6. DO REMITTANCES HURT DOMESTIC PRICES? NEW EVIDENCE FROM LOW, LOWER-MIDDLE AND MIDDLE-INCOME GROUPS

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Abstract

We examine the remittances-inflation Nexus using System Generalized Method of Moments and bootstrap panel Granger causality approach. This study selected 58 countries from low, lower-middle and middle-income groups and tested the relationship using newly constructed remittances series. The outcome using the SGMM approach reveals that remittances have a negative and significant impact on inflation in low and lower-middle income countries, while positively influencing it in the middle-income group. Furthermore, remittances used for consumption and saving cause inflationary situation only in low and lower-middle income groups. The bootstrap panel Granger test results show that remittances have a strong impact on the prices of the lower-middle income countries. However, we find causality evidence only in one-fifth of the low and one-fourth of the middle-income countries. In general, the results are more country specific. The outcomes have significant policy implications for the researchers and decision-makers targeting the groups under study.

Keywords: remittances; inflation; panel bootstrap Granger test; income groups; foreign exchange

JEL Classification: F24, E31 C22, F31

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1. Introduction

Inflation and remittances affect the economic activity of the recipient's economy and are especially of great importance for developing countries (Cáceres and Saca, 2006; Thang, 2013). The worker remittances accelerate economic activity by increasing personal income, improving living standards, and ultimately enhancing the aggregate demand for goods and services that put upward pressure on prices. The inward flow of remittance increases consumption patterns with no increment in output growth, boosting the prices of the commodities in the recipient economy. The inflow of remittance raises the income of the remitter household, which causes the fall in labour supply. The limited labour supply shrinks the labour markets, which uplifts wages and increases the cost of production that eventually leads towards contraction of the sector. Consequently, the exchange rate and the ratio of the outputs encourage high spending and resource movements that generate an inflationary situation (Acosta *et al.,* 2007). It has a positive impact on the accumulation of foreign reserves causing a surplus in the balance of the payment account. Failing to sterilise the rise in foreign reserves will widen the monetary base and appreciate the exchange rate and will increase price levels (Bugamelli and Paternò, 2009).

Remittances contribute to the socio-economic development of developing countries as an important and maybe biggest source of external cash flows and foreign currency. It is more appropriate way to stabilise the exchange rate in low (hereafter LI) and lower-middle (hereafter LMI) income countries of the world (Mughal and Makhlouf, 2011; Ahmed *et al*., 2013). At microeconomic level, remittances help in reducing poverty and inequality among households and represent a funding source for children education (Stark, Taylor, and Yitzahki, 1986, 1988; Taylor and Wyatt, 1996; Calero *et al*., 2009; Kugler, 2006). It is also greatly used for consumption, health care and housing expenses (Airola, 2007; Amuedo-Dorantes, 2006). The remittance flow increases during periods of financial distress as a tool for sustaining families (Yang, 2004). On the other hand, at the macroeconomic level, remittances increase foreign reserves, boost the accumulation of physical and human capital, insure financial sector development and help in current account adjustment (Giuliano and Ruiz-Arranz, 2009; Adams and Page, 2005; Barajas *et al*., 2009; Gazi and Holmes, 2015). The inward flow of remittances improves the macroeconomic stability level and helps in reducing output volatility as well (Chami, Hakura and Montiel, 2009).

A significant flow of remittances can cause an appreciation of the real exchange rate that adversely affects external competitiveness and the tradable sector of the receiving economy. The appreciation of exchange rate makes imports cheaper and exports relatively more expensive which in turn affects the trade balance of the country. The increase in household income raises the prices in the non-tradable sector of the economy (Acosta *et al*., 2009). The increase in the prices of the non-tradable sector and the movement of resources from tradable to non-tradable sector appreciates the exchange rate. It also encourages labour to move from tradable to the non-tradable sector (Amuedo-Dorantes and Pozo, 2006), increasing the wages in the traded sector. As a consequence, it increases the production cost and prices and adversely affects the tradable sector (Acosta *et al*., 2007; Bussolo and Medvedev, 2008). Because of the loss of competitiveness in the international market and the movement of resources from the

non-traded sector, the traded sector of the economy is considerably deteriorated. This phenomenon is known as the Dutch Disease.

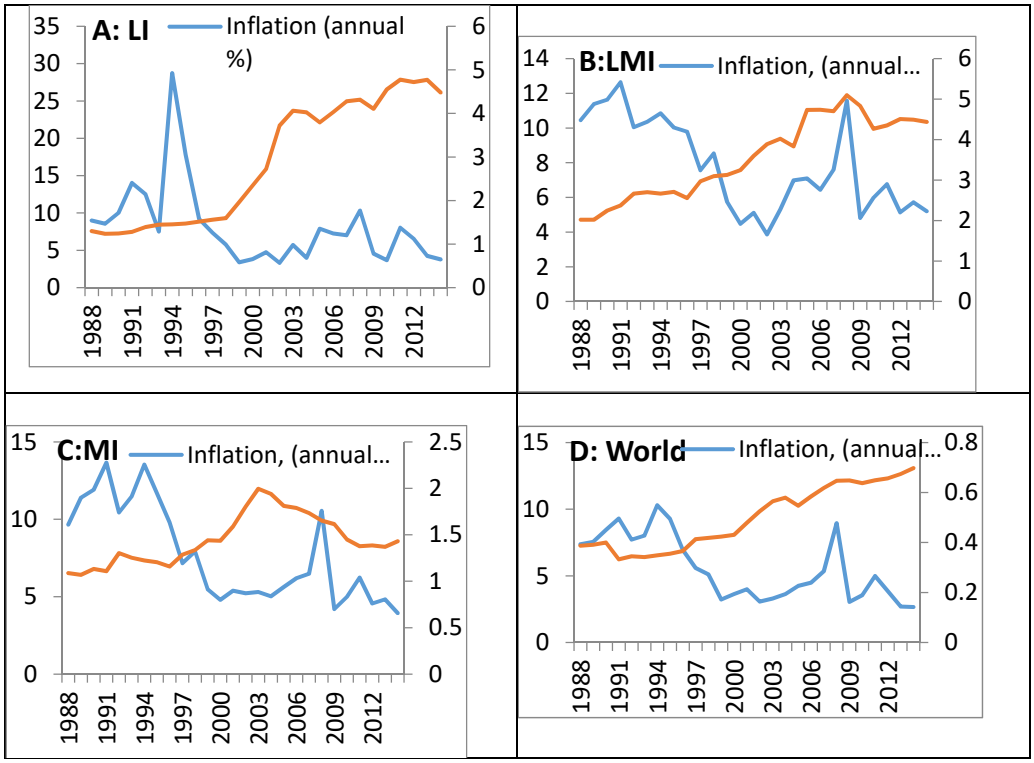
Remittances to developing countries surged to $93 billion in 2003, which represented a growth of over 200 percent as compared to 1990. Remittances have been rising continuously during the last four decades. According to the World Bank, more than 70 percent of this global movement went to developing countries and reached approximately $206 billion in 2006. The primary source of the remittance is the US, fact enhanced by the economic boom of the 90s and temporary removing the migration (Global Monitoring Report 2004). There is a decreasing trend in remittance growth since 2012. It reached 4.1 % in 2012 and 0.4% in 2015, due to an uneven recovery in developed countries and in the Russian economy, exchange rate effect, tighter immigration control, conflicts and driving forced migration and displacement. In LI and LMI income countries its growth rate declined from 12.5% to 5.6%. Figure 1 shows the remittance and inflation trends by group for the 1988-2014 period. Figure I (a) show that in the LI group, the highest average inflation rate was 28.74% (1994) and the lowest 3.77% (2014). In the LMI group the inflation rate fluctuates between 12.64% (1991) to 3.88% (2002). Similarly, the average inflation trends in the MI group change in the same way. In MI countries the highest rate of inflation was noticed in 1991 that is 13.66% while the lowest was 3.94% in 2014. The similarities in the highest inflation trends are caused by the 1990s global currency crises, due to which, beginning with New Zealand in 1989, most of the countries shifted from fixed exchange rate regime and adopted inflation targeting monetary policy.

The remittances inflow and inflation trends in each economy are rather different. Figure 2 (a, b), show that India from the lower middle-income group is a top remittance receiver with $70.97 billion (with *0.6 % growth*), followed by China and Mali, where remittance consists of 8.004% of their GDP in 2014. From the low-income group, Mali, Ethiopia, Madagascar and Togo receive the highest remittance, namely $624.37, $427.48 and $344.76 million. In the Madagascar economy, inflation goes up from 5.8% to 6.08% and remittances decrease from 4.02% to 3.92% of GDP (2013-14). The highest inflation ever recorded for Madagascar was 49.08% in 1995, while the lowest was -1.22% in 2003. In the LMI group, India remains on top in this group, followed by the Philippines ($28.4 billion), Nigeria ($20.92 billion), and Pakistan ($17.066 billion). Moreover, in Pakistan, remittance growth was 16.6%, currency appreciated, and inflation rate went down to 7.19%. Pakistan economy faced the maximum inflation rate (25%) during the global financial crisis in 2008.

Similarly, worker remittances are the second biggest source of the capital inflow in middle-income countries due to low-cost transfer facilities. In this group, the countries which saw robust growth include China, Mexico, and Thailand. China hosted $62.33 billion, while Mexico and Thailand received $24.46 and $5.65 billion respectively (World Bank, 2015). The increasing trend of remittances in Philippine did not affect the domestic prices and a decreasing trend in the inflation rate is observed in the economy.

Figure 1

Remittance and Inflation Trends

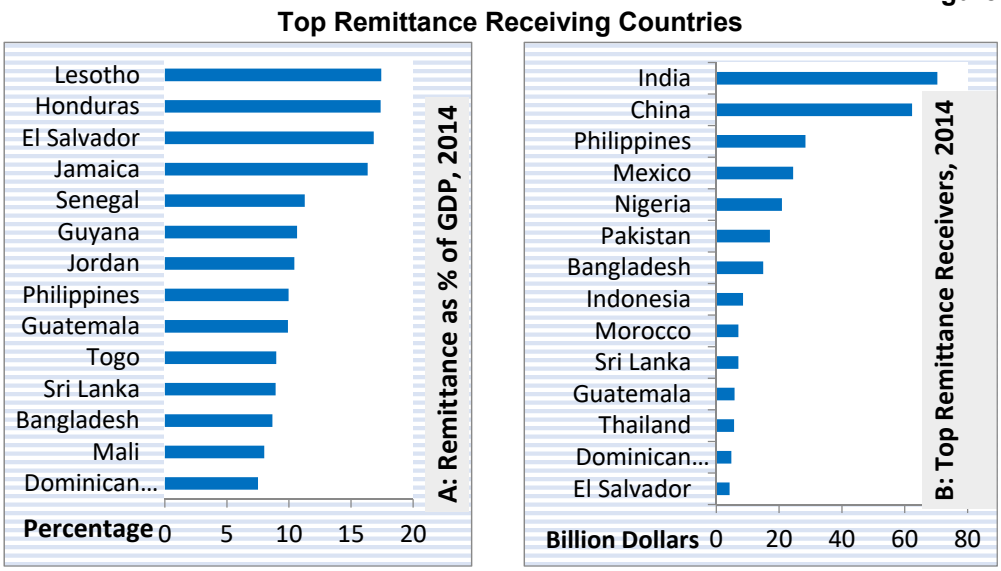


Source: World Bank development Indicators (WDI).

Summing up, remittance inflows and the inflation rate varies in different groups. Therefore, the expected relationship between the variables could be different in all countries in the same group. The top remittance receiving countries both as volume and share of GDP are shown in Figure 2.

Numerous researchers oriented their reseach towards the relationship between inflation and remittance. Arellano and Bond (1991) and Arellano and Bover (1995) find a long-term relationship between remittance and inflation. Amuendo-Dornates and Pozo (2004), Moline and Bussolo (2007), Narayan *et al*., (2011) show that remittance is a leading factor which causes an increase in inflation. Reinhart and Rogoff (2004) find that the remittance flow raises price levels under a flexible exchange rate regime. In addition to this, Buch and Kuckulenz (2004) study the impact of worker remittances and capital inflow to developing countries. The results of this study using OLS technique reveal that remittances have a negative relationship with inflation. Iqbal and Abdus (2005) investigate the effect of workers remittance on the labour force participation rate and find that remittance exerted upward pressure on prices. Irfan (1986) examined the relationship between remittances and consumption and claimed that remittance cause inflation. Cáceres and Saca (2006) explore the relationship between remittance and inflation and their results indicate the causality running from remittance to inflation.

Figure 2



Balderas and Nath (2008) investigate the causal link between inflation and remittance and observe a positive relationship. By using the GMM approach, Narayan and Mishra (2011) conclude that the upward trend in remittance raises domestic prices (money supply channel). Furthermore, remittances have a significant and positive impact on inflation both in the short and in the long run. Castillo-Ponce (2011) examines remittance impact on inflation, and finds that inflation and remittance have long term relationship. Nazir *et al*. (2012) examine the effect of capital inflow on inflation by using cointegration and a VECM model and notice a positive link between the two. Khan and Islam (2013) examine the relationship between remittances inflows and inflation using the vector autoregressive (VAR) approach. The findings reveal that 1 percent growth in remittance inflow in the long-run raises inflation by 2.48 percent. They did not find any significant trace of evidence in the short-run. Ball, Lopez & Reyes (2013) tested the same effect in 21 emerging countries. They used panel vector autoregression technique and the results suggest that under a fixed exchange rate regime, remittances increase the money supply and cause inflation. Mughal (2013) discusses the developmental role of remittance in Pakistan, and the approach suggests that remittances cause inflation due to an increase in products demand. Iqbal *et al*. (2013) and Thang (2013) investigate the relationship between remittance and inflation and affirm that remittance has a positive effect on inflation. Nisar and Tufail (2013) examine the effect of remittance on different categories of inflation using VECM technique in Pakistan and the results reveal that the remittance is positively correlated with inflation and have a positive impact on its various groups. Abdul-Mumuni and Quaidoo (2016) studied the impact of remittance on inflation in Ghana using ARDL approach and find the long-term relationship between the two. Adhikari and Guru-Gharana (2014) investigate the nexus between the remittance and domestic price by applying OLS approach and conclude that remittance has no sizeable impact on the inflation in India.

This study is intended to find answers to the following questions. Have the prices gone up due to remittance inflow? If yes, which income group suffered most? What is the impact of remittances if they are used for consumption or saving? Furthermore, are the group results consistent with the individual economy? Finally, is this a global phenomenon or an individual problem?

The choice of statistical method is important in empirical analysis (Nazlioglu *et al*., 2011). The above stated empirical studies are mostly country specific and suffer from data and methodological limitations. This study constructed a new remittances series by adding "worker remittances", "Migrant Transfers" and "compensation of employees" to overcome the data limitation. The informal flow consists of 10% to 40% of total remittance, in the absence of "Migrant Transfers" and "compensation of employees" data, this figure rose to 60% of the total remittance. So, in that case, the outcome cannot project the real happenings in the economy. The new series has never been used before to check the remittance inflation relationship empirically. Due to a significant number of parameters, limited observations and the potential endogeneity problem, the use of Ordinary Least Squares (*OLS*) is not suitable in this case. Therefore, the use of System Generalized Method of Moment Regression (*SGMM*) can be more useful in this situation. Also, the economic and social conditions in each economy are different. Basically, monetary and fiscal policy, exchange rate regime and the level of unemployment, productivity and remittances as a share of the economy are different. So, the effect of remittances on prices may vary from country to country. This study fills this gap using bootstrap panel Granger causality test along with cross-sectional dependency and the slope homogeneity approach. This technique has several benefits such as: (i) this procedure does not assume that the panel is homogeneous as it tests for the Granger causality on each member separately. Though contemporaneous correlation is allowed, that helps in exploiting the extra information provided by the panel data setting. (ii) This technique does not require pre-testing for cointegration and unit root (as it generates the country specific bootstrap critical values). (iii) This technique allows us to identify how many and for which panel member there exists two ways, one-way or no Granger-causality. This study makes a contribution to the existing literature by providing further evidence of a relationship between inflation and remittance. It is the first research that examines the causality between the remittances and inflation taking panel countries. After addressing the concerns related to endogeneity, data and methodology, the results reveal that the relationship between remittances and inflation is more country specific.

This paper is organised as follows. Section II deals with the data and methodology used in this study. Section III discusses the empirical findings while Section IV concludes this study and offers a discussion on policy implications.

2. Data and Methodology

2.1 Data

This study uses annual data covering the period from 1988 to 2014 for 58 countries, considering the LIC, LMI and MIC groups. We intend to find a nexus between remittance and inflation. This study defines remittances as the sum of the "worker remittances", "Migrant Transfers" and compensation of employees" and in all

regressions used as the % of GDP (see the Appendix). The consumer price index (CPI, 2010=100) is representing the domestic prices, and all data series are collected and compiled from the World Bank development indicators (WDI, 2015). The other explanatory variables in this approach are: exchange rate (*EXR*), Money and quasi-money M2 % GDP (*M2*), Gross national expenditure (*GNE*) as % GDP, Trade openness (*TOPN*) and GDP are used as a proxy for productivity (*PROD*). Also, Capital market development (*CMD*) is the sum of foreign direct investment and official development assistance (*FDI + ODA*). This study also used two interaction variables such as; (*REM*HHCE*) and (*REM*GS*). These two terms explain the consumption and saving behaviour due to remittances and its impact on the prices.

Due to unavailability of data in the panel setting, this study ignores the remittances flow coming from informal channels such as friends, relatives, Hundi (Hawala). The legislation against money laundering reduced the informal movement of money in the word. However, it is quite difficult to judge the way in which the informal flow of remittances can affect the empirical findings our research. Nevertheless, this is a common problem in the all previous research on remittances. If other things remain constant, we can expect that unofficial flow can have an added effect on the inflation of the host economies.

2.2 Methodology

To empirically estimate these relationships, we divide our study into two parts. In the first section, we check the impact of remittances on the exchange rate and exports in each group. In the second section, this study will estimate the causal relation between the stated variables in the individual economy.

2.2.1 Group Effect using SGMM Technique

In another study, Rajan and Subramanian (2005) used the distance from the country of origin as an instrumental variable for the remittance. These variables do not vary over the time so, because of this drawback, we did not use them in the panel framework. To deal with the endogeneity problem, we use the System Generalized Method of Moment Regression (hereafter *SGMM*), proposed by the Arellano and Bover (1995). To estimate the impact of remittance and other variables along with two interaction terms on CPI we estimated the following equation:

$$CPI_{it} = \alpha_0 + \alpha_1 CPI_{i,t-1} + \alpha_2 REM_{it} + \alpha_3 (REM * HHCE)_{it-1} + \\ + \alpha_4 (REM * GS)_{it} + \alpha_5 X_{it} + \varepsilon_{it} \quad (1)$$

where: $CPI_{i,t-1}$ is representing the initial CPI, REM_{it} is the remittance, $(REM * HHCE)_{it-1}$ is the previous period consumption due to remittance inflow, $(REM * GS)_{it}$ is the remittances used for saving. The X_{it} is in place of other explanatory variables and instrumental variables such as: exchange rate (*EXR*), Money supply (*M2*), Gross national expenditure (*GNE*), Trade openness (*TOPN*), Capital market development (*CMD*) and productivity (*PROD*). In the equation (1), ε_{it} is the error term. The demographic change variable (Age dependency ratio) is used as an exogenous instrument in the regression equations. The results of regression (1) using SGMM test are shown in Table I.

2.2.2 Cross-sectional Dependence and Homogeneity

It is important to check the possible cross-sectional dependency across the countries before examining the bootstrap Granger causality test in the panel framework. Due to the globalisation and significant cross-border movement of workers, financial integration and international trade, it is entirely possible that a shock affecting one country can also affect the others in the panel. Pesaran (2006) carried out a Monte Carlo experiment and emphasised the importance of the cross-sectional dependence test and explained the possible size distortions and bias when it is ignored. Before carrying out causality test and imposing causality restrictions on the estimated parameters, it is also important to see whether the slope coefficients are treated as homogeneous and heterogeneous. According to Granger (2003), the causality running from one variable to another by imposing the joint restriction for the panel is the strong null hypothesis. Moreover, the homogeneity assumption for the parameter is not able to capture the heterogeneity because of the country-specific characteristics (Breitung, 2005).

Following the above discussion, we start our empirical work with testing for cross-sectional dependence and the slope homogeneity across countries. Based on the outcomes of these two tests, we will decide which causality method we should employ to check the direction of the causality relation between remittances and inflation. To test the causal relationship we selected 58 countries from the LI, LMI and MI groups. The detail descriptions of the econometric methods used are hereafter.

2.2.3 Cross-sectional Dependency Tests

To check the presences of the cross-sectional dependence, Breusch and Pagan (1980) proposed Lagrange multiplier test (LM hereafter). This technique is widely discussed and extensively used in the empirical studies. The technique to compute Lagrange multiplier test requires the estimation of the following model:

$$y_{it} = \alpha_i + \acute{\beta}_i x_{it} + \varepsilon_{it} \; for \; i = 1,2,3,\dots\dots,N; t = 1,2,3,\dots\dots..,T \quad (2)$$

where: *i* and *t* are the cross section and time dimension respectively, while x_{it} is the k_{x1} vector of the explanatory variables. In the equation (2), α_i and β_i are the intercept and slope that varies across the countries. The null and alternative hypothesis of LM test is described as:

H_0: $Cov\,(u_{it}, u_{it}) = 0$, $for\ all\ t\ and\ i \neq j$

H_1: $Cov\,(u_{it}, u_{it}) = 0$, $for\ at\ least\ one\ pair\ of\ i \neq j$

To test the null hypothesis of no cross section against the alternative hypothesis of cross-sectional dependency, Breusch and Pagan (1980) proposed *LM* statistic as:

$$LM = T \sum_{i=1}^{N-1} \sum_{j=i+1}^{N} \hat{\rho}_{ij}^2 \quad (3)$$

where: $\hat{\rho}_{ij}^2$ is the sample estimate of pair wise correlation from OLS estimation of equation (2) for each *i*. The LM test statistic has asymptotically distributed as chi-square with *N* (*N* □1) / 2 degrees of freedom under the null hypothesis. The LM test is valid with relatively small N and comparatively large T. The shortcomings of LM test are solved by Pesaran (2004) by following scaled version of this test that is:

$$CD_{lm} = \left(\frac{1}{N(N-1)}\right)^{1/2} T \sum_{i=1}^{N-1} \sum_{j=i+1}^{N} (T\hat{\rho}_{ij}^2 - 1) \quad (4)$$

Under the null hypothesis, the CD_{lm} test has the standard normal distribution with T→∞ then N→∞. The CD_{lm} test is applicable on the large N and T but it exhibits the size distortions when N is large, and T is small. To overcome the shortcoming of LM and CD_{lm} test, Pesaran (2004) proposed *CD* test statistic as:

$$CD = \sqrt{\left(\frac{2T}{N(N-1)}\right)} \left(\sum_{i=1}^{N-1} \sum_{j=i+1}^{N} \hat{\rho}_{ij}^2\right) \quad (5)$$

Under the null hypothesis, for any value of *N* and *T* the *CD* test has asymptotic standard normal distribution.

2.2.4 Testing Slope Homogeneity

It is also crucial in the panel causality studies to know whether the slope coefficients are heterogeneous or homogenous before imposing the causality restrictions (Granger, 2003). The null hypothesis of slope homogeneity against the alternative heterogeneity can be described as:

H_0: $\beta = \beta_i \ (for\ all\ i)$

H_1: $\beta_i = \beta_j \ (for\ a\ non-zero\ friction\ of\ pair-wise\ slopes\ for\ i \neq j$ (*Apply F-test*)

The *F* test is only valid if; the time dimension (T) of the panel is large and cross section dimension (N) is small; the explanatory variables should be exogenous, and the error variance is homoscedastic. Swamy (1970) developed the slope homogeneity test by relaxing homoscedasticity assumption in the *F* test. This approach is based on the individual slope estimates from a suitable pooled estimator. Though, both of these tests require the panel model where *N* is small about the *T*. Pesaran and Yamagata (2008) extended Swamy's version and proposed $\tilde{\Delta}$ test for testing the slope homogeneity in a large panel.

The $\tilde{\Delta}$ the test is valid as (N, T) → ∞ deprived of imposing any limitation on the relative expansion of the T and N once the error term is normally distributed. The modified version of the Swamy's test is:

$$\tilde{S} = \sum_{i=1}^{N} (\hat{\beta}_i - \tilde{\beta}_{WFE})' \frac{x_i' M_\tau x_i}{\widetilde{\sigma_i^2}} (\hat{\beta}_i - \tilde{\beta}_{WFE}) \quad (6)$$

where: $\hat{\beta}$ is pooled OLS while, $\tilde{\beta}_{WFE}$ is the weighted fixed pooled estimator. In addition to this, $\tilde{\sigma}_i^2$ is the estimator of σ_i^2 and M_τ represents the identity matrix[5].

The standard dispersion can be stated as:

$$\tilde{\Delta} = \sqrt{N} \left(\frac{N^{-1}\tilde{S} - k}{\sqrt{2k}}\right) \quad (7)$$

The null hypothesis with the condition (N, T) → ∞, $\sqrt{N}/T \to \infty$ and lastly the error terms are normally distributed, the $\tilde{\Delta}$ test has asymptotic normal distribution. The following

[5] *For the details regarding estimator and Swamy's test see Pesaran and Yamagata (2008).*

bias adjusted version can improve the small sample properties of $\tilde{\Delta}$ test under the normally distributed errors. The bias adjusted version is stated as:

$$\tilde{\Delta}_{adj} = \sqrt{N}\left(\frac{N^{-1}\tilde{S} - E(\tilde{z}_{it})}{\sqrt{var(\tilde{z}_{it})}}\right) \quad (8)$$

where: $E(\tilde{z}_{it}) = k$ is the mean and the variance is $var(\tilde{z}_{it}) = \frac{2k(T-k-1)}{T+1}$

2.2.5 Bootstrap Panel Granger Causality Test

The Granger causality means that the information of the past value of one variable (X) helps in improving the forecast of another variable (Y) (Granger, 1996). Despite the fact, different causality approaches have been proposed (see Kar *et al*., 2011). However, the panel bootstrap causality approach developed by the Kónya (2006) account for both country-specific heterogeneity and cross-sectional dependence. This technique has many advantages. Firstly, this procedure does not assume that the panel is homogeneous as it tests for the Granger causality on each member of the panel separately. Though contemporaneous correlation is allowed, that helps in exploiting the extra information provided by the group data setting. Second, this technique does not require pre-testing for cointegration and unit root (as it generates the country specific bootstrap critical values), but still requires the specification of the lag structure. It is an essential characteristic of panel bootstrap Granger causality test as the unit-root and cointegration tests suffer from low power and different tests lead to differing outcomes. Thirdly, this technique allows us to identify for how many and for which panel member there exist two ways, one-way or no Granger-causality.

The panel causality approach is based on a bivariate finite order vector autoregressive model, and we apply it our context to remittance (*REM*) and Inflation (*CPI*). The system of the Granger causality test is formulated for our panel settings as:

$$CPI_{1,t} = \alpha_{1,1} + \sum_{j=1}^{p_{y1}} \beta_{1,1,j} CPI_{1,t-j} + \sum_{j=1}^{p_{x1}} \gamma_{1,1,j} REM_{1,t-j} + \varepsilon_{1,1,t}$$

$$CPI_{2,t} = \alpha_{1,2} + \sum_{j=1}^{p_{yi}} \beta_{1,2,j} CPI_{2,t-j} + \sum_{j=1}^{p_{xi}} \gamma_{1,2,j} REM_{2,t-j} + \varepsilon_{1,2,t}$$

$$CPI_{N,t} = \alpha_{1,N} + \sum_{j=1}^{p_{y1}} \beta_{1,N,j} CPI_{N,t-j} + \sum_{j=1}^{p_{x1}} \gamma_{1,N,j} REM_{N\ t-j} + \varepsilon_{1,N,t}$$

And ..... **(A)**

$$REM_{1,t} = \alpha_{2,1} + \sum_{j=1}^{p_{y2}} \beta_{1,1,j} CPI_{1,t-j} + \sum_{j=1}^{p_{x2}} \gamma_{2,1,j} REM_{1,t-j} + \varepsilon_{2,1,t}$$

$$REM_{2,t} = \alpha_{2,2} + \sum_{j=1}^{p_{yi}} \beta_{2,2,j} CPI_{2,t-j} + \sum_{j=1}^{p_{xi}} \gamma_{2,2,j} REM_{2,t-j} + \varepsilon_{2,2,t}$$

$$REM_{N,t} = \alpha_{2,N} + \sum_{j=1}^{p_{y2}} \beta_{2,N,j} CPI_{N,t-j} + \sum_{j=1}^{p_{x2}} \gamma_{2,N,j} REM_{N\ t-j} + \varepsilon_{2,N,t}$$

In the system (A) *i (i= 1, 2…, N)* means the country*, t (t= 1, 2… N*) represents the period, while *j* lags and p_{1i} and p_{2i} are the indications for the longest lag in the system which differ across the variables but same across the each equation. For each possible pair we assume 1 to 4 lags and then choose the one that minimises the Schwarz Bayesian Criterion[6]. In the system (A), the error terms ($\varepsilon_{1,i,t}$ and $\varepsilon_{2,i,t}$) are white noises and are correlated each other for a given country but not across the countries. The Seemingly Unrelated Regressions (SUR) procedure is being used to estimate the system (A). Subsequently, the possible link may exist between the individual regressions via coexistent correlation within the two equations. The Wald test for the Granger causality is performed with each country specific bootstrap values that are generated by simulations.

Too many or few lags can cause problems for instance; too few means some variables are gone from the model and this cause bias in the remaining regression equation that leads to incorrect results. Conversely, too many lags waste observation that increases the standard error and making outcomes less reliable.

As per the system (A), in the country *i* there is one-way Granger causality running from *REM* to *CPI* if all $\gamma_{1,i}$ are not zero but in the second equation all $\beta_{2,i}$ should be zero. However, otherwise in the case of *CPI* to *REM.* There will be two-way causality between the variables if neither all $\gamma_{1,i}$ nor $\beta_{2,i}$ are zero. Lastly, there will be no causality between *REM* and *CPI* if both $\gamma_{1,i}$ and $\beta_{2,i}$ in the system (A) are zero[7].

3. Results

3.1 SGMM Results

The results of the remittance and inflation nexus using SGMM approach in the three income groups are summed up in Table 1. The findings report that remittances have a negative and significant impact on the prices in LI, LMI, while positively affecting them in the MI group. The exchange rate volatility has a deflationary effect in LMI, however it is the reason causing inflation in the LI and MI groups. The flow of remittances is the life blood for the LI and LMI countries because it helps in reducing financial constraints and fulfils the credit needs of the financial market. In the LI and LMI countries, remittances are used for small-scale production that increases the output and pushes the inflation down (Iqbal *et al.,* 2013). The appreciation of exchange rate increases the purchasing power of the consumers, consumer goods, capital goods and raw materials; thus, it is supposed to have a deflationary effect on inflation. Therefore, appreciation in the exchange rate due to worker remittance declines inflation. The MI countries are more financially stable, and a major portion of remittances are used to improve living standard, which ultimately increases the demand for goods and services and demand for money increases. According to Cáceres and Saca (2006), remittances increase consumption patterns with no increase in output growth as they boosts the prices of the commodities in the recipient economy. Being a stable source, remittances positively contributes to the accumulation of foreign reserves and therefore cause a surplus in the

[6] *As proposed by Kónya (2006), the causality results critically depend on the lag structure.*
[7] *As per Kónya (2006), this definition implies causality for one period ahead.*

balance of payment account. Failing to sterilise the rise in foreign reserves will wider the monetary base and appreciate the exchange rate. Therefore, there will be an increase in the prices (Bugamelli & Paternò, 2009). The results show that capital market development negatively affects the prices whereas; gross national expenditure and productivity are positively influencing it in three groups. Fiscal policy through the expansion of government spending stimulates economic growth. This, in turn, will lead to high inflation and to government budget deficit in developing countries. The deficit in the governmental budget needs to be financed through borrowing from the domestic and international institutions, or prompts the central bank to increase the supply of currency by printing new money. Thus, the fiscal deficit of the government finances enhances the liquidity of government spending resulting in an increase in aggregate demand, leading to inflationary pressures in the economy.

Table 1

Remittances and Inflation (SGMM Results)

	Low Income			Lower-Middle Income			Middle-Income		
Variable	**Coef.**	**[95% Conf. Interval]**		**Coef.**	**[95% Conf. Interval]**		**Coef.**	**[95% Conf. Interval]**	
CPI(-1)	1.021*	1.001	1.040	1.067*	1.059	1.074	1.026*	1.019	1.032
REM	-0.498*	-0.826	-0.170	-0.27*	-0.341	-0.209	0.399*	0.201	0.598
EXR	0.021*	0.011	0.027	-0.027	-0.001	0.094	0.223**	0.008	0.437
M2	0.0457	-0.010	0.102	-0.06*	-0.075	-0.051	-0.031 *	-0.039	-0.021
CMD	-0.0641	-0.173	0.043	-0.015	-0.072	0.041	-0.115*	-0.187	-0.042
GNE	0.127*	0.068	0.186	0.059*	0.035	0.083	0.036**	0.002	0.074
GDP	1.367**	0.159	2.574	1.343*	0.942	1.743	0.524*	0.235	0.814
TOPN	0.017	-0.029	0.027	0.084**	0.041	0.163	-0.031	-0.011	0.501
REM*CON (-1)	0.6595	-0.835	2.154	0.936*	0.349	1.523	-0.614**	-1.214	-0.015
SAV	0.070	-0.078	2.154	0.03*	0.021	0.038	-0.12*	-0.19	-0.510
C	-26.91*	-0.007	-13.71	-18.5*	-23.56	-13.55	-3.237	-8.28	1.804
Countries	10			25			19		
Obs.	260			650			494		
AR(2)	0.104			0.574			0. 301		
Sargant test	0.324			0.342			0.965		

Note: *, **, *** represent significance at 1, 5 and 10 %. EXR and EXP are the dependent variables in two regression equations.

The historical prices have significant and positive effects on the future inflation. A relatively high inflation rate in the past leads to higher inflation equilibrium by making disinflation more expensive for backward-looking inflation expectations (Cotarelli, 1998). Previous period consumption and saving due to remittance inflow has a positive effect on future prices in LI and LMI, while otherwise in the MI group. Due to the limited production capabilities in LI and LMI, if the major portion of remittances is used for consumption and saving that appreciates the exchange rate, affect the tradable sector and increases domestic prices.

The results of Hansen test confirm the validity of our instruments and autocorrelation AR (2) test exhibits no second order serial correlation in our models. In the next section, we will discuss the country specific effect due to the remittance inflow.

3.2 Cross-sectional Dependence, Homogeneity and Panel Causality Results

In the light of above mentioned aspects, in order to select an appropriate estimator in the panel causality, it is imperative to test for cross-sectional dependence and the slope homogeneity across countries. To examine the cross section dependence, we conducted three tests (*LM, CD*$_{lm}$, and *CD* test) and reported the results in Table 2. The results reveal that the null hypothesis of no cross section dependence across the countries is not accepted for all tests at all significance levels suggesting that *SUR* approach is more suitable than the country by country OLS estimation[8].

More specifically, the results advocate for transmission shocks from one country to another in the same group. The results of three slope homogeneity tests ($\tilde{S}$, $\tilde{\Delta}$, *and* $\tilde{\Delta}_{adj}$**)** are also shown in Table II. The null hypothesis of slope homogeneity is rejected in the three tests at all significance levels, supporting the country specific heterogeneity.In other words, a significant economic relationship in one income group country is not transmitted in other.

Table 2

Cross-sectional Dependency and Homogeneity Tests

Test	Low Income		Lower-Middle Income		Middle Income	
	Rem	CPI	Rem	CPI	Rem	CPI
LM	69.129***	199.548***	405.685***	672.201***	513.974***	627.681***
CD_{lm}	2.543***	16.291***	4.315***	15.195***	11.602***	16.657***
CD	2.804***	10.71***	2.564***	13.138***	6.282***	12.358***
$\tilde{S}$	910.629***	188.675***	3952.31***	561.46***	812.44***	4769.329***
$\tilde{\Delta}$	201.386***	39.953***	555.41***	75.866***	116.397***	699.808***
$\tilde{\Delta}_{adj}$	8.244***	1.629**	22.747***	3.096***	4.757***	28.666***

Note: (1): *** and ** mean the significance at 1, 5 % levels; (2) LM, CD_{lm} and CD tests are the cross-sectional dependence tests proposed by Breusch and Pagan (1980) and Pesaran (2004). (3)$\tilde{\mathbf{S}}$**,** $\tilde{\Delta}$ and $\tilde{\Delta}_{\mathbf{adj}}$ are the slop homogeneity tests of Swamy (1970) and Pesaran et al. (2008) respectively.(4) The cross-sectional dependence tests are performed in EVIEWS 8 and for slope homogeneity tests we use GAUSS 10 software.

The outcomes of both cross-sectional dependence and slope heterogeneity in the three income groups support the appropriateness of the bootstrap panel Granger causality approach. The outputs using this method are illustrated in Table-3 (A, B, C) (in the Appendix) while causality results in three income groups are summarised below:

[8] *The cross-sectional dependency further indicates that inspecting causal link between remittance and the export competitiveness in the LI, LMI and MI countries requires as this info in estimations of causality regressions. The SUR approach is more efficient in the presence of the cross-section dependence, than country by country OLS method (Zellner, 1962). Hence, the causality outcomes from the SUR estimation procedure developed by Zellner (1962) will be more consistent than those obtained from OLS estimation.*

	REM CPI	*CPI REM*	*REM CPI*
LIC	-Guinea-Bissau, +Tunisia	+Guinea-Bissau,	Guinea-Bissau
LMC	+Bangladesh, +Cote d'Ivoire, +El Salvador, +Guatemala, - Kenya, + Lao PDR, + Morocco, + Nigeria, - Sudan	+Bolivia, +Cameroon, -Lesotho, -Papua New Guinea, + Sri Lanka	No evidences
MIC	+Botswana, -Colombia, +Dominican Republic, + Ecuador, - Jordan, + Turkey	-Algeria, + Belize, -Brazil, + Jamaica	No evidences

The results show that remittances negatively cause prices in Guinea-Bissau while positively affecting it in Tunisia. However, CPI is only causing REM in Guinea-Bissau.

The two-way causality is only observed in Guinea-Bissau from the LI group. In the LMI group, one-third countries supported the remittance-inflation hypothesis. In this group except for Kenya and Sudan, all other countries such as: Bangladesh, Cote d'Ivoire, El Salvador, Guatemala, Lao PDR, Morocco and Nigeria remittances are positively causing inflation. On the other hand, CPI is negatively affecting the remittance inflow in Lesotho and Papua New, whereas positively boosting its inflow in Bolivia, Cameroon, Guinea and Sri Lanka. In the MI group, one-way causality is running from REM to CPI and is obtained in one-fourth of the sample countries. The positive effect of remittances on prices is observed in Botswana, Dominican Republic, Ecuador and Turkey, however an inverse relation was witnessed only in Colombia and Jordan. In the *REM-CPI* relationship, we find no proofs that support the two-way causality hypothesis in the LMI and MI groups. Similarly, in all other cases no causality evidence are found in the three income groups. It is interesting to note that remittance inflow is affecting the domestic prices of one-fifth of LI, one-fourth of MI and one-third of LMI countries. Table III reports the strong causality evidence between the two variables in LMI countries. However, regarding the sign, we find mix results in the three income groups. In few cases, our results are consistent with existing literature but do not hold in for all countries. Summing up, remittances are an important determinant of inflation in many countries, but results do not support this assumption in all countries. Therefore, we can carefully say that the relationship between remittances and inflation varies from country to country.

4. Conclusions

This study examines the empirical relationship between remittance and inflation for LI, LMI and MI groups, using the *SGMM* and bootstrap panel Granger causality approach over a period from 1988 to 2014. The results from three groups reveal that there is both cross-sectional dependence and slope homogeneity, considering the fact that the countries in these income groups have common economic characteristics and are influenced by globalisation. Apart from this, any substantial economic relationships in one will not transfer into the other country. The major outcomes using SGMM approach are as follows. Remittances inflow affects prices negatively in LI and LMI however exchange rate causes deflationary situation only in LMI countries. In the MI group, both remittances and exchange rate put upward pressure on the prices. To be more specific, remittances use for consumption and saving cause inflation in LI and LMI countries while the negative relation between the two variables was observed in MI countries. The

results further show that remittances used other than investment (saving, consumption) positively affect the prices in LI and LMI groups.

The main findings of bootstrap panel Granger test are as follows. Remittances do Granger-cause inflation mainly in LMI countries. However, upward pressure on prices due to remittances inflow was observed on one-fourth of MI and about one-fifth of the LI countries. Apart from Kenya and Sudan, remittances positively affect prices in the LMI group while we find mix evidence in LI and MI groups. The two-way causality is only observed in Guinea-Bissau from LI group. In all other cases, we did not find causality evidence in the three income group. This leads to the general conclusion that remittance and inflation nexus is more country specific.

The results indicate that remittances can cause inflation for economies. As a consequence, this may involve welfare costs and therefore, in the economic decision-making, it is important to consider the positive and negative impacts of remittances.

The remittances are mostly used for food consumption in the LI or LMI groups. Therefore they contribute in the health status of recipient households but uplift the prices in the recipient economy. Hence, to ensure the price stability, the government must take serious policy measures regarding bumper stock of staple food. Clearly, additional steps to boost the supply of agricultural products and productivity are essential for GDP growth and low inflation.

However, as the receiving family continuously is subject to remittance money, it become more solvent. After attainment of a reasonable life standard, they consider upon investing in other sectors. If the investments are not channeled towards the productive sectors and can flourish other markets, the effect of inducing inflation will spread in other areas as well. Remittances have some social cost, policies such as; Remittances Initiative program by Pakistan and Philippine can help in guiding funds towards the productive sector of the economy that boost economic growth. The financial intermediaries should be creative and prudent in attracting remittances, changing them into deposits and converting them into loans to the private sector.

Finally, the current banking policy regarding foreign currency holdings does not allow a buildup of private household's capital in the national banking system. The further liberalisation of foreign exchange accounts for remitters and private credit to non-traded sectors in foreign currency can encourage investment and dampen the effects of inflation. The possible weakness of this policy might be that it originates the higher risk of currency crises that few developing economies have experienced (Tornell, Westermann and Martinez (2003); and Tornell and Westermann (2005)). Nevertheless, household deposits, in contrast to the international portfolio flows, are quite unlikely to undergo sharp reversal.

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Appendix

Definition of the Remittance Variable

To study the remittance growth Nexus, we use 58 countries from 3 income groups for a period from 1988 to 2014. The remittances are calculated as the sum of “Migrant Transfers,” “Compensation of Employees” and “Workers' Remittances.” These three variables are taken from IMF’s are Balance of Payment Statistics Yearbook.

Workers' Remittances represent the current transfers made by the workers employed in another economy; these migrants are expected to stay a year or longer in that economy. Compensation of Employees stands for the salaries and benefits earned by nonresident workers for the work performed for residents of the other economy. This category includes workers such as border and seasonal workers along with local embassy staff. The migrant transfers are the source of capital flow arising from the individual migration from one economy to another. Worker remittances are a part of the current transfers into the current account, because compensation of employees and migrant transfers are added in the income component of the current employees and capital account respectively.

According to Balance of Payment Statistics Yearbook, compensation of the employees is excluded from the remittance in Argentina, Belize, Barbados, Brazil, Benin, China, Cambodia, Cote d'Ivoire, Cape Verde, Dominican Republic, El Salvador, Ecuador, Guyana, Rwanda, Panama, Seychelles, Senegal, and Turkey. Furthermore, according to IMF’s report, the migrant's transfers are recorded in the “other current transfers” for Malaysia and Kenya.

Table 3 Remittance-Inflation Causality Outcomes

A: Low Income Group

	REM **does not cause** ***CPI***					***CPI*** **does not cause** ***REM***				
			Critical values					***Critical values***		
LI Countries	**C**	**Wald test**	**1%**	**5%**	**10%**	**C**	**Wald test**	**1%**	**5%**	**10%**
Benin	-0.022	6.108	25.549	14.799	9.611	-0.328	3.443	20.316	14.020	10.390
Burkina Faso	-0.015	2.356	25.761	13.838	9.319	-0.200	0.845	26.276	14.638	10.806
Ethiopia	0.030	1.237	25.017	12.812	9.399	0.110	0.298	24.110	15.338	11.525
Guinea	0.024	5.709	22.226	9.315	6.268	0.418	2.076	26.416	15.413	11.086
Guinea-Bissau	-0.132	20.529	22.372	12.497	9.321	0.303	19.925	26.339	15.972	12.007
Madagascar	-0.092	1.066	23.921	11.289	7.868	0.312	3.857	35.027	15.900	11.805
Mali	0.021	2.373	22.541	12.226	8.592	0.160	1.330	29.199	15.045	10.587
Mozambique	0.100	7.145	23.160	11.079	7.347	-0.067	2.018	20.788	12.674	9.1422
Tunisia	0.068	21.322	14.462	8.101	5.652	0.161	7.038	22.892	11.953	7.9571
Togo	-0.009	0.021	27.346	13.256	9.030	0.582	6.768	31.949	17.254	11.214

(B): Lower-Middle Income Group

	REM **does not cause** ***CPI***					***CPI*** **does not cause** ***REM***				
			Critical values					***Critical values***		
Income	**C**	**Wald test**	**1%**	**5%**	**10%**	**C**	**Wald test**	**1%**	**5%**	**10%**
Bangladesh	0.060	27.735	40.397	20.540	14.65	0.150	1.593	54.490	32.154	23.526
Bolivia	-0.004	0.0161	45.788	20.727	14.18	1.025	11.906	36.706	16.560	12.266
Congo, Rep.	-0.005	0.2676	53.883	23.715	16.52	-0.015	0.0047	11.979	6.975	4.891
Cameroon	-0.016	4.8720	41.051	20.464	15.52	1.911	36.093	23.672	12.507	9.166
Cote d'Ivoire	0.044	20.516	39.493	18.923	13.88	-0.003	0.0037	35.676	14.066	8.740
El Salvador	0.098	43.028	39.082	22.259	14.75	0.089	2.253	26.308	14.771	10.448
Ghana	0.008	0.688	38.207	17.345	11.33	0.321	6.645	32.036	16.293	10.896
Guatemala	0.054	20.697	31.708	19.611	12.06	0.076	0.695	53.236	21.594	14.107
Guyana	0.012	7.8647	26.405	13.974	10.09	0.595	2.281	34.048	17.712	12.915
Honduras	-0.034	5.043	38.033	17.539	12.20	0.347	9.432	52.183	20.048	13.443
India	-0.032	5.709	29.425	14.945	10.03	0.315	8.149	30.872	18.199	13.565
Indonesia	0.045	7.227	30.045	15.230	10.27	0.174	1.180	26.926	17.340	12.698
Kenya	-0.119	70.829	31.691	15.964	10.11	-0.008	0.027	18.538	10.200	6.769
Lao PDR	0.059	19.663	23.115	12.186	7.702	-0.093	0.376	29.466	13.717	9.682
Lesotho	0.015	0.044	27.553	15.628	9.926	-0.412	18.682	33.228	17.318	11.752
Morocco	0.026	9.286	27.522	11.788	7.887	-0.043	0.129	26.172	12.181	8.817
Nigeria	0.051	13.725	34.636	17.947	10.86	0.081	0.243	26.763	11.927	8.261
Pakistan	0.028	5.816	25.353	11.601	7.944	0.197	6.119	22.601	12.393	8.241
Papua New Guinea	-0.009	0.495	23.061	12.741	8.564	-0.911	24.764	21.773	12.873	9.202
Philippines	-0.022	1.861	20.604	11.437	8.803	0.219	4.503	26.877	14.678	9.934
Senegal	0.043	2.666	21.169	12.398	8.525	0.043	0.284	51.254	29.912	20.912
Sri Lanka	0.222	5.187	22.745	12.403	7.853	0.108	17.684	35.781	23.718	17.800
Sudan	-0.145	46.011	25.107	11.458	8.326	0.058	1.021	28.991	15.384	10.550
Swaziland	-0.015	3.191	22.494	12.298	7.984	-0.188	2.009	50.172	32.981	26.163
Vanuatu	-0.043	6.000	19.817	11.395	7.620	-0.667	1.016	27.872	14.875	10.033

(C): Middle Income Group

	REM* does not cause *CPI					***CPI* does not cause *REM***				
			Critical values					***Critical values***		
Income	**C**	**Wald test**	**1%**	**5%**	**10%**	**C**	**Wald test**	**1%**	**5%**	**10%**
Algeria	-0.005	1.305	17.778	10.040	6.589	-0.696	21.226	40.403	18.387	12.839
Belize	0.360	0.097	23.360	11.243	7.250	0.698	18.086	25.391	12.486	8.389
Botswana	0.015	9.184	31.348	13.392	9.035	-0.521	9.141	29.792	16.756	11.358
Brazil	0.136	1.539	31.036	12.533	7.912	-0.066	23.107	28.651	14.697	9.503
China	-0.274	1.352	18.458	10.901	6.719	-0.058	1.535	26.080	15.206	9.828
Colombia	-0.020	16.965	24.021	11.711	8.783	0.012	0.040	26.440	12.469	8.755
Costa Rica	0.004	0.405	22.628	12.890	8.591	0.112	0.496	36.272	15.687	10.964
Dominica	-0.009	2.915	33.029	15.436	9.720	-0.012	0.0021	19.553	10.755	6.652
Dominican Republic	0.244	18.842	26.170	13.754	8.804	0.084	3.850	24.337	14.341	9.791
Ecuador	0.070	12.392	26.900	13.674	9.045	0.123	4.764	23.299	12.148	7.857
Fiji	0.010	3.900	26.355	15.059	10.53	0.426	2.602	31.315	16.503	11.064
Grenada	-0.890	4.890	18.459	11.282	7.528	-0.702	4.929	30.789	15.044	9.717
Jamaica	-0.023	0.110	29.768	14.060	9.393	0.245	21.556	28.532	15.425	10.770
Jordan	-0.033	9.018	21.501	12.431	7.875	-0.115	1.432	39.258	22.489	17.514
Malaysia	-0.006	0.041	22.607	12.160	8.292	0.378	2.604	28.781	14.636	10.403
Mexico	-0.042	1.352	21.731	11.433	7.573	0.124	6.031	32.931	15.945	11.021
Paraguay	-0.023	5.642	21.641	10.244	7.034	0.013	0.027	25.281	13.971	9.650
South Africa	-0.007	0.487	21.142	11.203	6.898	0.135	1.422	28.698	13.593	9.435
St. Lucia	0.013	4.620	21.283	10.600	6.910	-0.640	2.115	19.043	8.958	6.179
St. Vincent and the Grenadines	-0.005	1.390	38.235	15.004	8.455	0.282	0.398	15.403	8.764	5.605
Suriname	0.031	1.418	19.253	11.349	7.291	-0.006	0.0046	14.289	8.269	5.501
Thailand	-0.006	1.496	24.907	12.258	8.343	0.135	0.511	20.153	12.403	8.411
Turkey	0.153	233.07	24.060	12.469	8.926	-0.077	8.316	30.021	17.691	13.274

Note: We obtain these results running TSP codes in GiveWin software**.** ***, ** and * mean the significance at 1, 5 and 10% levels.

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