Finance, Institutions, Remittances and Economic growth: New Evidence from a Dynamic Panel Threshold Analysis

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Abstract

This paper empirically examines how the local financial development and institutions influence a country's capacity to take advantage from remittances over the period 1985-2014. We use a dynamic panel threshold model (see Hansen, 1999 and Caner and Hansen, 2004) to estimate remittances thresholds for long-term economic growth. The evidence strongly suggests that the impact of remittances on economic growth depends on the level of financial development and the institutional environment. More precisely, a strong institutional environment is sine qua non for the effective contribution of remittance to sustainable growth in ECOWAS countries. One of main contributions of this paper is to successfully identify the conditions under which the remittance has a positive impact on economic growth. This is crucial for governments in the ECOWAS area to improve institutional quality and the support they provide for the financial system, in their economies should therefore be a main priority for policy makers as there are gains to be made in terms of economic development. The results seem to indicate the design of policies that would facilitate simultaneous improvements in institutions indicators and financial development indicators.

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1   Introduction

Over the past decades, remittance flows accelerated and have grown to become an increasingly prominent source of external funding for many countries. Despite the increasing importance of remittances in total international capital flows, the role of remittances in development and growth is still not well understood. There is a considerable debate on the role of remittances to economic development process of developing countries. Theoretical and empirical research into the economic impact of remittances has produced highly mixed results. On the positive side, remittances help improves recipients' standard of living and encourage households' investment in education and healthcare. Moreover, remittances' contribution to growth increases at higher levels of remittances relative to GDP (Glytsos, 2002; WorldBank, 2008; Giuliano and Ruiz-Arranz, 2009; Rao and Hassan, 2011; Fayissa and Nsiah, 2011; Meyer and Shera, 2016). However, the negative view of remittances indicates that remittances can fuel inflation disadvantage the tradable sector by leading to an appreciation of the real exchange rate, and reduce labor market participation rates as receiving households opt to live off of migrants' transfers rather than by working. Some studies have found that remittances can have a deleterious impact on national economic growth in the medium and longer term - see, for example, (Chami et al., 2003, 2005; Lopez et al., 2007; Lartey et al., 2008; Acosta et al., 2009; Abdih et al., 2012). Finally, the third group finds no empirical evidence of any effect of remittance on economic growth (Chami et al., 2005; Leon-Ledesma and Piracha, 2004). Previous empirical studies on the economic impact of remittances produce mixed results. A better understanding of their impacts is needed in order to formulate specific policy measures that will enable developing economies to get the greatest benefit from these monetary inflows. To contribute to this growing debate, this paper tries to investigate the relationship between remittances and economic growth. In particular, this study examines how the local financial development and institutional environment influence a country's capacity to take advantage from remittances. An interesting possibility to explain this lack of robustness is the presence of threshold effects: the relationship between remittances and economic growth would not be linear but conditional on the different situations in which the economies are located. For example, Catrinescu et al. (2009) highlight threshold effects, showing that remittances have positive effects on long-term economic development when the institutional environment is healthy. The impact remains either negative or insignificant for low-quality institutions. They find that this result is even more relevant for poor countries. It is therefore clear that the relationship between remittances and growth would only be significantly positive beyond a threshold. A key question regarding threshold effects in the relationship between remittances and economic growth is to identify the factors that may explain this non-linearity. In this respect, the quality of institutions and the development of the financial system seem to play a key role. Demetriades and Law (2006) highlight the threshold effects - showing in 72 countries that, for a

financial development to have a greater impact on growth, when the financial system operates in a healthy institutional environment. The impact remains negative or insignificant when institutions are of low quality. Their results support the importance of a healthy institutional environment, especially in poor countries. Therefore, the quality of institutions seems to be a determining variable in the link between remittances and growth. This paper aims to test whether the effect of remittances on growth is conditioned by the quality of the institutions and/or the financial development of the beneficiary countries. In other words, a level of remittances alone cannot guarantee a substantial effect on the real performance of the economy and there always is a need for developed institutions and/or performing financial sectors to ensure that effect. It is therefore sought whether there is a threshold at which the remittance effect is significant. To answer these questions, this paper introduces a novel methodology (econometric approach) based on a dynamic panel model with threshold effects to determine whether the relationship between remittances and growth is different in each sample grouped on the basis of certain thresholds. Models with threshold effects are simple and efficient methods for capturing nonlinearities in cross-sectional and time series models. They divide the samples into classes based on threshold values. Indeed, there are several ways to identify the presence of a threshold in an economic relationship, according to the criteria used to determine the sample breaking points. Durlauf and Johnson (1995) applied this technique exogenously by arbitrarily selecting the sample breaking point into subsamples. To determine the existence of threshold effects between the two variables, we adopt a different approach to the traditional one where the threshold level is determined exogenously. However, under this approach, the number of regimes and the sample breaking point are chosen arbitrarily and are not based on any economic theory. Other limitations include the impossibility to compute the confidence interval of the threshold's break point. The robustness of the results of the conventional approach is likely to be sensitive to the threshold level. The econometric estimator generated on the basis of an exogenously sub-sample can also generate serious inference problems (for more details see (Hansen, 1999, 2000)). Models with threshold effects are widely used in the field of applied econometrics. The model divides the sample into classes based on the value of an observed variable whether or not it exceeds a certain threshold. When the threshold is unknown (which is typical in practice), it must be estimated therefore, it increases the complexity of the econometric problem. Inference on parameters is fairly well developed for linear models with exogenous explanatory variables (Chan, 1993; Hansen, 1996, 1999, 2000; Caner and Hansen, 2004). These papers explicitly exclude the presence of endogenous variables, and this has been an obstacle to the empirical application, including panel models. The advantages of the regression technique with endogenous threshold compared to the traditional approach are: (1) it does not require any specific functional form of nonlinearity, and the number and breakpoints of the thresholds are endogenously determined by the data; and (2) the asymptotic theory applies, therefore can be used to establish

appropriate confidence intervals. A bootstrap method for determining the degree of statistical significance of the threshold in order to test the null hypothesis of a linear formulation against a threshold alternative is also available. This approach is supposed to eliminate the problems of multicollinearity between some regressors, in order to be able to identify the effects of these partial variables on the dependent variable. The resilience of the approach is tested on a sample of ECOWAS countries covering the period 1985-2014. The remainder of this paper is structured as follows: Section 2 briefly reviews the literature on the subject, Section 3 provides the econometric approach, Section 4 sets out our analysis and interpretation of our empirical results, and Section 5 offers concluding observations.

2   A Brief Literature Review

2.1 Remittances and Economic growth

There is a large volume of published studies describing the impact of remittances on economic growth. Remittances are "the Sum of transfers and compensation of employees and a transfer which include all transfers in cash or in kind between residents and non-residents individuals, independent of the source of income of the sender and the relationship between the household", World Bank (2016). It represents one of the major international flows of financial resources with their reel impact on growth misunderstood. Moreover, there is evidence showing that these flows are over-estimate. Over past decades, researchers tried to come to a consensus over whether international migrant's remittances boost or degrade long-run growth. Most of macroeconomics work done in the field of remittances and their impacts on growth is qualitative and suggest that remittances are mostly spent for consumption and are not used for productive investment in order to contribute to long run growth. In the same vein, Ratha (2004) shows that remittances contribute to output growth if they are invested and it generate positive multiplier effect even if they are consumed. Moreover, some economists argue that remittances create a valuable source of funds that can assist family members and friends in the recipient countries to meet basic needs or invest in businesses (Woodruff and Zenteno, 2007; Yang, 2008; Leon-Ledesma and Piracha, 2004). Furthermore, by performing the Solow growth model and the Generalized Method of Moments (GMM) panel data estimation method, Rao and Hassan (2009) distinguished between the indirect and direct growth effects of remittances. They found that migrant remittances seem to have positive but minor effects on growth.

From a positive perspective, remittances impact (weakly positively) economic growth in long term Catrinescu et al. (2006) – "While the rates and levels of officially recorded remittances to developing countries has increased enormously over the last decade, academic and policy-oriented research has not come to a consensus over whether remittances contribute to longer-term growth by building

human and financial capital or degrade long-run growth by creating labour substitution and 'Dutch disease' effects". Furthermore, some researchers (Adams and Page, 2005; Insights, 2006; Siddiqui and Kemal, 2006; Gupta et al., 2009) argued that remittances alleviate poverty by increasing recipient's family income. From a negative perspective, Chami et al. (2005) examined the growth impact of remittances and found a negative effect on growth. Moreover, other researchers argue that remittances may discourage work and lead to lower development in the recipient country (Amuedo-Dorantes and Pozo, 006a; Airola, 2008). However, at the other end of the spectrum, Bhaskara and Hassan (2009) find that remittances have no long run effect on growth but a short to medium term transitory one. In addition, Barajas et al. (2009) results show that worker's remittances had no impact on economic growth. According to them: "Part of the reason why remittances have not spurred economic growth is that they are generally not intended to serve as investments but rather as social insurance to help family members and finance the purchase of life's necessities". Similarly, Catrinescu et al. (2006) in their study on 114 countries not found neither positive nor negative relationship between remittances and growth. And Bhaskara and Hassan (2010) results show that there are insignificant direct effects of remittances on growth but, remittances can have a small indirect growth effect.

2.2 Remittances, Financial development and Economic growth

Remittances where shown to have a direct positive impact on the breadth and depth of the banking sector (Demirguc-Kunt et al., 2010) - using municipality-level data for Mexico for 2000, they show that in municipalities where a larger share of the population receives remittances, the number of branches, number of accounts, and value of deposits to GDP is higher. Also, Granger Causality Analysis used by Akinci et al. (2014) indicates that there is a unidirectional causality relationship running from economic growth to financial development. However, Aggarwal et al. (2010) finds that controlling for financial development in the analysis strengthens the positive impact of remittances on growth and concludes that financial development potentially leads to better use of remittances, thus boosting growth. This result is also confirmed by Gupta et al. (2009) for Sub-Saharan Africa. In many studies a debate is taking place between remittances and growth concerning their relationship and their interaction with the financial development in the recipient country - for example Giuliano and Ruiz-Arranz (2009) find that remittances boost growth in countries which have less developed financial systems, by using the System Generalized Method of Moments regressions(SGMM), following Arellano and Bover (1995) and Hansen (1996, 2000), in order to endogenously determine the threshold level of financial development at which the sample should be split. Furthermore, studies that link remittances to investment, where remittances either substitute for, or improve financial access, conclude that remittances stimulate growth (Giuliano and Ruiz-Arranz, 2005; Toxopeus and Lensink, 2006). Likewise, with regard to the relationship between international remittances and financial sector development,

Aggarwal et al. (2006) defend that remittance inflows can improve financial sector in developing countries and therefore promote economic growth. Moreover, further analysis showed that financial development has positive effect on growth. (Beck et al., 2004; Levine, 2004). In another study, to evaluate the interaction effects among economic growth and financial sector development, Hwang et al. (2010) introduced the simultaneous GMM equations between financial sector development and economic growth and they find a two-way relationship between financial sector development and economic growth-financial markets develop as a consequence of economic growth, which, in turn, provides a stimulant to real growth. Likewise, evidences suggest that there exists bidirectional causality between financial development and economic growth (Apergis et al., 2007; Singh, 2008; Pradhan, 2009; Oluitan, 2012). Nevertheless, some researchers come up with no causal link (Lu and Yao, 2009; Chakraborty, 2010). After all, a study introduced by Halkos and Trigoni (2010) indicate that financial development has a negative impact on the process of economic growth.

2.3 Remittances, Institutions and Economic growth

With regards to the definition of Institutions by North (1990) as the rules of the game in a society or, more formally, the humanly devised constraints that shape human interaction, Acemoglu et al. (2001) argued that the economic institutions of a society depend on the nature of political institutions and the distribution of power in society, so they are the fundamental cause of economic growth and development differences across countries. Other researchers such as Kaufmann et al. (2007) focused on the impact of institutional factors such as the role of political freedom, political instability, voice and accountability on economic growth and development and they find that the Worldwide Government Indicator permit meaningful cross-country comparisons as well as monitoring progress over time. Moreover, some empirical work done by (Acemoglu et al., 2001; Easterly and Levine, 2003; Rodrik et al., 2002) suggest that institutional quality is not only associated with positive economic growth, but also that this relationship is causal. Nathan and Ousmane (2012) argued that, with the presence of high-quality institutions, remittances impact positively business formation. Additionally, Barajas et al. (2009) analyses seems to prove that Institution can play a role in how remittances affect growth, so they suggest that, in a presence of good institutions remittances could be more invested and more efficient in order to lead to higher output.

2.4 Institution, Financial development, Remittances and Economic growth

While the evidence on the contemporaneous effect of remittances on growth may be mixed, it is likely that remittances can affect long-term growth by fostering financial deepening. Recently, by using the GMM-system method of estimation, Gazdar and Kratou (2012) find that in economic growth, there is a complementarity between financial development and remittances, such that

remittances foster growth in countries with developed financial system. In addition, remittances can promote bank deposits and credits, which help to highlight another channel through which it can have a positive influence on recipient countries' development Aggarwal et al. (2010). However, his finding contradicts the one of Gazdar and Kratou (2012) who suggest that, African countries must have a developed financial system and a strong institutional environment in order for remittances to contribute to economic growth. In addition, Aggarwal et al. (2006) and Beck et al. (2007) find a positive influence of remittances on financial development in developing countries. Else, other researchers' results show that a strong economic growth highly depends on a combination between financial development, institutions and remittances. Moreover, Abdih et al. (2008) find evidence that remittance flows adversely impact the quality of institutions in recipient countries. Also, Bjuggren et al. (2010) suggest that the use of remittances for investment depends on the institutional quality and the depth of financial intermediation.

2.5 Institution, Financial development, Remittances and Economic growth

On "Figure 2.1", Remittance flows to developing countries are rising year to year. And those flows are larger than Official Development Assistance (ODA) and Private Capital flows.
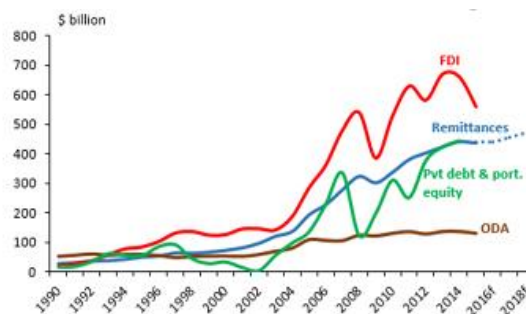
Source: World Bank, 2016

Figure 2.1: Remittances – ODA and Private Capital Flows

Remittances have increased throughout ECOWAS countries "Figure 2.2", rising from about US$3.8 million in 2005 to US$5.5 million in 2007 and fluctuate till 2014. However, Official Development Assistance (ODA) flows decreased from 2006 to mid-2008 and from mid-2009 to 2014. This graph shows that Remittances in ECOWAS countries are more important than ODA.
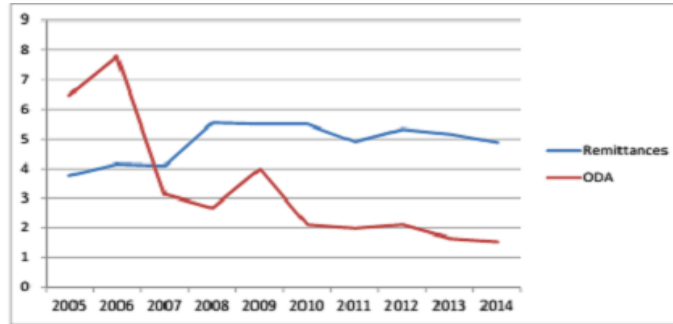
Figure 2.2: Remittances and ODA Flows (In percent of GDP)

3   Econometric Methodology

Threshold models are simple yet efficient methods to capture nonlinearities in cross section and time series models. They split the sample into classes based on the value of observed variables according to threshold values. The theory of estimation and inference in threshold models with exogenous regressors has been extensively studied in the classical papers of Chan and Tong (1986), Chan (1993) and Hansen (1996) Hansen (1999) Hansen (2000). In this section we introduce the dynamic panel threshold model and propose an estimation strategy that extends Hans en (2000) and Caner and Hansen (2004) to the case where some explanatory variables are endogenous.

3.1 Econometric Framework: Dynamic Panel Threshold Analysis
In this empirical study, following Bick et al. (2013), we develop a dynamic panel threshold model that extends Hansen (1999). We therefore analyse the role of financial development and institutions in the relationship between remittances and economic growth $(y_{it} = growth)$, the endogenous regressor will be initial income (*initial*).
Following Caner and Hansen (2004), we adopt the cross-sectional threshold model, where GMM type estimators are used to allow for endogeneity in the dynamic setting. To that aim, consider the following panel threshold model:

$$y_{it} = \mu_i + \beta_1' z_{it} I(q_{it} \leq \gamma) + \beta_2' z_{it} I(q_{it} > \gamma) + \varepsilon_{it} \qquad (1)$$

where $i = 1, \dots, N$ represents the country and $t = 1, \dots, T$ is stand for time. The dependent variable y_{it} is the growth rate of real GDP per capita of country i at time t. μ_i is the country specific fixed-effect and $\varepsilon_{it} \sim N(0, \sigma^2)$ is the error term. $I(.)$ represents the indicator function, taking on a value of either 1 or 0, depending on whether the threshold variable μ_{it} is less or more than the threshold level γ. This effectively splits the sample observations into two groups, one with slope β_1 and another with slope β_2. z_{it} is a m-dimensional vector of

explanatory variables, which may include lagged values of *y* and other endogenous variables. The vector of explanatory variable can be divided into two parts: (i) a part of exogenous variables z_{1it} uncorrelated with ε_{it}, and (ii) a part of endogenous variables z_{2it} correlated with ε_{it}. In addition to the structural equation 1, the model requires a suitable set of $k \geq m$ instrumental variables x_{it} including z_{1it}.

3.2 Estimation and Test strategy

Following Hansen (1999), we eliminate the individual effects in the model. One traditional method to eliminate the individual effect is to remove individual-specific means. However, with lagged dependent variable as explanatory variables, this traditional approach is inconsistent. In this section, first, a fixed-effect elimination approach is discussed and afterwards the case of estimation method.

3.2.1 Fixed effect elimination

In our first stage, to estimate the slope coefficients and potential threshold point, we have to eliminate the individual fixed effects μ_i from the model. The main defiance is to transform the panel threshold model in a way that eliminates the country-specific fixed effects without violating the distributional assumptions underlying Hansen (1999) and Caner and Hansen (2004), and also Hansen (2000). However, in our dynamic model of, the within-group transformation applied by Hansen (1999) does not eliminate dynamic panel bias because the transformed lagged dependent variable $initial^*$ negatively correlates with the transformed error term ε_{it}^*. To eliminate the individual fixed effects, we use the forward orthogonal deviation proposed Arellano and Bover (1995). The distinguishing feature of the forward orthogonal deviations' transformation is that serial correlation of the transformed error terms is avoided. Therefore, for the error term, the forward orthogonal deviation transformation is given by:

$$\varepsilon_{it}^* = \sqrt{\frac{T-t}{T-t+1}} \left[\varepsilon_{it} - \frac{1}{T-1} (\varepsilon_{i(t+1)} + \cdots + \varepsilon_{iT}] \right. \tag{2}$$

Where $Var(\varepsilon_{it}) = \sigma^2 I_T \rightarrow Var(\varepsilon_{it}^*) = \sigma^2 I_{T-1}$, see Arellano and Bover (1995).

3.2.2 Dealing with Endogeneity

Our structural equation (1) needs a set of suitable instruments to solve the problem of endogeneity. To this end, according to Caner and Hansen (2004) paper, in the first step, we estimate a reduced form regression for the endogenous variables z_{2it}, as a function of the instruments x_{it}.

Then we replaced the endogenous variables z_{2it}, by the predicted values $\hat{z}_{2it}$, in the structural equation (1). In the second step, the equation is estimated via least squares for a fixed threshold γ where z_{2it}'s are replaced by their predicted values from the first step regression.

Then, we find the residual of square (RSS) as a function of γ.

$$\hat{\gamma} = arg\min_\gamma S(\gamma) \tag{3}$$

Once $\hat{\gamma}$ is determined, the slope coefficients can be estimated by the generalized method of moments (GMM) for the previously used instruments and the previous estimated threshold $\hat{\gamma}$.

4   Empirical Analysis

4.1 The variables

Our empirical analysis of the dynamic panel threshold model to remittances-economic growth relationship is based on a panel data set of ECOWAS countries which were gathered from multiple sources at various time points from 1985 to 2014.

  ➢ *Annual growth rates of real GDP per capita* (*growth*) for each country are obtained from the World Bank's World Development Indicators (WDI) database.
  ➢ *Remittances*: We consider the remittances to GDP ratio *remt*, which is defined as the sum of two items: "the Sum of transfers and compensation of employees and a transfer which include all transfers in cash or in kind between residents and non-residents individuals, independent of the source of income of the sender and the relationship between the household", WorldBank (2016). These data are taken from World Development Indicators (WDI 2017 - World Bank).
  ➢ *Institutions*: We consider the Composite risk dataset of the International Country Risk Guide (ICRG)[3] published by the PRS group, denoted (*institution*).

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[3] The International Country Risk Guide (ICRG) rating comprises 22 variables in three subcategories of risk: political, financial, and economic. The political risk rating contributes 50% of the composite rating, while the financial and economic risk ratings each contribute 25%.

  - The Political Risk Components: Government Stability (12 Points), Socioeconomic conditions (12
    Points), Investment Profile (12 Points), Internal Conflict (12 Points), External Conflict (12 Points), Corruption (6 Points), Military in Politics (6 Points), Religious Tensions (6 Points), Law and Order (6 Points), Ethnic Tensions (6 Points), Democratic Accountability (6 Points) and Bureaucracy
    Quality (4 Points).
  - The Economic Risk Components: GDP per Head, Real GDP Growth, Annual Inflation Rate, Budget Balance as a Percentage of GDP and Current Account as a Percentage of GDP.
  - The Financial Risk Components: Foreign Debt as a Percentage of GDP, Foreign Debt Service as a Percentage of Exports of Goods and Services, Current Account as a Percentage of Exports of Goods and Services, Net International Liquidity as Months of Import Cover and Exchange Rate Stability.

➢ *Financial development data*: We consider domestic private sector (*finance*) as indicator for financial development. It refers to financial resources provided to the private sector by financial corporations, such us through loans, purchases of non-equity securities, and trade credits and other accounts receivable, that establish a claim for repayment. The financial indicator is extracted from Global Financial Development Database (GFDD) - World Bank.

➢ *Control Variables*: In order to analyse the impact of remittances on economic growth we have to control for the influence of other potential economic variables. To this end, we consider: i) gross national income per capita (*initial*) which is equal to the initial income per capita. It is included to verify the convergence hypothesis. The convergence hypothesis and the steady-state theory predicted in the neoclassical growth theory rests on the premise that countries are similar except for their starting GDP level. Therefore, poor countries are predicted to grow faster than rich countries. If this is true, we expect a negative sign for the coefficient of this variable. ii) trade (*opens*), proxies by the ratio of the sum of exports and imports to GDP since the empirical growth literature has shown that openness to international trade is an important determinant of economic growth; iii) government spending (*goc*) where we control for the level of government spending by using the ratio of government spending to GDP; iv) investment (*invest*)which is the money committed or property acquired for future income and v) inflation (*infl*) proxies by the annual inflation rate, which is included as an indicator for macroeconomic stability.

4.2 Data and Preliminary Analysis

In this paper, we consider annual data from the ECOWAS countries which are collected from various sources and covered the period 1985 to 2014. Data are collected from the Penn World Table 6.1 and 6.2, World Development Indicators (WDI), African Development Indicators (ADI), the IMF's International Financial Statistics and the International Country Risk Guide (ICRG). We can identify the regime of the economy with respect to the financial development system and institutional quality which depend on the estimate of the financial index and institutional quality thresholds. Thus, we can also investigate all combinations of those regimes. So, we can distinguish between four different states as shown in "Figure 4.1".

"Figure 4.1" displays the four states the policymakers can face when deciding about the impact of remittances in recipient countries.

We have to use the threshold estimated $\gamma_{finance}$ and $\gamma_{institutions}$ to determine the regime. We are able to distinguish with this approach between a situation where the financial development system and institutional quality are below $\gamma_{finance}$ / $\gamma_{institutions}$ *(state I)*, the financial development system is below and institutional quality above $\gamma_{finance}$ / $\gamma_{institutions}$ and vice versa *(state II and III),* and a situation where both are above $\gamma_{finance}$ / $\gamma_{institutions}$ *(state IV).* We can therefore estimate for each case the remittances impact on economic growth and compare those to each other.
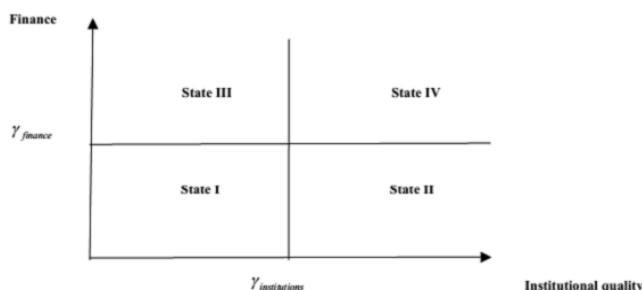
Figure 4.1: The four states of the economy

However, some differences are of special economic growth. Since when comparing
states I and II it becomes obvious that only the sign of the institutional quality has changed while the financial development system remains negative (below the threshold value $\gamma_{finance}$) in both cases. The same holds for the states III and IV where again only the financial development system remains positive (above the threshold value $\gamma_{finance}$. The same argumentation applies when comparing states I and III with respect the negative sign of institutional quality (below the threshold value $\gamma_{institutions}$) or positive (above the threshold value $\gamma_{institutions}$). According to our analysis, we expect that the remittances negatively affect economic growth in states I and III and has positive impact in states II and IV. Having constructed the data, we can now separate them into the four states by simply introducing the threshold measures explained in "Figure 4.1".

The summary statistics of the different states together with those for each threshold and linear relationship between remittances and growth are given in *Table 1*. Several interesting insights can be drawn from *Table 1*. First, following Hansen (1999), each regime contains at least 5% of all observations. So, we have enough data points for each regime to get consistent estimates. Furthermore, for their combination given by the four states the same conclusion can be drawn. Second, the descriptive statistics show that the remittances in average are lower if the institutional quality is above its threshold value. This suggests that a better institutional quality allow a little remittance to improve economic development. The remittances are higher when the institutional quality is below its threshold value. This implies that even they have more quantitative remittances; its impact on growth is unclear. However, there is opposite observation when it comes to financial development. Following, the four states, our statistics show that economic is highly efficient if the financial development and the institutional quality achieve optimal value.

Table 1: Descriptive statistics

	Linear	Remittances		Finance index		Institutions index	
		<4.954376	>=4.954376	<18.0526	>=18.0526	<56.875	>=56.875
$\overline{growth}$	1.454171	1.132595	2.438998	1.379581	1.685793	1.589706	1.321387
σ_{growth}	4.837710	5.039938	4.023534	4.820668	13.43982	5.973148	3.385629
$growth_{max}$	30.34224	30.34224	15.92903	30.34224	15.92903	30.34224	18.06457
$growth_{min}$	-29.63470	-29.63470	-7.397034	-29.63470	-17.11456	-29.63470	-7.397034
$\overline{goc}$	20.80001	20.21847	22.58097	21.52269	18.55588	26.65032	15.06849
σ_{goc}	24.05064	24.24192	23.48998	26.56009	11.35109	31.54788	10.31190
goc_{max}	112.8514	112.8514	22.58097	111.9283	112.8514	112.8514	101.6113
goc_{min}	4.833249	4.833249	6.331392	4.833249	9.047725	4.833249	6.331392
$\overline{finance}$	14.72832	12.14064	22.65311	9.998776	29.41481	13.55951	15.87340
$\sigma_{finance}$	10.85492	7.639805	14.77427	4.750372	11.35109	11.46094	10.12520
$finance_{max}$	65.74181	37.93907	65.74181	17.76928	65.74181	65.74181	64.32432
$finance_{min}$	0.410356	0.410356	1.345850	0.410356	18.06715	0.410356	3.657340
$\overline{infl}$	10.89638	13.04720	4.309499	12.82442	4.909335	14.91003	6.964231
σ_{infl}	18.85399	21.12552	4.578697	20.82073	8.204389	24.16255	10.10879
$infl_{max}$	178.7003	178.7003	25.17788	178.7003	49.05889	178.7003	59.46155
$infl_{min}$	-35.83668	-35.83668	-2.681784	-35.83668	-4.140724	-7.796642	-35.83668
$\overline{initial}$	32364.93	42582.46	1073.773	28380.46	44737.77	12702.14	51628.48
$\sigma_{initial}$	117147.7	133394.9	938.5078	113711.5	127067.4	74131.11	145258.9
$initial_{max}$	732790.7	732790.7	3766.111	633316.2	732790.7	496372.2	732790.7
$initial_{min}$	134.8031	134.8031	335.3975	134.8031	152.2383	134.8031	316.3823
$\overline{invest}$	17.04983	16.55416	18.56780	16.44264	18.93529	15.45293	18.61430
σ_{invest}	7.598578	7.941467	6.230819	7.902758	6.233404	7.887705	6.976800
$invest_{max}$	48.39674	48.39674	30.69527	48.39674	38.98193	48.39674	41.53801
$invest_{min}$	-2.424358	-2.424358	4.279829	-2.424358	8.323477	-2.424358	4.562497
$\overline{institution}$	54.54416	54.84593	53.62001	55.04668	52.98372	47.12856	61.80920
$\sigma_{institution}$	9.716312	8.398508	12.95690	8.658056	12.36828	8.392692	3.342039
$institution_{max}$	70.95833	70.95833	69.00000	70.95833	67.79167	56.85417	70.95833
$institution_{min}$	3.04167	28.29167	13.04167	28.29167	13.04167	13.04167	56.87500
$\overline{opness}$	63.03406	60.82067	69.81254	58.29250	77.75785	60.04285	65.96453
σ_{opness}	20.59313	18.84401	24.07694	19.10318	17.99786	21.24926	19.54240
$opness_{max}$	131.4854	131.4854	125.0334	131.4854	125.0334	120.3374	131.4854
$opness_{min}$	23.71676	23.71676	28.37402	24.24384	23.71676	23.71676	30.73252
$\overline{remt}$	3.605518	1.436230	10.24896	2.541914	6.908286	3.706330	3.506753
σ_{remt}	4.508814	1.328069	4.317472	2.771267	6.747920	5.224835	3.685926
$remt_{max}$	21.73069	4.932489	21.73069	15.07100	21.73069	21.73069	18.38290
$remt_{min}$	0.003429	0.003429	5.017221	0.003429	0.010612	0.003429	0.011685
N	390	294	96	295	95	193	197

	State I	State II	State III	State IV
$\overline{\text{growth}}$	1.223151	1.537074	2.864756	0.668647
σ_{growth}	5.811732	3.569128	6.452541	2.686039
growth_{max}	30.34224	18.06457	15.92903	6.661120
growth_{min}	-29.63470	-7.397034	-17.11456	-4.520189
$\overline{goc}$	27.99824	15.00309	22.41895	15.22304
σ_{goc}	34.46566	11.79909	18.82540	3.215483
goc_{max}	111.9283	101.6113	112.8514	22.95328
goc_{min}	4.833249	6.331392	12.12223	9.047725
$\overline{\text{finance}}$	8.645231	11.36153	30.06595	28.85303
σ_{finance}	4.916621	4.168389	11.91316	10.93086
finance_{max}	17.76928	17.53927	65.74181	64.32432
finance_{min}	0.410356	3.657340	18.45125	18.06715
$\overline{infl}$	17.57124	8.045305	6.254571	3.748740
σ_{infl}	26.44124	11.09860	10.57391	5.236952
infl_{max}	178.7003	59.46155	49.05889	26.08157
infl_{min}	-7.796642	-35.83668	-4.140724	-2.248021
$\overline{\text{initial}}$	12848.55	44018.03	1217.171	82284.96
σ_{initial}	74474.93	141288.6	959.8040	165073.3
initial_{max}	483429.0	633316.2	3766.111	732790.7
initial_{min}	134.8031	316.3823	152.2383	429.9040
$\overline{\text{invest}}$	14.37560	18.52374	19.16388	18.73808
σ_{invest}	8.170494	7.060925	5.581822	6.794672
invest_{max}	48.39674	41.53801	38.98193	31.83010
invest_{min}	-2.424358	4.562497	10.91705	8.323477
$\overline{\text{institution}}$	48.23574	61.90395	43.18338	61.43891
$\sigma_{\text{institution}}$	6.597684	3.571348	11.97311	2.620101
institution_{max}	56.75000	70.95833	56.75000	67.79167
institution_{min}	28.29167	56.85417	13.04167	56.87500
$\overline{\text{opness}}$	53.39595	63.22235	81.73257	74.32869
σ_{opness}	17.29834	30.73252	18.42924	17.05845
opness_{max}	120.3374	131.4854	117.8167	125.0334
opness_{min}	24.24384	30.73252	23.71676	50.20406
$\overline{\text{remt}}$	2.152398	2.934081	8.994055	5.108799
σ_{remt}	2.575133	2.911986	7.882564	5.003747
remt_{max}	15.07100	12.15574	21.73069	18.38290
remt_{min}	0.003429	0.013794	0.010612	0.011685
N	148	147	44	51

Notes: $\bar{x}$ stands for the mean of the respective variable, $x_{\max}$ and $x_{\min}$ for the maximum and minimum realization, while σ_x is the standard deviation, *N*= number of observations.

Table 2 displays the situation of countries regarding thresholds and according to the total number of observation of different countries. Countries like Burkina Faso, Cote d'Ivoire, Ghana, Gambia, Guinea, Guinea Bissau, Mali, Niger, Nigeria and Sierra Leone have low financial system (Finance index under threshold). Others

like Guinea, Guinea Bissau, Niger, Nigeria and Sierra Leone have poor institutional environment (Institution index under threshold). On the other side, countries like Cape Verde, Senegal and Togo have a developed financial system (Finance index above threshold). Others like Burkina Faso, Cote d'Ivoire, Ghana, Gambia, Mali Senegal, and Togo have a strong institutional environment (Institution index above threshold). Furthermore, our findings show that all ECOWAS countries have remittances under its threshold beyond Cap Vert. This situation shows why we need to know if some variable like Financial Development and Institution play a role in how remittances impact economic growth.

The four last columns display countries situation regarding states. Our findings show that Guinea, Guinea Bissau, Niger, Nigeria and Sierra Leone are in State I. Policy makers of those countries have to improve financial development system and

Institutional environment so that their remittances (which are under their threshold) can have a positive impact on economic growth. Burkina Faso, Ghana and Gambia are in State II. Policy makers have the choice to substitute financial development to Institutions or to improve their financial development system. Cape Verde and Togo are in State III. Policy makers make some effort for the Finance index, but they have to improve Institutional environment so that remittances can have a positive impact on growth. Senegal is in State IV - means that he has a developed financial system and a strong Institutional environment. Moreover, Cote d'Ivoire has the same number of observation in State II and IV. These countries have a developed financial system, but policy makers have to ameliorate the Institutional environment. Likewise, policy makers of Mali who is in State I and II have to improve their financial development system and Institutional environment.

Table 2: Countries under thresholds and States

Country	Remittances		Finance Index		Institution Index	
	T (<4.954376)	T (>=4.954376)	T (<18.0526)	T (>=18.0526)	T (<56.875)	T (>=56.875)
Burkina Faso	15	15	27	3	9	21
Cape Verde	0	30	2	28	26	4
Cote d'Ivoire	30	0	17	13	5	25
Ghana	30	0	29	1	7	23
Gambia	30	13	29	1	5	25
Guinea	17	0	30	0	23	7
Guinea Bissao	23	7	28	2	28	2
Mali	26	4	28	2	14	16
Niger	30	0	30	0	18	12
Nigeria	22	8	26	4	17	13
Senegal	22	8	9	21	5	25
Sierra Leone	30	0	30	0	23	7
Togo	19	11	10	20	13	17

T stands for Country *i*'s total number of observations during period 1985-2014.

Country	T (State I)	T (State II)	T (State III)	T (State IV)
Burkina Faso	9	18	0	3
Cape Verde	2	0	24	4
Cote d'Ivoire	4	13	0	13
Ghana	7	22	0	1
Gambia	4	25	1	0
Guinea	23	7	0	0
Guinea Bissau	26	2	2	0
Mali	14	14	0	2
Niger	18	12	0	0
Nigeria	16	10	1	3
Senegal	1	8	4	17
Sierra Leone	23	7	0	0
Togo	1	9	12	8

T stands for Country *i*'s total number of observations during period 1985-2014.

Before conducting the regression investigation as proposed in the recent panel data econometric literature Baltagi (2008), we tested for possible unit roots in the panels. Hansen (1999) dynamic panel threshold regression model is an extension of the traditional least squared estimation method, in fact. It requires that variables considered in the model need to be stationary in order to avoid the so-called spurious regression[4]. Since the stationarity properties of the variables are studied, i.e. the examination of whether or not the variables app ear to contain panel unit roots. Non-stationary panels have become extremely popular and have attracted much attention in both theoretical and empirical research over the last decade. Several panel unit root tests have been proposed in the literature, in this research, we use Levin et al. (2002), Breitung (2000), Im et al. (2003), Maddala and Wu (1999) all based on a null hypothesis that a unit root exists in the panels. Indeed, the Breitung (2000) and Levin et al. (2002) panel unit root tests assume a homogeneous autoregressive unit root under the alternative hypothesis whereas Im et al. (2003) allows for a heterogeneous autoregressive unit root under the alternative hypothesis. Fundamentally, the Im et al. (2003) test averages the individual augmented

Dickey-Fuller (ADF) test statistics. Both the Levin et al. (2002) and Im et al. (2003) tests suffer from a dramatic loss of power when individual specific trends are included, which is due to the bias correction. However, the Breitung (2000) panel unit root test does not rely on bias correction factors. Monte Carlo experiments showed that the Breitung (2000) test yields substantially higher power and smallest size distortions compared to Levin et al. (2002) and Im et al. (2003). Maddala and Wu (1999) and Choi (2001) suggest comparable unit root tests to be performed using the non-parametric Fisher statistic.

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[4] Spurious regression is argued in Granger and Newbold (1974) that the estimation of the relationship among non-stationary series is easily getting higher R^2 and t statistics.

Table 3 displays the results of panel unit root tests in levels for all the variables. All tests reject the null hypothesis of a unit root in the examined series. As regards to institutional quality and investment, the tests failed to reject the null hypothesis of unit root. According to Omay and Kan (2010), this result may be due to the fact that the tests have a low power against nonlinear stationary process. From the nonlinear unit root test, we can conclude that all the variables in the paper are stationarity. It was deemed safe to continue with the panel data estimates of the above econometric specification. Suspecting strong collinearity between some regressors, *Table 4* reports the pairwise correlation coefficients between all the candidate variables of the models. Our results suggest that the inclusion of all these variables in the same model pose none problem of multicollinearity. Indeed, coefficients of correlation appear quite low overall. To test the presence of non-linear effect with respect to remittances, institutional quality and the financial development index we apply the Hansen's test described above, with 1000 bootstrap replication to compute the p-value of the F-test statistic.

Table 3: Panel Unit Root Test Results

	FINANCE	GOC	GROWTH	INFL	INITIAL	INVEST	INSTITUTION	OPENS	REMT
Intercept Levin, Lin & Chu t*	1.403 (0.919)	-0.980 (0.163)	-5.088[a] (0.000)	-10.829[a] (0.000)	3.442 (0.999)	-0.102 (0.459)	-1.371[c] (0.085)	0.324 (0.627)	-1.372[c] (0.085)
Im, Pesaran and Shin W-stat	2.386 (0.992)	-2.187[b] (0.014)	-7.444[a] (0.000)	-7.896[a] (0.000)	3.168 (0.992)	0.075 (0.530)	-0.067 (0.473)	-0.637 (0.262)	0.297 (0.617)
ADF - Fisher Chi-square	15.525 (0.947)	42.75[b] (0.021)	108.188[a] (0.000)	113.056[a] (0.000)	30.132 (0.262)	23.485 (0.605)	23.889 (0.582)	28.212 (0.348)	19.490 (0.815)
PP - Fisher Chi-square	18.948 (0.839)	52.724[a] (0.002)	217.843[a] (0.000)	106.672[a] (0.000)	53.841[a] (0.001)	30.384 (0.2520)	29.1464 (0.305)	52.894[a] (0.001)	22.525 (0.659)
Intercept + trend Levin, Lin & Chu t*	1.499 (0.933)	-0.254 (0.399)	-4.912 (0.000)	-9.646 (0.000)	0.752 (0.774)	-0.812 (0.209)	-0.855 (0.196)	-0.679 (0.249)	-2.319[a] (0.010)
Breitung t-stat	3.436 (0.999)	-0.483 (0.315)	-4.128 (0.000)	-6.087 (0.000)	2.043 (0.979)	-0.344 (0.365)	-1.447 (0.074)	-0.152 (0.439)	-2.023[b] (0.022)
Im, Pesaran and Shin W-stat	2.914 (0.998)	-0.437 (0.331)	-7.602[a] (0.000)	-6.785[a] (0.000)	0.206 (0.582)	-0.162 (0.436)	-0.103 (0.459)	-1.296[c] (0.098)	-1.896[b] (0.029)
ADF - Fisher Chi-square	16.264 (0.930)	31.321 (0.217)	105.206[a] (0.000)	94.789[a] (0.000)	31.791 (0.200)	26.914 (0.414)	22.053 (0.686)	38.286[c] (0.057)	38.294[c] (0.057)
PP - Fisher Chi-square	27.179 (0.400)	39.712[b] (0.042)	231.96a (0.000)	99.957[a] (0.000)	64.424[a] (0.000)	41.959[b] (0.025)	31.979 (0.194)	220.110[a] (0.000)	36.863[c] (0.077)

[a,b,c] significance at 1%, 5%, and 10% respectively. The maximum number of lags is set to be four. MAIC is used to select the lag length. The bandwidth is selected using the Newey-West method. Barlett is used as the spectral estimation method.

Table 4: Correlation matrix of the variables include in the model

	FINANCE	GOC	GROWTH	INFL	INITIAL	INVEST	INSTITUTION	OPENS	REMT
FINANCE	1.000								
GOC	-0.076	1.000							
GROWTH	0.044	-0.056	1.000						
INFL	-0.235	0.102	-0.027	1.000					
INITIAL	0.098	-0.081	-0.068	-0.102	1.000				
INVEST	0.260	0.094	0.164	0.016	-0.185	1.000			
INSTITUTION	0.034	-0.256	-0.062	-0.231	0.135	0.123	1.000		
OPENS	0.474	-0.151	0.115	-0.078	0.223	0.220	0.093	1.000	
REMT	0.472	0.024	0.231	-0.234	-0.156	0.131	-0.230	0.281	1.000

Table 5: F-test of null of no threshold $(H_0 : \beta_1 = \beta_2)$

	Remittances	Finance index	Institutional quality
Estimated threshold	4.954	18.053	56.875
Confidence Interval	[3.146 6.976]	[14.125 22.054]	[49.753 65.135]
LR-test	21.650	36.508	17.711
p-value	0.039	0.000	0.038
critical values			
10%	17.264	11.826	11.756
5%	19.921	13.967	14.498
1%	25.817	21.162	20.107

The estimated threshold and the p-value of the F-test for the null of no threshold are reported in *Table 5*. The results show that the linearity hypothesis is strongly rejected in favour of threshold regression for both three variables. This confirms the presence of nonlinearities in remittance-growth relationship. Once the presence of threshold effect is confirmed the next step is to estimate the threshold regression following the procedure as discussed in the methodology section.

4.3 Benchmark Remittance-growth linear model

Table 6 reports the empirical results of the regressions on the link between economic growth and remittances for our sample of 13 ECOWAS countries between 1985 and 2014. The results show that all control variables, i.e. initial per capita income, investment, inflation, government spending, and trade appear with the expected sign and are consistent with theory. The positive coefficient associated with initial income not supports the conditional convergence hypothesis

where poor economies tend to grow faster than rich economies once the determinants of their steady state are held constant. The positive and significant coefficient of openness points out that trade liberalization is a useful policy in promoting economic growth, which supports Mankiw et al. (1992). By contrast, the coefficient estimate associated with inflation is negative, suggesting that macroeconomic instability is bad for growth (see Barro (1991)).

Table 6: Remittance-growth linear regressions

Impact of remittances	Coefficient
$\hat{\beta}$	0.065 (0.0885)
Impact of covariates	
Inflation	-0.074[a] (0.0026)
Initial	0.0001 (0.9507)
Trade	0.024[a] (0.0051)
Investment	0.105[a] (0.0000)
Government spending	-0.023[a] (0.0011)
Finance index	-0.047[b] (0.0104)
Institutions index	-0.153[a] (0.0000)
$\hat{\delta}_1$	8.200[a] (0.0000)
R2	0.4872
Number of instrument	67
J-Statistic	56.5053
Prob(J-Statistics)	0.5310
Number of observations	195

[a,b,c] denotes significance levels at 1%, 5% and 10%, respectively. Numbers in parenthesis indicate standard errors (using a consistent covariance matrix for heteroscedasticity and serial correlation); J-statistics is Hansen's test of the model's overidentifying restrictions, which is distributed as a $X^2_{(n+1)}$

Other things being equal, the impact of remittances on economic growth is positive but statistically insignificant. However, the impact of financial development and institutions quality are statistically significant negative. These results contrast with some literature that has outlined the positive effect of financial development and institutions quality on economic development. These

results may be reflecting the inadequacy of the linear remittances-growth relationship. This poses the question of whether the impact of remittances is homogeneous across countries or whether it varies along a dimension, which has not been properly accounted for in the estimated specification. Indeed, the remittances-growth relationship is very likely to be nonlinear in the sense that the growth effect of remittances may vary with alternative financial and institutional conditions. Therefore, the aim of the next step of our study is to explore whether the financial development and institutional quality of the recipient country influences the capacity of remittances to influences growth. To be done, a number of threshold variables have been determined to gauge the right conditions in which remittance can promote growth.

4.4 Remittance Thresholds and Economic Performance

Let us now apply the modified dynamic panel threshold model to the analysis of the impact of remittances on economic growth in ECOWAS countries. To that aim, consider the following threshold model of the remittances-growth relationship:

$$GROWTH_{it} = \mu_i + \beta_1 REMT_{it} I(REMT_{it} < \gamma) + \delta_1 I(REMT_{it} < \gamma) + \beta_2 REMT_{it} I(REMT_{it} \geq \gamma) + \theta_1 INVEST_{it} + \theta_2 INITIAL_{it} + \theta_3 INFL_{it} + \theta_4 FINANCE_{it} + \theta_5 INSTITUTION_{it} + \theta_6 OPNES_{it} + \theta_7 GOC_{it} + \varepsilon_{it} \qquad (4)$$

Where $I(REMT_{it} < \gamma)$ and $I(REMT_{it} \geq \gamma)$ are indicator functions which take the value of one if the term between parentheses is true and are zero otherwise. This model specifies the effects of remittances with two coefficients: of β_1 and β_2. β_1 denotes the effect of remittances below the threshold level γ, and β_2 denotes the effect of remittances exceeding the threshold level γ. Remittance is both, the threshold variable and the regime dependent regression. z_{it} denotes the vector of partly endogenous control variables, where slope coefficients are assumed to be regime independent. Following Bick et al. (2013), we allow for differences in the regime intercepts (δ_1). Initial income is considered as endogenous variable, i.e. $z_{2it} = initial_{it}$, while z_{1it} contains the remaining control variables. All GMM estimations are based on internal instruments only; the relevant diagnostics are reported in the bottom part of the table. Our results may depend on the number of instruments, see Roodman (2009). To assess the validity of the instruments employed, the Hansen test of over-identifying restrictions is performed. The Hansen J-test tests the null hypothesis that the instruments are valid instruments, uncorrelated with the error term. These instruments were generated as lagged per capita initial income; remittances, financial development and institutions quality are treated as potentially endogenous variables. The Hansen test fails to detect any problem with instrument validity as the p-value for the Hansen test is higher than the conventional 5 percent level but not as high as 1.000. The instruments therefore seem to be valid and informative. Moreover, all diagnostics suggest that the model is correctly instrumented and estimated coefficients are reliable for inference.

Table 7: Remittance-growth threshold regressions using Remittance as a threshold

Impact of remittances	**Coefficient**
$\hat{\beta}_1$	-0.106 (0.4334)
$\hat{\beta}_2$	0.066 (0.0418)
Impact of covariates	
Inflation	-0.069[a] (0.0072)
Initial	0.0002 (0.8733)
Trade	0.027[a] (0.0022)
Investment	0.119[a] (0.0000)
Government spending	-0.023[a] (0.0019)
Finance index	0.052[a] (0.0074)
Institutions index	0.155[a] (0.0000)
$\hat{\delta}_1$	7.969[a] (0.0000)
R2	0.5122
Number of instrument	67
J-Statistic	54.2138
Prob(J-Statistics)	0.5803
Number of observations	195

[a,b,c] denotes significance levels at 1%, 5% and 10%, respectively. Numbers in parenthesis indicate standard errors (using a consistent covariance matrix for heteroscedasticity and serial correlation); J-statistics is Hansen's test of the model's overidentifying restrictions, which is distributed as a $X^2_{(n+1)}$ variate under the null hypothesis of valid over-identifying restrictions (*n* stands for the number of instruments minus the number of freely estimated parameters).

Table 7 presents the estimation results obtained of equation 4 and includes two parts. The first part of the table displays the regime-dependent coefficients of remittances on growth. Specifically, $\hat{\beta}_1$ ($\hat{\beta}_1$) denotes the marginal effect of remittances on growth in the low (high) remittances regime, i.e. when remittances are below (above) the estimated threshold value. The coefficients of the control variables are presented in the second part of the table. Our results reveal that the

coefficients of remittance have different signs and significances across the low and high remittance regimes. When remittance is above the threshold value ($\gamma \geq 4.954$), our results indicate that remittance have positive but not statistically significant. However, when remittance is below the threshold value, there are negative relationship between remittance and growth and remittance marginal effect is insignificant. These results show that remittances alone have no effect on growth. This leads us to believe that the effect of remittances on growth would depend on other variables such as. Regarding the control variables, we notice that investment, development financial, institutional quality and openness have positive impact on growth, while the government spending and inflation are negatively and significantly correlated with economic growth. These results reveal that remittances, institutions quality and financial development are used as substitutes to promote growth. On the other hand, when remittance is above its threshold value, remittances, institutions quality and financial development are complementary and that the growth effects of remittances are enhanced in countries with developed financial system and a strong institutional environment.

4.5 Remittance Impact Conditional to Financial Development
We examine the role of remittances on growth through financial markets. The hypothesis we would like to test is whether the recipient country's financial depth could influence the impact of remittances on growth. To this end, we consider dynamic panel threshold model to investigate impact of remittance conditional with an indicator of financial depth and test for the significance of the co efficient. A negative co efficient would indicate that remittances are more effective in countries with shallower financial systems; in other words, evidence of substitutability between remittances and financial instruments. On the other hand, a positive coefficient would imply that the growth effects of remittances are enhanced in deeper financial systems, supporting complementarities of remittances and other financial flows. The regression to be estimated is the following:

$$GROWTH_{it} = \beta_2 REMT_{it} I(FINANCE_{it} \geq \gamma) + \theta_1 INVEST_{it} + \theta_2 INITIAL_{it} + \theta_3 INFL_{it} + \theta_4 INSTITUTION_{it} + \theta_5 OPNES_{it} + \theta_6 GOC_{it} + \varepsilon_{it} \qquad (5)$$

Where $I(FINANCE_{it} < \gamma)$ and $I(FINANCE_{it} \geq \gamma)$ are indicator functions which take the value of one if the term between parentheses is true and are zero otherwise. This model specifies the effects of remittances with two coefficients: of β_1 and β_2. β_1 denotes the effect of remittances below the threshold level γ, and β_2 denotes the effect of remittances exceeding the threshold level γ.
To examine the effect of remittance on growth in the presence of financial development, we estimate the Equation 5. The results are reported in *Table 8*. The empirical analysis shows that remittances can promote growth in higher financially developed countries. This relationship controls for the endogeneity of remittances

and financial development using a Generalized Method of Moments (GMM) approach, does not depend on the measure of financial sector development used, and is robust to a number of sensitivity tests.

Table 8: Remittance-growth threshold regressions using a conditional variable (financial development) as a threshold

Impact of Finance index	Coefficients
$\hat{\beta}_1$	-0.076[b] (0.0452)
$\hat{\beta}_2$	0.100[a] (0.0000)
Impact of covariates	
Inflation	-0.076[a] (0.0042)
Initial	-0.0006 (0.6760)
Trade	0.022[b] (0.0281)
Investment	0.092[a] (0.0040)
Government spending	-0.021[a] (0.0034)
Institutions index	0.137[a] (0.0000)
$\hat{\delta}_1$	7.921[a] (0.0000)
R^2	0.4394
Number of instrument	67
J-Statistic	57.8228
Prob(J-Statistics)	0.4819
Number of observations	195

[a,b,c] denotes significance levels at 1%, 5% and 10%, respectively. Numbers in parenthesis indicate standard errors (using a consistent covariance matrix for heteroscedasticity and serial correlation); J-statistics is Hansen's test of the model's over-identifying restrictions, which is distributed as a $X^2_{(n+1)}$ variate under the null hypothesis of valid over-identifying restrictions (*n* stands for the number of instruments minus the number of freely estimated parameters).

The main results are easily summarized. Our investigation shows that, on low financial system remittance has a negative effect on the economic growth

suggesting that remittances alone may hamper economic growth, but it can be avoided only if the recipient countries are characterized by a reasonable level of financial development. These findings suggest that the marginal impact of remittances on growth is decreasing with shallower financial development and remittances and financial systems are used as substitutes to promote growth. In contrast, we find strong evidence of a positive and significant coefficient of remittance flows in developed financial system. In other words, remittances have contributed to promote growth in countries with improved financial systems. Remittances have de facto act as a complement for financial services in promoting growth, by offering the response to the needs for credit and insurance that the market has failed to provide.

Finally, when remittance is above the threshold value, it appears to be an important source of growth for these ECOWAS countries during the period under study. Moreover, remittances appear to be working as a complement to financial development.

4.6 Remittance impact conditional to institutional quality

Let us now use the dynamic panel threshold model specification to the investigation of the effect of remittance on economic growth conditional to institutional quality in ECOWAS countries. To that aim, consider the following threshold model of the remittance-growth nexus:

$$GROWTH_{it} = \mu_i + \beta_1 REMT_{it}I(INSTITUTION_{it} < \tau) + \delta_1 I(INSTITUTION_{it} < \tau) + \beta_2 REMT_{it}I(INSTITUTION_{it} \geq \tau) + \theta_1 INVEST_{it} + \theta_2 INITIAL_{it} + \theta_3 INFL_{it} + \theta_4 FINANCE_{it} + \theta_5 OPNES_{it} + \theta_6 GOC_{it} + \varepsilon_{it} \tag{6}$$

Where $I(INSTITUTION_{it} < \tau)$ and $I(INSTITUTION_{it} \geq \tau)$ are indicator functions which take the value of one if the term between parentheses is true, and are zero otherwise.

Table 9: Remittance-growth threshold regressions using a conditional variable
(Institutions) as a threshold

Impact of Institutions index	Coefficient
$\hat{\beta}_1$	-0.087[b] (0.0191)
$\hat{\beta}_2$	0.105[a] (0.0005)
Impact of covariates	
Inflation	-0.031 (0.1559)
Initial	-0.0007 (0.5868)
Trade	0.034[a] (0.0004)
Investment	0.115[a] (0.0000)
Government spending	-0.026[a] (0.0001)
Finance index	0.051[b] (0.0121)
$\hat{\delta}_1$	4.886[a] (0.0037)
R2	0.5396
Number of instrument	67
J-Statistic	56.9522
Prob(J-Statistics)	0.5143
Number of observations	195

[a,b,c] denotes significance levels at 1%, 5% and 10%, respectively. Numbers in parenthesis indicate standard errors (using a consistent covariance matrix for heteroscedasticity and serial correlation); J-statistics is Hansen's test of the model's over-identifying restrictions, which is distributed as a $X^2_{(n+1)}$ variate under the null hypothesis of valid over-identifying restrictions (*n* stands for the number of instruments minus the number of freely estimated parameters).

Table 9 indicates the results obtained with respect to the institutional quality conditioned in remittance-growth nexus. Our findings suggest that for the low institutional quality regime (in which the institutional quality is below 56.875), the marginal impact of remittance on economic growth is negative and strongly significant. In the better institutions regime, our results show a positive impact of remittance on growth and this impact is statistically significant. Strongly positive and significant coefficient of remittance in remittance-growth relationship implies

that impact of remittance on growth is function of institutional quality. An interesting finding is that the marginal impacts of remittance on growth when we take institutional quality as condition variable are more important than to consider financial development as condition variable. Therefore, controlling low institutional quality regime should be the main goal for policymakers in ECOWAS zone since in this regime more remittance is detrimental to economic growth.

4.7 Remittances impact conditional to combination of two indexes

From this econometric approach, we identify four states of the economy consistent with the results of the growth framework. Using these four states, we are able to estimate the relation between remittances and economic growth in nonlinear fashion in each state based on the deviation from institutions environment and the financial development. Our model specification is:

$$GROWTH_{it} = \mu_i + \beta_1 REMT_{it} I(FINANCE_{it} < \gamma; INSTITUTION_{it} < \tau) + \delta_1 I(FINANCE_{it} < \gamma; INSTITUTION_{it} < \tau) + \beta_2 REMT_{it} I(FINANCE_{it} < \gamma; INSTITUTION_{it} \geq \tau) + \beta_3 REMT_{it} I(FINANCE_{it} \geq \gamma; INSTITUTION_{it} < \tau) + \beta_4 REMT_{it} I(FINANCE_{it} \geq \gamma; INSTITUTION_{it} \geq \tau) + \theta_1 INVEST_{it} + \theta_2 INITIAL_{it} + \theta_3 INFL_{it} + \theta_4 OPNES_{it} + \theta_5 GOC_{it} + \varepsilon_{it} \quad (7)$$

Where $(FINANCE_{it} < \gamma; INSTITUTION_{it} < \tau)$ indicates state I, $(FINANCE_{it} < \gamma; INSTITUTION_{it} \geq \tau)$ state II, $(FINANCE_{it} \geq \gamma; INSTITUTION_{it} < \tau)$ state III and $REMT_{it} I(FINANCE_{it} \geq \gamma; INSTITUTION_{it} \geq \tau)$ represents state IV. This model specifies the effects of Remittance with four coefficients: of β_1, β_2, β_3, β_4. β_j denotes the marginal effect of Remittance in state *j* (*j* = 1, 2, 3, 4).

The estimation results of equation (7) are presented in *Table 10*. Using the combination terms which signal the state of the economy, we find that the impact of remittance on growth is negative in the states I and III (situation where institutional quality is below its threshold value and financial development is above or below its threshold value). The marginal impact of remittance is statistically significant in both states but strongly significant in state I. This negative relationship between remittance and economic growth strength the idea that resources transfer from migrants to ECOWAS countries are oriented towards their own economic and strategic interest instead of needs of the recipient countries. The negative effect of remittance on growth in these countries can be justified on the following arguments. Remittances lead to Dutch disease effect, labour supply contract and a loss of external attractiveness Acosta et al. (2009). Moreover, remittance income would engage government in more corruption activity, since corruption acts are likely to be less costly for domestic households. In addition, lower financial development and bad institutional quality have spoiled the favorable effect of remittance on economic growth. In contrast to States I and III, our results show the positive and statistically significant relationship between remittance and growth in States II and IV. However, the marginal effect of remittances on growth is statistically significant and more consistent in terms of environments.

Table 10: Estimation result of Remittance-growth threshold depending on the state of the economy

Impact of different states	Coefficient
$\hat{\beta}_1$	-0.820[a] (0.0000)
$\hat{\beta}_2$	0.057 (0.4610)
$\hat{\beta}_3$	-0.177[a] (0.0100)
$\hat{\beta}_4$	0.178[a] (0.0000)
Impact of covariates	
Inflation	-0.049[b] (0.0434)
Initial	0.0001 (0.9463)
Trade	0.035[a] (0.0069)
Investment	0.127[a] (0.0000)
Government spending	-0.028[a] (0.0049)
$\hat{\delta}_1$	-1.663[b] (0.0130)
R^2	0.6970
Number of instrument	67
J-Statistic	51.0150
Prob(J-Statistics)	0.6979
Number of observations	195

[a,b,c] denotes significance levels at 1%, 5% and 10%, respectively. Numbers in parenthesis indicate standard errors (using a consistent covariance matrix for heteroscedasticity and serial correlation); J-statistics is Hansen's test of the model's over-identifying restrictions, which is distributed as a $X^2_{(n+1)}$ variate under the null hypothesis of valid over-identifying restrictions (*n* stands for the number of instruments minus the number of freely estimated parameters).

Furthermore, all control variables app ear with the expected sign and are consistent with theory. The role of government in the economic growth of the countries in the sample is also tested. In our investigation, it is found that the estimated coefficient of government spending to GDP ratio is negative and largely significant in all the specifications. This finding seems to give credence to the notion that higher

involvement of the government in economy will have significant negative consequences on the growth performance.

The role of inflation in dampening economic growth is also investigated here. Our estimation inflation is found to be consistently negative. However, it is noted that the estimated coefficients are not unanimously significant at the conventional levels of testing. The negative coefficient supports the traditional view that higher economic growth may only be achieved in an environment of low and stable inflation rate. Low inflation is advocated for because it creates an environment that is easy to predict into the future. This is because investors are more worried about the future and will tend to attach their long-term investment decisions based on level of certainty they see in a country. The estimated co efficient of private investment is found to be positive as expected. The ratio of private investment to GDP ratio is positive and significant at the conventional level of testing. This finding therefore gives support to the notion that higher level of private investment leads to higher economic growth. The convergence theory is tested in this study using the national income per capita. In our estimation it is found that the estimated coefficients are negative and statistically insignificant at the conventional levels of testing. These results are not consistent with the neo classical model which postulates that the economy tends to approach its long run position if the starting per capita income is low. The result therefore not supports the conditional convergence hypothesis in which case poor countries grow faster than richer countries.

The major point emerging from this study is that remittances have positive effect on economic growth of ECOWAS countries conditional on sound financial system and better institutional quality. Based on the empirical results we find that remittances and growth have negative relationship in States I and III while this relation has positive and significant in States II and IV. The interesting results emerge in state IV, i.e. if financial development and institutional quality are above its threshold value. In other words, financial development and quality of institutions are complementary. Our finding suggests that higher level of financial development and better institutional quality in terms of lower risk of contract repudiation, lower level of governmental corruption, efficient government stability and lower ethnic tensions is crucial for remittances effectiveness. Therefore, it is desirable for ECOWAS policymakers to target state IV and good institutional quality regime should be the main goal for these countries.

5   Conclusion

The belief that remittances help to promote sustainable economic growth and improve the welfare in developing countries is debatable issue since its start. A large literature now is available on remittance effectiveness but the issue regarding its contribution for growth and welfare remain controversy. The aim of our paper is to investigate the relationship between remittances and economic growth. In

particular, this study examines how the local financial development and political institutions influence a country's capacity to take advantage from remittances. For this purpose, we have estimated the impact of remittances on economic growth by considering the local financial development, institutional quality and the combination of two latter indexes. Therefore, we use Bick et al. (2013), dynamic panel threshold model that extends Hansen (1999) model based on 13 ECOWAS countries covering the period from 1985 to 2014. Specifically, we adopt the cross-sectional threshold model of Caner and Hansen (2004), where GMM type estimators are used to allow for endogeneity in the dynamic setting. According to our econometric results, the null hypothesis of linearity against the alternative of a nonlinear specification is rejected by the data. Hence, the relationship between remittances and growth can be better modelled as a nonlinear model. Our results suggest that the impact of remittances on economic growth depends on the level of financial development and the institutional environment. More precisely, a high level of financial development and a strong institutional environment are required to enable remittances to enhance growth. In other words, the increasing flows of remittances into ECOWAS countries have not promoted meaningful development due to the lower level of financial development and bad institutional quality. These findings suggest that for remittances to contribute to economic growth, ECOWAS countries must possess a developed financial system and a strong institutional environment. Considering the political institutions, our results outlined that remittances are more effective in enhancing economic growth in countries with strong institutions. The interaction between remittances and the political institutions indicators was more important to growth than the interaction between remittances and financial development indicators. These results are robust to the threshold estimation. From a policy perspective, the present research offers three interesting insights. First, policy interventions to improve the functioning of governance institutions, enforcing regulation and political stability, enhancing socio-economic environment are also crucial for increasing the benefit effects of remittances. According to our investigation no amount of remittances will promote sustainable growth and development in ECOWAS countries if the problem of lower financial development and bad institutional quality persist. The second insight is that institutional quality is a sine qua non condition for remittances may to promote economic performance. Hence, states II and IV are identified as determinant regimes for the effective contribution of remittances to sustainable growth and improve the welfare in ECOWAS countries. Finally, from the two conditional indexes, institutional quality is more important condition through which remittances positively affect economic growth. Making access to better institutional quality may be a way to spur economic growth even in a lower financial development. It is crucial for governments in the ECOWAS area to improve institutional quality and the support they provide for the financial system, in ECOWAS economies should therefore be a main priority for policy makers as there are gains to be made in terms of economic development. The major policy implication of this finding is that different countries require different sets of

institutions and financial development for ensuring long-term economic growth. The core of the analysis is that the institutions and finance development are indeed important in determining the long-term relationship between remittances and growth. One of main contributions of this paper is to successfully identify the conditions under which the remittances have a positive impact on economic growth. The study recommended the design of policies that would facilitate simultaneous improvements in the political institutions indicators and financial development indicators, a situation that has previously been ignored.

Future work

The extension of this work is to use the twelve components of the Political risk database (Government Stability, Socio economic Conditions, Investment Profile, Internal Conflict, External Conflict, Corruption, Military in Politics, Religious Tensions, Law and Order, Ethnic Tensions, Democratic Accountability, Bureaucracy Quality) in our estimation in order to evaluate different impacts of remittances on Economics growth. Following Calderon et al. (2008), we will classify the different indexes of institutions to a set of groups. Political institutions (ICRG1 - the sum of the sub components military in politics and democratic accountability); quality of institutions (ICRG2 - the sum of corruption, law and order, and bureaucratic quality); socio economic environment (ICRG3 - the sum of government stability, socio economic conditions, and investment profile); and conflict (ICRG4 - the sum of internal and external conflict and ethnic and religious tensions). Regarding financial development index, we will consider two indicators: (i) private credit which equals banking institution credit to private sector as a percent of GDP. It is considered as an indicator for financial intermediary's activity (Demirguc-Kunt and Levine (1999)) (ii) liquid liabilities which are the ratio of liquid liabilities of the financial system (currency plus demand and interest-bearing liabilities of banks and non-bank financial intermediaries) divided by GDP. I t is also a general indicator for the size of financial intermediaries relative to the size of the economy.

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Appendix A

A.1 Tables

Table A.1: List of Variables

growth	Annual growth rates of real GDP per capita
goc	Ratio of Government spending to GDP
finance	Domestic private sector which refers to the financial resources provided to the private sector by financial corporations, such us through loans, purchases of non-equity securities, and trade credits and other accounts receivable, that establish a claim for repayment
infl	Annual inflation rate
initial	Gross national income per capita (initial) which is equal to the initial income per capita
invest	Investment - Money committed or property acquired for future income
institution	Composite risk dataset of ICRG (International Country Risk Guide)
opnes	Ratio of the sum of exports and imports to GDP
Remt	Remittances inflows to GDP ratio

Table A.2: List of Countries

Country	t
Burkina Faso	30
Cabo Verde	30
Cote d'Ivoire	30
Gambia, The	30
Ghana	30
Guinea	30
Guinea-Bissau	30
Mali	30
Niger	30
Nigeria	30
Senegal	30
Sierra Leone	30
Togo	30