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Article

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The impact of remittances on economic growth: An econometric model

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Abstract

Remittances in the world represent one of major international financial resources, which sometimes they exceed the flows of foreign direct investment (FDI). For centuries, there have been heated debates on the sources of economic growth in developing economies and also why some countries reflect strong economic growth comparing to others.

This study aims to observe the impacts of remittances on economic growth, using panel data set of six high remittances receiving countries, Albania, Bulgaria, Macedonia, Moldova, Romania and Bosnia Herzegovina during the period 1999–2013. These countries have experienced a major increase in remittance inflows, and at this time accounts for the bulk of total remittance receipts, compared with other regions. Most countries, remittances represent the largest source of foreign exchange earnings and represent more than 10 percent of GDP.

In other words, the econometric analysis will be based on those six remittance receiving countries. The paper is then to review the empirical literature devoted to the impact of remittances on economic growth, in order, to identify empirically if there are significant relationships between remittances and growth in these countries. The results suggest that remittances have a positive impact on growth and that this impact increases at higher levels of remittances relative to GDP.

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JEL classification: C3; O1; F3

Keywords: Remittances; Economic growth; Panel data

Resumo

As remessas no mundo representam um dos principais recursos financeiros internacionais, que por vezes ultrapassam os fluxos de investimento direto estrangeiro (IDE). Durante séculos, tem havido acalorados debates sobre as fontes de crescimento econômico em economias em desenvolvimento e também porque alguns países refletem forte crescimento econômico em comparação com outros.

Este estudo tem como objetivo observar os impactos das remessas sobre o crescimento econômico, usando o conjunto de dados de seis países receptores de remessas, a Albânia, a Bulgária, a Macedônia, a Moldávia, a Romênia e a Bósnia-Herzegovina durante

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o período 1999-2013. Esses países experimentaram um grande aumento nos fluxos de remessas e, neste momento, respondem pela maior parte das receitas totais de remessas, em comparação com outras regiões. Na maioria dos países, as remessas representam a maior fonte de divisas que correspondem a mais de 10% do PIB.

A análise econométrica será baseada nos seis países receptores de remessas. O trabalho objetiva rever a literatura empírica dedicada ao impacto das remessas sobre o crescimento econômico, a fim de identificar empiricamente se há relações significativas entre remessas e crescimento nesses países receptores de remessas. Os resultados sugerem que as remessas têm um impacto positivo no crescimento e que esse impacto aumenta com o nível de remessas em relação ao PIB.

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Palavras-chave: Remessas; Crescimento econômico; Análise de dados de painel

1. Introduction

Remittances are a new financial phenomena and one of the main important sources of incomes based on it seize and economic impact in the world. Data from (World Bank, 2014) indicates that global remittance is \$430 billion dollar in 2011 and remittance is 0.31% of global GDP in 2009. The impact of remittance on economy system is more profound in developing countries because, they receive \$307.1 billion of the total \$416 billion inward remittances, which is about 74 percent. Remittance is also 27 percent of the GDP of developing countries. According to the World Bank, remittances flows to the developing world have reached USD 414 billion in 2013 (up 6.3 percent over 2012), and are now, behind foreign direct investment, the second largest source of external financial flows to developing countries. Given the 232 million international migrants and the almost 70 million internal migrants, the earnings generated and transferred by migrants are projected to reach USD 540 billion by 2016. Importance of remittances is increasing potentially and they are becoming one of main important sources of foreign financial flows, especially in developing countries, both in size and growth rate. The true size of remittances as well as unrecorded flows through formal and informal channels is believed to be significantly large (Fig. 1 and Graphs 1–3).

Recorded remittances are more than twice as large as official aid and nearly two-thirds of foreign direct investment (FDI) flows to developing countries. The enormous upward movement in remittances payments may be attributed largely to two factors, namely; immigration between developing and developed countries has increased dramatically

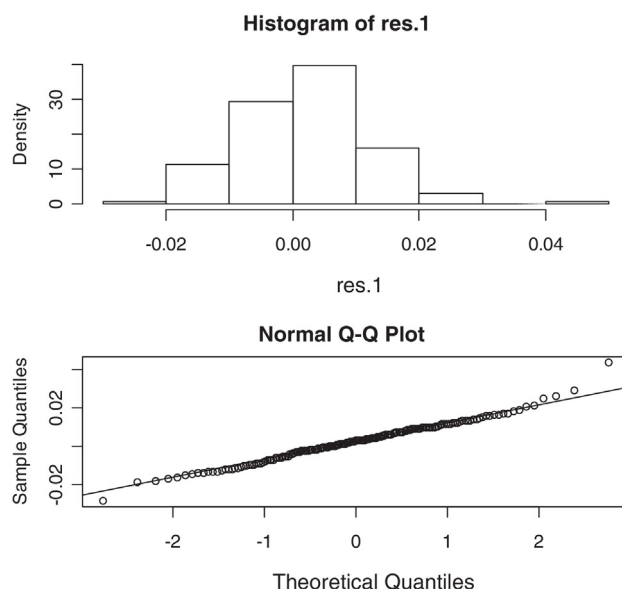
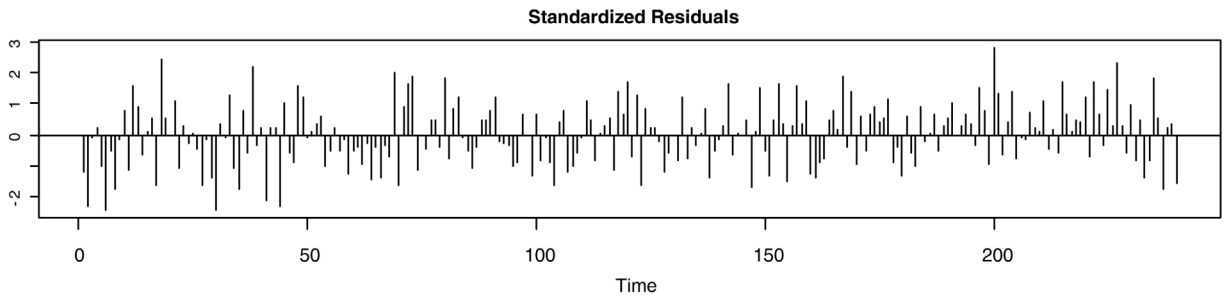
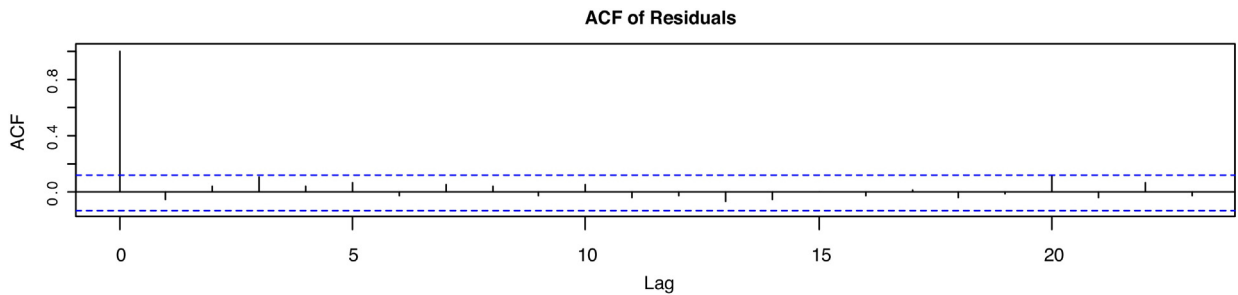


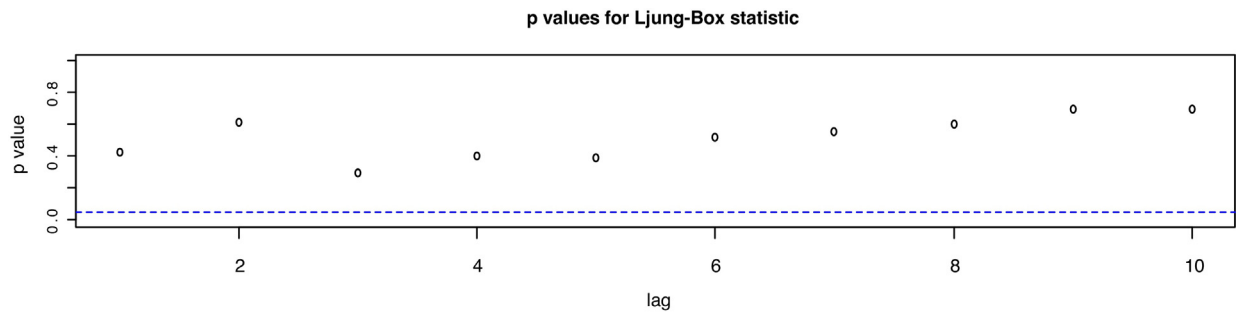
Fig. 1. Residuals Control for the 'Fixed Effects' model. The first graph (above) shows the histogram of the distribution of the model residuals. Comment: Form approaching normal distribution. Second graph: Comparison of theoretical quintiles. We see that the points fit very well with the normal line. So this shows that our model is valid.



Graph 1. Observes a series of random performance residuals.



Graph 2. We see that the residuals series does not show any sign correlation since all lines are within the confidence limits.



Graph 3. Always accept the null hypothesis of absence of autocorrelation Ljung Box test (see p -value are observed all over the limit of 5%). So there is no dependency between residuals.

in the past 20 years and decline in transaction costs as technological improvements have allowed for faster, lower cost mechanisms for the international transfer of payments between individuals. Remittance is different from other external capital inflow like foreign direct investment, foreign loans and aids due to its stable nature.

The purpose of this paper is to examine whether remittances has a positive effect or negative effect in the increase in GDP per capita in the developing countries. By using empirical method in six developing countries in Europe, the region with countries of high receiving ratio in remittances to GDP, the impact of remittances is to be observed.

2. Empirical literature review

Many economists and analysts have realized several large empirical studies on various aspect of remittance, such as motivation of remittance senders, impact of remittance on economic growth, cost of remittance, etc. There are diverse opinions on the impact of remittances on economic growth.

2.1. Positive impact

There is empirical evidence that remittances contribute to economic growth, through their positive impact on consumption, savings, or investment.

In this regard, several studies report supporting evidence on the positive impact of remittances in accelerating investment in Morocco, India and Pakistan and in Mediterranean countries.

Adams and Page; Acosta et al. and World Bank argued that migrant remittances impact positively on the balance of payments in many developing countries as well as enhance economic growth, via their direct implications for savings and investment in human and physical capital and, indirect effects through consumption.

Ratha (2003) concludes that remittances increase the consumption level of rural households, which might have substantial multiplier effects, because they are more likely to be spent on domestically produced goods.

Giuliano and Ruiz-Arranz had worked on data set of more than 100 developing countries from years 1975–2002 and found that remittances can enhance economic growth only in less financially developed countries.

The positive developmental effects of remittances focuses on the multiplier effects of consumption, development of the financial institutions that handle remittance payments, use of remittances as foreign exchange, and the role of remittances as an alternative to debt that helps alleviate individuals credit constraints in countries where micro-financing is not widely available.

Barajas et al. explained that remittances are likely to expand the quantity of funds flowing through the banking system. This in turn may lead to enhanced financial development and thus to high economic growth through one or both of two channels: (1) increased economies of scale in financial intermediation, or (2) a political economy effect, whereby a larger constituency (depositors) is able to pressure the government into undertaking beneficial financial reform.

Remittances provide the catalyst for financial market and monetary policy development in developing countries. Guilano and Arranz study found that remittances improve credit constraints on the poor, improve the allocation of capital, substitute for the lack of financial development and thus accelerate economic growth.

Iqbal and Sattar found that in the absence of worker remittances, it was likely that exchange rate, monetary and fiscal policies will come under pressure.

Rao and Hassan explained the effects of remittances on growth by using the Solow growth model. The study found that migrant remittances have positive but marginal effect on growth. World Bank and IMF findings show that remittances indirectly increase the growth rate by reducing output volatility.

Most recently, Nsiah and Fayissa had investigated the relationship between economic growth and remittances through panel data of 64 different countries of African, Asian, and Latin American-Caribbean from 1987–2007. They had employed panel unit root and panel co-integration tests to investigate the exact relationship between remittances and economic growth. They found that there is positive relationship between remittances and economic growth throughout the whole group.

2.2. Negative impact

Conversely, Amuedo-Dorantes and Pozo and López et al. posited that remittances, like capital flows can appreciate the real exchange rate in recipient economies and therefore generate a resource allocation from the tradable to the non-tradable sector.

Rodrik provided evidence that real exchange rate overvaluation undermines long-term economic growth, particularly for developing countries, in that in those countries tradable goods production suffers disproportionately from weak institutions and market failures.

Lipton, Ahlburg and Brown and Ahlburg argued that remittances undermine productivity and growth in low-income countries because they are readily spent on consumption likely to be dominated by foreign goods than on productive investments.

Nevertheless, Barajas et al. pointed out that the more highly integrated an economy is with world financial markets, and the more highly developed the domestic financial system, the less likely it is that remittance receipts will stimulate investment by relaxing credit constraints. Using, estimated dynamic simultaneous Keynesian type model for investigating the impact of remittances on consumption, investment, imports and output for eight countries including Algeria, Egypt, Greece, Jordan, Morocco, Portugal, Syria and Tunisia for the period of 1969–1993 and then further extended

in the other study that is, 1969–1998, Glytsos findings for both studies pointed out that the effect of remittances on growth is partial and in several years negative impact of remittances to growth is observed.

Chami and Jahjah found that migrants remittances have negative impact on growth in per capita incomes. The study reported three stylized facts: first, that a “significant proportion, and often the majority,” of remittances are spent on consumption; secondly, that a smaller part of remittance funds goes into saving or investment; and thirdly, the ways in which remittances are typically saved or invested – in housing, land and jewelry – are “not necessarily productive” to the economy as a whole.

Empirical results also indicate that remittances may indirectly affect real exchange rate leading to the “Dutch Disease” phenomenon, where remittances inflow causes a real appreciation, or postpones depreciation, of the exchange rate. Exchange rates appreciate in countries with large remittances which will in turn hurt the economic growth.

3. An empirical model of economic growth with remittances

3.1. Evaluation methods

Model 5.1, presented above, is just the general shape of the equation that we will test. The following two techniques are characteristic of panel data study. Panel data consisting of repeated observations of the same unit, in our case, the regional countries. Observations occur in different time, annual data that we analyze. The observation period is 14 years break, from 1999 to 2013. Our ‘Panel’ is balanced, which means that the period is the same for every state. Panel Study data allows control of variables, which cannot be observed or measured, for example, cultural factors between countries. This type of analysis is also performed to study the variables that change over time, but not from one country to another, as for example, the agreements.

A *fixed effects* model (FE) to analyze the Panel data considers explanatory variables as non-random. This fact is in contrast with the pattern of ‘random’ effects (RE), which considers as explanatory variables derived from random events. In panel data analysis, the term ‘fixed effects estimator’ (or ‘Within estimator’) is used to identify appraisers regression model parameters. A FE model is used to identify the type of impact variables, which change over time. This technique explores the relationship between independent variables and ‘output’ within the same unit (partner country). Every country has its own individual characteristics that probably can affect the independent variables. When using FE, we assume that the variables are influenced by an individual characteristic and need to check for this. In econometric terms, we talk about the correlation between the error term and independent variables. FE techniques destroy the effect of these characteristics (independent of time) of the independent variables, so we can estimate the net effect of independent variables. Another important hypothesis of the FE model is that these features are individual for each country, so there should not be correlated with characteristics of other countries. Every country is different from the other, so the error term is the constant (which captures the individual characteristics) should not be correlated with the others. So, in substance, FE models are constructed to study the factors of change within an entity (place). One characteristic that does not change with time may not have caused this change because it is constant for each country.

The logic behind the ‘random’ effects model (RE) is based on the assumption that the difference between the units (countries) is casual (random) and uncorrelated with the independent variables included in the model. According to Green the fundamental difference between the fixed effects and the ‘random’ is the link between individual effects and regressors in the model. These effects may be random or correlated with the independent variables. One advantage of the technique is the inclusion of RE independent variables in modeling time. In the FE model, these variables are ‘within’ a constant term.

In this study data for all variables is collected from the publications of World Bank data set “World Development Indicators”. Data set covers most recent year’s annual data from 1999–2013. Gujarati recommended that standard tests of stationary are mostly applicable for large sample size and as the sample size in the current study is not so huge that is way researcher have not employed any test for stationary. In order to investigate the impact of worker remittances on economic growth of Albania, Bulgaria, Macedonia, Moldova, Romania and Bosnia Herzegovina panel data regression analysis are employed. Some studies had been employed multiple regression analysis to investigate the impact of worker remittances on economic growth (Chami et al., 2003).

To determine the responsiveness of income growth rate to remittances and the traditional sources of economic growth we give the equation:

$$\text{GDPGROWTH} = \beta_0 + \beta_1 \text{WORREM} + \beta_2 \text{GCF} + \beta_3 \text{CONSUM} + \beta_4 \text{ENR} + \beta_5 \text{FDI} + \beta_5 \text{TRADE} + \beta_6 \text{POP} + \beta_7 \text{REAL_EXCH} + \beta_8 \text{DEBT} + \varepsilon \quad (1)$$

Data description

Variable description

GROWTH_i = Natural log of GDP per capita

WORREMi = Worker Remittances Received to GDP

CAP_FIX_GDP_i = Gross Capital fix formation as a percentage of GDP

FCONSUM_i = Household final consumption expenditure as a % of GDP

SCHOOL_i = Ratio of school enrollment percentage to GDP

TRADE_i = Current account BAL or balance as a percentage of GDP

POP_{G_i} = Population growth as a percentage of GDP

REAL_EXCH_i = Real exchange rate

DEBT_i = Government debt as a percentage of GDP

β_0 and ε = Intercept term and error term in the model

Proxies and expected relationship of all the variables is provided in Table 1. Here, GROWTH_i is the dependent variable which is measured in percentage. WORREMi is a stand for worker remittance is an independent variable and taken as ratio of worker remittances received to GDP. The worker remittances and economic growth has a positive relationship. While the remaining six variables are control variables which are add in the model to control for the effect of other most important variables that effects the economic growth.

Where GCF_i is the gross fixed capital formation as a percent of real GDP used as a proxy for investment in physical capital; ENR_i is log of secondary school enrollment used as measure of investment in human capital which has a positive effect on the economic growth of developing countries (Stark and Lucas, 1988). TRADE_i is in the terms of trade for each country under consideration, measured by the ratio of the export to import price indices to capture the impact of trade, or openness of the economy on economic growth. FCON_i is the Final Consumption expenditures. The theoretical relationship between house hold consumption expenditure and economic growth is positive. POP_i is the population rate. Hence, we expect the sign of the Population growth is to be negative. REAL_EXCH_i is the real exchange rate and we expect a positive or negative sign. And finally we have the DEBT_i Government debt as a percentage of GDP which have a negative impact on economic growth.

To estimate the parameters corresponding to variables of interest from the data under consideration, we employ a panel data estimation, an empirical exposition of which is provided in Eq. (1).

Table 1
Variables descriptions and their relationship.

Variable	Proxy or definition	Expected sign
GROWTH _i	GDP per capita growth in current %	
WOR.REMi	Workers' remittances received as a % of GDP	+
CAP_FIX_GDP _i	Gross capital fix formation % of GDP	+/-
SCHOOL _i	Ratio of school enrollment percentage to GDP	+
FCONSUM _i	Household final consumption expenditure as a % of GDP	+
TRADE _i	Trade as a % of GDP	+
POP_G _i	Population growth as a % of GDP	-
REAL_EXCH _i	Real exchange rate	-/+
DEBT _i	Total debt as % of GDP	-

Table 2
Descriptive statistics.

	gdp-g	remit	cap_fix_gdp	school	trade
Minimum	−6.799000	0.174000	13.516000	66.443000	49.316000
Maximum	10.100000	40.622000	34.104000	96.136000	145.370000
1. Quartile	1.841000	3.658000	18.829750	80.472750	84.680750
3. Quartile	6.200000	16.473500	25.470500	88.930750	123.342250
Mean	3.809711	10.935800	22.704244	84.301800	102.373256
Median	4.663500	7.840500	22.367000	82.663000	103.403500
Sum	342.874000	984.222000	2043.382000	7587.162000	9213.593000
SE mean	0.372534	1.012369	0.524288	0.645475	2.595133
LCL mean	3.069495	8.924244	21.662496	83.019255	97.216782
UCL mean	4.549928	12.947356	23.745993	85.584345	107.529729
Variance	12.490324	92.240196	24.738969	37.497438	606.124176
Stdev	3.534165	9.604176	4.973828	6.123515	24.619589
Skewness	−0.881502	0.959023	0.472403	−0.268572	−0.034701
Kurtosis	0.553712	0.075541	−0.487697	0.427969	−1.075932

	cons	pop-g	real_exch	debt
Minimum	62.397000	−1.911000	62.244000	12.622000
Maximum	109.740000	3.008000	146.700000	150.739000
1. Quartile	72.325500	−0.640000	86.488250	23.864000
3. Quartile	88.721750	−0.068500	102.780750	54.670750
Mean	80.678922	−0.316433	96.610900	39.150433
Median	80.072500	−0.262500	99.656000	32.488000
Sum	7261.103000	−28.479000	8694.981000	3523.539000
SE mean	1.085882	0.075283	1.605631	2.300026
LCL mean	78.521298	−0.466019	93.420546	34.580330
UCL mean	82.836546	−0.166847	99.801254	43.720537
Variance	106.122555	0.510080	232.024567	476.110953
Stdev	10.301580	0.714199	15.232353	21.819967
Skewness	0.365813	1.320110	0.388189	1.837883
Kurtosis	−0.414512	5.470410	1.492561	5.963035

Source: Own calculations.

3.2. Empirical results and interpretations

Several versions of Eq. (1) are tested in order to obtain a model which yields robust results and best fits the data. Accordingly, column 2 of Table 3 presents the estimation results of a quasi fixed-effects panel with heteroskedasticity corrected standard errors, whereas column 3 presents the estimation results for the random-effects model with bootstrap standard errors. The correction for heteroskedasticity and the presence of the initial income converts the pooled regression with heteroskedasticity corrected standard errors into a quasi fixed-effects model. Apart from the magnitude of the coefficients, the results reported in columns 2 and 3 are comparable.

This portion of paper describes the descriptive diagnostics, outcomes of multiple regression analysis, results of diagnostic tests and then discussion on these outcomes. First of all result of descriptive diagnostics is provided in Table 2.

Similarly the average, standard deviation, largest and smallest value of independent and control variables is given in this table.

After descriptive diagnostics the diagnostics tests are employed in order to check the assumptions of OLS. The diagnostics tests are applied to investigate the OLS assumptions like; Multicollinearity, Autocorrelation and Heteroskedasticity.

We present in Table 3, the evaluations based in three different methods (OLS, fixed effects, random effects):

Fixed effects method results: The above model expresses the impact of Remittances on economic growth, where it is clear that Remittances have a positive impact on economic growth. Adjusted R^2 means that the estimated model explains 33.85% of the variance of the dependent variable (GDP growth). With a p -value (or alpha) which is always

Table 3
Evaluations of the model.

Estimation method	OLS		Fixed effects		Random effects	
	Estimate	P-value	Estimate	P-value	Estimate	P-value
Dep. variable: gdp_g						
remit	0,157	0,06	0,293	0,00	0,24	0,01
cap_fix_gdp	0,048	0,01	0,003	0,00	0,011	0,06
school	0,263	0,05	0,305	0,00	0,298	0,00
trade	0,009	0,01	0,058	0,00	0,044	0,00
cons	0,037	0,04	0,081	0,01	0,054	0,02
pop_g	−1,203	0,11	−1,037	0,19	−0,904	0,23
real_exch	−0,047	0,10	−0,041	0,02	−0,046	0,08
debt	−0,031	0,10	−0,005	0,01	−0,017	0,07
F-statistic	7,527	0,00	9,542	0,00	8,526	0,00
Adjusted R-squared	0,1543		0,3385		0,2848	
Number of observations	90		90		90	

Source: Own calculations.

less than 1 percent of all parameters are statistically valid. Remittances coefficient is statistically significant with a positive sign means that remittances reduces economic growth, an increase in remittances with a unit increases GDP by 0.293%. The estimated coefficients for population growth, government spending, education (School Enroll), Investments, Trade (Opening), exchange rate and fixed capital formation are statistically significant and have the expected signs. A growing population with a unit of GDP decreases by 1.037%. While a growing trade with one unit of GDP rose to 0.58% respectively. So in the above table clearly seen as statistically variables affecting economic growth. Reject the hypothesis that the estimated model is statistically invalid because alpha test F is equal to zero (i.e. less than 5%).

Hausman test can be used to compare the two methods, ‘fixed effects’ and random effects. Null hypothesis of this test is: individual effects are not correlated with other model regressor. If they are correlated, then the null hypothesis is rejected, then a random effects model is not suitable. In this case, it would be a handy fixed effects model. Below we present and output of our program, associated with this test. We can observe, that p -value is less than 1%, then reject or accept the hypothesis zero fixed effects model. So, this test confirms again that the best method to use is what ‘Fixed effects’.

```
>phptest(ModRandom,ModWithin)
```

```
  Hausman Test
```

```
data: gdp_g ~ remit + cap_fix_gdp + school + trade + cons + pop_g + real_exch + debt
```

```
chisq = 21.4524, df = 8, p-value = 0.00604
```

```
alternative hypothesis: one model is inconsistent
```

4. Evaluation of residuals of fixed effects method

To prove again if our evaluation of data by ‘Fixed Effects’ method is available, check the Software through our respective residues. So, the analysis of the following model performs better with fixed effects assessment.

To see more clearly the performance of standard residuals, perform the test and Ljung-Boxin see the structure of interdependence through global autocorrelation functions.

5. Ljung Box test

Ljung-Box test (is named for Greta M. Ljung and George EP Box) is a type of statistical test that analyzes whether the presence of autocorrelation is statistically valid in a time series. He tests the overall variability based on a number of delays. This test is sometimes known as the Ljung-Box Q, and it is closely related to the Box-Pierce test (which is named after George EP Box and David A. Pierce). Box-Pierce test statistic is a simplified version of the Ljung-Box test

statistic for which subsequent studies have shown poor performance. Ljung-Box test is widely applied in econometrics and other models of time series analysis.

6. Conclusions

This study is conducted to explore the impact of worker remittances on economic growth of Albania and five regional countries by employing the annual panel data from 1999–2013. In order to explore the relationship between worker remittances and economic growth multiple regression analysis is utilized. Different diagnostic tests are applied in order to confirm the major assumption of multiple regression analysis like multicollinearity, heteroskedasticity and autocorrelation. After employing all these tests multiple regression analysis is conducted which shows that worker remittances is positively and significantly contribute in the economic growth of six countries. So, contribution of worker remittance is the significant and most important in economic growth. But its productive use can help the economy of these countries to maintain and improve the economic growth by investing this money into consumption and investments. This study has been focusing only on relationship between worker remittance and economic growth and the upcoming studies must investigate the relationship of worker remittances with other macroeconomic indicators that have a great impact on economic growth.

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