6x_6 + a_7x_7 + a_8x_8 + u_1 \qquad (1)$$

Where UA stands for urban agglomeration, X_1 for market size effect, X_2 for distance from a bigger city, X_3 for city vehicle density, X_4 refers to district urbanization level, X_5 refers to Government policy for urban agglomeration, X_6 for environmental effect, X_7 refers to Political Instability, X_8 refers to size of a district and u_1 refers to stochastic error term. The above equation (1) is a linear regression model and estimated through OLS.

Market size effect>0   Distance<0

Vehicle density <0   Urbanization level >0
Government Policy for urban agglomeration>0   Environmental effect>0
Political instability<0   Size of district<0

District environmental effect is considered for the positive impact of First Nature Geography (FNG). Because the population may be attracted towards a district due to the encouraging climatic circumstances of the district concerned leading to concentration of population in that district.

Related positive and negative factors are considered that are included in the New Economic Geography (NEG), also called Second Nature Geography (SNG), to explain urban agglomerations. Size of the market is among the encouraging factors because larger market provides labor pool (that can be utilized by firms) and also because firms enjoy economies of scales at factory level. Firms can produce a variety of consumer products that can be enjoyed by the residents of the area. Availability of variety of products attracts the population towards that urban residency. Whereas negative factors in SNG include following variables:

- Distance from divisional headquarters: Longer distance to headquarter decrease market potential as headquarters and larger cities become key magnet centers for economic activities.
- Higher vehicle Density: It detains the external diseconomies.
- Other variables that were expected to affect the urban agglomeration positively are following:
- Road length constructed in a district which shows government expenditure for the development of agglomeration because the more government spend on the provision of public amenities the more firms and workers will be attracted towards that district.
- Urbanization level of the district because higher level of population concentration is revealed in the higher level of urbanization of the district.

While on the other side negative factors affecting urban agglomeration consist of following variables:
- Political instability: It is assumed that it creates aloof environment for the city residents resulting in repelling the population from the district.
- Size of the district: It is believed that as the land area of district increases urban population concentration will be stretched over several smaller residencies instead of creating an agglomeration because resources are dispersed over the whole area of the district.

After estimation of the above equation (1), following equation is used to estimate the urban economic growth.

$$UG = b_0 + b_1\overline{U}A + b_2z_1 + b_3z_2 + b_4z_3 + u_2 \qquad\qquad (2)$$

Where UG stands for urban economic growth, $\widetilde{U}A$ refers to predicted values of the dependent variable (i.e., urban agglomeration) of equation (1), Z_1 stands for minimum distance from another district, Z_2 refers to literacy rate of the district and Z_3 refers to city density. OLS technique is used for the estimation of equation (2), which is a linear regression model for cross sectional data.

Predicted UA>0   City density >0
Literacy>0   Minimum distance from another district<0

Following the NEG models, the study expected that urban agglomeration will positively affect urban economic growth, because larger cities have higher wages, productivity and capital per worker (i.e., higher economies of agglomeration) and greater efficiency benefits.

Among the other variables the study expected city density to have a positive impact on urban economic growth. Literacy rate of a district is expected to affect the urban economic growth positively. As literacy rate captures human capital accumulation effect and human capital accumulation can create a skilled labor force pool by attracting production units and residents. Distance from another district is expected to have

negative effect on the urban economic growth while square and cube of the minimum distance from another district are expected to have positive and negative effect on urban economic growth respectively.

Model (1) and (2) together form the recursive equation system for the estimation of determinants of urban economic growth particularly for capturing the impact of urban agglomeration on urban economic growth.

2.1 Data Sources

Unit of observation in the study is district and data on 36 districts of Punjab is utilized in the study. Data used in the study is taken mainly from Punjab Development Statistics 2006-07, 2011-12 published by Bureau of Statistics Government of Punjab, District Census Reports 1981, 1998 published by Pakistan Bureau of Statistics and Regional Meteorological Centre Lahore. Data used in the study is comprised of weak proxies of the variables as exact variables were not available. Most of the variables are generated from the information available at hand.

3. Results and Discussion

Table 1 and table 2 shows the means, standard deviations, minimum and maximum values of the sample used in the study regressions. More importantly standard deviation measures the fickleness of the variables which is found higher for distance from the nearest district, size of the district and for vehicle density. Data on these variables constitute values that are spread over a wider range of values.

Table 1
Descriptive Statistics of Model 1

Variables	Obs.	Mean	Std. Dev.	Minimum	Maximum
Percentage share of total urban population in each district urban population	36	2.77	4.26	0.52	24.01
Distance to nearest district	36	66.60	32.06	36.4	201
District Vehicle Density	36	131.37	355.44	5.95	2160.04
Percentage share of district wise urban population to total population	36	24.83	2.40	12.18	82.05
District wise road length per 1000 population	36	4.85	2.91	0.17	15.74
District temperature differences	36	33.06	4.58	14	38
District wise crime rate	36	0.37	0.13	0.20	0.92
District land area	36	5704.02	4303.25	1772	24830

Mean distance from the nearest district is 66.60 kilo meters while minimum and maximum distances from the nearest districts are 36.4 and 201 kilo meters respectively. Rahim Yar Khan has the maximum distance from another nearest district while Toba Take Singh has the minimum distance from other district that is present nearest to it. Vehicle density is smallest in district Chiniot while it is largest in the district Lahore. Urbanization level is lowest in the district Chakwal whereas it is highest in the district Lahore. However on the other hand road length constructed per thousand populations in a district is lowest in Lahore while highest in the district Chakwal. Muzafargarh, Hafizabad and Khanewal are the districts where temperature variations are largest while in district Toba Take Singh its variations are lowest. Khushab is the district where crime rate is lowest on the other hand crime rate is highest in the district Lahore. Size wise district Bahawalpur is the largest district while Lahore is the smallest district.

The study used following key proxy variables. Distance to the divisional headquarter is used to capture the market size effect. Crime rate is used to consider the political instability in the district because it is related to law and order situation. Temperature differences are used to capture the environmental effect on urban agglomerations. Vehicle density in the district is used to capture external diseconomies in terms of transfer congestion.

Table 2 *Descriptive Statistics of Model 2*

Variables	Obs.	Mean	Std. Dev.	Minimum	Maximum
Distance to nearest district	36	66.60	32.06	36.4	201
Distance to division headquarter	36	74.19	56.93	0	199
District population density	36	672.53	818.94	125.35	5087.47
District wise literacy rate	36	44	11.635	20.7	70.5
District labour force growth rate	36	1.23	2.067	-5.41	6.47

3.1 Determinants of urban agglomeration

In table 3 results of OLS regressions are presented that are estimated to find the major determinants of urban agglomeration. A number of different regressions are used due to insufficiency of data so that best results can be obtained. Different dependent variables were used however most satisfactory results are obtained only with the use of log of urban population agglomeration as dependent variable. Results are presented with respect to best fitted model in reference to the forecasted signs, statistical significance of the variables and overall goodness of fit of the model. All the regressions results are presented with standard errors in parentheses.

Regression (1) includes all the variables for which data was available and it captures 83 per cent of the total variation in the dependent variable. Proxy variable for market size effect shows that a 10 per cent increase in market size leads to almost one per cent increase in the size of urban agglomeration. This finding is in line with our a priori expectation and statistically significant, because larger market size provides more opportunities for the firms established there to sell their output in an expanded market. This will lead to growth of the firms and population will be fascinated by established firms. District vehicle density which shows external diseconomies negatively affect urban agglomeration as expected however its coefficient revealed that it has smaller effect on urban agglomeration. Proxy variable of government policy for urban agglomeration i.e. district wise road length per 1000 population shows positive effect on the size of urban agglomeration as its coefficient is statistically significant at 10 per cent level. To be specific every 10 per cent rise in district wise road length per 1000 population leads to 2.5 per cent increase in the size of urban agglomeration. This result is according to our expectations because it is obvious that when government pays more attention to the amenities available for people in a district, population will be attracted towards that locality.

Results of regression (1) shows that urbanization level is negatively linked with urban agglomeration possibly because higher urbanization levels are associated with greater dispersion forces and they dominate the agglomeration forces propelling the population and discouraging the agglomeration. However the coefficient of the variable is insignificant showing that it may have no strong relationship with the urban agglomeration. District crime rate a proxy variable for political instability in the district shows positive effect on agglomeration which is against our priori expectation. However its coefficient is very small and also statistically insignificant showing that it has no important role as determinant of urban agglomeration in Punjab. Environmental effect which is proxies by temperature differences in the districts shows negative relationship with urban agglomeration and this result is in accordance to our expectation, indicating that extreme weather conditions discourage urban agglomeration. However this relationship is statistically insignificant indicating that environmental effect may not be that much important determinant of agglomeration. Among other variables in regression (1) coefficients of distance to nearest district and district land area both shows positive relationship with the urban agglomeration. However this relationship is not strong as coefficients are statistically insignificant revealing that they may have no role as determinants of urban agglomeration.

In regression (2) district crime rate variable is dropped as its coefficient was statistically insignificant in regression (1) and very small showing very weak relationship with urban agglomeration. Here in

regression (2) all the explanatory variables together explain 82 per cent of the deviation in dependent variable which is a good estimate for a cross sectional regression.

Results in regression (2) shows that "percentage share of district wise urban population to total population" a proxy for urbanization level has negative relationship with the urban agglomeration which means that higher urbanization level in a district is accompanied by centrifugal forces that dominate the centripetal forces. Centrifugal forces are the factors that repel the population from the core while centripetal forces are the factors that attract the population to the core region.

Market size effect which is presented by percentage share of total urban population in each district urban population shows positive relationship with urban agglomeration again in the results of regression (2). It means that as the market size for an agglomeration increases size of the agglomeration will also increase because larger market size provides more consumers for the firms and businesses in the district and they will grow. When firms and businesses will grow more jobs opportunities will be created which will attract population towards the district leading to increase the size of the agglomeration.

Every ten percent increase in the market size for an agglomeration leads to increase the size of agglomeration by 0.93 percent. Results of regression (2) again shows positive relationship of distance to nearest district with urban agglomeration which means farther the district lies from another district the more will urban agglomeration grows. It can possibly be explained as when a district is at larger distance from another large district it might attract the population from nearby areas and form a separate larger agglomeration. On the other hand when a district is located near to another larger district then it is quite possible that the larger district might attract population from the other district leaving that agglomeration smaller in size.

Table 3 *Determinants of urban agglomeration*

Dependent Variables: Log of District Population in 2011					
	1	2	3	4	5
Intercept	6.69*** (0.185)	6.61*** (0.165)	6.62*** (0.168)	6.48*** (0.098)	6.52*** (0.091)
Percentage share of total urban population in each district urban population	0.099*** (0.022)	0.093*** (0.021)	0.099*** (0.021)	0.092*** (0.021)	0.096*** (0.021)
Distance to nearest district	0.001 (0.001)	0.001 (0.001)	0.001 (0.001)	0.001 (0.001)	
District Vehicle Density	-0.001*** (0.000)	-0.001*** (0.000)	-0.001*** (0.000)	-0.001*** (0.000)	-0.001*** (0.000)
District temperature differences	-0.003 (0.004)	-0.004 (0.004)	-0.004 (0.004)		
District land area	0.0058 (0.000)	0.007 (0.000)		0.065 (0.000)	0.0798* (0.000)
Percentage share of district wise urban population to total population	-0.007 (0.004)	-0.007* (0.004)	-0.008* (0.004)	-0.007** (0.004)	-0.008* (0.004)
District wise crime rate	0.009 (0.000)				

District wise road length per 1000 population	0.254*** (0.064)	0.24*** (0.064)	0.24*** (0.065)	0.24*** (0.063)	0.23*** (0.061)
	R^2 0.83 Adj.R^2 0.775	R^2 0.821 Adj. R^2 0.776	R^2 0.807 Adj. R^2 0.767	R2 0.814 Adj. R^2 0.776	R^2 0.808 Adj. R^2 0.776
	No. of Observatios36	No. of Observatios36	No. of Observatios36	No. of Observatios36	No. of Observatios36

Note: Figures in parentheses represent robust standard errors. ***, ** and * indicate statistical significance at one %, five %, and ten % level, respectively.

However coefficient of spatial interaction variable is very small and also statistically insignificant meaning that it may have no important role in the determination of urban agglomeration. District environmental severity (measured by temperature differences between mean maximum and mean minimum) results in regression (2) shows negative relationship with urban agglomeration. This negative relationship implies that extreme weather conditions in a district discourage population concentration in that district and negatively affect the urban agglomeration. But the coefficient of this variable is statistically insignificant therefore it may not be considered as important determinant of urban agglomeration in Punjab Pakistan.

Results of regression (2) showed that district vehicle density is negatively related to urban agglomeration. Specifically every ten percent increase in district vehicle density agglomeration size will decrease by 0.01 percent. This result shows that when number of vehicles in a district will increase without additional road construction, more external diseconomies will be generated in the form of congestion and pollution. This congestion and pollution effect will dominate centripetal forces and agglomeration will be discouraged by repelling population from it. It is statistically significant showing that it is an important determinant of urban agglomeration. Government policy for urban agglomeration captured by district wise road length per 1000 population showed strong positive relationship with urban agglomeration as its coefficient is significant at 1 percent level of significance. To be specific every ten percent increase in the road length per 1000 population will lead to an increase of 2.44 percent in the size of urban agglomeration. District land area showed positive relationship with the urban agglomeration in the second regression results. It may have positive relationship with the agglomeration because when more space is available, larger population can be the part of agglomeration. However its effect on urban agglomeration is statistically insignificant showing that it may not be an important determinant of the urban agglomeration.

Regression (3) reports the estimates with a thrifty set of controls. Cross section regression again performs well as results show that it explains 80 percent of the variation in the population agglomeration of districts. Here the results are almost similar to results in the regression (2). Similarly regression (4) and regression (5) also performs well explaining 81 percent and 80 percent of the total variation in dependent variable respectively. Cross section regression (5) is the best fitted regression for determinants of urban agglomeration as all the variables contained in it are statistically significant. Urban agglomeration predicted through regression (5) gives best fitted values which are used as dependent variable to capture the positive effect of urban agglomeration on urban economic growth in the second model.

3.2 Determinants of Urban Economic Growth
Table 4 summarizes the results of the regressions (6) to (10) based on equation 2. In regression (6), results are presented of the model (2) using all the available independent variables. All the variables, including agglomeration variable (estimated values of agglomeration variable of regression 5), are controlled and results are presented in regression (6). Effects of agglomeration on economic growth of cities are found to be positive and significant but majority of the coefficients of other variables came out against our

expectations and portrayed lower level of statistical significance (or statistically insignificant effect).

Therefore the study used estimations of regression (7) to (10) where controls were excluded that do not match with the expected signs or showed insignificant statistical effect of the variables. In regression (7) only urban agglomeration effect on urban economic growth is captured without controlling any of the other variables.

While in regression (8) effect of distance variable (in linear form only) on economic growth is measured along with controlling some of the other variables. Then a regression is run for two proxy measurement of the distance variables in the form, which is predicted in the CP model of NEG theory. And finally regression (10) is presented which shows most satisfactory results in terms of expected signs and level of significance of the variables.

The result of regression (7) shows that urban economic growth is positively and significantly affected by agglomeration variable while controlling it endogenously. This positive effect of agglomeration on urban economic growth is in line with our main hypothesis that agglomeration has a positive impact on urban economic growth. Specifically every 10 percent increase in agglomeration will lead to an increase of 33 per cent in the urban economic growth. In regression (8) where distance variable is included (in the linear form only) along with some other explanatory variables depicted that as minimum distance from another district increases, urban economic growth moves along with it. But low coefficient value and statistical insignificance of the distance variable suggest that it might have no important role in the determination of urban economic growth. Among other variables district density positively affect the urban economic growth. Specifically every 10 per cent increase in the district density increases the urban economic growth by 0.01 per cent. District literacy variable which is included to capture human capital effect on urban economic growth does not show expected sign however its coefficient is statistically insignificant suggesting that it might have no important role in urban economic growth performance.

**Table 4** *Determinants of Urban Economic Growth*

	Dependent Variables: District labour force growth rate				
	6	7	8	9	10
Intercept	-23.54 (15.224)	-20.04 (12.377)	-18.44 (11.496)	-35.94 (13.398)	-19.45 (13.535)
Predicted values of the dependent variable (ǔ) of model 5	2.97* (1.997)	3.37* (1.963)	3.31* (1.849)	6.29*** (1.918)	4.36** (1.936)
Minimum distance to another district	-0.167 (0.196)		0.009 (0.010)	-0.205 (0.163)	-0.031* (0.191)
Square of minimum distance to other district	0.002 (0.002)			0.003 (0.002)	0.001* (0.002)
Cube of minimum distance to other district	-0.008 (0.000)			-0.0008 (0.000)	-0.002* (0.000)
Distance to divisional headquarter district	0.061 (0.042)			0.077** (0.038)	
Square of distance to divisional headquarter district	-0.001 (0.000)			-0.001 (0.001)	
Cube of distance to divisional headquarter district	0.00105 (0.000)			0.00014 (0.000)	

District density	0.000 (0.000)	-0.001*** (0.000)			0.002* (0.001)
District literacy	-0.007 (0.031)	-0.018 (0.031)			0.019* (0.031)
Log of district density	3.120 (4.540)				
	R^2 0.546 Adj.R^2 0.338	R^2 0.080 Adj.R^2 0.053	R^2 0.38 Adj.R^2 0.28	R^2 0.453 Adj.R^2 0.317	R^2 0.493 Adj.R^2 0.397
	No. of Observations 36	No. of Observations 36	No. of Observations 36	No. of Observations 36	No. of Observations 36

Note: Figures in parentheses represent robust standard errors. ***, ** and * indicate statistical significance at one %, five %, and ten % level, respectively.

Result of regression (9) shows that distance variable, which is included in the form as predicted in the CP model of the NEG theory, has the expected signs in case when proxies by minimum distance from another district which partially prove the non-linearity in the urban system of Punjab because the results are statistically insignificant. Regression (10) presents evidence of the non-linearity pattern of Punjab's urban system because coefficients of the distance, distance square and distance cube show expected signs and are statistically significant.

Figure 4 Distances to Nearest Largest City and Urban Economic Growth
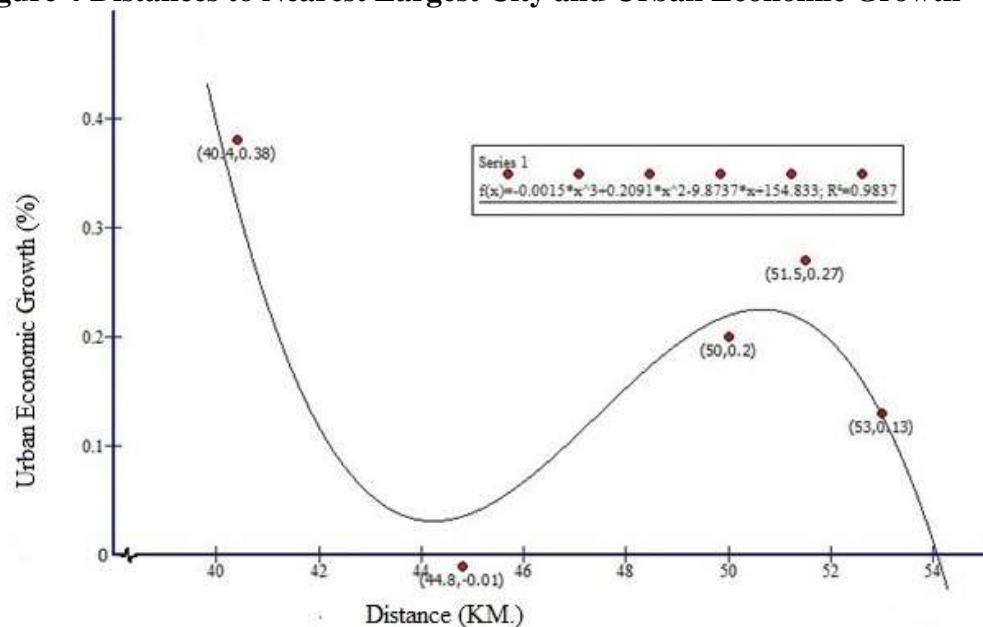
Source: Author's own estimation

Fig 4 shows that as the distance from a nearby larger city increases urban economic growth first decreases then it increases and afterwards when the distance is increased sufficiently larger urban economic growth decreases again.

However, among the other variables district density and district literacy rate showed positive effect on the urban economic growth. Most importantly every 10 per cent improvement in the district literacy rate will result in a 0.19 per cent increase in the urban economic growth. This result is in accordance to our

expectations and statistically significant. Coefficient of the district density variable is also in line with our priori expectation and statistically significant. Specifically every 10 per cent rise in the district density will lead to an increase of 0.02 per cent in the urban economic growth.

The positive effect of distance from another nearest district on urban agglomeration is in line with and supports the findings of Mills and Becker (1986) and differs from the results of Sridhar (2010) and Tripathi (2013). Positive effect of market size variable on urban agglomeration supports Krugman (1991) and Tripathi (2013). Results of positive relationship between district land area and district population concentration match with the Leichenko (2001) while differs from the findings of Gans and Bradley (1998), Henderson (2003) and Tripathi (2013). The negative effect of difference in district temperature on urban population concentration matches with the results of Haurin (1980) while differs from the findings of Sridhar (2010) and Tripathi (2013). Positive effect of road length per 1000 population on urban agglomeration supports the results of Sridhar (2010) and Tripathi (2013). Result of the negative impact of external diseconomies on urban agglomeration supports the findings of Krugman (1991) and Tripathi (2013). Human capital accumulation positive effect on urban economic growth is in line with the results of Gans and Bradley (1998), Sheng (2006), Sridhar (2010) and Tripathi (2013). The results of the CP model resemble the findings of Fujita and Mori (1997), Fujita et al. (1999), Chen et al. (2010) and Tripathi (2013). Finally, the positive impact of urban agglomeration on urban economic growth is in line with the prediction of Krugman (1991), Ades and Glaeser (1995), Fujita and Thisse (2002), Henderson (2003, 2005), Brülhart and Sbergami (2009) and Tripathi (2013).

4. Conclusion and Policy Recommendations

Aim of the study was to identify the determinants of urban agglomeration at sub-national level (i.e., district level) across the 36 districts of Punjab, Pakistan. And also measure the effect of urban agglomeration (considering urban agglomeration exogenously and endogenously) on urban economic growth, following Tripathi (2013) by using NEG approach originally developed by Krugman (1991).

For the identification of relevant determinants of urban agglomeration, factors included in the First Nature Geography and Second Nature Geography is focused in the study. The study also included some other important factors that might have some contribution towards urban agglomeration for which several proxy variables are constructed.

The results of the study showed that the Government policy for urban agglomeration, the market size control variable and district land area positively and significantly affect the urban population agglomeration which is measured by district urban population and log of district urban population. While on the other side the percentage share of urban population to total population in each district and district vehicle density negatively and significantly affect the district population agglomeration. However, among the variables that do not show strong effect on population agglomeration includes district wise crime rates, district wise temperature differences and minimum distance to nearest district.

Urban economic growth regression results of the study showed that urban agglomeration positively and significantly affect urban economic growth when agglomeration variable endogenously (or exogenously) considered to the basic recursive econometrics model used in the study. The study is also a little beginning towards the verification of the spatial distribution of the urban system of Punjab province in Pakistan using the basics of CP model. The study results verified " ∽ꝰ' " shaped non-linear correlation between geographical distance from another district (or division headquarter) to the sample district and urban economic growth of the sample district. This result is in line with the CP model prediction of urban system in the NEG theory. The study additionally finds that the initial growth factors (like initial level of human capital accumulation measured by literacy rate) play an important role in the Punjab's urban economic growth.

These results of the study show that urban growth in Punjab is policy induced (for example road

constructed per 1000 population) and market determined. The study attempted to shed light on the phenomenon of slower growth of class I cities (with a population above 100,000) as compared to other cities by determining relevant factors that negatively (or positively) affect urban agglomeration.

The study results suggest that NEG predictions about the urban agglomeration and its impact on urban economic growth are much more successful than any other predictions made by the existing theories (including First Nature Geography predictions).

In the light of the results of the current study Govt. may give attention towards the urban agglomerations as they contribute positively in the city economic growth. Instead of focusing on already established agglomerations Govt. should provide amenities to the less developed urban areas so that these areas could grow and play their role in development of the country. By developing the smaller areas, it would be quite helpful for the Government to tackle the problem of poverty as well. Additionally the pressure on the large urban centers could also be released if other areas become attractive for the population to move. Political stability should be brought which will increase the agglomeration leading to economic growth of cities. Furthermore it will open the doors for other researches to analyze the different aspects of urban agglomerations and urbanization. Finally the study suggests that government should take serious steps towards the collection of improved data regarding cities for a better analysis and appropriate policy suggestions.

Govt. should estimate district level GDP because income estimates across districts can be helpful in recognizing industries/sectors that are driving or retarding economic growth at the district level. Also, these estimates can be very much useful in facilitating better resource management for policy implementation at micro and macro levels and to remove the constraints imposed by lack of reliable data on latest situation at the district level. Last but not the least, this can provide valuable background information to credit facilitating companies and investors to prioritize locations for further investment.

References

Adilabad, A. P. (2012). Addendum to determinants of city growth and output in India. *Review of Urban and Regional Development Studies,23*(2-3):162-165.

Arif, G. M., Ibrahim, S., and Ahmed, T. (1998). The process of urbanisation in Pakistan, 1951-98. *The Pakistan Development Review,37*(4):507-522.

Arif, G., and Hamid, S. (2009). Urbanization, city growth and quality of life in Pakistan. *European Journal of Social Sciences,10*(2):196-215.

Au, C.-C., and Henderson, J.V. (2006). Are Chinese Cities Too Small?. *The Review of Economic Studies,73*(3):549-576

Beeson, P., DeJong, D.N., and Troesken, W. (2001). Population growth in U.S.counties, 1840-1990. *Regional Science and Urban Economics,31*(6):669–699.

Behrens, K., and Robert-Nicoud, F. (2009). Survival of the Fittest in Cities: Agglomeration Polarization, and Income Inequality. *CIRPEE Working Paper Series Cahier de recherché,0919*.

Bosker, M., Brakman, S., Garretsen, H., De Jong, H., and Schramm, M. (2008). Ports, plagues and politics: Explaining Italian city growth 1300–1861. *European Review of Economic History,12*(1):97-131.

Bradley, R., and Gans, J. S. (1998). Growth in Australian cities. *Economic Record,74*(226):266-278.

Brinkhoff, T. (2011). The principal agglomerations of the world. Accessed on Aug, 16, 2011.

Brülhart, M., and Koenig, P. (2006). New economic geography meets comecon. *Economics of Transition1*(14):245-267.

Brülhart, M., and Sbergami, F. (2009). Agglomeration and growth: Cross-country evidence. *Journal of Urban Economics,65*(1):48-63.

Burgess, E. W. (2008). *Urban Ecology,* Springer Link, 71-78.

Cheshire, P. C., and Magrini, S. (2002). *The distinctive determinants of european urban growth: does one size fit all?* London: LSE Research Online.

Christiaensen, L., and Todo, Y. (2013). Poverty reduction during the rural–urban transformation–the role of the missing middle. *World Development,63*:43-58.

Coetzee, C. (2008). Growth in cities: A kwazulu-natal perspective. *Working Paper 5, IGR Unit, Provincial Treasury Province of KwaZulu-Natal.*

Cohen, B. (2004). Urban growth in developing countries: a review of current trends and a caution regarding existing forecasts. *Policy Research Working Paper Series 6445, World Development.*

Cohen, B. (2006). Urbanization in developing countries: Current trends, future projections, and key challenges for sustainability. *Technology in society,28*(1):63-80.

Cota, J. E. M. (2002). Agglomeration economies and urban manufacturing growth in the northern border cities of Mexico. *Economia Mexicana NUEVA EPOCA,11*(1):163-190.

Da Mata, D., Deichmann, U., Henderson, J.V., Lall, S.V. and Wang, H.G. (2005). Determinants of city growth in Brazil. *National Bureau of Economic Research Working Paper Series 11585.* Cambridge.

De Groot, H. L., Poot, J., and Smit, M. J. (2009). Agglomeration externalities, innovation and regional growth: Theoretical perspectives and meta-analysis. *Working Paper Series, Department of Economics, University of Waikato.*

Dobkins, L., and Ioannidis, Y. (2001). Spatial interaction among US cities: 1900-1990. *Regional Science Urban Economics31*(6):701-731

Duranton, G., and Puga, D. (2000). Diversity and specialisation in cities: why, where and when does it matter? *urban Studies,37*(3):533-555.

Duranton, G., and Puga, D. (2001). Nursery cities: Urban diversity, process innovation, and the life cycle of products. *American Economic Review,91*(5):1454-1477.

Duranton, G., and Puga, D. (2004). *Handbook of regional and urban economics,* Vol 4*,* Elsevier, 2063-2117.

Duranton, G., and Turner, M. A. (2012). Urban growth and transportation. *The Review of Economic Studies,79*(4):1407-1440.

Fujita, M., Krugman, P., and Venables, A.J. (1999). *The Spatial Economy: Cities, Regions, and International Trade.*1st Edition. The MIT Press, United States.

Gabaix, X. (1999). Zipf's Law and the Growth of Cities. *American Economic Review,89*(2):129-132.

Gabaix, X., & Ioannides, Y. M. (2004). *Handbook of regional and urban economics*, Vol 4, Elsevier, 2341-2378.

George, P., Kallioras, D., and Anagnostou, A. (2007). A generalized model of regional economic growth in the european union. *Economic and Social Research Institute Working Paper Series*, DYNREG12.

Glaeser, E. L. (1994). Cities, information, and economic growth. *Cityscape,1*(1):9-47.

Glaeser, E. L., and Shapiro, J. M. (2001). *City growth and the 2000 census: Which places grew, and why.* Brookings Institution Report, Center on Urban and Metropolitan Policy.

Glaeser, E. L., Kallal, H.D., Scheinkman, J.A., and Shleifer, A. (1992). Growth in cities. *Journal of Political Economy,100*(6):1126-1152

Glaeser, E. L., Scheinkman, J.A. and Shleifer, A. (1995). Economic growth in a cross-section of cities. *Journal of Monetary Economics, Elsevier,36*(1):117-143.

González-Val, R., Tirado, D. A., and Viladecans-Marsal, E. (2013). Market potential and city growth: Spain 1860-1960. *Working Papers in Economic History,* WP 13-04.

Growth; United Nations Population Fund, New York: Martine, G.

Haurin, D. (1980). The regional distribution of population, migration and climate. *Quarterly Journal of Economics,95*(2):294–308.

Henderson, J. V. (2000). The effects of urban concentration on economic growth, *National bureau of economic research, Working Paper 7503.*

Henderson, J. V., and Wang, H. G. (2007). Urbanization and city growth: The role of institutions. *Regional Science and Urban Economics,37*(3):283-313.

Ingram, G. K. (1998). Patterns of metropolitan development: what have we learned? *urban Studies,*35(7):1019-1035.

Ioannides, Y. M., & Overman, H. G. (2004). Spatial evolution of the US urban system. *Journal of Economic Geography*,4(2):131-156.

Ismail, W., and Fikry, W. I. (1996). Urban growth determinants for the state of kelantan opinions of the state's policy makers. *Buletin ukur,7*(3):176-189.

Jan, B., and Iqbal, M. (2008). Urbanization trend and urban population projections of Pakistan using weighted approach. *Sarhad Journal of Agriculture,24*(1):173-180.

Krugman, P. (1991). Increasing returns and economic geography. *Journal of Political Economy,99*(3):483-498

Lall, S. V., Shalizi, Z., & Deichmann, U. (2004). Agglomeration economies and productivity in Indian industry. *Journal of Development Economics,73*(2):643-673.

Landes, D.S. (1969). *The Unbound Prometheus.* 1ˢᵗ Edition. Cambridge University Press, Cambridge.

Leichenko, R. M. (2001). Growth and change in US cities and suburbs. *Growth and Change,32*(3):326-354.

Mieszkowski, P., and Mills, E. S. (1993). The causes of metropolitan suburbanization. *The Journal of Economic Perspectives,7*(3):135-147.

Mills, E.S. and Becker, C.M. (1986). *Studies in Indian Urban Development*. World Bank and Oxford University Press, Washington, D.C.

Mohan, R., & Dasgupta, S. (2005). The 21st century: Asia becomes urban. *Economic and Political Weekly,40*(3):213-223.

Mukherjee, M. (2011). Urban growth and spatial transformation of kolkata metropolis: A continuation of colonial legacy,*2*(special issue):365-380.

Narayana, M. (2009). Size Distribution of Metropolitan Areas Evidence and Implications for India. Margin: *The Journal of Applied Economic Research*,3(3):243-264.

O'sullivan, A., & Irwin, R. D. (2007). *Urban economics,* McGraw-Hill/Irwin.

Overman, H. G., & Ioannides, Y. M. (2001). Cross-sectional evolution of the US city size distribution. *Journal of Urban Economics*,49(3):543-566.

Partridge, M. D., and Rickman, D. S. (2008). Distance from urban agglomeration economies and rural poverty. *Journal of Regional Science,48*(2):285-310.

Petrakos, G., Arvanitidis, P., and Pavleas, S. (2007). Determinants of economic growth: the experts' view. *Paper presented at the 2nd Workshop of DYNREG in Athens*.

Polèse, M. (2005). Cities and national economic growth: a reappraisal. *urban Studies,42*(8):1429-1451.

Population distribution, urbanization, internal migration and development: An international perspective. Department of Economic and Social Affairs Population Division: United Nations

Puga, D. (2010). The magnitude and causes of agglomeration economies. *Journal of Regional Science 50*(1):203-219.

Rosen, K. T., & Resnick, M. (1980). The size distribution of cities: an examination of the Pareto law and primacy. *Journal of Urban Economics*,8(2):165-186.

Rosenthal, S. S., and Strange, W. C. (2001). The determinants of agglomeration. *Journal of Urban Economics,50*(2):191-229.

Royuela, V., Moreno, R., and Vayá, E. (2007). Is the influence of quality of life on urban growth non-stationary in space? A case study of Barcelona. *IREA Working Papers, 2007,03*.

Satterthwaite, D. (2007). The transition to a predominantly urban world and its underpinnings: *Retrieved from Web,* http://www.iied.org/pubs.

Sheng, Z. (2007). A study of cross-city growth in China. Thesis submitted in Fudan Univeristy

Smit, M. J., de Groot, H., and Poot, J. (2007). Determinants of growth in cities: a meta-analysis. *Paper presented at the European Regional Science Congress, Paris.*

Soo, K. T. (2005). Zipf's Law for cities: a cross-country investigation. *Regional Science and Urban Economics*,35(3):239-263.

Sridhar, K. S. (2010). Determinants of city growth and output in India. *Review of Urban and Regional Development Studies,22*(1):22-38.

Starrett, D. (1978). Market allocations of location choice in a model with free mobility. *Journal of*

Economic Theory,17(1):21-37.

Tabuchi, T. (1998). Urban agglomeration and dispersion: a synthesis of Alonso and Krugman. *Journal of Urban Economics*,44(3):333-351.

Tripathi, S. (2013). Do large agglomerations lead to economic growth? evidence from urban India. *Review of Urban and Regional Development Studies,25*(3):176-200.

UN-DESA (2008). *United Nations Expert Group Meeting on Population Distribution, Urbanization, Internal Migration and Development*; Population Division, U.N Department of Economic and Social Affairs: Champion, A.

UNFPA (2007). *The state of the world report, 2007: Unleashing the potential of urban*

Wheaton, W. C., & Shishido, H. (1981). Urban concentration, agglomeration economies, and the level of economic development. *Economic development and cultural change*,*30*(1):17-30.

Zheng, X.-P. (2001). Determinants of agglomeration economies and diseconomies:: empirical evidence from Tokyo. *Socio-Economic Planning Sciences,35*(2):131-144.