
Remittances, Financial Development and Economic Growth: The Case of North African Countries

Zouheir Abida¹
Imen Mohamed Sghaier²

The present paper examines the causal linkage between remittances, financial development, and economic growth in a panel of 4 countries of North Africa (Tunisia, Morocco, Algeria and Egypt) over the period 1980-2011. Using system Generalized Method of Moment (GMM) panel data analysis, we find strong evidence of a positive relationship between remittances and economic growth. We also find evidence that remittances appear to be working as a complement to financial development and, moreover, that the effect of remittances is more pronounced in the presence of the financial development variable. The policy implications of this study appeared clear. Improvement efforts need to be driven by local-level reforms to ensure the development of domestic financial system in order to take advantage of remittances.

Keywords: Remittances, Financial development, Economic growth, Panel data analysis

JEL Classifications: E21; F34; F21; J61

¹ Zouheir Abida, Associate Professor in Economics at the University of Sfax, Faculty of Economics and Management of Sfax, Tunisia. E-mail: zouheir.abida@gmail.com

² Imen Mohamed Sghaier, PhD in Economics, University of Sfax, Faculty of Economics and Management of Sfax, Tunisia. E-mail: medsghaier.imen@gmail.com

I. Introduction

It is now well documented that remittances are a sizable and important feature of developing economies throughout the world. According to World Bank estimates the remittances inflows to developing countries in 2011 increased by 8.0 per cent from US\$ 325 billion in 2010 and is forecast to grow at 7 to 8 per cent annually till 2014. In nearly 40 countries, remittances make up more than 10 per cent of GDP. About one third of remittances go to rural areas where they play an especially important role in raising incomes and reducing poverty. Remittances sent home by migrants to developing countries are equivalent to more than three times the size of official development assistance and can have very important implications for economic development and human welfare (Ratha and Silwal, 2012). It is common for remittances to be the primary source of external funding in many countries, often dwarfing other flows to the external capital account (Chami et al. 2008). For recipient countries over the period 1998-2007, on average, remittances were equal to 15 times official transfers, 18 times official capital flows, more than double private capital flows, and about 30 percent of exports (Barajas et al., 2010).

In the extant literature, there is substantial disagreement as to what economic factors determine the inflow of remittances, as well as what impact, if any, these inflows have on economic growth. For example, Chami et al. (2005) found a negative relationship between remittances and economic growth. Basically remittances were found to be counter-cyclical in nature. They argue that remittances act like compensatory transfers and, hence, do not aid in the process of economic growth. Their idea was that remittances are intended for consumption rather than investment. Hence, the impact of remittances on economic growth is insignificant. On the other hand, Giuliano and Ruiz-Arranz (2009) argue that remittances boost economic growth in countries with less developed financial systems by providing an alternative way

to finance investment and helping overcome liquidity constraints. However, Giuliano and Ruiz-Arranz (2009) found a nil or even negative impact of remittances at high levels of financial development as suggestive evidence that remittances are more likely to discourage labor supply in more financially developed countries.

In view of the growing economic importance of remittance inflows and the contradictory findings in the literature, this study estimates a dynamic panel model using the Arellano and Bover (1995) system GMM estimator and shows the effects of remittance inflows on the economic growth of 4 North African countries over the period 1980-2011. The paper also assesses the role of financial development in determining the relative effectiveness of remittance inflows to the region. The results suggest that remittances have a positive and significant effect on economic growth in the region, and that the impact is more pronounced when financial development is included in the model. Thus, the findings reported in this study represent a significant contribution to the extant literature, particularly because they have been generated utilizing estimation techniques that address the inherent endogeneity of the included variables.

The paper is organized as follows. Section 2 presents an account of evolution of remittances to North Africa over the period 1980-2011. Section 3 reviews some of the voluminous extant literature. Section 4 describes the data and empirical methodology. The empirical results are presented in Section 5. The final section draws conclusions based on the results.

II. Trend of remittances in North Africa

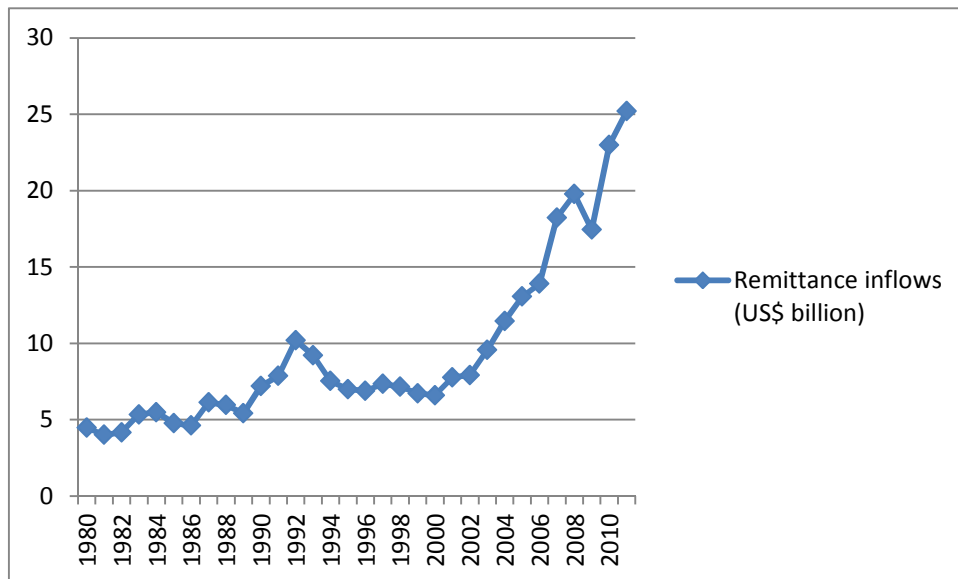
Fig. 1 shows the time profile of remittances to the countries in North Africa during the period 1980-2011. From the figure it is evident that remittances to North Africa during the early 1980s stood at approximately US\$4.5 billion. This started to grow gradually at an average annual growth rate of 4.2 percent reaching approximately

US\$7.2 billion. The growth during this period may have been sustained by a 28 percent and 33 percent growth rates reported in 1983 and 1987, respectively. During the 1990s the remittances appear to have stabilized at a level slightly above US\$7.5 billion, with an average annual growth rate of 3.3 percent. During the 2000s the remittances appear to have gained prominence, it stood at US\$6.6 billion in 2000 rising rapidly at an average rate of 13.4 percent during this period to stand at US\$19.8 billion in 2008 before declining slightly by US\$2.3 billion to stand at US\$17.5 billion in 2009. The decline witnessed during this period may have been on account of the effects of the financial crisis which may have led to job losses for migrant workers thus occasioning reduced remittances to their mother countries.

The reduction in remittance inflows during the financial crisis can be attributed to two factors: (1) Reduced ability of the Diaspora to send money home, and (2) Return migration as migrants lose jobs and are forced to return home. Until the financial crisis, remittances had proven to be a remarkably dependable source of foreign income for North African countries. As shown in Fig. 1, remittance to North Africa was on an increasing trend standing at US\$4.5 billion in 1980 rising to US\$13.9 billion in 2006, just before the global financial crisis set in. At the onset of the financial crisis in 2007, remittance to North Africa totaled US\$18.2 billion and grew by 8.8 percent to stand at US\$19.8 billion in 2008. The effect of the crisis on remittances inflows was felt in 2009 when the total remittances to North Africa declined by 11.6 percent to stand at US\$17.5 billion. However, remittances are estimated to have reached US\$25.2 billion in 2011. Overall, remittances to North Africa grew at an average rate of 9.7 percent per annum during the period 1980-2011.

Fig. 1.

Evolution of remittances in North Africa: 1980-2011.

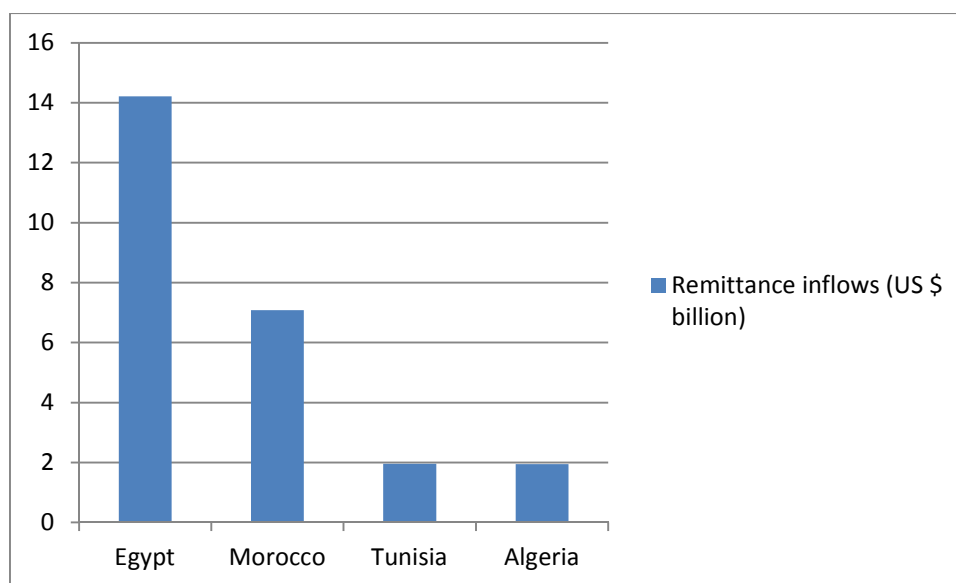


Source: World Bank. World Development Indicators.

While Fig. 1 shows trend of the remittances to North Africa in general, Fig. 2 shows the quantum of remittances to the top destinations in North Africa in 2011. Among the North African countries Egypt was the leading recipient with US\$14.2 billion. Other leading destinations in the region were Morocco (US\$7 billion), Tunisia (US\$1.96 billion) and Algeria (US\$1.94 billion). On average, Egypt received US\$4.73 billion annually. Although, Egypt has a large stock of highly skilled expatriates in the *United States*, the *United Kingdom* and other Organization of Economic Cooperation and Development countries, about two-thirds of its migrants are working in oil rich countries within the Middle East and North Africa region, which are benefitting from robust oil prices. With about 80 percent

leaving immediate family in Egypt, migrants maintain strong connections to Egypt, driven in part by the temporary nature of their employment in destination countries and geographical proximity to Egypt. As a result, remittances are a reliable source of revenue for migrant families, meeting as much as 40 percent of household expenses (International Organization for Migration, 2010). The impetus to make remittances is likely to have become stronger with the economic difficulties in Egypt, the robust economic performance of destination countries in the Gulf Cooperation Council (GCC), and the return of large numbers of migrant workers from Libya who repatriated their assets at the same time. The GCC accounted for 50 per cent of the US\$14 billion in remittances to Egypt in 2011. For Algeria, Morocco and Tunisia, it is France (and to a lesser extent Spain and Italy) that is the most important source of remittances. In Algeria's case, 90 per cent of the US\$1.9 billion of remittances that flowed into the country in 2011 came from Europe, with the vast majority of that coming from France. For Morocco, the equivalent figure was US\$6.3 billion or 86 per cent, while for Tunisia, it was US\$1.6 billion or 80 per cent.

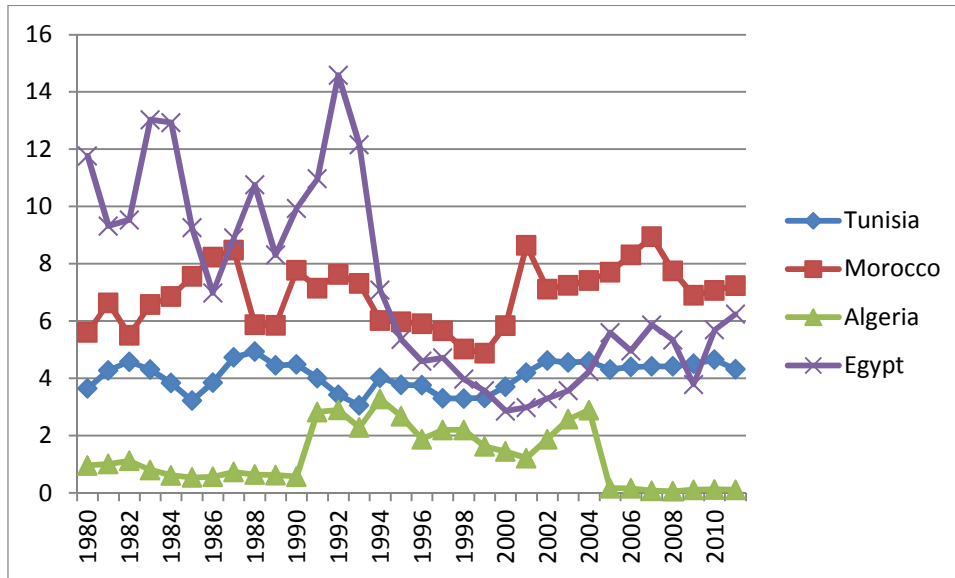
Fig. 2.

Top remittance destinations in North Africa, 2011.

Source: World Bank. World Development Indicators.

Fig. 3 tries to compare the remittances as a share of GDP. In so doing it will be possible to discern the countries that are heavily dependent on remittances. As shown in Fig. 3 it appears, on average, Morocco is the highest recipient of remittances as a percentage of GDP at 7.2 percent of GDP followed by Egypt with a value of 6.2 percent in 2011. On the global scale (see World Bank, 2012), as a share of GDP smaller countries were the largest receipts of remittances in 2011: Tajikistan (46.9 percent), Tonga (16.5 percent), Lesotho (25.7 percent), Moldova (22.8 percent), and Nepal (22.1 percent).

Fig. 3.
Top destinations - remittances as percent of GDP, 1980-2011.



Source: World Bank. World Development Indicators.

III. Literature Review

III.1 Remittances and economic growth

The literature on remittances to developing countries has developed rapidly in recent years. Many empirical studies concentrate on the impact of remittance inflows on the living standards of recipient households. In this context, Abdih et al. (2012) show that remittances help lift more people out of poverty by enabling them to consume more than they could otherwise. Remittances also tend to help the recipients maintain a higher level of consumption during economic adversity (Chami et al. 2012). Recent studies report that these inflows

allow households to work less, take on risky projects they would avoid if they did not receive this additional source of income, or invest in the education and health care of the household. In other words, remittances are a boon for households. Others focus on the short run macroeconomic impact of remittances, typically finding a positive relationship with aggregate income, investments and employment (Glytsos, 1993; León-Ledesma and Piracha, 2001; Le, 2011; Dzansi, 2013).

As a consequence, these results say nothing definite on the effects of an increase in remittance inflows upon the economic growth of the receiving country in the long run, which largely depends on how such financial resources are used, whether directly by recipients or indirectly, through the intermediation of financial institutions, by other people in the country. If remittances are channelled into productive investment, or if they improve the creditworthiness of recipients and their access to external financial resources, the impact on economic growth is positive. If, however, the prevailing end uses of remittances are on increasing consumption and expenditures on housing, land and other forms of second-hand non-financial assets the association with the economic growth is very feeble - depending on the type of purchased goods and on the existence of unexploited national productive capacity. In addition, if we consider the wealth impact of remittances on the labor force participation of recipient households and the effects on the competitiveness of national exports, the relationship between remittances and GDP growth turns out to be negative.

In a study covering up to 113 countries over the period 1970 to 1998, Chami et al. (2005) find a negative link between remittances and economic growth. Basically remittances were found to be counter-cyclical in nature. They argue that remittances act like compensatory transfers and, hence, do not aid in the process of economic growth. Their idea was that remittances are intended for consumption rather

than investment. Hence, the impact of remittances on economic growth is insignificant. In this view, Barajas et al. (2011) have shown how remittances can lead to real exchange rate appreciation, which in turn can make exports from remittance-receiving countries less competitive. The industries or companies that produce the exports may be transferring know-how to the rest of the economy or providing opportunities for other local companies to climb up the value chain. This is often the case, for example, with manufacturing. Therefore, if these companies become less competitive owing to exchange rate changes (which are themselves caused by remittances), then these firms must scale back or close, and their beneficial impact on productivity is reduced.

Given the contrasting channels through which remittances influence long-run economic growth, precisely what is the actual causal nexus between remittances and GDP growth is therefore a matter of empirics. The evidence is far from conclusive, results varying with time and the country sample analysed, the definition of remittances used, the econometric specification and estimation methodology adopted. However, a stylized fact that seems to emerge is that on average the effect of remittance inflows on economic growth is small in magnitude and statistically not very robust with regard to both the sign and significance of the estimated coefficients.

An alternative instrument used in several subsequent studies is the distance between migrants' home country and their main destination country. This was used in a study by the IMF (2005), along with a dummy variable indicating whether the home and main destination country shared a common language over 1980 to 2004. The IMF study was able to use time-invariant instruments because it employed a cross-section rather than an annual dataset on 101 countries over the period 1970-2003. The results yielded no statistical link between remittances and per capita output growth, or between remittances and other variables such as education or investment rates.

Faini (2006) also used distance from the migrants' main destination countries as the instrument for remittances in cross-sectional growth regressions using a sample of 68 countries with data averaged over the period 1980-2004. The coefficient on the remittance-to-GDP ratio in the growth regressions was positive but statistically insignificant. Acosta et al. (2008) instead reported a panel of 67 countries in the period 1991-2005 and found that remittances have a positive albeit modest influence on economic growth. These positive results were also confirmed through the studies on Latin American and Caribbean countries by Ramirez and Sharma (2008) and Mundaca (2009).

Barajas et al. (2009) examine the impact of remittances on economic growth in 84 recipient countries, based on annual observations in the period 1970-2004. They use the following instruments: the ratio of remittances to the GDP of all other recipient countries, which captures the effects of global reductions in transaction costs and other macroeconomic determinants of remittances. In most cases, remittances have a negative sign and, in others, there is no robust relationship between remittances and economic growth. However, Vargas-Silva et al. (2009) examine the impact of remittances on poverty and economic growth in Asia (using annual data). In their specification, GDP growth rate and poverty gap ratio are expressed as a function of remittances, logarithm of initial GDP per capita, primary school completion rate, logarithm of gross capital formation, openness of trade and GDP deflator. While the impact of remittances on economic growth is positive, the impact on poverty is negative. Pradhan et al. (2008) examined the effect of remittances on economic growth using panel data from 1980-2004 for 39 developing countries; they confirmed a positive impact on economic growth.

Other studies treat endogeneity problems by using internal instruments via dynamic panel techniques. Giuliano and Ruiz-Arranz (2009) analyse the five-year growth of GDP of a set of 73 developing countries in the period 1975-2002 using the system GMM, following

Arellano and Bover (1995) and show that, on average, remittances have no significant influence on economic growth. Similarly, Jongwanich (2007) examined the effects of migrant remittances on economic growth in developing Asia-Pacific countries using **panel data** over the period 1993-2003. The results suggest that the correlation between remittances and the three-year growth rate of GDP is statistically insignificant.

By contrast, using panel unit root and cointegration techniques, [Ramirez and Sharma \(2008\)](#) found that remittances have a positive and significant effect on economic growth of selected upper and lower income Latin American and Caribbean countries. Fayissa and Nsiah (2010) explore the aggregate impact of remittances on economic growth within the conventional neoclassical growth framework using panel data spanning from 1980 to 2004 for 36 African countries. They found that remittances positively impact economic growth by providing an alternative way to finance investment and helping to overcome liquidity constraints. Also using the system GMM estimator, Nyamongo et al. (2012) confirmed that remittances appear to be an important source of economic growth in a panel of 36 countries in Africa over the period 1980-2009. Similar results are reported by Nsiah and Fayissa (2013), who found that remittances had a positive and significant effect on economic growth in Africa, Asia and Latin American-Caribbean countries over the period 1985-2007.

III. 2 Finance and growth

The *recent empirical literature shows* that the development of financial market is relevant (see, for example, Hermes and Lensink 2003; Alfaro et al. 2004, 2010; Azman-Saini et al. 2010; among others). The conventional wisdom suggests that financial development is an essential determinant as well as a major contributor of economic growth for few reasons.

First, a more developed financial system provides a fertile ground for the allocation of resources, better monitoring, fewer information asymmetries, and economic growth (Shen and Lee, 2006). Financial system may contribute to GDP growth via two channels. On the one hand, it mobilizes savings; this increases the volume of resources available to finance investment. On the other hand, it screens and monitors investment projects (*i.e.* lowering information acquisition costs); this contributes to increasing the efficiency of the projects carried out (Greenwood and Jovanovic 1990; Levine 1991). The more developed the domestic financial system, the better it will be able to mobilize savings, and screen and monitor investment projects, which will contribute to higher economic growth.

Second, financial systems influence the amount of credit rationing in financial markets and constrain potential entrepreneurs, which in turn determine economic growth. This is especially true when the arrival of an entirely new technology brings with it the potential to tap not just domestic markets but export markets (Alfaro et al. 2004).

Third, financial sector may also determine to what extent foreign firms will be able to borrow in order to extend their innovative activities in the host country, which would lead further increase the scope for technological spillovers to domestic firms. Hence, the diffusion process may be more efficient once financial markets in the host country are better developed, since this allows the subsidiary of a multinational corporation to elaborate on the investment once it has entered the host country (Hermes and Lensink 2003). As Demetriades and Andrianova (2004) explain, the existence of a developed financial system is a precondition for the country to materialize new innovations and exploit its resources efficiently. In this way, finance is seen as a facilitator for economic growth, rather than as a deep determinant for GDP growth.

Finally, the efficiency of financial market matters to the economic growth.³ In fact, some researchers have indicated that countries with efficient financial systems are less susceptible to the risk that a financial crisis will erupt in the wake of real economic disturbances and more resilient in the face of crises that do occur (Bordo and Meissner 2006; Beck et al. 2000). Indeed, countries with better developed financial systems, i.e. financial markets and institutions that more effectively channel society's savings to its most productive use, experience faster economic growth (Bekaert et al. 2003; Ranciere et al. 2006). As mentioned by Blejer (2006), countries with efficient financial systems are less prone to banking and currency crises, and these countries also suffer much less when a crisis does occur.

III. 3 Interactions between remittances and finance in promoting growth

Current discussions on the relation between remittances and financial development are based on the question whether these two variables are substitutes or complements. On the one hand, the complementarity hypothesis claims that remittances and financial development foster one another. While a higher degree of financial development allows migrants to send money home faster, safer and above all cheaper, large amounts of remittances stimulate the interest of financial institutions and public authorities, bringing about higher levels of competition between financial intermediaries, as well as

³ The financial system's efficiency can be gauged by the efficiency with which it transforms resources into capital. In other words, the financial sector functions efficiently if it intermediates at a minimum price and reduces the comprehensive cost of capital to its optimal level (Blejer, 2006).

institutional reforms aiming at channeling remittances towards productive investment. In addition, a more developed financial system in the home country should entail lower costs of transferring money (Freund and Spatafora, 2008): these would reduce the number of households who are prevented from remitting by a budget constraint and increase the optimal amount transferred by each remitter. Finally, in countries where the banking system is well developed, remittances may complement bank credit or may act as collateral to gain access to it. Migrants might then be encouraged to transfer money to their families in the hope that it will not be wasted in unproductive consumption (Chami et al. 2005).

On the other hand, a substitution mechanism could also be at work: when domestic credit markets are poorly developed, a large number of households with potentially productive investment projects have no access to external finance or may borrow only at a large premium over the risk-adjusted interest rate. In this case, remittances may be used as an alternative source of finance allowing recipient households to fund productive activities, or may be pledged as collateral, helping recipients to access formal credit markets. Alternatively, they may be intermediated directly by recipients, enabling other village households to overcome credit constraints and start new businesses (Bettin and Zazzaro, 2012).

The empirical literature on the relationship between remittances and financial development tests two hypotheses; the substitutability hypothesis on the one hand, and the complementarity hypothesis, on the other. Substitutability between remittances and finance appears to be robust to the sample of countries analysed and the econometric method employed. For example, Giuliano and Ruiz-Arranz (2009) use a cross-section of 73 countries over the period 1975-2002 to test the substitutability hypothesis. They contended that formal credit and remittances are substitute rather than complement; remittances substitute for the lack of finance, which implies that their impact on

economic growth is more pronounced whenever finance is missing. They interpret this finding to suggest that in shallow financial markets where potential investor lack collateral and face a credit constraint remittances support entrepreneurial activities, conversely in developed markets entrepreneurs can access credit through formal channels. In a related study, Ramirez and Sharma (2008) show that remittance inflows have a positive and significant impact on economic growth in the selected Latin American and Caribbean countries over the period 1990-2005, and that the effect of remittances is more pronounced in less financially developed countries. Calderon et al. (2008) find additional support for this hypothesis of substitutability for which the promoting effect of remittances on the investments and economic development of the receiving country declines as the domestic financial sector becomes deeper. Similar results are reported by Barajas et al. (2009), who analyse a larger set of countries by using fixed-effect methods, and by Le (2011), who focus on the impact of remittances on investments.

The complementarity relationship between remittances and financial development in boosting economic growth is found by Mundaca (2009). Using the panel data of 25 Latin American and Caribbean countries from period 1970 to 2002, the author shows that remittances can further promote GDP growth in economies with well developed financial systems. This is confirmed in a study by Aggarwal et al. (2011) using data on remittance inflows for 109 developing countries over the period 1975-2007, which reveals the existence of a positive and significant link between remittances and financial sector development. This is premised on the notion that remittances contribute to the development of the financial sector by increasing the aggregate level of deposits and/or the amount of credit to the private sector extended by the local banking sector. Providing remittances, services allow banks to “get to know” and reach out to unbanked

recipients or recipients with limited financial intermediation. If this argument is valid, financial development will in turn promote economic growth as shown in the literature (see Misati and Nyamongo, 2011). Similarly, using a panel of 66 developing countries over the period 1991-2005, Bettin and Zazzaro (2012) show that an efficient banking system complements the positive effect of remittances on GDP growth. Similar results are reported by Nyamongo et al. (2012), who find that remittances appear to be working as a complement to financial development in a panel of 36 countries in Africa over the period 1980-2009.

IV. Data and Empirical Methodology

IV.1. Data

This section describes the data used in the empirical analysis, specifically the measures of remittances, financial market development, economic growth, and a number of controlling variables used in growth regressions. Our sample consists of 4 countries of the North Africa (Tunisia, Morocco, Algeria and Egypt) with annual data for the period 1980-2011.

The dependent variable is the real GDP per capita growth. This variable is obtained directly from the World Bank: World Development indicators (2013). In addition, the real GDP per capita used here is in US dollars (2005 prices).

Data on remittances as a ratio of GDP is obtained from the World Bank: African development indicators (2013). The broader measure records remittances as the sum of three aggregates: First, *workers' remittances* records current transfers to nonresidents by migrants who are employed in, and considered a resident of, the countries that host them. The category *employee compensation* is composed of wages, salaries, and other benefits earned by individuals in countries other than those in which they are residents for work performed for and paid for by

residents of those countries. Finally, *migrants' transfers* are contra-entries to the flow of goods and changes in financial items that arise from individuals' change of residence from one country to another, such as movement of accumulated savings when a migrant returns permanently to the home country. In most research on remittances, all three types of transfers are summed and labeled "remittances".

In this study we use two indicators to measure financial deepening, facilitate resource mobilization, and gauge the efficiency of financial intermediation. The first indicator is liquid liabilities of the financial system (LIQUID): equal currency plus demand and interest-bearing liabilities of banks and non financial intermediaries divided by GDP. It is the broadest measure of financial intermediation and includes three types of financial institutions: the central bank, deposit money banks, and other financial institutions. Hence, LIQUID provides a measure for the overall size of the financial sector without distinguishing between different financial institutions. The data are obtained from World Development Indicators (WDI) (World Bank, 2013).

This commonly used measure of financial sector development has shortcomings. It may not accurately represent the effectiveness of the financial system in ameliorating information asymmetries and easing transaction costs as well as the measure takes into account deposits by one financial intermediary in another, which may involve double counting problem (Levine et al. 2000). The use of this indicator is based on the McKinnon - Shaw hypothesis, which implies that a monetized economy reflects a highly developed capital market; hence a high degree of monetization, therefore, should be positively related to economic growth. Under this assumption, many researchers use this measure as financial depth (McKinnon 1973; King and Levine 1993a; Schich and Pelgrin 2002). Thus, we include it as one measure of financial intermediary development.

The second measure is the credit provided by the banking sector to GDP (CREDIT), which measures how much intermediation is performed by the banking system, including credit to the public and private sectors. Calderon and Liu (2003) suggest that this indicator has an advantage as it takes into account the credits to private sector only and isolates credit issued to the private sector, as opposed to credit issued to governments, government agencies, and public enterprises. Furthermore, it excludes credits issued by the central bank. They argue that the measure is even better than indicators used by previous studies such as King and Levine (1993a, b)⁴ and Levine (1999).⁵ Indeed, De Gregorio and Guidotti (1995) claim that CREDIT is a better measure of financial development than measures of monetary aggregates such as M1, M2 and M3 because it reflects the more accurately on the actual volume of funds channeled into private sector. The ratio, therefore, is more directly linked to the investment and economic growth. Moreover, Calderon and Liu (2003) contend that a higher ratio of CREDIT to GDP indicates more financial services and hence, greater financial intermediary development. The data are from the WDI (2013).

Our set of controls includes: Inflation, measured as the annual percentage change in the consumption price index (INF), is used as a proxy for macroeconomic stability. To capture openness to international trade, we use the ratio of the sum of exports plus imports to GDP (OPENNES). Investment ratio, defined as the ratio of gross fixed capital formation to GDP (INV). Government consumption, defined as the ratio of central government expenditures to GDP

⁴ King and Levine (1993a, b) use a measure of gross claims on the private sector divided by GDP. But, this measure includes credits issued by the monetary authority and government agencies.

⁵ Levine (1999) uses a measure of money bank credits to the private sector divided by GDP, which does not include credits to the private sector by non-deposit money banks and it only covers the period 1976-1993.

(GOVCON). Lagged GDP per capita was included to control for economic convergence in our regressions. Several studies point out that per capita income could serve as a good proxy for the general development and sophistication of institutions (La Porta et al., 1998; Beck et al., 2003). All control variables, except inflation, are specified in natural logs. The data are from the WDI (2013).

IV.2 Empirical Methodology

Here we explain the estimation strategy used in this paper. As a starting point we formulate the standard growth model in a manner consistent with Bettin and Zazzaro (2012). We estimate the impact of remittances on economic growth by system GMM. For illustrative purposes, we do not include in our first regression any variable for financial development. We estimate the following equation:

$$GDP_{i,t} = \beta_0 + \beta_1 GDP_{i,t-1} + \beta_2 Rem_{i,t} + \beta_3 X_{i,t} + \mu_t + \eta_i + \varepsilon_{i,t} \quad (1)$$

where $GDP_{i,t-1}$ denotes the (logarithm of) initial level of GDP per capita, Rem is equal to remittances over GDP and $X_{i,t}$ is a vector of variables found in standard growth models including: the ratio of gross investment to GDP; inflation rate; ratio of government consumption to GDP and openness variable (sum of exports and imports to GDP), μ_t is a time specific effect, η_i is an unobserved country-specific fixed effect and $\varepsilon_{i,t}$ is the error term.⁶ We are interested in testing whether the marginal impact of remittances on growth, β_2 , is statistically significant.

⁶ Note that Eq. (1) can be alternatively written with the growth rate as dependent variable as:

$Growth_{i,t} = GDP_{i,t} - GDP_{i,t-1} = \beta_0 + (\beta_1 - 1)GDP_{i,t-1} + \beta_2 Rem_{i,t} + \beta_3 X_{i,t} + \mu_t + \eta_i + \varepsilon_{i,t}$, where $(\beta_1 - 1)$ is the convergence coefficient.

While remittances have the potential to affect economic activity through a host of channels, in a second set of regressions we examine one specific link between remittances and economic growth, specifically the one working through financial markets. The hypothesis we would like to test is whether the level of financial development in the recipient country affects the impact of remittances on economic growth. To this end, we interact the remittances variable with an indicator of financial development and test for the significance of the interacted coefficient.⁷ A negative coefficient would indicate that remittances are more effective in boosting economic growth in countries with shallower financial systems. In other words, a negative interaction provides evidence of substitutability between remittances and financial development. On the other hand, a positive interaction would imply that the growth effects of remittances are enhanced in deeper financial systems, supporting complementarity of remittances and other financial flows.

The regression to be estimated is the following:

$$GDP_{i,t} = \beta_0 + \beta_1 GDP_{i,t-1} + \beta_2 Rem_{i,t} + \beta_3 FinDev_{i,t} + \beta_4 (Rem_{i,t} \cdot FinDev_{i,t}) + \beta_5 X_{i,t} + \mu_t + \eta_i + \varepsilon_{i,t} \quad (2)$$

where *FinDev* is a set of financial development indicators, and *Rem.FinDev* is an interaction variable. As shown in Eq. (1) remittances are critical to economic growth performance. Here we hypothesize that higher level of remittances will affect on economic growth. This follows the work of Giuliano and Ruiz-Arranz (2009)

⁷ In order to ensure that the interaction term does not proxy for remittances or the level of development of financial markets, these variables are also included in the regression separately.

and Rao and Hassan (2011). Further motivation is found in Aggarwal et al. (2011) where it is shown that remittances may directly promote financial development which will in turn positively impact the level of economic growth.

In Eq. (2) the interaction term (Rem.FinDev) is incorporated. This variable serves to show the role of remittances on economic growth using the financial sector transmission mechanism. The inclusion of the interaction term in this equation is based on the debate in the literature on whether these two variables are complements or substitutes. The proponents of the substitutability hypothesis argue that remittances relaxes the lack of financial development condition in emigration countries, by allowing poor people to invest in high return projects despite their difficulties to obtain credit (see Calderon, et al. 2008; Giuliano and Ruiz-Arranz, 2009). On the other hand, the complementarity hypothesis is built on the notion that remittances and financial development support one another (see Aggarwal et al. 2011; Bettin and Zazzaro, 2012). Here it is shown that a higher degree of financial development allows migrants to send money home cheaply, faster and safely. If remittances are transmitted in large amounts they may stimulate the interest of financial institutions and public authorities, bringing about higher levels of competition between financial institutions, as well as institutional reforms with a view to channeling remittances towards productive investment.

Our estimation technique addresses issues of endogeneity and unobserved country characteristics. Therefore, to account for endogeneity and country-specific unobserved characteristics, we use the system GMM dynamic panel estimation method. The option to use system GMM is based on the argument that the existence of weak instruments implies asymptotically that the variance of the coefficient increases and in small samples the coefficients can be biased. To reduce the potential bias and inaccuracy associated with the use of Difference GMM (Arellano and Bond, 1991), Arellano and Bover

(1995) and Blundell and Bond (1998) develop a system of regressions in differences and levels. The instruments for the regression in differences are the lagged levels of the explanatory variables and the instruments for the regression in levels are the lagged differences of explanatory variables. These are considered as appropriate instruments under the assumption that although there may be correlation between the levels of explanatory variables and the country specific effect, there is no correlation between those variables in differences and the country specific effect

The consistency of the system GMM estimator is assessed by two specification tests. The Sargan test of over identifying restrictions tests the overall validity of the instruments. Failure to reject the null hypothesis gives support to the model. The second test examines the null hypothesis that the error term is not serially correlated. Again, failure to reject the null hypothesis gives support to the model.

V. Empirical results

To investigate the role of remittances, financial development and economic growth we present a range of results. We follow the approach of first estimating the growth model following the standard variables as shown in Table 1 then financial development indicators is included.

Further evidence of the importance of remittances to economic growth are shown in Table 1, where the financial development indicators are introduced into the model, and it is found that the estimated coefficients are largely positive and significant at the conventional levels of testing. The results suggest that the main variable of interest, migrant remittances to GDP are positive and statistically significant in all columns, suggesting that remittances contribute significantly to economic growth in North Africa. However, the impact is more pronounced when the financial development variable is included. Column (1), for example, suggests

that a 1% increase in remittances leads to a 0.004% increase in the growth rate. A 1% increase in migrant remittances leads to a 0.008% increase in economic growth in column (3). This conclusion is also consistent with previous empirical studies such as Aggarwal et al. (2011); Bettin and Zazzaro (2012) and Ramirez (2013).

The role of financial development is shown in Table 1. In particular, we explore whether the financial development of the recipient country influences the specific uses given to remittances and their capacity to influence growth. To this end, we estimate Eq. (2), which allows the impact of remittances on economic growth to vary across levels of financial development in the recipient country. The sign of the interacted coefficient provides information regarding the nature of remittances. More specifically, a positive interaction term reveals that they are complementary and that a well functioning financial system enhances the impact of remittances. On the other hand, a negative sign indicates that remittances and financial development are used as substitutes to promote economic growth. Table 1 (columns 2 and 3) present system GMM estimates using domestic credit as ratio of GDP and M2 as a ratio of GDP as a measure of financial development. All two financial development indicators are positive and statistically significant at the 10% significance levels.

Table 1. Remittances, Financial Development, and Economic Growth

	(1)	(2)	(3)
GDP _{t-1}	-0.026**	-0.032**	-0.025**
GOVCON	-0.08*	-0.04*	-0.02*
INF	-0.001**	-0.001*	-0.001*
OPENNESS	0.043***	0.052**	0.046***
INV	0.09*	0.08*	0.06*
Rem	0.004*	0.009*	0.008*

CREDIT	-	0.004*	-
Rem*CREDIT	-	0.001*	-
LIQUID	-	-	0.006*
Rem*LIQUID	-	-	0.002*
Constant	0.53*	0.51*	0.45*
R-squared	0.58	0.54	0.56
AR(1) test	0.00	0.00	0.00
AR(2) test	0.82	0.75	0.81
P-value Sargan test	0.81	0.78	0.80

Dependent variable is real GDP per capita growth. *, **, and *** indicate statistical significance at 10 percent, 5 percent and 1 percent levels, respectively.

Table 1 presents the results where the interaction variable is added to the regressions. As shown in columns 2 and 3, the coefficients on Rem*CREDIT and Rem*LIQUID are positive and statistically significant, confirming the results that remittances contribute to an increase in economic growth through its interaction with financial sector development. This finding supports the complementarity hypothesis and corroborates the findings by Mundaca (2005); Bettin and Zazzaro (2012) and Nyamongo (2012). However, our findings suggest that public authorities in today's North African countries should try to maximize the impact of remittances by identifying policies aiming to promote financial democracy, that is, policies that facilitate the access to bank service, that provide information about the remittance market, and that ensure greater transparency in the financial system. Insofar as financial development has positive impacts on economic growth, such policies should also contribute to accelerate the process of catching-up in real income of emigration countries.

We introduce the level of initial GDP per capita (the natural logarithm) as independent variable according to the conditional convergence hypothesis. The initial GDP per capita coefficient is negative, meaning that the conditional convergence hypothesis is evidenced: holding constant other growth determinants, countries with lower GDP per capita tend to grow faster. The initial position of the economy is thus a significant determinant of economic growth, as recognized by the neoclassical theory. The initial income has a negative effect on economic growth coherent to the theoretical study and statistically significant at a 5% level. The result corroborates the work of Barro and Sala-i-Martin (1997); Easterly and Levine (1997) and Sachs and Warner (1997). With regards to the effect of the other variables in the regression, they are all consistent with standard growth regression results. The openness ratio and the private investment to GDP ratio *have a significantly positive effect* on economic growth in most of the regressions, unlike inflation and government spending, which have a negative impact. Barro and Sala-I-Martin (1995) attributed the negative impact of government on economic growth to unproductive public sector or some aspects of bad government such as corruption, which is likely to be captured by the variable. These factors have the tendency to hinder economic growth. The p values for the Sargan test for over-identifying restrictions where the null hypothesis is that the instruments are uncorrelated with the residuals, and the Arellano-Bond test for second order serial correlation in the first-differenced residuals, confirm that the moment conditions cannot be rejected.

VI. Conclusions

Our study examines the relationship between remittances and economic growth in the presence of domestic financial system. Using system GMM panel data model to examine the link between remittances, financial development, and economic growth in a panel of 4 countries of North Africa (Tunisia, Morocco, Algeria and Egypt)

over the period 1980-2011, both remittances and financial development indicators generally show a significant and positive impact on economic growth.

To examine whether financial development helps a country to benefit more from remittances, the study interacted remittances with different measures of financial market development. The result is that when remittances is interacted with the financial development indicators, the interaction terms are generally positive and significant, shedding light on the role of financial development in benefiting from remittances.

The results have clear policy implications, namely the effect of remittances on economic growth is subject to the underlying financial conditions and institutions. A well developed domestic financial system plays an important role in complementing the impact of remittances on economic growth; that is, countries with better-developed financial sectors experience a raise in their growth rates.

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