DO WORKERS' REMITTANCES PROMOTE CONSUMPTION STABILITY IN EGYPT?

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Abstract. This paper examines cyclical characteristics of remittances and explores their counterbalancing and consumption-smoothing potential. First, it uses quarterly data to better reflect the short-term dynamics of consumption and remittances. Second, it uses different methodologies to examine whether the results are robust or not, namely OLS, VAR and SVAR. Third, to control for the endogeneity of remittances, we use a Generalized Method of Moments technique by instrumenting remittances. Finally, we apply this on the Egyptian case since studies on the MENA region in this field are quite rare. Our main findings show that there is a significant consumption smoothing effect of remittances. Moreover, we found that, even when the endogeneity of remittances is controlled for, this consumption smoothing effect remain robust. This finding is robust under a battery of sensitivity tests.

Keywords: Egypt, remittances, business cycle, consumption smoothing.

JEL Classification: C5, E32, F22, F24

1. INTRODUCTION

Over the period 2009/2010-2014/2015, foreign exchange revenues for Egypt shrank considerably. With the turmoil in the global financial markets and the onset of the Egyptian Revolution in 2011, Egypt's trade deficit widened from $25 billion to $39 billion (from 11.5 percent to 11.8 percent of GDP) and tourism revenues dropped from $11.6 billion to $7.4 billion (from 5.3 percent to 2.2 percent of GDP), worsening the current account deficit from $4 billion to $12 billion (from 2 percent to 3.7 percent of GDP) over the same period. While foreign direct investment (FDI) inflows slightly increased from $11 billion in 2009/2010 to $12.9 in 2014/2015 (from 5 percent to 3.9 percent of GDP), foreign portfolio investment (FPI) witnessed sharp volatility turning the $7.9 billion inflows in 2009/2010 to $0.6 billion outflows in 2014/2015 (from 3.6 percent to 0.19 percent).

However, workers' remittances to Egypt increased from $9.8 billion in 2009/2010 to $19.3 billion in 2014/2015 (from 4.5 percent to 5.8 percent of GDP), becoming the largest source of foreign exchange revenue for the country. In 2015, remittances are three times higher than the foreign exchange revenue from the Suez Canal or tourism and are significant compared to foreign direct investment inflows (150 percent). Remittances exceed foreign exchange reserves (117 percent) and cover more

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than 30 percent of Egypt's total import bill (The Central Bank of Egypt, 2015). Hence, remittances could provide an enormous source of finance for development.

Effective management of remittances requires a clear understanding of their potential benefits and consequences on the real economy (Ziesemer, 2010 and Castillo-Ponce et al. 2011). Knowledge on the behavior of remittances over the business cycle in Egypt and its implications for macroeconomic stability is limited. Hence, this paper will examine cyclical characteristics of remittances and explore their counterbalancing and consumption-smoothing potential. First, it uses quarterly data to better reflect the short-term dynamics of consumption and remittances. Second, it uses different methodologies to examine whether the results are robust or not, namely Ordinary Least Squares (OLS), Vector Auto-Regressive (VAR) and Structural VAR (SVAR). Third, to control for the endogeneity of remittances, we use a Generalized Method of Moments (GMM) technique by instrumenting remittances. Finally, we apply for the Egyptian case since studies on the MENA region in this field are quite rare. Moreover, Egypt is an interesting case since remittances represent a significant source of foreign currency and income for the Egyptian economy.

The paper is organized as follows. After this introduction, Section 2 presents a brief review of the literature on the macroeconomic effects of remittances in developing countries, including Egypt. Section 3 highlights the stylized facts regarding workers' remittances to Egypt. In section 4, the model used to estimate the impact of remittances on the comovement between domestic consumption and output is laid out. Finally, Section 5 presents the empirical results. Section 6 concludes and highlights some policy implications.

2. Role of Remittances Over the Business Cycle: Review of the Literature

Workers' remittances can be procyclical, countercyclical or acyclical to economic conditions in the recipient country.[4]If remittances are *procyclical*, they can exacerbate output fluctuations and contribute to the volatility of consumption in the country when abruptly leaving the country. If remittances are *countercyclical* to economic crisis and downturns in the receiving country- that is, remittances tend to rise during recessive phases in the economic cycle as migrants send more money home, they can help buffer consumption from short-run fluctuations in income. The ability to reduce fluctuations in consumption is an important determinant of economic welfare. If remittances are *acyclical,* not significantly related to the domestic business cycle, they have the potential to make a critical contribution in supporting consumption in the face of economic adversity (Vacaflores and Beckworth, 2015). This is particularly important in countries where remittances are used to finance household consumption directly.

[4] Workers' remittances can be *procyclical* if the correlation between output and the cyclical component of flows is positive and statistically different from zero; *countercyclical* if it is negative and statistically different from zero; or *acyclical* if the correlation is not statistically different from zero.

Hence, the purpose of this section is to present a brief review of the literature that examines how remittance inflows behave over the business cycle in the recipient countries and analyzes whether remittances support consumption stability over time. Whether workers' remittances are counter-cyclical or pro-cyclical mainly depends on the motive to remit. The two main remitters' motives are altruism and investment (profit driven motive).

Procyclical remittances

If remittances are sent with a profit-driven motive, such as investment, they are likely to be pro-cyclical. Jidoud (2015) evaluated the empirical correlation between the size of remittances and macroeconomic volatility (HP filtered) by estimating a cross section model using Generalized Least Squares (GLS) on a sample of 27 African countries –over the period 1980–2005. The empirical results showed that remittances had a significant smoothing impact on output volatility but their impact on consumption volatility is somewhat small. The inability of remittances to significantly reduce consumption volatility was explained by the possibility that remittances might actually reduce the volatility of consumption of non-durables goods but not the volatility of durables. Thus, the inability to disentangle these two components makes it harder to observe a significant impact on aggregate consumption fluctuations. Moreover, the paper argued that the consumption smoothing effect of remittances may not show up because these households have access to alternative means (e.g., credit markets) to smooth their consumption and may use these remittances for investment instead.

Khodeir (2015) analyzed the cyclical behavior of remittances in Egypt by estimating a vector error correction (VEC) model and using annual data from 1980 to 2012. Results of this study revealed that remittances inflows were pro-cyclical with output shocks, reducing support for the ability of remittances to hedge against macroeconomic shocks and corroborating the investment motive to remit.

Cooray and Mallick (2013) acknowledge the endogeneity problem and estimate a dynamic panel data model using the system-GMM method (that use lagged values of growth in the recipient countries) for 116 countries over the period 1970-2007. Results showed that remittance inflows decrease by about 6% for a 10% increase in growth volatility thus reducing their usefulness as a hedge against a negative shock in home countries. This result suggested that economic uncertainty in home countries reduced remittance inflows and therefore supported the investment motive. Contrarily, remittance inflows increased with the volatility in host countries, especially for middle-income countries.

Ncube and Brixiova (2013) examined empirically the key macroeconomic factors driving remittances from the perspective of receiving countries in Africa during 1990 -2011. Results of the pooled OLS regressions pointed to a statistically significant positive relationship between the level of income in receiving African countries and the remittance inflows- the volume of remittances through formal channels increased with higher income and vice versa, pointing to the investment motive in remitting to Africa. Al-Mashat and Billmeier (2012) explored the determinants of remittances to Egypt by analyzing the relationship between remittances flows and other macroeconomic variables. The study applied a 6-variable vector autoregression (VAR) and a cointegrated vector error correction (VEC) to reach the conclusion that economic activity in (the

majority of) host countries for Egyptian migrants, as proxied by oil prices, 'pushes' remittances into Egypt and that economic growth in Egypt provides a 'pull' effect in the same direction. However, the paper did not reach a clear conclusion whether the altruism or the investment motive is more important in terms of pull factors.

Încalţărău and Maha (2012) proposed an econometric analysis of the effects of remittances on the Romanian economy in terms of consumption and investment between 1990 and 2009 using OLS. Results showed that remittances had a more significant contribution to investment than to consumption. The authors returned these results to the data used, which include only remittances sent through formal channels that are indeed bigger and meant for investment purposes. Moreover, Neagu and Schiff (2009) analysis was performed on a sample that included 116 developing countries for the period between 1980 and 2007. Their methodology relied on coefficients of variation to assess the stability and stabilizing impact, whereas cyclicality is evaluated using correlations between GDP on the one hand and the cyclical components of REM, FDI and ODA on the other. They found that official development aid is counter-cyclical, while remittances are pro-cyclical, although less than foreign direct investment, and that official development aid is stabilizing while remittances are destabilizing, although less so than foreign direct investment. The paper also raises a very important point: that it is necessary to examine counter-cyclicality separately from the stabilizing impact, as the former does not seem to always imply the latter.

Under the investment motive, Giuliano and Ruiz-Arranz (2006) analyzed the correlations of the cyclical components of remittances and output, employing the HP filter to assess the cyclical properties of remittance flows, for about a hundred developing countries over the period 1975-2002. The study suggested that remittances are predominantly profit-driven and mostly pro-cyclical and that they tend to boost growth in countries with less developed financial systems by providing an alternative way to finance investment and helping overcome liquidity constraints.

Osili (2004) used a probit model to analyze the likelihood of migrant investment in housing on survey data from Nigerian migrants and their home households in the home country. Empirical results showed that the flow of migrants' savings across international borders - especially remittances of older migrants and those with more income- are sent to finance housing investments suggesting a considerable investment role for migrants' remittances.

Countercyclical remittances

If workers' remittances prove to be counter cyclical- increasing during economic downturns or after a shock, when private capital flows tend to decrease- then remittances would help smooth shocks. Many studies supported the counter-cyclicality of remittances among developing countries.

Remittances can help stabilize consumption fluctuations by *supporting saving*. Some studies based on microeconomic data document that remittances are an important source to enable households to smooth consumption over time, as they help improve access to financial services and ease liquidity constraints. Aga and Martinez-Peria (2014) document that remittances improve financial inclusion for the poor households by increasing access to savings, bank deposits and bank credit.

The stabilizing effect of remittances may also depend on *the exchange rate system*. Under a flexible exchange rate regime, the stabilizing effect of remittances on consumption tends to be much more pronounced (exchange rate flexibility provides an automatic stabilizer to recipients of remittances, in that the domestic currency values of remittances increases when the US$ value of the currency drops, as it usually does during an adverse event).

Bettin et al (2014) used a simple gravity model for a rich panel data set, covering bilateral remittances from 103 Italian provinces to 107 developing countries over the period 2005-2011. Remittances were found to be positively correlated with economic conditions in the source province but negatively correlated with the business cycle in recipient countries, and increase in response to adverse exogenous shocks, such as natural disasters.

Ahmed and Martínez-Zarzoso (2013) examined the stability, cyclicality and stabilization impacts of migrant remittances to Pakistan, between 1974 and 2011. Results confirmed the counter-cyclical mechanism of remittances with Pakistani output. Remittances were found to be a less volatile source of external finance than foreign direct investment (FDI) and official development assistance (ODA), thus serving to steady the recipient economy in times of economic downturns. In particular, results indicated that remittance flows to Pakistan were mainly due to the economic conditions in the receiving economy. Using a sample of 17 remittance-dependent countries in the Middle East, North Africa, Central Asia, and the Caucasus for the period 1990–2009, Abdih et al (2012) showed that remittances were strongly procyclical vis-à-vis sending country income and remittances were spent on consumption of both imported and domestically produced goods, rather than on investment.

Ahmed (2012) analyzed whether remittances to Pakistan acted pro or counter cyclically in the face of external and internal economic shocks between 1973 and 2010. Results showed that remittances to Pakistan are counter-cyclical to both output and household consumption. However, they were found to be acyclical with the output of Pakistan's major remittances sources such as the United States and United Kingdom and the overall impact of remittance inflows to Pakistan appeared to be a stabilizing one.

Das (2012) established a relationship between remittances and other important macroeconomic variables, such as consumption, investment and economic growth in Egypt and three other developing countries (Bangladesh, Pakistan and Syria) over the period 1975-2006. Negative remittance-growth coefficients for Egypt suggested a *counter-cyclical* relationship. Results from panel estimation procedure also showed that the enlightened self-interest motivation “tempered altruism” was the most likely cause of the growth impact in Egypt.

Moreover, Clément (2011) assessed the impact of remittances on household expenditure patterns in Tajikistan by applying propensity score matching methods to the 2003 Tajikistan Living Standards Measurement Survey. The results showed that remittances are devoted to consumption and have no positive effect on investment expenditures. Craigwell et al. (2010) evaluated the impact of remittance flows on economic volatility in a panel of 95 countries over the period 1970-2005. Findings of the study revealed that remittances can play a key role in mitigating the effect of adverse output shocks but exert no significant influence on consumption and investment

volatility. Combes and Ebeke (2010) analyze the impact of remittances on household consumption instability on a large panel of developing countries over the period 1975-2004 after controlling for endogeneity of remittances using GMM-IV. The results show that remittances significantly reduce household consumption instability and dampen the effect of various sources of consumption instability in developing countries (natural disasters, agricultural shocks, discretionary fiscal policy) inducing the insurance motive.

Frankel (2009) estimated a homogenous panel model using OLS and 2SLS on annual bilateral remittances data for 64 pairs of countries, mostly from Europe and Asia over the period 1975-2004. Results confirmed the smoothing hypothesis that remittances are countercyclical with respect to income in the worker's country of origin, while pro-cyclical with respect to income in the migrant's host country. Singh et al. (2009) analyzed the determinants and macroeconomic impact of remittances in Sub-Saharan Africa, using data for 36 countries from 1990 through 2005. Employing a fixed-effect two-stage least square (FE 2SLS) estimation method and using the variables in the system as instruments, they found that remittances behave counter-cyclically, consistent with a role as a shock absorber.

In Mexico, Vargas Silva (2009) discussed key differences between the cyclical properties of remittance inflows and the cyclical properties of foreign direct investment (FDI). Using BK filter to estimate the cyclical component of remittances, FDI, and the output of Mexico and the US and then estimating impulse response functions and variance decompositions using a structural vector autoregressive (SVAR) model. The study revealed that remittances are countercyclical with respect to the Mexican business cycle. However, the lack of a robust relationship between remittances and Mexico's business cycle, suggested that the use of remittances to smooth cyclical fluctuations in output may not be a straightforward strategy.

Speaking of output volatility, Acosta et al. (2008) studied the cyclical behavior of remittances in Latin America using different filters and IV estimations. Evidence indicated that remittances have a positive and significant impact on growth and that they reduce aggregate volatility, which indicates that remittances behave countercyclically in countries of the region, and they increase sharply after macroeconomic crises. In the same vein, Bugamelli and Paternò (2008) provided robust evidence that remittances were negatively correlated to output growth volatility, by applying OLS to a sample of about 60 emerging and developing economies over the period 1980-2003, after filtering remittances and per capita GDP using Hodrick-Prescott (HP) filter.

Bouhga-Hagbe (2006) used a simple regression framework that relates workers' remittances to agricultural GDP, which is used as an indicator of economic "*hardship*" in the home country on data from selected countries in the Middle East and Central Asia, between 1975 and 2002. Evidence suggested that *altruism* could have played an important role in the flow of remittances to Egypt, Jordan, Morocco, Pakistan, and Tunisia in the addressed period.

Spatafora (2005) tested the hypothesis that countries with access to significant remittance inflows may be less prone to damaging fluctuations, whether in output, consumption, or investment using data of a broad sample of up to 101 countries, over the period 1970–2003. Results, of a standard cross-country growth regression and instrumental variable techniques - to minimize the endogeneity problem, showed that

remittances can help improve a country's development prospects, maintain macroeconomic stability, mitigate the impact of adverse shocks, and reduce poverty.

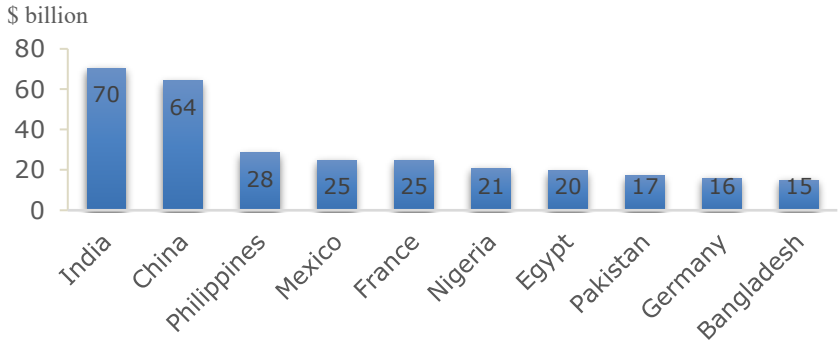
Quartey and Blankson (2004) used a classical linear regression on micro (surveys data) and macro datasets, covering the period 1992 to 1999, to investigate migrant remittances ability to reduce the impact of economic shocks on household welfare in Ghana. Results confirmed the counter-cyclicality of remittances sent to Ghana. Remittances improved household welfare and played an important role as source of income for consumption smoothing. Glytsos (2002) built a Keynesian type econometric model with a dynamic perspective and a sound theoretical basis, for investigating the impact of remittances on consumption, investment, imports and output. The model was estimated by two-stage least squares (2SLS) to estimate short and long-run multiplier effects of exogenous shocks of remittances and was applied individually to 5 countries: Egypt, Greece, Jordan, Morocco and Portugal. The analysis revealed that in Egypt, remittances positively affected consumption but influenced investment negatively.

To sum up, the review of the literature shows that the cyclical properties of remittances depend on the countries studied, the periods examined and the methodology used. This study attempts to overcome the limitations of previous studies and contribute to the current literature in several ways. First, it uses quarterly data to better reflect the short-term dynamics of consumption and remittances. Second, it uses different methodologies to examine whether the results are robust or not, namely OLS, VAR, SVAR and Generalized Method of Moments technique to control for the endogeneity of remittances. Third, we apply for the Egyptian case since studies on the MENA region in this field are quite rare. Moreover, Egypt is an interesting case since remittances represent a significant source of foreign currency and income for the Egyptian economy.

3. WORKERS' REMITTANCES TO EGYPT: STYLIZED FACTS

Egypt is the seventh largest remittances recipient in the world and the largest remittances recipient in the Middle East and North Africa (MENA) region (Figure 1).

Figure 1: Top 10 remittances recipients in absolute terms in 2014



Source: The World Bank Migration and Remittances Data.

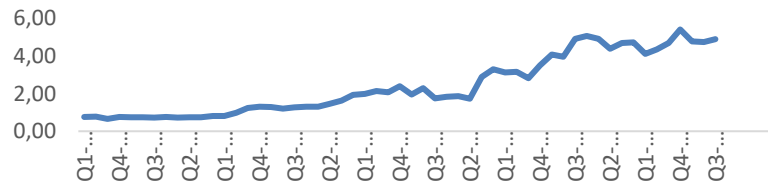
Moreover, the MENA region includes two different groups of countries. The first group is the one of oil exporters and thus remittances senders. The second includes those who are oil importers and remittances receivers. Table 1 confirms this facts since Algeria, Kuwait, Iran, Libya, Oman, Qatar and Saudi Arabia have less remittances than Egypt, Jordan, Morocco, Tunisia and Lebanon who rely heavily on remittances. Over 2001/2002-2014/2015, Egypt has witnessed positive remittances growth rates, except for 2008/2009 when remittances dropped by almost 9% influenced by the global financial crisis. Nevertheless, the negative growth rates did not last for a prolonged period. Despite the January 2011 Revolution, remittances flows continued to grow, registering around $12.6 billion during 2010/2011. Remittances were the only source of capital inflows that increased (by 29%) from 2009/2010 to 2010/2011, while FDI inflows, tourism revenues and (FPI) inflows declined by 13 percent, 9 percent and 132 percent respectively. Remittances proved to be a stable source of foreign exchange inflows compared to other private capital inflows, and did not display the sharp pro-cyclicality associated with the latter inflows. (Figure 2).

Table 1: Remittances' evolution between 1980-2013 (constant millions US$)

	1980	1981-1990	1991-2000	2001-2010	2011	2012	2013
DZA	406.0	390.9	1091.5	685.9	202.9	214.8	209.6
DJI	.	.	12.9	25.5	32.4	33.3	35.6
EGY	2696.0	3291.7	3898.1	5840.5	14324.3	19236.4	17833.1
IRN	.	.	947.8	1029.0	1329.8	.	.
IRQ	.	.	.	250.5	223.0	271.0	.
ISR	421.0	471.7	824.0	519.8	594.6	684.9	764.8
JOR	793.9	962.7	1360.8	2771.9	3368.0	3489.6	3642.7
KWT	.	.	.	4.8	5.6	2.6	4.2
LBN	.	.	.	5603.1	6913.5	6730.1	7863.6
LBY	.	.	9.0	11.0	.	.	.
MLT	35.0	45.4	24.5	35.7	37.2	199.8	350.6
MAR	1053.9	1226.3	2008.6	5033.0	7256.3	6507.9	6881.7
OMN	34.7	41.0	39.0	39.0	39.0	39.0	39.0
QAT	.	.	.	.	573.6	803.3	574.4
SAU	.	.	.	165.0	243.7	245.9	268.8
SYR	773.5	373.6	327.5	899.5	.	.	.
TUN	318.6	398.5	650.7	1530.2	2004.5	2265.7	2290.5
WBG	.	.	825.7	987.4	1665.7	2059.7	1748.3
YEM	.	1498.2	1121.2	1312.4	1403.9	3351.0	3342.5

Source: Constructed by the authors using the World Development Indicators.
Note: Remittances are deflated using the CPI.

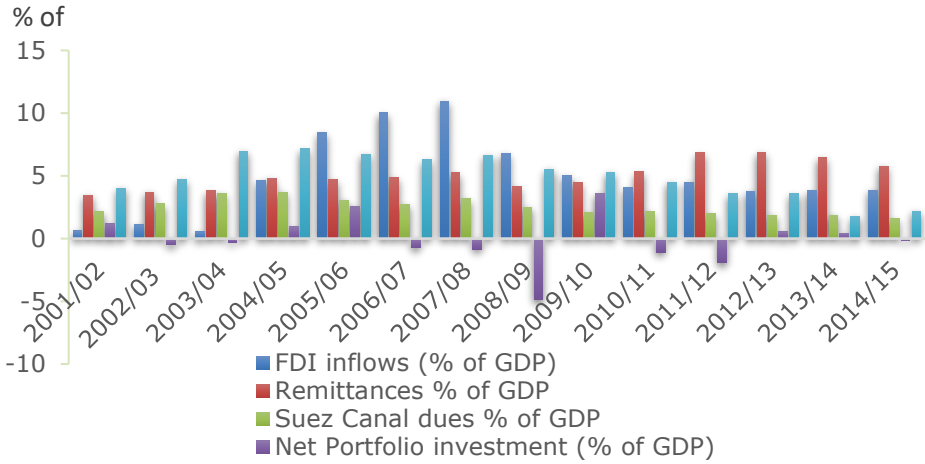
Figure 2: Evolution of Remittances in Egypt (% of GDP)



Source: Central Bank of Egypt

By 2014/2015, workers' remittances became the largest source of foreign financing for Egypt, exceeding foreign direct investment (FDI) inflows, tourism receipts and Suez Canal revenues. In 2014/2015, remittances reached $19 billion (around 6 percent of GDP), compared to $13 billion FDI inflows (3.9 percent of GDP); $7 billion tourism receipts (2.2 percent of GDP) and $5.4 billion Suez Canal revenues (1.6 percent of GDP) (Figure 3).

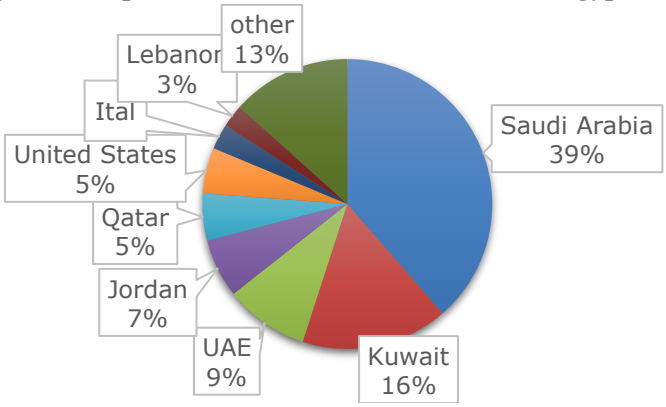
Figure 3: Sources of Financial Inflows to Egypt
(% of GDP, average FY2002-FY2015)



Source: Central Bank of Egypt*, Monthly Statistical Bulletin,* various issues

It is important to identify the main destination countries or regions for Egyptian workers and where do remittances flows come from. The United States has been the main remittances source for Egypt since 2002 until late 2009. After the financial crisis, workers' remittances from the USA dropped from $2.3 billion in 2009 to 534 million in 2010. By 2014, the USA accounted for only 5 percent of total remittances receipts, while Saudi Arabia became the main source of remittances, accounting for nearly 39 percent of the total (Figure 4).

Figure 4: Top remittances source countries for Egypt in 2014



Source: The World Bank Migration and Remittances Data.

Currently, the top three destination countries for Egyptian migrants are Saudi Arabia, Kuwait and the United Arab Emirates (members of the Gulf Cooperation Council (GCC)). Hence, remittance inflows to Egypt may moderate sharply in 2015/2016 due to the expected reduction in the (GCC) government spending due to lower oil prices; in addition to the Nationalization[5] policies suggested by a number of these countries (Saudization, for example) that are also likely to have an impact on the job prospects for migrants; and the instability in the MENA region that could prompt Egyptian workers in countries in this region to return and reduce remittances flows.

4. DATA AND METHODOLOGY

This paper focuses on two main questions. While the first question examines how remittance inflows to Egypt behave over the business cycle, the second one analyzes whether remittances support consumption stability over time. Thus, two main hypotheses will be tested. First, remittances are relatively stable and not significantly related to the domestic business cycle, implying that they might have the potential to make a critical contribution to supporting consumption in the face of economic adversity. Second, during periods of exchange rate depreciation, remittances can function as an automatic stabilizer to their recipients, in that the domestic currency value of remittances increases when the US-dollar value of the currency drops.

To estimate the stabilizing effects of remittances on consumption fluctuations, and assess the impact of remittances on the co-movement between domestic consumption and output, the paper will follow a standard approach in the risk sharing literature.

Particularly, consumption growth will be regressed on output growth in Egypt:

$$\Delta c_{it} = \beta_0 + \gamma_1 R_{it} + \beta_1 (\Delta y_{it}) + \beta_2 R_{it} (\Delta y_{it}) + \Delta \varepsilon_{it} \quad (1)$$

Where Δc_{it} is the first difference of real private consumption at time t;

Δy_{it} is the first difference of real GDP at time t;

R_{it} is remittance inflow as a ratio to GDP at time t.

R_{it} (Δy_{it}) is the interaction term (Inter.)

The coefficient β_2 estimates the extent to which domestic consumption growth is dependent on output fluctuations. An interaction term between remittances and output growth is added to the regression, and measures the extent to which remittance flows help delink domestic consumption from domestic output growth. A negative β_2 suggests that remittances help lower the correlation between Egypt's consumption and output growth. We also control for the real effective exchange rate as well as a dummy variable to measure the effect of political instability in Egypt.

The model mixes increase of some variables with the ratio of Remittances to GDP. Models with this type of mixed variables may present some problems that should be had into account in the conclusions, as seen in Guisan (2008) and (2015).

This model is estimated using four main techniques. First, *a first difference OLS* is used to control for the stationarity of our variables. Second, a *Vector Auto-Regressive*

[5] A new Saudization program since 2011, the so-called "Nitaqat program", seeks to increase the number of Saudi nationals employed in the private sector.

(VAR) model is used. Adopting a VAR model allows us to capture the dynamic interdependence of macroeconomic aggregates within a linear model, where the value of each variable is expressed in terms of its own past values, past values of all other variables and an error term. We also test for the existence of cointegration between our variables and run a vector error correction model (VEC).

Third, an *exactly identified SVAR approach* is used to study the impact and dynamic effects of remittances on consumption. An SVAR model imposes restrictions on the response of variables on each other based on the underlying VAR model. The SVAR model is based on two main matrices: a matrix called *B* which includes the covariance between two variables that are unrelated and estimating the own variance (σ) as follows:

$$B=\begin{pmatrix}\sigma^1 & 0\\ 0 & \sigma^2\end{pmatrix} \quad (2)$$

It is clear the that the diagonal elements are just $E(\varepsilon^2)$ and the off-diagonal are $E(\varepsilon_i\, \varepsilon_j) = 0$.

The second matrix *A* imposes restrictions on the off-diagonal terms. The diagonal terms reflect the unit change of element i on i or on itself

$$A=\begin{pmatrix}i\rightarrow i & i\rightarrow j\\ j\rightarrow i & j\rightarrow j\end{pmatrix} \quad (3)$$

If we assume that the own effect has to be one, making the diagonal 1. Moreover, let's assume that i does not affect neither j nor k, but j affects i:

$$A=\begin{pmatrix}1 & 0\\ a_{21} & 1\end{pmatrix} \quad (4)$$

We assume that consumption is affected by all the variables, GDP is affected by both consumption, REER and remittances and finally remittances are not affected neither by GDP nor by REER. This is why the order of the variables matters in the econometric specification. The goal is to give impulse response functions, as well the variance decomposition a "more" causal meaning. While serially uncorrelated, the error terms associated with each variable are likely to be mutually correlated, as long as contemporaneous relationships between variables are not taken into account. SVAR models are therefore explicit about contemporaneous relationships between variables in order to ensure identification (Corsetti and Muller, 2006).

Fourth, we run a *Generalized Method of Moments* technique in order to control for the endogeneity of remittances. Indeed, we instrument the latter using four instruments namely, oil prices, GDP in USA and REER. First, if the level of economic activity in the main destination countries is strong, remittances would also grow strongly (GDP of USA and EU). Conversely, financial hardships and weak job markets in the destination countries would decrease the demand for migrant workers and lower their remittances flows. Second, since most of the sending economies are oil abundant, oil prices may be correlated with remittances. A recovery in oil prices is likely to help maintain employment levels for existing migrants. Finally, REER is a major factor that determines trends in remittance flows. Exchange rate changes appear to affect the consumption/investment motivation for remittances. Depreciation of the home currency (LE, for example), can spur a surge in remittance flows via a "sale effect" that

encourages migrants to remit home their savings to make large purchases such as land, house, and durable assets. The higher purchasing power of each dollar of remittances may increase the incentive to remit to take advantage of the higher purchasing power in the home country (Egypt). Before running those estimations, we make two important transformations to the data. First, we use the Hodrick-Prescott filter that separates a time series y_t into a trend component T_t and a cyclical component C_t such that $y_t = T_t + C_t$. The objective function for the filter has the for:

$$\sum_{t=1}^{m} C_t^2 + \lambda \sum_{t=2}^{m-1}((T_{t+1} - T_t) - (T_t - T_{t-t}))^2 \quad (5)$$

where m is the number of samples and λ is the smoothing parameter. The programming problem is to minimize the objective overall $T_1,..., T_m$. The first sum minimizes the difference between the time series and its trend component (which is its cyclical component). The second sum minimizes the second-order difference of the trend component (which is analogous to minimization of the second derivative of the trend component). Hence, since we trying to examine whether remittances help smooth consumption or not, it is crucial to focus only on the cyclical component of both of the two variables. This is why, in the following regressions, we introduce the cyclical component of our variables.

Second, we employ the Augmented Dickey-Fuller (ADF) test to check for the stationarity of the variables (Dickey and Fuller 1979). The test is undertaken through the following equation:

$$\Delta Y_t = \alpha + \beta t + (\rho - 1)Y_{t-1} + \sum_{j=1}^{p} \gamma_j \Delta Y_{t-1} + \varepsilon_t \quad (6)$$

where Y_t will be replaced by each of the model's variables, t refers to the trend and j refers to the number of lags. The null hypothesis of ADF test is $\beta = 0 \; and \; \rho = 1$ indicating a non-stationary variable. The null hypothesis will be rejected, indicating that the variable is stationary, if the estimated absolute value of the ADF test statistic is greater than Mackinnon absolute critical values. The analysis may show that all variables fail to reject the unit root hypothesis at levels. However, this hypothesis could be rejected at first differences, indicating that all variables are integrated of order one (see Table A1a and A2b in Appendix 1). The variables could be made stationary by taking first differencing (Granger and Newbold 1986).

Quarterly data over the period 2002-2014 are used. Data for remittances come from the Central Bank of Egypt, consumption and GDP from the Ministry of Planning, REER from Darvas (2012). All variables are measured in real terms.

5. EMPIRICAL FINDING

First Difference OLS

As it is shown in Table 3, the dependent variable is the first difference of real consumption. Our explanatory variables include first difference of real GDP, Remittances and the interaction term. We also control for real effective exchange rate (REER). The equation includes intercept, a Rev dummy (for revolution of year 2011), quarter dummies (3 dummies) and year dummies (13 dummies).

Table 3: OLS – First Difference

	Consumption growth
Remmittances	1.790* (1.040)
GDP growth	0.110 (0.107)
Interaction	5.128 (15.03)
REER	0.000836 (0.000573)
Rev. dummy	0.102*** (0.0267)
Constant	0.0112 (0.0806)
Quarter dum.	YES
Year dum.	YES
Observations	47
R-squared	0.839

Note: Robust standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1

Table 3 shows the OLS first difference results where remittances have a positive and significant effect on private consumption growth. Yet, both GDP growth and its interaction with remittances do not show significance in spite of the great impact that GDP usually has on consumption. This should be analyzed having into account the possible existence of multicollinearity. In fact, a linear relationship between real household consumption per capita and real GDP per capita shows significance of the parameter and high goodness of fit (see Annex).

Finally, the revolution dummy turns to be positive and significant which is consistent with what has been observed after the revolution. Indeed, consumption has increased despite a decrease in real income. This can be partially explained by the increase in remittances that boosted consumption during this period.

VAR Estimation

As it was mentioned before, we run a VAR and an SVAR models to examine the impact of remittances, GDP growth and their interaction on consumption growth. Yet, to do so, we have to determine first the appropriate lag length. Table A2, in Appendix 1, determines the latter using the Akaike Information Criterion (AIC) and/or Schwartz Bayesian Criterion (SBC). In fact, as it is shown, four lags are introduced in our model.

Table A3 in Appendix 1, presents the results of the VAR model using four lags.

Two remarks are worth to be mentioned. First, we found that remittances exert a positive impact on consumption but with four lags, while GDP boosts consumption in a contemptuous way. Second, the interaction variable between remittances and GDP is significant and negative in the second lag showing that remittances can have a smoothing effect on consumption during recessions. Moreover, in order to employ the Granger causality test, variables must be in their stationary state (that is, first differenced).

The direction of the causality between the variables of interest may be unidirectional or bidirectional. Indeed, we found that while remittances have an impact on private consumption, its interaction with GDP does not Granger cause Consumption (Table 4).

Table 4: Granger Causality for Consumption growth

Equation	Excluded	Fstat	df	Probability

Rem.	Cons.	14.84	4	0.005
GDP growth	Cons.	6.5378	4	0.162
Inter.	Cons.	3.3765	4	0.497
REER	Cons.	2.3438	4	0.673
Rev.	Cons.	19.22	4	0.001

Source: Constructed by the authors using STATA. The hypothesis "The explanatory variable is not Granger cause" is usually rejected when the F statistic is great enough to be on the right region of the distribution with Probability lower than 0.05.

In the case of the relationship between consumption growth and GDP growth usually there is a causal relationship and the non-rejection of "non-causality" may be due to "uncertainty of the test result". According to Guisan (2015): *"Granger test is interesting but it may present several limitations due to the effects of missing variables and multicollinearity. Thus we should not interpret the lack of significance of some parameters always as a proof of non-causal relationships. In order to diminish multicollinearity the modified version of Granger test suggested by Guisan usually improves the results."*

The variance decomposition [6] shows that private consumption is highly idiosyncratic since between 73% and 100% of the consumption variance are explained by consumption itself (Table A4 in Appendix 1). Moreover, remittances variation explains around 20% of the consumption variance and 1% are explained by GDP.

Thus, to sum up, the VAR model shows that while remittances Granger cause consumption, this latter is highly idiosyncratic and remittances explain a significant share of its variance.

VEC estimation

The issue of potential cointegration between consumption and remittances has been investigated. Indeed, Table A5 in Appendix 1, shows that we reject the null hypothesis of no cointegration between consumption and remittances since there are two cointegrating relationships between them. This is why an error correction model would be appropriate (see Table A6 in Appendix 1). The adjustment coefficient is negative and statistically significant as predicted. Thus, for the speed of adjustment, the error correction term is 91 percent per quarter. Hence, consumption growth adjusts by 91 percent each quarter to reach long-term equilibrium. In other words, the consumption process has the tendency to eliminate deviations from the cointegrating relationship quickly, that is, it returns to the equilibrium value.

[6] We use the Cholesky ordering where the first variable is selected such that it is the only one with potential immediate impact on all other variables. The second variable may have an immediate impact on the following components, but not on the first component, and so on. The order we adopted is remittances, consumption, GDP, interaction of both and real effective exchange rate. We tried various orderings to see whether the resulting interpretations are consistent. Indeed, we found that the effect of consumption on itself ranges from 45% to 77% but it is still characterized by a high idiosyncrasy.

SVAR estimation

Table A7 in Appendix 1 shows the findings for the SVAR model which are in line with both the literarture and our previous results. Indeed, we found a positive and significant impact of GDP and remittances on consumption, while the former is stronger than the latter as it will be shown later. Furthermore, the interaction term is negative and significant with more or less the same value as the one obtained from the VAR model.

In terms of the private consumption response to changes in other variables, the SVAR models generates similar findings as Table A8 shows that private consumption is highly idiosyncratic and remittances effect increases over time. This is why as it is shown in Figure A1, in Appendix 2, consumption responds the most when remittances are shocked.

GMM estimation

Finally, to control for the endogeneity of remittances, we instrument them using four instruments which are important determinants of remittances, namely GDP of USA, GDP of EU, oil prices and REER. We run two sets of regressions using the GMM technique and the 2SLS one. We found similar findings for the interaction term confirming the consumption smoothing effect of remittances. Yet, Table A9 in Appendix 1 shows a stronger effect of remittances compared to that of the GDP even though both of them are positive and significant.

In a nutshell, our different estimation techniques yield similar results showing to what extent remittances in Egypt have a consumption smoothing effect. The following section will provide some potential explanations for this robust empirical finding.

Potential Explanation

The previous section showed that, regardless the method, we obtain from the VAR, SVAR, GMM and 2SLS a consumption smoothing effect of remittances and a positive impact of remittances and GDP on consumption. This is confirmed by both Figures A2a and A2b, in the Annex, showing that consumption growth is much more related to GDP growth rather than remittances growth.

It is worthy to mention also that, following a survey that was done by the International Organization of Migration (2010), while consumption uses represent around 54.6 percent of remittances (as presented by the red bars of Figure A3, Appendix 2), investment in human capital (education and health) and in physical capital (property investment and capital investments) represent 33.1 percent of remittances uses and 12.3 percent are allocated to savings. Such an allocation is different compared to the suggested use of remittances made by the senders since the latter advice their families to use remittances mainly in savings then in current consumption (Figure A4 in Appendix 2). This is why we can claim that remittances can help smooth consumption for the recipient families as it was proven in the empirical part.

6. CONCLUSION AND POLICY IMPLICATIONS

This paper examines cyclical characteristics of remittances and explores their counterbalancing and consumption-smoothing potential. First, it uses quarterly data to

better reflect the short-term dynamics of consumption and remittances. Second, it uses different methodologies to examine whether the results are robust or not, namely OLS, VAR and SVAR. Third, to control for the endogeneity of remittances, we use a Generalized Method of Moments technique by instrumenting remittances. Finally, we apply for the Egyptian case since studies on the MENA region in this field are quite rare. Our main findings show that there is a significant consumption smoothing effect of remittances. Moreover, we found that, even when the endogeneity of remittances is controlled for, this consumption smoothing effect remain robust. This finding is robust under a battery of sensitivity tests.

From a policy standpoint, in order to maximize the benefits from workers' remittances for Egypt's development, policy responses should involve efforts to facilitate the flow of these remittances, make these flows cheaper, safer and more productive. Moreover, to lower the cost of sending remittances and facilitate their flow, many countries are using new remittance tools- based on mobile phones, smart cards or the Internet. Moreover, policymakers who want to generate more remittance receipts through official channels are advised to tackle financial sector deficiencies, ease current account restrictions, and discontinue dual exchange rate practices. Finally, establishing partnerships between remittance-service providers and existing postal networks could help expand remittance services without requiring large fixed investments to develop payment networks.

On uses of remittances, to channel workers' remittances to productive uses, it is necessary to improve the quality of data on the various aspects of workers' remittances (for example, in the household surveys). A better knowledge of the location of Egyptian workers abroad and their profile, such as age, education, occupation, and sector of work, income, wealth, savings, remittances and investments are key for assessing the marginal propensity to save of the workers abroad and their potential demand for appropriately structured and marketed innovative financing instruments such as bonds, prior to issuing them and coming to the market. Moreover, it is important to continue facilitating remittances inflows as an important external financial source, especially with the descriptive evidence about their advantage, that they are less volatile than FDI flows.

Yet, to increase their positive effect on the economy, there is a need to a specific institutional framework governing remittances to be directed to deal with the lack of encouraging investment policies that could attract the majority of remittances to small and medium-sized enterprises instead of unproductive investments in real estate. Some countries (e.g., Greece, India and Israel) use remittance-backed bonds to finance infrastructure and development projects (such as railways, roads, power plants and educational institutions), at lower cost and longer maturities. If issuing such bonds is a possible option for Egypt, it would require a legal framework; pricing and risk management and guarantees. In other countries, banks have been able to raise overseas financing using future remittances as collateral.

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Annex on line at the journal Website: https://www.usc.gal/econo met/eaat.htm

Appendix 1: Tables

Table A1a: Augmented Dickey-Fuller test

Test	Test. Stat	1% Cri. Val.	5% Cri. Val.	10% Cri. Val.
Total consumption growth				
Constant and Trend	-2.366	-4.159	-3.504	-3.182
Constant no trend	-2.455	-3.587	-2.933	-2.601
No constant	-1.458	-2.622	-1.95	-1.61
GDP growth				
Constant and Trend	-2.168	-4.159	-3.504	-3.182
Constant no trend	-2.235	-3.587	-2.933	-2.601
No constant	-1.285	-2.622	-1.95	-1.61
Remittances/GDP				
Constant and Trend	-4.086	-4.143	-3.497	-3.178
Constant no trend	-2.631	-3.576	-2.928	-2.599
No constant	-0.157	-2.619	-1.95	-1.61
Private consumption growth				
Constant and Trend	-2.405	-4.159	-3.504	-3.182
Constant no trend	-2.488	-3.587	-2.933	-2.601
No constant	-1.523	-2.622	-1.95	-1.61

Source: Constructed by the authors using STATA.

Table A1b: Augmented Dickey-Fuller test for first-differenced variable

Test	Test. Stat	1% Cri. Val.	5% Cri. Val.	10% Cri. Val.
Total consumption growth				
Constant and Trend	-6.728	-4.168	-3.508	-3.185
Constant no trend	-6.767	-3.594	-2.936	-2.602
No constant	-6.836	-2.623	-1.95	-1.609
GDP growth				
Constant and Trend	-6.068	-4.168	-3.508	-3.185
Constant no trend	-6.109	-3.594	-2.936	-2.602
No constant	-6.176	-2.623	-1.95	-1.609
Remittances/GDP				
Constant and Trend	-8.965	-4.146	-3.498	-3.179
Constant no trend	-9.049	-3.577	-2.928	-2.599
No constant	-9.103	-2.619	-1.95	-1.61
Private consumption growth				
Constant and Trend	-6.637	-4.168	-3.508	-3.185
Constant no trend	-6.677	-3.594	-2.936	-2.602
No constant	-6.745	-2.623	-1.95	-1.609

Source: Constructed by the authors using STATA

Table A2: Lag Length – VAR Consumption equation

lag	LL	LR	df	P	FPE	AIC	HQIC	SBIC
0	440.647				6.70E-17	-20.2161	-20.1255	-19.9704*
1	500.945	120.6	36	0	2.20E-17	-21.3463	-20.7119	-19.626
2	533.772	65.653	36	0.002	2.80E-17	-21.1987	-20.0206	-18.0039
3	600.756	133.97	36	0	8.80E-18	-22.6398	-20.918	-17.9706
4	687.158	172.8*	36	0	1.5e-18*	-24.9841*	-22.7185*	-18.8404

Table A3: Empirical Results – VAR model

	Cons. gr.
Cons. gr. (-1)	-0.630***
	(0.141)
Cons. gr. (-2)	-0.545***
	(0.147)
Cons. gr. (-3)	-0.265
	(0.161)
Cons. gr. (-4)	0.251*
	(0.142)
Rem (-1)	0.0950
	(0.569)
Rem (-2)	-0.562
	(0.551)
Rem (-3)	-0.320
	(0.493)
Rem (-4)	1.287***
	(0.487)
GDP gr. (-1)	0.140**
	(0.0569)
GDP gr. (-2)	-0.0572
	(0.0533)
GDP gr. (-3)	0.0215
	(0.0580)
GDP gr. (-4)	0.156**
	(0.0664)
Inter. (-1)	-7.280
	(6.046)
Inter. (-2)	**-21.63*** **
	(6.471)
Inter. (-3)	8.938
	(8.291)
Inter. (-4)	-0.392
	(9.274)
REER (-1)	-0.00220
	(0.00166)
REER (-2)	0.00538**
	(0.00215)
REER (-3)	-0.00493**
	(0.00207)

REER (-4)	0.00210**
	(0.000891)
Constant	-0.0773
	(0.0872)
Rev. dummy	YES
Quarter dummies	YES
Observations	43

Standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1

Table A4: Variance Decomposition for the Private Consumption – VAR model

	Cons.gr.	GDP gr.	Rem/GDP	Other
0	0.0%	0.0%	0.0%	0.0%
1	77.2%	0.0%	22.8%	0.0%
5	74.6%	0.7%	24.0%	0.7%
10	73.9%	0.9%	24.3%	0.9%
15	73.5%	1.0%	24.3%	1.2%
20	73.4%	1.0%	24.3%	1.3%
25	73.4%	1.0%	24.3%	1.3%
30	73.4%	1.0%	24.3%	1.3%
35	73.4%	1.0%	24.3%	1.3%
40	73.4%	1.0%	24.3%	1.3%

Source: Constructed by the authors

Table A5: Johansen tests for cointegration

Maximum rank	Parms	LL	Eigenvalue	Trace stat.	Critical value 5%
0	80	471.9759	.	119.057	68.52
1	89	500.2744	0.72371	62.4599	47.21
2	96	517.6535	0.54614	27.7017*	29.68
3	101	524.7049	0.27423	13.5989	15.41
4	104	530.5269	0.23252	1.9549	3.76
5	105	531.5044	0.04346		

Source: Constructed by the authors

Table A6: Vector Error Correction Model Results

	Cons. Gr.
α_1	-0.918**
	(0.384)
α_2	1.018
	(0.939)
Cons. gr. (-1)	0.120
	(0.374)
Cons. gr. (-2)	-0.111
	(0.313)
Cons. gr. (-3)	-0.0131
	(0.270)
GDP gr. (-1)	-0.897
	(0.995)
GDP gr. (-2)	-1.145
	(0.887)
GDP gr. (-3)	-0.594
	(0.664)
Rem (-1)	-1.721
	(2.762)
Rem (-2)	-2.367
	(2.655)
Rem (-3)	-3.426
	(2.515)
Inter. (-1)	18.59
	(18.81)
Inter. (-2)	21.37
	(17.39)
Inter. (-3)	12.89
	(14.76)
REER (-1)	-0.00116
	(0.00587)
REER (-2)	0.00488
	(0.00397)
REER (-3)	-0.000199
	(0.00330)
Constant	-0.00528
	(0.0133)
Observations	44

Robust standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1

Table A7: Structural VAR results

	Consumption
GDP	1.246***
	(0.377)
Rem	0.121**
	(0.0499)
Inter	-24.97***
	(5.734)
REER	-0.00489***
	(0.00151)
Rev	YES
Observations	43

Robust standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1

Table A8: Variance Decomposition for the Private Consumption – SVAR model

	Cons. gr.	Rem/GDP	GDP gr.	Inter.	Other
1	100.0%	0.0%	0.0%	0.0%	0.0%
2	91.4%	5.0%	1.2%	0.0%	2.4%
3	67.1%	6.6%	16.4%	4.2%	5.7%
4	64.2%	6.3%	20.1%	4.0%	5.5%
5	66.8%	4.9%	17.4%	6.3%	4.5%
6	66.0%	9.5%	14.9%	4.6%	4.9%
7	60.4%	16.3%	13.4%	4.8%	5.2%
8	58.8%	16.1%	15.0%	4.7%	5.4%
9	60.1%	15.6%	14.1%	5.0%	5.2%
10	60.3%	17.7%	11.3%	4.0%	6.6%
11	59.7%	18.9%	10.1%	3.8%	7.5%
12	58.7%	20.1%	10.1%	3.8%	7.4%
13	58.2%	20.1%	9.9%	4.5%	7.2%
14	57.6%	21.6%	8.8%	4.1%	7.8%
15	57.6%	22.5%	8.1%	3.9%	8.0%

Source: Constructed by the authors

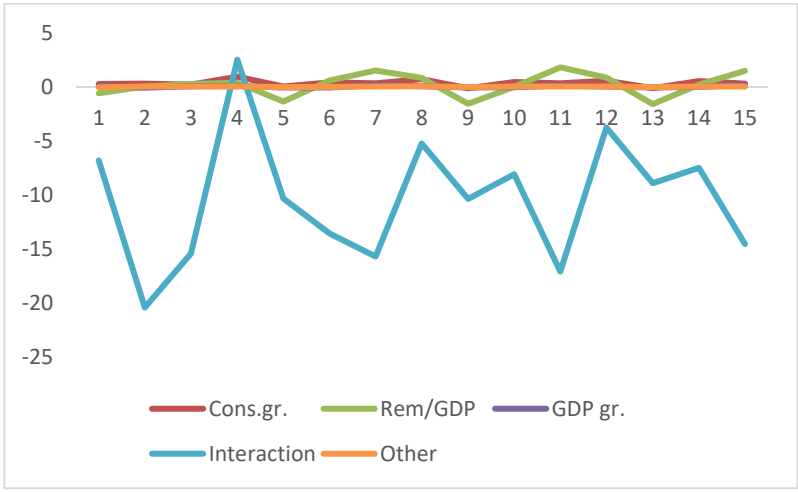
Table A9: GMM results

	GMM	2SLS
	Consumption	Consumption
Rem.	4.359***	4.287***
	(1.344)	(1.313)
GDP	0.946**	0.900**
	(0.478)	(0.457)
Inter.	-23.25**	-21.76**
	(10.87)	(10.31)
Constant	0.558***	0.557***
	(0.0606)	(0.0596)
Rev	YES	YES
Observations	48	48
R-squared	0.089	0.091

Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Appendix 2: Figures

Figure A1: Impulse Response Function for the Private Consumption – SVAR model



Source: Constructed by the authors

Figure A2a: Real consumption growth rate and growth rate and real GDP growth rate in Egypt

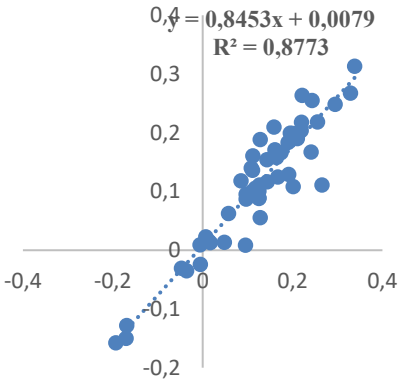
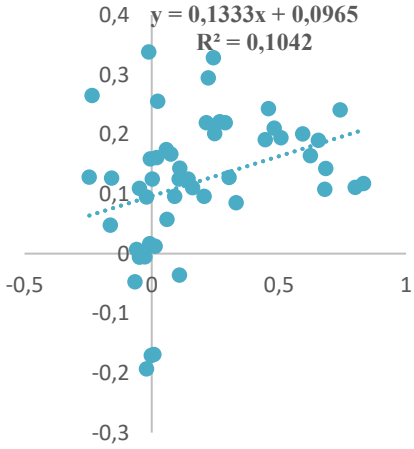
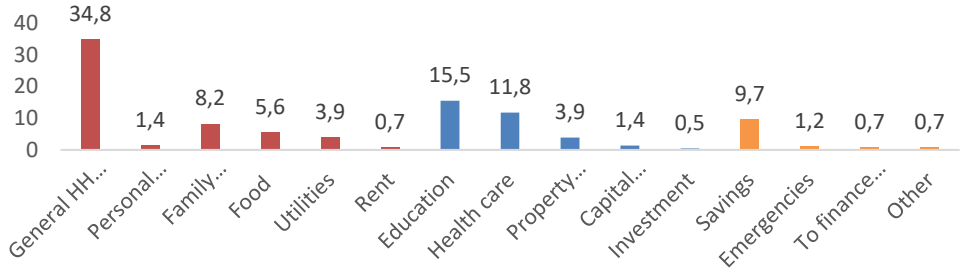


Figure A2b: Real consumption remittances growth rate in Egypt



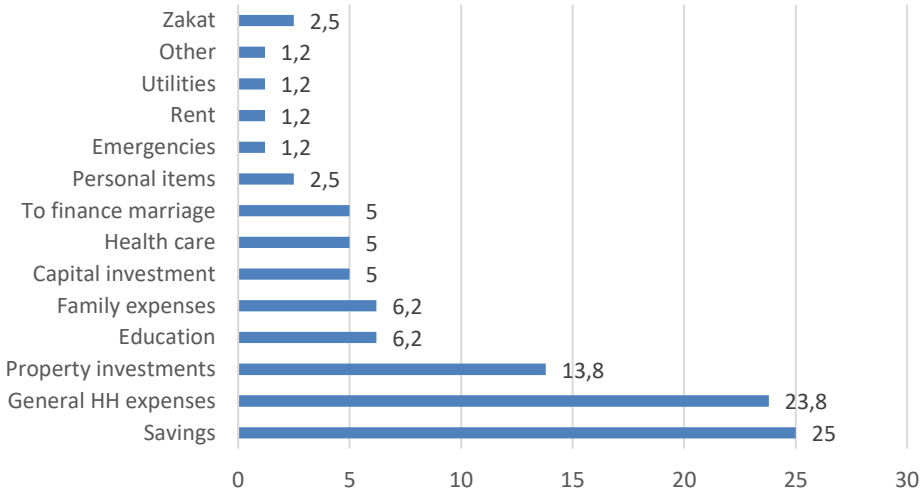
Source: Constructed by the authors

Figure A3: Remittances uses



Source: IOM (2010). Note: Bars in orange represent remittances allocated to consumption, in blue to investment in both human and physical capital and in green to savings.

Figure A4: Migrants' advice on spending remittances



Source: IOM (2010)

Estimations of the relationship between real Household Consumption per inhabitant (CH) and real Gross Domestic Product per inhabitant (PH). Data in US Dollar at 2010 prices.

Generalized least Squares (GLS) of a linear equation between CH and PH:

CH = c(1)*PH + ε (t)

C(1) estimation=0.7764 (t=13.50), Adj.R-square 0.9529, %SE =3,26%, AR(1)=0.87, DW=1.78
Autocorrelation in OLS regression, due to missing variables, was corrected by GLS.

Non Linear estimation (NLS) of dynamic model with coefficient of the lagged value restricted to unity: CH (t) = CH (t-1) + c(1)*D(PH) +ε (t)
(c1) estimated: 0.7992, (t=3.46), Adj. R-square=0.9567. % of S.E.=3.10% DW=1.99