THE ECONOMETRICAL ANALYSIS OF THE RELATIONSHIP BETWEEN URBANISATION AND ECONOMIC GROWTH (THE CASE OF EU COUNTRIES AND TURKEY)

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Abstract
The aim of this study is to determine whether there is a relationship between urbanisation and economic growth in terms of 13 European Union Member countries and of Turkey as well as to determine the direction of this relationship, if it exists. In the study, GDP per capita was used as a dependant variable where population density and employment rates of industry and services sectors, which represent the urbanisation, as well as the employment rate of agriculture sector and general employment rate, which were included in our model, were used as independent variables. The annual series of the variables of the model that was created within the scope of the study for the period between 1990-2014 were analysed by panel co-integration method. According to panel causality test, there is a bilateral causality relationship between GDP and employment rates of services, industry, and agriculture sectors. Additionally, there was a unilateral causality relationship from GDP towards urban population density and towards general employment rate. Also, according to the DOLS and FMOLS results, the increases in urban population density and in the employment rate of services sector have a positive effect on GDP per capita. Findings from the study show that urbanisation and economic growth are mutually dependent processes in 13 EU member countries and in Turkey.
Keywords: Urbanisation, Economic Growth, EU Countries, Turkey, Panel Cointegration
JEL Classification: E24, C33, O18, O57, R11

KENTLEŞME VE EKONOMİK BÜYÜME İLİŞKİSİNİN EKONOMETRİK ANALİZİ (AB ÜLKELERİ VE TÜRKİYE ÖRNEĞİ)

Öz
Bu çalışmanın amacı, Avrupa Birliği'nin 13 Ülkesi ve Türkiye açısından kentleşme ve ekonomik büyüme arasında bir ilişki olup olmadığını, ilişki var ise bu ilişkinin yönünü belirlemektir. Çalışmada, kişi başına GSYH bağımlı değişken, kentleşmeyi temsilen kentsel nüfus yoğunluğu, sanayi, hizmetler sektörü istihdam oranları ve ayrıca modele dahil edilen tarım sektörü istihdam oranı ve genel istihdam oranı bağımsız değişken olarak ele alınmıştır. Çalışma kapsamında oluşturulan modelin değişkenlerine ait 1990-2014 yıllık serileri panel eşbütünleşme yöntemi ile analiz edilmiştir. Panel nedensellik testi sonuçlarına göre, hizmetler sektörü istihdam oranı ve sanayi sektörü istihdam oranı ve tarım sektörü istihdam oranı ile kişi başına GSYH arasında çift yönlü nedensellik ilişkisi vardır. Bununla birlikte kişi başına GSYH'den kentsel nüfus yoğunluğu ve genel istihdam oranına doğru tek yönlü nedensellik ilişkisi vardır. Ayrıca, DOLS ve FMOLS sonuçlarına göre kentsel nüfus yoğunluğu ve hizmet sektörü istihdam oranındaki artışlar kişi başına GSYH'yi pozitif yönde etkilemektedir. Çalışmadan elde edilen bulgular kentleşme ve ekonomik büyümenin 13 AB ülkesi ve Türkiye'de birbirlerini besleyen süreçler olduğunu göstermektedir.
Anahtar Kelimeler: Kentleşme, Ekonomik Büyüme, AB Ülkeleri, Türkiye, Panel Eşbütünleşme
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1. Introduction

Urbanization expresses – as a part of development – a transition period in which technologies that increase the ratio of industry and services sector within national output composition and in which rural agricultural population migrates to urban production facilities due to the advantages provided by scale economies (Henderson, 2002: 90). According to some studies, urbanization was thought to be a driving force of this economic growth due to the advantages of the infrastructure, capital, workforce, managerial sources it has and due to scale economy (Liddle and Messinis, 2014: 2). When the development process of the developed countries is studied, it is observed that rapid urbanisation played the part of a driving force in metropolitan areas where non-agricultural activities are intensified. A city based economic growth model comprises two components and the first of these expressed the spatial organisation. Population and production and the level of these are parts of this organization. The second component of the urban development model contains the investment decisions of migration and human capital (Black and Henderson, 1999:256).

One of the most important indicators of urban development is the number of cities and their size; another one is urban density. Urban density means the gathering of resources and workforce in urban areas (Farahmand et al., 2010:2). Today, in developing countries, increase in rate of public expenditures to GDP as well as economic growth that emerge through private sector investments and through production increases leads to a migration from rural areas to urban areas; in other words, they lead to a change in the mass movements of population, which is one of the basic parameters of urbanisation and in the sectoral distribution of employment. In the literature, urbanisation is a proof of economic growth and it is pointed out that urbanisation can play the part of a catalyser (Henderson, 2003:48).

After all, the positive effect of urbanisation may not always be seen on economic growth. The theory of economics and empirical studies show that there is a U shaped relationship between urbanisation and economic growth. In the first phase of development, urbanisation improves economic growth and in the second phase, there is a negative correlation. The second phase emerges with rapid urbanisation's enforcing effect on economy and on urban infrastructure. Therefore, the effect of urbanisation on economic growth depends on the urbanisation phase, development level, and the qualities of economic activities and it is complicated (Arauri et al., 2014:3). On the other hand, it is put forward by different disciplines (economist, planning, etc.) that urbanisation is an inevitable consequence of economic growth and economic development in the long-term. In addition to this, there are views indicating that the relationship between economic growth and urbanisation is not clear (Wheaton and Shishido, 1981:17).

The aim of this study is to determine the direction of the relationship between economic growth and urban population density and sectoral distribution of employment that is accepted as the indicator of urbanisation for 14 European Union (EU) member countries[1] and for Turkey. The study has five sections. In the second section, literature can be found; in the third section, method and data are presented. The fourth section is where findings of the practice can be found. The study is finalised with the result section where there is a general evaluation of the study.

2. Overview of the Literature

In the literature, different results were obtained depending on the country studied, period observed, variable used, and practices econometrical method in the studies on the relationship between urbanisation and economic growth. Results obtained from the literature research show that the relationship between economic growth and urbanisation is not homogeneous for the countries. The studies in the literature is presented chronologically below.

In their study, Moomaw and Shatter (1996) analysed the relationship among GDP per capita, urbanisation rate, urban density, and sectoral distribution of employment for 90 countries through panel data method. The findings of the study show that there is a causality relationship from economic growth towards urbanisation and that economic growth has a positive effect on urbanisation. Also, urbanisation increases the employment rate of industry sector.

Bertinelli and Strobl (2003) examined the relationship between urban population density and economic growth for 39 countries through panel data method. The findings obtained from the study show that urbanisation has a negative effect on economic growth in developing countries. This result originates from the enforcing effect of rapid urbanisation on economy and on urban infrastructure in developing countries. In the study of Chang and Kai-ming (2006), the relationship between economic growth and urbanisation was tested by Granger causality test. In the study, it was concluded that urbanisation has a very limited effect on economic growth while economic growth has a dense effect on urbanisation in China.

Bala (2009) used Bayesian estimation method in the study carried out in 68 developed and developing countries. According to the results of the study, urbanisation has a positive effect on EU countries. Non-homogeneous results were obtained for Asian and Latin American countries. These non-homogeneous results stem from the fact that there are differences from country to country in terms of urbanisation phase, development level and main economic activities.

[1] *Austria, Belgium, Czech Republic, Denmark, Estonia, Greece, Hungary, Ireland, Poland, Portugal, Slovenia, Slovakia, and the Netherlands*

Farahmand et al. (2010) observed the relationship between economic growth an urbanisation for 27 European Union countries in their research. The relationship between human development index as an indicator of urban density and GDP per capita was analysed by Solow-Swan Growth Model. The empirical findings obtained from the study show that urban density has a negative effect on growth since it leads to economic costs. In the study of Shabu (2010), the relationship among urbanisation rates, population growth, growth rate of GDP per capita was tested by multiple error correction method for 10 developing countries. As a result of the study, it was determined that there are weak relationships between urbanisation and economic growth especially in developing countries.

In the study carried out by Bhojwani (2011) for India, it was concluded that urban employment increase and urbanisation have a positive effect on economic growth. Cheng (2012) examined the relationship between urbanisation and employment rate of services sector in China for the period between 1978-2012 through panel data analysis. According to the empirical findings of the study, it was emphasized that there is a positive relationship between urbanisation rate and services sector as well as the employment rate of this sector. Meanwhile, it was concluded that the level of urbanisation plays the part of a driving force for the increase in the employment rate of services sector.

Castells and Royuela (2013) analysed the relationship among the development rate of GDP, urban population density, urban transportation system, public investment expenditures, fertility rate, death rate, schooling rate data for countries in Europe, America, Asia, Africa, and Oceania through panel data method. According to the findings of the analysis, there is a positive relationship between urban density and economic growth in Asia in the long-term and a negative relationship for Africa. In the study of Lewis (2014), the relationship between urbanisation and economic growth in Indonesia was tested by the panel data method. The empirical findings show that there is a positive relationship between urbanisation level and economic growth but also that there is a negative relationship between changes in the urbanisation rate and the changes in the economic growth in the long-term.

In the study of Dimou and Schaffar (2014), the effect of economic growth on urbanisation in China for the period between 1984-2004 was analysed through panel data method. According to the empirical findings of the study, urbanisation and GDP per capita are in a positive relationship. However, these findings show that GDP is in a positive relationship with urbanisation up to a threshold in the economic development and that after this threshold this relationship weakens. In the study Chen et al. (2014) carried out on a global scale, GDP per capital rate of 226 countries and population density that represents the urbanisation were tested by panel data method. In the study, it was put forward that urbanisation has a positive effect on economic growth due to the fact that rural population pours into non-agricultural sectors in the long-term. Yet, it was also put forward that in the short and mid-term, urbanisation rate has a limited effect on economic growth.

3. Methodology

In this study, the direction of the relationship between the sectoral distribution of employment and urban population density, which are known as the indicators of urbanisation, and the economic growth was examined in terms of 13 EU member countries and of Turkey. Therefore, annual data of 13 EU countries and Turkey for the period between 1996 and 2013 were analysed using the panel data method, and Dynamic Ordinary Least Squares (Dynamic OLS or DOLS), and Fully Modified Ordinary Least Squares (Fully Modified OLS or FMOLS). In the study, the stationarity of the series were tested in the first place. The panel unit root tests of Levin et al. (2002) and of Im, Pesaran and Shin (2003) were used in order to test the stationarity. Following the unit root tests, the Durbin-Hausman panel co-integration test that is used to test the long-term relationship among the series was put into practice. After the co-integration test, the study analysed whether there was a causality relationship among the variables using the causality tests developed by Dumitrescu and, Hurlin (2012). Finally, DOLS and FMOLS methods that are the estimators the model estimators predicting the long-term relationship among the series that were used.

In this section, the variables used in the study as well as the required data and manipulation methods will be introduced. Moreover, information related to the methods that will be used in the analysis will also be provided.

3.1. Variables and Data

The variables in the study, the explanation related to those variables, and the sources were presented in Table 1[1].

[1] By benefiting from similar studies, the rate of services employment, the rate of industrial employment, urban population density rates as representatives of urbanisation were included in the model of the study as variables. For example, Moomaw and Shatter (1996), Bala (2009), Cheng (2012), Huang et al. (2013) used the employment rates of industry and services sector as an indicator of urbanization. As seen in Table 1, the variables used in the study were obtained from World Bank (WB), and OECD electronic database.

Table 1: **Summary Statistics**

VARIABLES	EXPLANATION	SOURCE
GDP	GDP per capita (with constant prices of 2005),	WB
SSER	The rate of services employment, %	WB
IER	The rate of industrial employment, %	WB
AER	The rate of agricultural employment	WB
ER	Employment Rate, %	WB
UPD	Urban population density, %	OECD

3.2. Methods Deployed

Under this topic, information will be given about the panel unit root tests of Levin, Lin, and Chu (2002) and Im, Pesaran and Shin (2003); about the panel co-integration test of Durbin-Hausman; DOLS and FMOLS estimators.

3.2.1. Panel Unit Root Tests

In determining the stationarity of the series in Levin, Lin and Chu (2002) tests, the general unit assumes that there is a root procedure. In Levin, Lin and Chu (LLC) test, individually defined intersections and timing trends were taken into consideration in panel unit root test analysis. The LLC unit root test is carried out using ADF (Expanded Dickey &Fuller) type regression model. The null hypothesis of the LLC test expresses that “there is unit root” while the alternative hypothesis expresses that “there is not unit root”. The LLC unit root test is done using ADF type models. The content of the model is

$$\Delta y_{i,t} = \alpha_i + \rho y_{i,t-1} + \sum_{L=1}^{pi} \theta_{i,L} \Delta y_{i,t-L} + \alpha_{m,i} d_{m,t} + u_{i,t} \quad (1)$$

and equation (1) expresses the ADF regression where N number of cross-sectional unit are observed for T period (Levin et al., 2002:4). While d_{mt} stands for the vector of the deterministic variables in the equation, α_{mi} model stands for coefficient vector for m=1,2,3. The LLC test examines whether p=0. P=0 means that there is unit root in the series under discussion, and p<0 says that there is no unit root in the series under discussion (Baltagi, 2005: 240-242).

The Levin, Lin and Chu test is accepted as a restricted test since it requires that ρ – expressed as autoregressive parameter - be homogeneous among. Thus, the LLC test has a limited use among other popular panel unit root tests (LLC, IPS and MW) due to the fact that it is not completely realistic in terms of the null and alternative hypotheses. Im et al. (2003) (IPS) test – different from the others – takes unit root procedure related to each cross section into consideration. The IPS tests can be done for each unit root test that needs to be observed (one time series in each cross section). The IPS test is also carried out with ADF models (Hoang and Mcnown, 2006: 3-6).

$$\Delta y_{i,t} = \alpha_i + \delta_i t + y_{i,t-1} + \sum_{L=1}^{\rho i} \theta_{iL} \Delta y_{i,t-L} + u_{i,t} \quad (2)$$

In equation (2); while i = 1,..., N stands for cross section series, t = 1,…,T stands for observation values of time series. The IPS test expresses that there is unit root at least in one cross section under null hypothesis and that at least one cross section is stationary under alternative hypothesis.

3.2.2. Panel Co-integration Test

Since cross-sectional dependency was determined among the series used in the study, whether there is a co-integration in the panel was tested by Durbin-Hausman method developed by Westerlund (2008).

In the Durbin-Hausman panel co-integration method, as long as the dependent variable is I(1), panel co-integration is possible when independent variables are I(1) or I(0). The hypotheses of the test are as follows: (Westerlund, 2008: 203):

H0:ϕi =1, No co-integration relationship.(i=1,2,……n)

H1: ϕI <1, Co-integration relationship is available. (i=1,2,……n)

In the Durbin-Hausman method, Westerlund (2008) tests the co-integration relationship separately in the group and panel length. In equation 3, DH_g stands for the group statistics while DH_p stands for panel statistics.

$$DH_g = \sum_{i=1}^{n} \hat{S}_i (\tilde{\phi}_i - \hat{\phi}_i)^2 \sum_{t=2}^{T} \hat{e}_{it-1}$$

and (3)

$$DH_p = \hat{S}_n = (\tilde{\phi} - \hat{\phi})^2 \sum_{i=1}^{n} \sum_{t=2}^{T} \hat{e}_{it-1}$$

The DH_g test allows the differentiation of autoregressive parameters among cross sections. The rejection of H_0 hypothesis in this test means that there is co-integration relationship for at least for some cross sections. In the DH_p test, it is accepted that the autoregressive parameters are all the same for each cross-section. Under this hypothesis, when H_0 hypothesis is rejected, it is accepted that there is co-integration for all cross-sections (Westerlund, 2008:203).

3.2.3. Dumitrescu and Hurlin Panel Causality Test

The primary advantage of Dumitrescu and Hurlin (2012) test over other causality tests is that it takes cross-sectional dependency among countries that make up the panel into account. Dumitrescu and Hurlin (2012) investigated the causality relationship between Y and X through the linear model mentioned below (Hurlin and Dumitrescu, 2012:1451):

$$y_{it} = \sum_{k=1}^{K} \gamma_i^{(k)} y_{i,t-k} + \sum_{k=1}^{K} \beta_i^{(k)} x_{i,t-k} + \varepsilon_{i,t} \tag{4}$$

In equation (4), K stands for the lag length which are identical in all cross-sections. $\beta_i = (\beta_i^{(1)} .....\beta_i^{(k)})$. It is assumed that individual effects (x_i) are constant and also that lag parameters ($\gamma_i^{(k)}$) and regression slope coefficients ($\beta_i^{(k)}$) change among units. Basic and alternative hypotheses for the equation above are as follows (Hurlin and Dumitrescu, 2012:1452):

$$H_0 : \beta_i = 0 \qquad \forall_i = 1,....N \qquad with \quad \beta_i = (\beta_i^{(1)} .....\beta_i^{(k)})$$

$$H_1 : \beta_i \neq 0 \qquad \forall_i = 1,....N$$
$$\beta_i \neq 0 \qquad \forall_i = N, +1, N_1 + 2,...., N$$

Dumitrescu and Hurlin (2012) calculated the individual Wald statistics ($W_{i,T}$) for horizontal cross-sectional units in order to test basic and alternative hypotheses and obtained the Wald statistics ($W_{N,T}^{HNC}$) for the panel by taking the mean of these statistics (Hurlin and Dumitrescu, 2012:1453):

$$W_{N,T}^{HNC} = \frac{1}{N} \sum_{i=1}^{N} W_{i,T} \tag{5}$$

Dumitrescu and Hurlin (2012) recommend $Z_{N,T}^{HNC}$ with asymptotic distribution in conditions where time dimension is larger than the cross-sectional dimension. When the cross-section dimension is larger than time dimension, it is recommended to use Z_N^{HNC} statistics. $Z_{N,T}^{HNC}$ and Z_N^{HNC} test statistics are calculated as follows (Hurlin and Dumitrescu, 2012:1454):

$$Z_{N,T}^{HNC}=\sqrt{\frac{N}{2K}}(W_{N,T}^{HNC}-K)\quad T,N\rightarrow\infty \qquad N(0,1) \tag{6}$$

$$Z_{N}^{HNC}=\frac{\sqrt{N}[W_{N,T}^{HNC}-N^{-1}\sum_{i=1}^{N}E(W_{i,T})}{\sqrt{N^{-1}\sum_{i=1}^{N}Var(W_{i,T})}}\qquad N\rightarrow\infty, \qquad N(0,1) \tag{7}$$

3.2.4.Co-integration Estimation Methods

In modern econometrics, various econometric methods are used in the estimation of the relationship among variables in the long term. Although deploying OLS estimator for model estimation is fairly simple, it may also lead to some issues, because estimation of panel data models through OLS method is deviant due to endogeneity. Even though endogeneity is controlled by instrumental variable use, it is possible not being able to mode unit and time effects (Tatoğlu, 2013: 103). Stock and Watson (1993) eliminated the endogeneity problem within the aforementioned OLS estimators as well as the deviations caused by these issues. For instance, this method eliminates the problem of ignoring small sampling and dynamic structure emerged in the OLS method. This method is a robust single equation method and it eliminates the endogeneity issue by taking lagged and next value of variables. Moreover, the autocorrelation issue is eliminated by Generalized Least Squares (GLS) in this method. It can also be expressed as equation (8) between DOLS and the model estimation:

$$y_t=\beta_0+\vec{\beta}\chi+\sum\nolimits_{j=-q}\bar{d}_j\Delta\chi_{t-j}+u_t \tag{8}$$

In equation (9), the y_t stands for dependant variable, χ_t stands for the matrix of explanatory variables, co-integration stands for the vector, p stands for the lag, q stands for the leading value.

The FMOLS panel co-integration estimation method developed by Philips & Hansen (1990) is obtained by making two corrections in the OLS estimators. The Fully Modified OLS estimator is obtained by correcting the deviation and endogeneity in OLS estimator. As in DOLS, the FMOLS method eliminates the endogeneity and autocorrelation effect caused by the co-integration relationship of OLS method. In addition to this, the FMOLS and DOLS methods can be used when it is required to estimate the long term relationship and when explanatory variables of both methods are I(1) or I(0) in co-integrated variables (Berke vd.,2014: 628).

The FMOLS method, different from DOLS estimator, is not susceptible to lag and leading variables. The model estimation with FMOLS is created with the equation (10) below:

$$y_t = \beta_0 + \beta' x_t + u_t \quad (9)$$

In Equation (9), y_t is the vector of dependent variable and x_t is the vector of independent variable at (kx1) dimension. Both the y_t and x_t are assumed to be I(1). When $\Delta x = \mu + w_t$, μ is the vector of slope parameters at (kx1) dimension. If the error term obtained from the FMOLS is stationary, the dependent and independent variables in Equation (10) are co-integrated.

4. Estimation Results

4.1.Panel Unit Root Test Results

In the first step, the stationarity of the series was tested. The stationarity of the series are studied according to the Levin, Lin and Chu (LLC) and Im, Pesaran and Shin (IPS) panel unit root tests. The fact that p probability value is close to zero means the rejection of the H_o hypothesis predicting the fact that the series under discussion include unit root, that is to say, the series are stationary. The fact that it results close to 1 means the acceptance of the H_o hypothesis, that is to say, the series are not stationary.

T statistics and probability values of LLC and IPS unit root tests (fixed and trend model) at the level where the variables are applied and at the first difference are shown in Table 2.

When the LLC and IPS unit root test results in Table 2 are studied, all variables except for GDP and AER variables are statistically significant at level and the null hypothesis saying that there is unit root test in the series is rejected. In other words, according to LLC and IPS panel unit root tests, ER, SSER, IER and UPD variables are stationary at a level, namely it is I(0). The GDP and AER series, which are not stationary at a level, seem to be stationary or I(1) when their first differences are taken. All the variables in the study are significant at 1% level.

Table 2: **Panel Unit Root Test Results**

Variables	LLC	IPS
GDP	0.2271	0.3328
	(0.6103)	(0.6304)
ΔGDP	-6.2500***	-4.3627***
	(0.0000)	*(0.0000)*
SSER	-3.4482***	-1.6971**
	(0.0003)	(0.0448)
ΔSSER	-9.2557***	-6.7835***
IER	-5.8106***	-2.4378***
	(0.0000)	(0.0074)
ΔIER	-5.9255***	-4.5182***
	(0.0000)	*(0.0000)*
AER	2.9157	3.3318
	(0.9982)	(0.9996)
ΔAER	-1.9810***	-3.6299***
	(0.0238)	*(0.0001)*
ER	4.27113	2.49662
	(0.0000)***	(0.0063)***
ΔER	10.6890	7.69158
	*(0.0000)****	*(0.0000)****
UPD	-4.0823***	-2.7938***
	(0.0000)	(0.0026)
ΔUPD	-6.6833***	-5.1315***
	(0.0000)	*(0.0000)*

Note: The values in the parentheses show *p* values.***,** and * determine significance at 1%, 5% and 10% level, respectively.

4.2. Panel Co-integration Test Results

As a result, according to LLC and IPS panel unit root test results, it can be concluded that the stationarity levels of the series under discussion are different. Thus, different from other panel co-integration tests, required conditions are provided for carrying out the Durbin-Hausman (DH) co-integration test that makes it possible for independent variables to have different stationarity levels. The DH test examines the existence of co-integration in two dimensions – group and panel. DH co-integration results were summarized in Table 3.

Table 3: **Durbin-Hausman Co-integration Test Results**

Dependent Variable	Test type	*t* statistics	*p* probability
GDP	DH_p	4.347	0.000***
	DH_g	109.813	0.000***

Note: DH_g is group statistic, DH_p is panel statistic. ***, ** and * determine significance at 1%, 5% and 10% level respectively.

In the DH test, it is assumed that the autoregressive parameter is the same under the null and alternative parameters for all cross sections. Under this assumption, rejection of the null hypothesis points out that there is co-integration for all sections (countries). When we have a look at the DH panel statistics results for our data set (Table 3), the null hypothesis predicting that there is no co-integration among the series is rejected at an importance level of 1%. That is to say, existence of co-integration relationship among all sections is matter of question. In other words, according to panel statistics (DHp): there is co-integration relationship among the series in the model where general employment rate and employment rates of services, industry and agriculture sectors are explanatory variable on one hand, and where GDP per capita is the dependant variable on the other.

Moreover, the DH group test allows the autoregressive parameter to differentiate among cross sections. In this group test, the rejection of the null hypothesis explains that null hypothesis is not valid for some countries at least, namely, that there is a co-integration test. The DH group test, as seen in Table 3, observes that the null hypothesis assuming the fact that there is co-integration relationship for each cross section units is being rejected at an important level of 1%. In other words, the alternative hypothesis expressing that there is co-integration in some units and none in some is accepted.

4.3.Granger Causality Test Results

According to the results shown in Table 4, a causal relationship existed between Rate of industrial employment, Rate of Employment in Services Sector, Rate of Employment in Agriculture, Employment Rate, Urban Population Density, and GDP between the years of 1990 and 2014 in EU countries and Turkey.

According to the results shown in Table 4, bidirectional causality relationships were found between Rate of Employment in Services Sector and GDP, and Rate of industrial employment and GDP, and Rate of Employment in Agriculture and GDP. A relationship of unidirectional causality were found between Urban Population Density and GDP, and Employment Rate and GDP. Following the panel causality test that helps us make inferences about the overall panel, DOLS and FMOLS test were used in order to obtain more specific results in the country’s market.

Table 4: **Dumitrescu-Hurlin Panel Granger Causality Test Results**

$\tilde{Z}_N^{HNC}$ Null Hypothesis	Test Statistics	
	W^{HNC}	$\tilde{Z}^{HNC}$
UPD ⇏ *GDP*	3.421	1.439 (0.149)
GDP ⇏ UPD	7.316	7.277*** (0.00)
ER ⇏ *GDP*	2.117	-0.544 (0.586)
GDP ⇏ *ER*	4.951	3.622*** (0.000)
AER ⇏ *GDP*	5.155	4.079*** (0.000)
GDP ⇏ *AER*	4.947	3.765*** (0.000)
IER ⇏ *GDP*	9.403	10.503*** (0.000)
GDP ⇏ *IER*	3.741	1.941* (0.052)
SSER ⇏ *GDP*	5.008	3.858*** (0.000)
GDP ⇏ *SSER*	5.800	5.054*** (0.000)

Note: The values in the parentheses show *p* values.***,** and *determine significance at 1%, 5% and 10% level respectively.

4.4. DOLS and FMOLS Tests Results

Upon finding that there is long-term relationship among the variables, coefficient estimation through co-integration vector estimators becomes possible. With this respect, the estimation is performed using DOLS approach model where economic development (GDP) is a dependent variable. The estimation results are summarized in Table 5.

Table 5: **DOLS Results**

Countries	**SSER**	**IER**	**AER**	**ER**	**UPD**
Austria	9.858***	-8.943***	-2.414**	0.897	9.589***
Belgium	4.050***	-5.900***	-2.384**	-0.447	0.554
Czech Rep.	4.654***	-2.176*	-24.960***	2.411**	2.088*
Denmark	1.522	-1.319	-2.414**	0.060	1.988*
Estonia	2.509**	1.070	-10.067***	1.009	-7.763***
Greece	2.268**	-0.137	-6.147***	0.543	49.692***
Hungary	5.083***	-1.467	-9.556***	-4.625***	-2.450**
Ireland	1.311	-0.411	-1.441	-0.800	4.604***
Poland	9.244***	0.155	-20.851***	1.55	0.281
Portugal	0.648	-0.643	-1.486	-1.632	7.015***
Slovenia	3.703***	-3.412***	-2.694**	-0.946	1.425
Slovakia	4.941***	-0.306	-6.051***	0.903	0.157
Turkey	5.126***	7.147***	-5.904***	2.353**	5.308***
Netherlands	4.437***	-4.389***	-3.114**	-0.515	7.896***

Note: ****, **, and * expresses the significance levels of 1%, 5%, and 10%,

When the DOLS results in Table 4 are examined, it can be seen that in all EU countries and in Turkey (except for Denmark, Ireland and Portugal), increases in the employment rate of services sector have positive effect on economic growth and that these effects are statistically significant at levels of 1% and 5%. Therefore, it can be said that an increase in the employment rates of services sector in EU countries and in Turkey leads to an increase in economic growth. It is seen that this effect is more visible, especially in Austria (9.9%) and Poland (9.2%). This effect seems to be less visible in Hungary, Turkey, Estonia, and Greece (5.08%, 5.13%, 2.50%, and 2.27%, respectively). It is determined that there is a statistically significant relationship between economic growth and employment in the services sector.

It was determined that there is a statistically significant relationship between economic development and employment in industry sector, which is an indicator of urban employment for Austria, Belgium, Czech Republic, Slovenia, Turkey, and the Netherlands. In addition to this, it was also determined that the employment in industry sector positively influences the economic development in Turkey but has a negative effect in Austria, Belgium, Czech Republic, Slovenia, and the Netherlands. According to this, it can be said that while an increase of 1% in the employment industry sector causes a growth of 7.1% especially in the Turkish economy, it causes a shrink of 8.9% in Austria. It was concluded that employment in industry sector does not have a significant effect on the economic development in other EU (Denmark, Estonia, Greece, Hungary, Ireland, Poland, Portugal, and Slovakia) countries.

It was concluded that, contrary to the employment rates of services and industry sectors showing the density of urban employment, the employment rate of agriculture sector expressing the density of rural employment negatively influences the economies of EU countries and of Turkey – except for Ireland and Portugal – and that these effects are statistically significant at levels of 1% and 5%. Thus, it can be said that increases in the employment rates of agriculture sector that stands for the increase in rural population as unpaid family worker in Turkey and most of the EU countries do not lead to economic growth but decline. It is seen that these negative effects are huge, especially in the economies of Czech Republic (25.0%) and Poland (20.9%). In the Irish and Portuguese economies, it was determined that there is not a significant relationship between economic growth and agriculture sector.

As far as the Total Employment Rate is concerned, it can be said that it does not have a significant effect on economic growth in all EU countries, except Czech Republic, Hungary and Turkey. In addition to this, it is determined that an increase in the Total Employment Rate in Czech Republic and Turkey positively influences the economic growth but the same increase in the Total employment rates has a negative effect in the Hungarian economy and that these effects are statistically significant at levels of 1% and 5%. It can be said that the effect of the Total employment is massive in the Hungarian economy.

A statistically significant relationship between Urban Population Density and economic growth was determined in all EU countries and in Turkey, except for Belgium, Poland, Slovenia and Slovakia. It is seen that urban population density has a positive effect on economic growth in Austria, Czech Republic, Denmark, Greece, Portugal, Turkey and Holland whereas this effect is negative in Estonia and in Hungary. As far as the effects of the magnitude of urban employment rate, it can be concluded that it has the biggest effect in the economy of Greece (49.7%) and that it leads to the largest shrink in the economy of Estonia (-7.8%). A statistically significant relationship between economic growth and urban population density could not be found in Belgium, Poland, Slovenia and Slovakia.

Following the DOLS estimation results, another estimation was carried out by using FMOLS approach – another co-integration vector estimator – and its results are presented in Table 6.

Table 6: **FMOLS Results**

Countries	SSER	IER	AER	ER	UPD
Austria	7.889***	-5.975***	-4.723***	1.281	9.257***
Belgium	3.512***	-4.671***	-3.220***	-0.193	2.760**
Czech Rep.	4.784***	-2.515**	-12.362***	2.660**	1.996*
Denmark	1.953*	-1.748	-3.788***	-0.591	1.730
Estonia	3.744***	0.182	-10.674***	1.326	-7.904***
Greece	1.841*	0.167	-5.690***	0.210	7.983***
Hungary	5.964***	-2.378**	-13.728***	-2.284**	-3.166***
Ireland	1.093	-0.644	-3.016***	-1.416	2.752**
Poland	12.513***	-0.475	-12.592***	0.935	0.083
Portugal	0.977	-0.778	-1.863***	-2.009*	11.234***
Slovenia	4.118***	-3.858***	-3.866*	-0.707	2.815**
Slovakia	4.792***	-1.059	-8.565***	1.087	0.959
Turkey	4.978***	7.269***	-5.891***	2.740**	7.630***
Netherlands	4.714***	-4.050***	-3.800***	-1.218	5.365***

Note:****, **, and * expresses the significance levels of 1%, 5%, and 10%, respectively.

When the FMOLS estimation results in table 6 are examined, it is seen that there is a similarity with the DOLS results in table 5. For example, when FMOLS estimation results are taken into consideration in terms of the employment in services sector, which was included in the group of independent variables as an indicator of urban employment, it can be seen that it has a positive effect on economic growth in Turkey and in all EU countries – except for Ireland and Portugal – and that these effects are statistically significant. Therefore, just as in DOLS estimation results, it can be said that an increase in the employment rate of services sector leads to economic growth in EU countries and in Turkey. It is seen that this effect is massive especially in Poland (12.5%). A significant relationship between employment in services sector and economic growth in Ireland and Portugal could not be determined.

It is determined that there is a statistically significant relationship between economic growth and employment in industry sector for Austria, Belgium, Czech Republic, Hungary, Slovenia, Turkey and the Netherlands at a significance level of 1% and 5%. Just as in DOLS estimation results, it can be put forward that the employment in industry sector affects economic growth positively only in Turkey and that it affects economic growth in Austria, Belgium, Czech Republic, Hungary, Slovenia, and the Netherlands negatively. As far as the size of these effects is concerned, it is seen that leading countries are Turkey – in a positive way (7.3%) –

and Austria – in a negative way (6.0%). It is concluded that employment in industry sector in other EU countries (Denmark, Estonia, Greece, Ireland, Poland, Portugal, and Slovakia) does not have a significant effect on economic growth.

According to FMOLS estimation results, it is determined that employment rate in agriculture sector has a negative effect on the economies of EU countries and of Turkey, and that these effects are statistically significant. Thus, just as in DOLS estimation results, it can be said that an increase in the agricultural employment rates in Turkey and EU countries-wide does not lead to increase in economic growth, but decrease. It is seen that these effects are massive especially in Hungary and Czech Republic (13.7% and 12.4%, respectively). As Gardner (2005) also pointed out, it is possible that growth in agriculture sector and in employment rate may not lead to the increase as an indicator of economic growth in terms of the income per capita for those who work in this sector.

As far as Total Employment rate is concerned, it is seen that general employment rate does not have a statistically significant effect on economic growth in all EU countries apart from Czech Republic, Hungary, Portugal, and Turkey. In other words, it is determined that while an increase in the rate of Total Employment rate affects economic growth positively in the Czech Republic and in Turkey, it affects economic growth negatively in Hungarian and Portuguese economies and that these effects are significant. It can be said that these effects are more massive in the Turkish economy, when compared to EU countries (2.7%).

There is a statistically significant relationship between economic growth and Urban Population Density in all EU countries and in Turkey, except for Denmark, Poland and Slovakia. Population density has a positive effect on economic growth in Austria, Belgium, Czech Republic, Greece, Ireland, Portugal, Slovenia, Turkey and Holland; whereas this effect is negative in Estonia and Hungary. It is seen that urban population density leads to shrink the most in the economy of Estonia (7.9%).

As a result, when the FMOLS estimation results in Table 6 are studied, it can be said that they show a great resemblance with DOLS estimation results in Table 5 in terms of both negative and positive effects of urban and rural employment on economic growth of EU countries and in terms of statistically insignificance.

As as result, the FMOLS and DOLS results obtained on country basis support the findings obtained from Dumitrescu and Hurlin (2012) panel causality test. In other words, there is a causality from employment rate of industry sector, services sector, and urban population density towards GDP. A negative effect can be seen in some countries depending on the country specific conditions.

5. Results and Recommendations

The aim of this study is to determine whether there is a relationship between urbanisation and economic growth in terms of 13 European Union Member countries and of Turkey as well as to determine the direction of this relationship, if it exists. In the study, a model was created where GDP per capita was used as a dependent variable while population density and employment rates of industry and services sectors, which represent the urbanisation, as well as the employment rate of agriculture sector and general employment rate were used as independent variable and this model was analysed by panel co-integration method. In the study, the annual series between 1990-2014 were used.

According to LLC and IPS panel unit root tests, ER, SSER, IER and UPD variables are stationary at a level, namely it is I(0). The GDP and AER series, which are not stationary at a level, seem to be stationary or I(1) when their first differences are taken. All the variables in the study are significant at 1% level. For that reason, whether there is a long-term relationship was tested using the Durbin & Hausman (DH) cointegration test that allows independent variables to possess different levels of stationarity. As a result of the DH test, it was determined that the series of the variables, which are subject to the analysis, move together in the long term, namely, they are co-integrated.

As a result of Panel Granger Causality Test, bidirectional causality relationships were found between the rate of Employment in Services Sector and economic growth, and rate of industrial employment and economic growth, and rate of Employment in Agriculture and economic growth, and Urban Population Density and economic growth. Moreover, a relationship of unidirectional causality were found between Urban Population Density and GDP, and Employment Rate and GDP.

Upon determining the co-integration relationship, the model where economic growth is dependent variable is estimated using DOLS and FMOLS methods for 13 EU countries and Turkey. When the DOLS and FMOLS estimation results are taken into consideration from services sector employment rate (SSER - a powerful indicator of urbanization), it was determined that increase in the services sector employment rate has a positive effect on economic growth in Austria, Belgium, Czech Republic, Denmark, Estonia, Greece, Hungary, Poland, Slovenia, Slovakia, the Netherlands and Turkey – not the economies of Ireland and Portugal – and that these effects are statistically significant.

It is concluded that employment in industry sector does not have a significant effect on economic growth in all EU countries, except for Austria, Belgium, Czech Republic, Slovenia, Turkey and the Netherlands. It is seen that the increases in the employment rate of industry sector – when the factor of being a developing country is taken into consideration – has a positive effect on economic growth only in Turkey as a parameter of urbanization. Therefore, it can be concluded that the increases of urban employment in the Turkish economy provide higher prices and employment possibilities and that it is an important potential from this point of view. As far as this result is concerned, Turkey seems to be a developing country, which has not completed its industrialization process when compared to other EU countries that are included in the model. Moreover, by practicing the factors that increase the quality and efficiency of the urban employment in a way that is valid for rural areas, the contribution of the rural areas to the economic growth performance can be achieved. Such policies in Turkey may contribute to the adaptation of those who are a member of unemployed population and agriculture workforce, which has a position of unpaid family workers, into the services an industry sector and to the solution of the problem of growth without employment. The fact that increases in the employment rates of industry sector in most of the EU countries affect economic growth negatively overlaps with the findings of Dimou and Schaffar (2014) saying that there is positive relationship between GDP per capita and urbanization to a definite threshold of economic growth level but after this threshold this relationship gets weaker. It was determined that increases in the agriculture employment rate have a negative effect on economic growth in Turkey and nearly in all EU countries and that these effects are statistically significant. These findings – also emphasized by Moomaw and Shatter (1996) – can be the evidence of the fact that increase in agriculture employment rate has an inevitable negative effect on economic growth provided that it is higher than the increase of employment rate in industry and services sector, an indicator of urbanization.

It was determined that increases in the Total Employment rate do not have a significant on the economic growth figures of EU countries generally and that it has a positive effect on economic growth only in Czech Republic and in Turkey; and a negative one in Hungary. These results are parallel to the findings of studies – carried out by Lewis (2014), and Chen et al. (2014) – emphasizing the fact that urbanization and/or urban employment rates have a positive effect on economic growth both in developed and in developing countries.

The results of both estimation methods proves the fact that urban population density has a positive effect on economic growth in Austria, Czech Republic, Greece, Ireland, Portugal, Turkey and Holland. The relationship under discussion here is statistically insignificant in Denmark, Slovenia, and Poland. There are non-homogeneous results for Belgium and Slovenia. As Dimou and Shaffar (2014) pointed out in their study, the density in urban population is in a positive relationship with GDP per capita. Meanwhile, the findings show that there is a positive relationship between GDP per capita and urbanization to some extend to economic development, but puts forward that after a threshold this relationship gets weaker.

The most important elements that lie behind the growth of European cities both population wise and economic wise are the phenomenon of human capital and labour mobility. These two elements show themselves mostly in the services sector and they increase the urban population. The qualified labour force who earns a high income moves from one country to another or part of a country to another. In parallel to this, the study results support the view that increases in the services sector in most of the developed EU countries and in developing Turkey have a positive effect on economic growth and that urbanization plays the part of a driving force in economic growth. Meanwhile, this result also expresses that a possible crisis within this services sector in most of the countries in the study may have a negative effect on economic growth via changes in the rates of employment in this sector. Additionally, this shows the fact that the workforce of urban employment provides high income and employment - with its character made up of various qualified, educated, middle-aged, career and various people – and that by this way, it plays the role of an important potential for economic growth. With this respect, increases in the employment rate of services sector that makes up a dimension of urban employment plays an important role for economic growth. Furthermore, the common ground of the relationship between employment market and economic growth in EU countries and in Turkey is the fact that increases in agriculture employment rate lead to decline in income per capita. This result makes it a necessity to adapt the workforce that drifted apart from agriculture sector into the services sector.

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