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A Theory of Workers' Remittances With an Application to Morocco

Jacques Bouhga-Hagbe

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Prepared by Jacques Bouhga-Hagbe[1]

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Abstract

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This paper provides a model on how altruism, "attachment" to the home country, and portfolio diversification may act as potential motives behind workers' remittances. It shows that the level of workers' remittances depends on how great are their degrees of altruism and "attachment" to their home country, and should also depend on interest rate differentials between the home country and the country of residence if portfolio diversification motives are significant in the decision to remit. The model is applied to Morocco using co-integration techniques. The paper then discusses the stability of remittances in Morocco and the policy implications in light of the empirical findings.

JEL Classification Numbers: D10, E20, C12, C22

Keywords: Morocco, remittances, altruism, portfolio diversification, co-integration

Author(s) E-Mail Address: jbouhgahagbe@imf.org

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I. INTRODUCTION

Foreigners working outside their home country often send regular remittances home. This paper develops a model in which an altruistic worker, with some degree of "attachment" to her home country, maximizes private welfare by allocating her revenue between consumption in the country of residence, family consumption in the home country, acquisition of financial assets in the country of residence, and acquisition of financial and nonfinancial assets, such as real estate, in the home country. The model has some implications that can be estimated. In particular, the model predicts that if workers have some degree of attachment to their home country, then the long-run elasticity between remittances and the acquisition of nonfinancial assets, such as real estate, must be positive. At the same time, if they are altruistic, the elasticity between remittances and real wages or real GDP in the home country must be negative, and the elasticity of remittances with respect to wages in their country of residence must be positive. It also predicts that if motives for portfolio diversification are behind workers' transactions with their home country, then there should be a positive semi-elasticity between workers' stock of financial assets in the home country and the interest rate differential between the home country and the country of residence, holding the long-run level of remittances constant. This is asset substitution.

The model is applied to remittances to Morocco, using co-integration techniques. All the above-mentioned predictions are consistent with the empirical evidence, except for the prediction on portfolio diversification, which could imply that portfolio diversification motives may not be significant in Moroccan workers' decisions to remit. Therefore, the empirical evidence seems to suggest that the usual risks associated with the volatility of capital flows may not be present in the case of remittance flows to Morocco. In other words, the evidence does not support an argument for a sharp decline in the level of remittances to Morocco in the foreseeable future. Nonetheless, the paper also argues that the analysis has only focused on one potential source of volatility, namely interest rates. The stability of remittances should also be seen in a broader context of the overall economic environment, which affects economic agents' levels of confidence in the country's policies. In this regard, the paper argues that the fact that remittances in Morocco are mostly channeled toward real estate construction, even though many of the workers who remit are likely to be entrepreneurs, should give an additional incentive to Moroccan authorities to accelerate economic reforms in order to further enhance the country's potential as an investment destination.

The literature on remittances can be divided in two segments, one focusing on the causes and uses of remittances, and the other on the macroeconomic impact of remittances.[2] The first segment emphasizes the role of altruism and family ties as a motivation for remittances.[3] However, some other theories have focused on the idea that there can be self-interested

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[2] See for example Taylor (1999) and Elbadawi and Rocha (1992), Russell (1986), and, more recently, Chami, Fullenkamp, and Jahjah (2003) for a review of the literature on remittances.

[3] See for example Johnson and Whitelaw (1974), and Lucas and Stark (1988).

reasons for remitting as well, which nevertheless center on the family.[4] The family can also be thought of as playing the role of an insurance company that provides members with protection against income shocks by diversifying the sources of income.[5] The family can also function as a bank that finances migration for some members. The borrowers remit funds in order to repay the loans.[6] Nonetheless, Chami and Fisher (1996) argue that these arrangements may not be as self-interested as they may appear and show that altruism can lead to risk-sharing arrangements that are self enforcing. Other authors have examined the possibility of portfolio investment motives behind remittances.[7] Regarding the macroeconomic impact of remittances in the recipient countries, the literature tends to emphasize the point that remittances increase family consumption and are not invested in productive assets,[8] with the possible exception of real estate. Other authors suggest that when remittances are invested in productive assets other than real estate, they can have Keynesian multiplier effects on the economy, which nonetheless will only have a short-term impact.[9] Finally, evidence suggests that remittances could be detrimental to long-run growth by reducing labor-force participation or, because of asymmetric information between recipients and remitters, by leading to other moral hazard problems, which encourage recipients of remittances to undertake riskier projects.[10]

This study could be seen as part of the literature on the workers' motives to remit, even though the use of remittances is only indirectly discussed. Nonetheless, it has two features that distinguish it from the literature previously mentioned. First, besides the notion of altruism, which could be viewed as a willingness to assist parents or friends left in the home country, the paper explicitly introduces the notion of workers' "attachment" to their home country, which could be viewed as a willingness to maintain ties in the home country through a nonfinancial asset such as a real estate. By doing so, it provides some theoretical foundations as to why remittances are often invested in real estate. This extends the theoretical literature on the causes of remittances, which has centered around altruism alone. This addition has an implication that tends to refine the claim on the effects of remittances on the economic performance of recipient countries. This motive to remit, will not necessarily

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[4] Lucas and Stark (1985) find evidence for self-interested behavior in Botswana and suggest that one reason for remitting could be that migrants may have investments that need attention while they are away.

[5] See Stark (1991), Agarwal and Horowitz (2002), Gubert (2002), Abel and Kotlikoff (1988), Altonji and Kotlikoff (1992), and Townsend (1994) among others.

[6] See Poirine (1997), and Ilahi and Jafarey (1999).

[7] See for example Straubhar (1986), Wahba (1991), and, more recently, Gordon and Gupta (2004).

[8] See Obeirai and Singh (1980), Durand and others (1996), Gilani (1981), Glytsos (1993), Alderman (1996), Adams (1998, 1991), Brown (1997), Sofranko and Idris (1999), Lopez and Seligson (1991), and Taylor (1992).

[9] See Stahl and Habib (1989), Nishat and Bilgrami (1991), Glytsos (1993), Adelman and Taylor (1990), and Durand, Parrado, and Massey (1996).

[10] See Kozel and Alderman (1990), Itzigsohn (1995), Gilani (1981), Amjad (1986), Ahmed (1986), and Chami, Fullenkamp, and Jahjah (2003).

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discourage labor force participation. Remittances may, in fact, boost economic growth in some sectors, such as real estate. This theoretical prediction is supported by the evidence in the case of Morocco. By sustaining economic performance in the construction sector, remittances may help increase employment with its accompanying potential positive multiplier effects on demand and therefore output. Before assessing the effect of remittances on growth, therefore construction GDP should be separated from the rest of the economy, and the potential effects of labor (mis)allocation between the two sectors carefully isolated. The second distinguishing feature of the study is that portfolio diversification motives for remittances are not examined separately from other motives, neither in the theoretical model nor in the empirical investigation. This unified framework implies that other prices, such as exchange rates and not only wages and interest rates, could play an important role on the level of remittances.

The paper is organized as follows. Section II presents the model of workers' remittances and discusses its testable implications. Section III introduces the characteristics of remittances in Morocco and their impact on monetary policy and the sustainability of the country's external position. The model's predictions are then used to empirically investigate the determinants of remittances in Morocco. Conclusions and policy implications are provided in Section IV. The appendices present some theoretical derivations, as well as a brief summary of the econometric techniques.

II. THE MODEL AND ITS MAIN IMPLICATIONS

The paper models a worker residing abroad as an economic agent who each period, maximizes her expected lifetime utility by allocating revenue between transfers to the home country, consumption and asset accumulation, including real estate in the home country. The worker then solves the following problem:

$$\text{Max } U_t = \sum_{j=t}^{\infty} \beta^{j-t} \left(\alpha_j Ln(H_j) + Ln(C_j^*) + \gamma_j Ln(C_j) \right) \tag{1}$$

Subject each period j to (2), (3), (4), and (5).

$$P_j^* C_j^* + M_j^* + B_j^* - B_{j-1}^* = W_j^* + i_j^* B_{j-1}^* \tag{2}$$

$$A_j = A_{j-1} (1+i_j) + e_j M_j^* - P_j (H_j - H_{j-1}) - e_j T_j^* \tag{3}$$

$$H_j > 0 \tag{4}$$

$$C_j = (P_j W_j + e_j T_j^*)/P_j, \tag{5}$$

where subscripts *t* and *j* denote the period. U_t denotes the worker's utility function. β is the worker's time discount rate. H_j denotes the size of the nonfinancial asset (real estate) in the home country (construction costs/unit price of construction goods). C_j^* denotes the worker's real consumption abroad. C_j denotes her parents' real consumption in the home country. α_j is

her degree of "attachment" to the home country. γ_j is her degree of altruism toward parents left in the home country. P^*_j denotes consumption goods prices abroad. M^*_j denotes the worker's total transfers to the home country in foreign currency (this is what enters in the balance of payments (BOP)). B^*_j is her end-of-period net assets held abroad in foreign currency. W^*_j is the worker's earnings in foreign currency. i^*_j is the level of interest rates abroad. A_j is the worker's net financial assets in the home country (balance of bank accounts held in the home country). The asset value is denominated in the home-country currency. i_j is the level of interest rates in the home country. P_j is price index in the home country. e_j is the exchange rate. It is the amount of home-country currency per unit of foreign currency. T^*_j denotes the worker's transfers to parents left in the home country, while W_j denotes the nominal level of wages in the home country.

Equation (2) is the budget constraint faced each period by the worker. It says that the amount of spending in consumption abroad, transfers to the home country and asset accumulation must be equal to total income in the period, including interest income. Given the fact that M^*_j can be positive or negative in equation (2), the model allows for portfolio diversification.

Equation (3) gives the law of motion of the interest-earning account held by the worker in the home country. It increases with the interest rate and the amount of transfers. However, it declines as money is withdrawn to finance construction and maintenance of real estate or to support relatives or friends in the home country. Equation (4) just says that the nonfinancial asset must remain positive.

Equation (5) assumes that the worker's family in the home country consumes all her revenue, including the transfers from the worker. This assumption is used solely to simplify the model. One could assume that only a fraction of the revenue is consumed each period without altering the results. One could also make the level of family's consumption an outcome of an optimization problem where the worker's family solves an intertemporal problem and could acquire her own assets to smooth consumption. However, such an approach would not only add complications to the model, but it will not be very realistic. The reason is that families receiving transfers from parents' living abroad are less likely to build sizeable stocks of financial assets because of their modest living conditions.

Note that such a representation of a worker's welfare takes into account future generations utility, but discounts it at a rate β. Note also that H_j, the size of the nonfinancial asset (real estate) enters directly in the utility function. This formulation implicitly assumes that the services, and the flow of "satisfaction" provided by a nonfinancial asset in the nature of a real estate increases with the size of the asset. Finally, note that the terms α_j and γ_j, which respectively capture attachment to the home country and the degree of altruism, can also vary over time. An increase in the degree of attachment to the home country should be expected to increase the desired size of the nonfinancial asset, and therefore increase transfers destined to accumulating such an asset. Similarly, an increase in the degree of altruism should also be expected to increase the amount of consumption C_j one would like her relatives to enjoy. The implications of the model will now be examined.

At the optimum, among other things, it is shown in the Appendix that we have the following

$$P_j C_j = \gamma_j e_j P_j^* C_j^* \qquad (6)$$

Equation (6) links the level of consumption the worker wants her family to have to her own level of consumption in the country of residence. Note the important role of the degree of altruism γ_j. The greater the degree of altruism, the greater the level of consumption enjoyed by the worker's family for a given level of her own consumption in the country of residence. Using equation (5), one can easily see why the model will imply that a greater degree of altruism will lead to larger transfers to the home country. This will be established more explicitly in the Appendix.

The steady state or long run in this framework is defined as an equilibrium where the exchange rate, the degree of altruism and attachment to homeland, interest rates, the inflation rates in the home country and abroad, the rates of growth of transfers, financial and nonfinancial assets are all constant. It is shown in the Appendix that such a steady state exists and that in particular, it implies that

$$\frac{P_j H_j}{e_j} = \frac{P_j (H_j - H_{j-1})}{ge_j} \equiv \frac{P_j}{g} Cstr_j = \alpha_j a_h P_j^* C_j^*, \qquad (7)$$

where g is the long-run growth rate of transfers as well as financial and nonfinancial assets, and a_h a constant term that depends on the long-run interest and inflation rates. Note that $Cstr$ is the amount of construction of real estate or the acquisition of other nonfinancial assets by the worker in the home country.

Equation (7) says that in the long-run or steady-state, the acquisition of nonfinancial assets by the worker in her home country will strongly depend on α_j, her degree of attachment to her home country as well as on her level of consumption in her country of residence. Note the important role played by the degree of attachment to the home country in equation (7). The higher the degree of attachment to the home country, the larger the desired level of nonfinancial asset. Using equation (3), one can intuitively see why the model would imply larger transfers to the home country if the worker's degree of attachment to the home country increases. We can now turn to the empirical implications of the model.

It is shown in the Appendix that the model presented in the previous section implies, once log-linearized around the steady-state, that the long-run relation between remittances and their determinants is as given in equation (9) and the short-run relation as in equation (12). These equations imply clear altruistic motives behind remittances, meaning that remittances will increase with poor economic performances in the home country, and with good performances in the country of residence. They also imply that "attachment to homeland," as captured by the construction of real estate in the home country, should imply a positive elasticity between remittances and the amount of construction GDP. Both relations also include the level of financial assets held in the home country and the interest rates differentials between the worker's home country and her country of residence. Therefore, the equations allow one to see if holding remittances constant, the stock of financial assets held

by the worker in her home country increases with the interest rate differential. They also help assess whether portfolio diversifications motives are significant behind remittances. Both regression equations will later be tested in the case of Morocco.

III. THE EMPIRICAL INVESTIGATION

A. Remittances in Morocco

This section argues why remittances are important in Morocco for macroeconomic policy and why this country is relevant to the effort of testing the theory. It also discusses how this theory could shed light on the debate about the stability of remittances in Morocco.

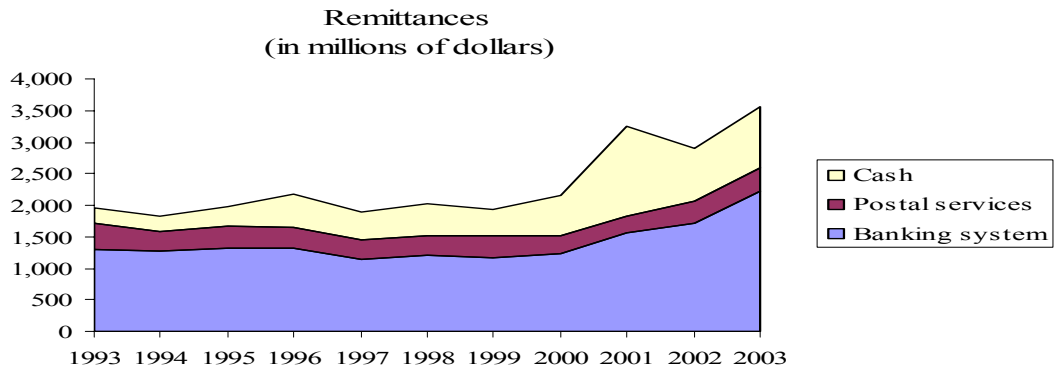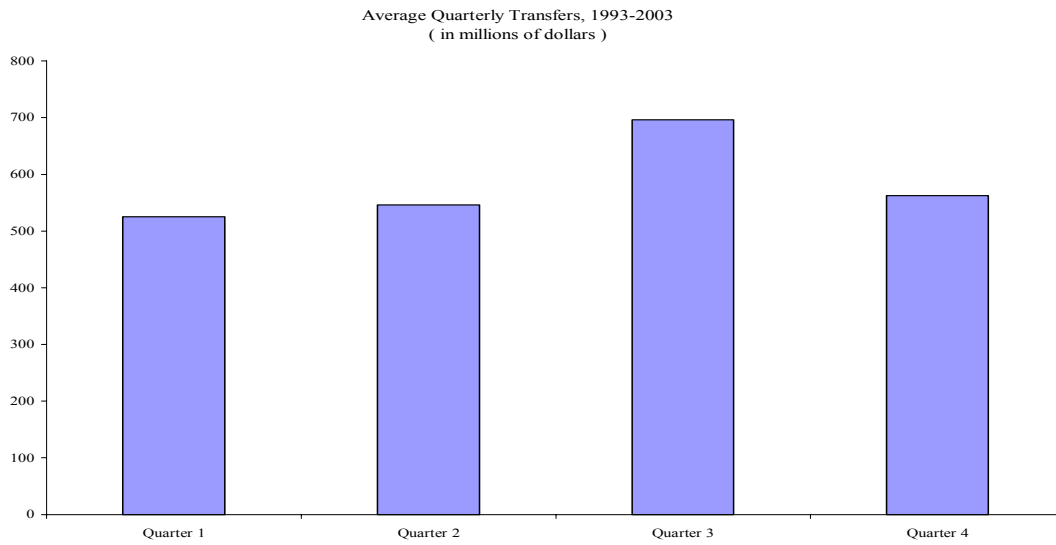Table 1. Morocco: Balance of Payments (1996–2003)

	1996	1997	1998	1999	2000	2001	2002	2003 Prel.
	(In percent of GDP)							
Current account balance	0.1	-0.3	-0.4	-0.5	-1.4	4.8	4.1	3.1
Trade balance	-6.0	-5.6	-6.5	-6.9	-9.7	-8.9	-8.5	-9.9
Exports	18.8	21.1	19.9	21.3	22.3	21.1	21.7	19.5
Imports	-24.8	-26.6	-26.4	-28.2	-32.0	-30.0	-30.2	-29.3
Services	2.6	2.2	2.4	3.2	3.4	5.6	5.4	5.4
Of which : tourism receipts	4.6	4.3	4.9	5.5	6.1	7.6	7.3	6.9
Income	-3.6	-3.5	-2.9	-2.8	-2.6	-2.5	-2.0	-1.6
Transfers	7.0	6.6	6.5	6.1	7.4	10.5	9.2	9.1
Of which : workers' remittances	5.9	5.7	5.6	5.5	6.5	9.6	8.0	8.0
Capital and finanical account	0.2	1.5	0.8	5.5	-0.1	5.8	-1.8	0.9
Reserve accumulation	-0.8	-1.7	-0.7	-4.6	1.2	-11.3	-1.8	-3.9
Errors and amoissions	0.5	0.4	0.3	-0.4	0.3	0.8	-0.6	0.0

Sources: Moroccan authorities; and IMF staff estimates

The evolution of workers' remittances to Morocco is mainly characterized by a sudden surge in 2001,[11] which is not yet fully explained (Table 1 and Figure 1). Since then, their level has remained high compared to other countries, at about 9 percent of GDP and about 25 percent of exports of goods and services. For example, in percent of GDP, they are 3 percent in Egypt, 1 percent in Turkey, 5 percent in Tunisia, and 18 percent in Jordan.

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[11] A similar phenomenon was observed in Pakistan at the same time, where remittances moved from about 2 percent of GDP before 2001 to more than 6 percent of GDP after 2002.

Figure 1. Workers' Remittances

Remittances relative to GDP and Exports of Goods and Services
(in percent)

Average Quarterly Transfers, 1993-2003
(in millions of dollars)

Remittances
(in millions of dollars)

Sources: Moroccan authorities; and IMF staff estimates

In percent of exports of goods and services, they are 16 percent in Egypt, 3 percent in Turkey, 13 percent in Tunisia, 42 percent in Jordan. Remittances in Morocco mostly originate from Europe, especially France, Italy, and Spain.

Transfers are made partly through the banking system but also through postal and other money-transfer services (Figure 1). A significant share of transfers is made in cash, especially when Moroccans living abroad travel to their home country. This share is estimated through foreign currency exchanges that are made at the central bank or at other foreign exchange providers, and is included in the estimate of total transfers.

The impact of workers' remittances on Morocco's external position and the conduct of monetary policy is significant. The remittances almost cover the trade deficit and have contributed to the recent surpluses of the external current account, as well as the overall BOP (Table 1). The BOP surpluses have contributed to the strengthening of Morocco's external position through the accumulation of reserves, which now cover the external public debt. The transfers also contribute to the liquidity of the banking system and affect the conduct of monetary policy, as evidenced by the recent policy measures taken by Bank Al Maghrib (BAM) to absorb that liquidity.[12] Therefore, understanding the long-run behavior of workers' remittances will be essential to both the long-term sustainability of Morocco's external position and the conduct of monetary policy.

In Morocco, all the motives for remitting that have been discussed in the theoretical section (or Section II) are potentially relevant. Furthermore, evidence in favor of the significance of a given group of motives has implications as to the stability of those remittances flow.

Altruism or solidarity motives as a determinant of workers' remittances to Morocco could contribute to their stability in the long run, mainly because it seems reasonable to expect such motives to remain stable.[13] However, the stability of such motives should also be seen in the context of changes in migration patterns. For instance, the migration of family members may reduce the scope for "altruistic" motives. Nonetheless, in the case of Morocco, this effect would be counterbalanced by the new waves of immigrants who are attracted by the increasing labor demand in industrialized countries. Moreover, altruistic motives for remittances may in fact partly reflect self-interested reasons for transfers from Moroccans who want their residential investments to be looked after when they are away. Therefore, "altruistic" flows could be thought of as being fairly stable. Evidence of altruism can be captured by a negative long-run correlation of remittances with wages in the home country. In the specific case of Morocco, one would expect altruism to be evidenced by a negative correlation between transfers and real GDP in Morocco. An additional indicator that could be considered is income in the country of residence. A positive correlation between income in

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[12] In order to absorb liquidity in the Moroccan banking system, BAM has recently used reserve requirements and interest rates on its deposit facilities. In addition, an auction mechanism to further absorb bank liquidity has just been introduced.

[13] According to the authorities, part of such solidarity motives could be explained by workers' strong family ties to Morocco, where they have left their parents, as well as children in some cases.

the country of residence and transfers, holding everything else constant, could also be seen as an indication of altruism or solidarity, since it would suggest a willingness to "share."

Attachment to homeland could also contribute to the stability of remittances in the long run, since one would expect such motives to remain stable. However, improved settlement opportunities for Moroccans in their countries of residence may in theory reduce their attachment to Morocco. Nonetheless these improvements in settlement opportunities could be expected to occur at a slow pace, therefore having in a foreseeable future, only a limited offsetting impact on Moroccans' attachment to their homeland. Attachment to the homeland could be assessed with the construction of real estate in Morocco by Moroccans living abroad or any other asset that could reflect their ties to Morocco. Therefore, the value added of the construction sector would then be a natural candidate for a proxy of Moroccans' attachment to their homeland. One would then expect remittances to be positively correlated with construction GDP. Construction of real estate could also be seen as an investment decision based on profitability considerations. However, the evidence on housing prices (Figure 2) would not support such an explanation in the case of Morocco.

Remittances as portfolio investment flows could be expected to add to a country's vulnerability since one would expect them to be sensitive to their rate of return. A small part of remittances are made by Moroccans who are willing to create small and medium-sized enterprises in Morocco. This is a direct investment flow that could also be interpreted as a sign of their attachment to their home country, and therefore one that is not expected to add to the country's vulnerability. However, the existence of such investments also implies that remittances, because of their potential investment nature, could be sensitive to their rate of return. If this were true, one would expect deposits held in Morocco by Moroccans living abroad to be positively correlated with interest rates in Morocco and negatively with interest rates abroad.

The exchange rate through the "substitution" and "wealth" effects could also influence the level of remittances. The overall effect of exchange rates movements is not always clear a priori because it is the sum of both the "substitution" and "wealth" effects. The idea behind the substitution effect is that because goods in the home country are less expensive with the devaluation or depreciation of the currency, one does not need to transfer as much money as before to buy a given amount of goods, and may even substitute some goods in the home country for the more expensive ones in the country of residence. On the other hand, a devaluation or depreciation of the home country's exchange rate can also enable its citizens to live abroad "wealthier," and therefore give them incentives to transfer more money in order to buy even more goods, including building residential real estate, in the home country, which are now less expensive. This is the "wealth" effect. However, even if the actual effect of exchange rate movements were known, interpreting their long-term impact on the sustainability of the external position would be difficult.[14]

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[14] For example, even if a devaluation or a depreciation of the currency can temporarily attract flows from workers willing to buy goods in their home country because they have become less expensive, this factor can also undermine their confidence in the economy in the long run.

National policies toward workers living abroad could be an important qualitative determinant for transfers in general. In Morocco, the authorities would like to keep Moroccans living abroad attracted to their home country. To this end, they have created a ministry in charge of Moroccans living abroad *(Ministère délégué auprès des affaires étrangères et de la cooperation chargé des Marocains Résidents à l'Etranger)*, which, among other things, helps streamline the administrative procedures related to their transactions with their home country. The model in this paper will not consider such qualitative items explicitly.

The surge of remittances in 2001 could remain unexplained, even after considering the potential factors discussed above. Since the empirical application of the model focuses on the long-term determinants of remittances, no analysis of this specific phenomenon (the surge in remittances in 2001) will be provided. However, it is possible that in addition to the wealth effect of the devaluation[15] discussed above, the surge in remittances could also be explained by an increase in Moroccans' "attachment" to their home country. Various events in the new post-September 11 environment could support an explanation based on the attachment to the home country.

B. Empirical Findings for Morocco

The existence of a long-run relation as presented in equation (9) is tested and estimated using Johansen (1991) approach (Tables 4 and 5). The short-run or error-correction relation in equation (12) is estimated by OLS (ordinary least squared) in Table 6. Using the Granger representation theorem,[16] equation (12) will confirm the existence of a long-run relation between remittances and their determinants as implied by the model.

$$Log\ M_j^* = a_o + 1.8 * Log\ W_j^* - 4.5 * Log\ A_j + 10 * Log\ Cstr - 4.2 * Log\ W_j$$

$$+ 19.3 * Log\ e_j - 0.1 * (i_j - i_j^*)$$

(8)

An estimate of the co-integration or long-run relation between remittances and their determinants as implied by the model is presented in equation (8). Since the relevant variables implied by the model are non stationary, estimating the model using a standard ordinary least square technique (OLS) could give a spurious regression equation, which could cause misleading inferences.[17] Therefore, a vector autoregression (VAR) is used to test for the existence of a stationary linear combination of the non stationary variables using Johansen (1991) method. Such a linear combination represents the long-run relationship among the variables. One can refer to Figure 6 to see how the VAR fits the data and Table 3

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[15] There was a 5 percent devaluation of the dirham with respect to the U.S. dollar in April 2001.

[16] See Engle and Granger (1987), Banerjee, Hendry and Smith (1986) and Kremers, Ericsson and Dolado (1992).

[17] See for example Yule (1926), Granger and Newbold (1974), Phillips (1986) for further discussion.

for the misspecification tests. Figure 4 presents deviations of remittances from their (long-run) value as predicted in equation (8).[18]

a_0 is an estimated constant term. A random error term is omitted for brevity. It is the deviation of remittances from the long-run value as defined in equation (8) and shown in Figure 4. Remittances and wages abroad (France) are in French francs or Euro. The real GDP in Morocco, which is used as a proxy for wages in Morocco in Morocco is in dirham. The real value added of the construction sector in Morocco is in French francs or in Euro. The exchange rate is in dirham per French franc or per euro. The interest rate differential is the difference between interest rates in Morocco and France in percent. Financial assets held in Morocco are the dirham equivalent of the end-of-period stock of total deposits held in Moroccan bank accounts by Moroccans living abroad.[19]

Empirical results presented in equation (8) are in line with a priori expectations. Remittances may partly be driven by a willingness to share, which would support the argument for altruism as a strong determinant of remittances in Morocco. Wages in France are used as a proxy for incomes of Moroccans living abroad, as well as the stock of financial assets they hold in their countries of residence. The logarithm allows one to abstract from the actual levels and focus only on growth and the elasticities. Therefore, taking the logarithm of wages in France assumes that its growth rate is positively correlated to the growth of income and financial assets held by Moroccans living abroad in their country of residence. This assumption seems reasonable since most of the remittances originate from Europe, especially France, Italy, and Spain. Note that the coefficient on $Log\ W_j^*$ in equation (8) is not the value of the actual elasticity of remittances with respect to wages abroad. However, one can see with equation (9) that its positive sign implies that the latter would also be positive. The reason why the coefficient is not the wage elasticity stems from the fact that wages in France are also used as a proxy for financial assets held by Moroccans living abroad in their countries of residence. However, the latter are expected to have a negative elasticity because an increase in assets abroad, everything else held constant, including wages and consumption

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[18] An alternative test was performed to confirm whether the vector in equation 1 is indeed a co-integration vector. The framework for this test is provided by Banerjee, Hendry and Smith (1986) and Kremers, Ericsson and Dolado (1992). The test essentially checks whether the coefficient on the term in equation (12) is negative and significant. Estimation results and 't' statistics are presented in Table 6. Note that the 't' statistics do not have the standard 't' distribution.

[19] One should note that accounts held by Moroccans living abroad in the Moroccan banking system are both in the form of interest bearing and noninterest bearing accounts. The latter represent about one third of total sight deposits in Morocco. At end-December 2003, the overall balance on noninterest bearing accounts held by Moroccans living abroad was equivalent to about half of the balance on their interest bearing ones. These facts tend to support the view that those accounts may not be part of a portfolio investment strategy. However, we have used the total balance on both interest and noninterest bearing accounts because noninterest bearing accounts can be used at any time to credit interest bearing ones and vice-versa. Therefore, if one ignores noninterest bearing accounts, one could loose information related to the fact that some funds in those accounts can in theory be held most of the time in interest bearing ones and then transferred in noninterest bearing accounts when they are needed. Moreover, taking total deposits will still capture the information about time deposits because the latter have the greatest share in total deposits.

in the country of residence, will tend to reduce remittances to the home country. Therefore, the positive coefficient on wages implies that the wage elasticity is positive, implying a willingness to share.

The negative elasticity for *GDP* provides additional evidence that altruistic or solidarity motives could partly be behind remittances in Morocco. *GDP* is a proxy for real incomes in Morocco. As implied in the theoretical framework, the negative correlation between remittances and real incomes in the home country, everything else being equal, is an indication that Moroccans living abroad could be taking into account the well-being of their Morocco-based families in their decision-making process.

The positive elasticity for *Cstr* suggests that attachment to one's homeland may be another strong motive behind the remittances in Morocco. *Cstr* is a proxy for the volume of real estate construction in Morocco made by Moroccans living abroad. As suggested by equation (7) such a phenomenon in the long run is possible only if Moroccans living abroad have some degree of attachment to their home country. As Figure 2 illustrates, the price index for housing, which grows at approximately the same rate as the whole price index, does not show any specific pattern that could significantly tie real estate construction by Moroccans living abroad to some form of investment.

The wealth effect of the exchange rate depreciation should not be excluded from the long-run determinants of remittances in Morocco. The coefficient on $Log\ e_j$ is not the long-run value of the elasticity of remittances with respect to the exchange rate as seen in equation (9). However, the estimated short-run model suggests that this elasticity could be positive (equation (10) and Table 6).

There is no evidence that portfolio diversification motives could be behind the remittances in the long-run. This claim is supported by the negative semi-elasticity of remittances with respect to interest rates differentials $(i_j - i_j^*)$ and the negative coefficient on $Log\ A_j$. The negative signs of these two coefficients imply that holding everything else constant, including the long-run level of remittances and financial assets abroad, an increase in the interest differential in favor of Morocco will not increase the long-run amount of deposits held in Morocco by Moroccans living abroad (Figure 3). Therefore, this finding implies that those deposits may not be accumulated as part of a portfolio diversification strategy. Furthermore, the negative elasticity for $Log\ A_j$ also suggests that increases in remittances could be associated with a draw down of those deposits. This supports the argument that those deposits could merely be transitory accounts that are used to complement spending in the home country when necessary.

Even though the analysis could be made richer by adding other variables that have been left aside, one should note that the model satisfactorily fits the data, including during the period since 2001, when the surge in remittances is observed (Figures 6 and 7). However, the model cannot irrevocably attribute the surge in remittances to a specific factor or group of factors. The wealth effect of the devaluation of the dirham, which occurred at that time, could be a potential explanatory factor. However, one cannot reach such a conclusion with certainty without a much deeper analysis, which should also include countries such as Pakistan, where a similar surge in remittances was observed during the same period.

IV. CONCLUSION AND POLICY IMPLICATIONS

This paper has presented a model in which an altruistic worker, with some degree of "attachment" to her home country, maximizes private welfare by allocating her revenue between consumption in the country of residence, family consumption in the home country, acquisition of financial assets in the country of residence, and acquisition of financial and nonfinancial assets, such as real estate, in the home country. The model has some implications regarding the relation between the worker's remittances and wages in her home country, wages in her country of residence, her degree of attachment to her home country, the structure of her portfolio and interest rate differentials between the home country and the country of residence. The model has been tested in the case of remittances to Morocco. The findings could have implications on the debate about the stability of remittances and help derive some policy recommendations.

The findings suggest that there is no evidence that implies significant risks for a sharp slowdown or reversal of workers' remittances to Morocco in the foreseeable future. The analysis suggests that altruism or solidarity, attachment to homeland, and economic growth in the countries of residence could be the main long-run determinants of workers' remittances to Morocco. Moreover, there is no strong evidence that motives for portfolio diversification are significant among the long-run explanatory factors. This finding potentially lowers the above mentioned risks. However, for future research on the possibility of having portfolio diversification as a motive to remit, one could use other related indicators, such as stock market indices, in addition to interest rates on deposits.

The evidence on Moroccans' attachment to their home country supports the view that Morocco should maintain its economic and political reform efforts, which could further help diversify the investment allocation of remittance inflows, limit the negative impact that remittances could have on labor force participation, and therefore help sustain a broad-based economic growth.[20] The evidence suggests that Moroccans living abroad already show some attachment to their home country, as confirmed by the positive long-run correlation between remittances to Morocco and the value added of the construction sector. However, because this spending in Morocco is concentrated in the construction sector and because only a small portion of remittances goes to the creation of small and medium-size enterprises, Morocco does not fully take advantage of the skills of the new generations who, according to the authorities' own analysis, are not only highly qualified but are also more likely to be entrepreneurs. Therefore, Morocco could further utilize the entrepreneurial skills of its citizens living abroad, which along with the attachment to their home country, could potentially increase remittances through investment and boost Morocco's economic growth.

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[20] The negative impact of remittances on labor force participation could be mitigated in Morocco by the fact that most family members who receive support from abroad are parents, wife and children or younger brothers and sisters who often are too old or too young to join the labor force.

A. Solving the Model

In this section, $\Delta_j LogX$ denotes the first difference in logarithm of X from its previous-period value (i.e., $\Delta_j X \equiv Log(X_j) - Log(X_{j-1})$). $\overline{X}$ denotes the long-run or steady state value of X. $D_j LogX$ denotes the first difference in logarithm of X from its long-run value $\overline{X}$ (i.e., $D_j LogX \equiv LogX_j - Log\overline{X}_j$). It is shown that the long-run relation between remittances and their potential determinants is as in equation (9).

$$Log\ M_j^* = \frac{1}{\sigma_m}(\ \sigma_w^*\ Log\ W_j^* + (\sigma_A + \sigma_A^{(-1)})\ LogA_j$$

$$+ (\sigma_B + \sigma_B^{(-1)})\ LogB_j^* + \sigma_h LogCstr_j + \sigma_w\ Log\ w_j$$

$$+ (\sigma_e - \frac{1}{1-\lambda_1}(\sigma_i + \sigma_i^*)\lambda_2)Loge_j + \frac{1}{1-\lambda_1}(\sigma_i + \lambda_1\sigma_i^*)(i_j - i_j^*))) + ECM_j$$

(9)

$$= \frac{1}{\sigma_m}(\ (\sigma_w^* + \phi(\sigma_B + \sigma_B^{(-1)}))\ Log\ W_j^* + (\sigma_A + \sigma_A^{(-1)})\ LogA_j$$

$$+ \sigma_h LogCstr_j + \sigma_w\ Log\ w_j\ + (\sigma_e - \frac{1}{1-\lambda_1}(\sigma_i + \sigma_i^*)\lambda_2)Loge_j$$

$$+ \frac{1}{1-\lambda_1}(\sigma_i + \lambda_1\sigma_i^*)(i_j - i_j^*))) + ECM_j$$

where the elasticities are defined as follows.

$$\sigma_m = 1 + \left(\frac{\overline{P \cdot e \cdot Cstr}}{\overline{eM}} + \frac{\overline{eT}}{\overline{eM}}\left(\frac{\overline{P \cdot C}}{\overline{eT}} - \frac{\overline{W}}{\overline{eT}}\right)\right)\frac{\overline{eM}}{\overline{P^*C^*}} > 0$$

$$\sigma_w^* = \left(\frac{\overline{P \cdot e \cdot Cstr}}{\overline{eM}} + \frac{\overline{eT}}{\overline{eM}}\left(\frac{\overline{P \cdot C}}{\overline{eT}} - \frac{\overline{W}}{\overline{eT}}\right)\right)\frac{\overline{W^*}}{\overline{P^*C^*}} > 0$$

$$\sigma_w = -\frac{\overline{eT}}{\overline{eM}}\frac{\overline{P \cdot w}}{\overline{eT}} < 0$$

(10)

$$\sigma_h = \frac{\overline{eT}}{\overline{eM}}\frac{\overline{P \cdot w}}{\overline{eT}} > 0$$

$$\sigma_e = \frac{\overline{P \cdot e \cdot Cstr}}{\overline{eM}} - 1$$

and

$$\sigma_A = \frac{\overline{A}}{\overline{eM}} > 0$$

$$\sigma_A^{(-1)} = -\frac{\overline{A}}{\overline{eM}}\frac{1}{1+g} < 0$$

$$\sigma_B = -\frac{\overline{B^*}}{\overline{P^*C^*}}\left(\frac{\overline{P\cdot e\cdot Cstr}}{\overline{eM}} + \frac{\overline{eT}}{\overline{eM}}\left(\frac{\overline{P\cdot C}}{\overline{eT}} - \frac{\overline{W}}{\overline{eT}}\right)\right) < 0$$

$$\sigma_B^{(-1)} = \frac{1}{1+g}\frac{\overline{B^*}}{\overline{P^*C^*}}\left(\frac{\overline{P\cdot e\cdot Cstr}}{\overline{eM}} + \frac{\overline{eT}}{\overline{eM}}\left(\frac{\overline{P\cdot C}}{\overline{eT}} - \frac{\overline{W}}{\overline{eT}}\right)\right) > 0$$ (11)

$$\sigma_i = \sigma_A^{(-1)} = -\frac{\overline{A}}{\overline{eM}}\frac{1}{1+g} < 0$$

$$\sigma_{i^*} = \sigma_B^{(-1)} = \frac{1}{1+g}\frac{\overline{B^*}}{\overline{P^*C^*}}\left(\frac{\overline{P\cdot e\cdot Cstr}}{\overline{eM}} + \frac{\overline{eT}}{\overline{eM}}\left(\frac{\overline{P\cdot C}}{\overline{eT}} - \frac{\overline{W}}{\overline{eT}}\right)\right) > 0$$

The short-run or error-correction model is given as in equation (12)

$$D_j Log\, M^* = q_w^* D_j LogW_j^* + q_A\, D_j LogA_j + q_A^{(-1)} D_j LogA_{j-1}$$

$$+ q_B\, D_j LogB_j^* + q_B^{(-1)} D_j LogB_{j-1}^* + q_h D_j LogCstr_j + q_w D_j Log\, w_j$$

$$+ q_p D_j LogP_j + q_e D_j Loge_j + q_i D_j\, i_j + q_i^* D_j i_j^*$$

$$+ (\eta - 1)\sigma_m ECM_{j-1} + q_o + v_j$$ (12)

$$= (q_w^* + \phi \cdot (q_B + q_B^{(-1)}))\, D_j LogW_j^* + q_A\, D_j LogA_j + q_A^{(-1)} D_j LogA_{j-1}$$

$$+ q_h D_j LogCstr_j + q_w D_j Log\, w_j + q_p D_j LogP_j + q_e D_j Loge_j$$

$$+ q_i D_j\, i_j + q_i^* D_j i_j^* + (\eta - 1)\sigma_m ECM_{j-1} + q_0' + v_j'$$

assuming that

$$i_j^* = \lambda_1 \cdot i_j - \lambda_2 Log\, e_j + \kappa_j, \quad 0 < \lambda_1 < 1, \quad \lambda_2 > 0$$ (13)

and that

$$LogB_j^* = \frac{1}{\phi}LogW_j^* + \upsilon_j \qquad (14)$$

Note that if capital was perfectly mobile, the model would predict that interest rates would be equalized up to the currencies' depreciation rates and that the stocks of financial assets held in the home country and in the country of residence are indeterminate. However, a more realistic assumption relevant to the empirical investigation would be that of imperfect capital mobility.[21] The paper will not explicitly present any specific form of capital control. Instead, it is assumed that because of capital controls, we have equation (13), which states that holding the exchange rate constant, an increase of interest rates abroad of one percent must be matched with a more than one percent increase in interest rates in the home country. This assumption is also consistent with the evidence on deposit rates in France, which will be used as a proxy for i_j^* , and interest rates in Morocco.

Equation (14) states that financial assets held by workers residing abroad increase with their wages, up to a term υ_j that is stationary. This assumption is made because in the empirical application there is no data on financial assets held by workers residing abroad in their countries of residence. One could have easily made this level of financial assets endogenous by solving for it as a discounted sum of future savings. However, one would then have to make another assumption about future wages and interest rates, which would just complicate the model without providing additional insight. In equation (12), v_j and v_j' are stationary random terms and the coefficients qs are the elasticities, which depend on the steady values of the variables.

Denote μ_{1j} and μ_{2j}, respectively, as the Lagrange multipliers for the constraints represented in equations (2) and (3). The Lagrangian for the optimization problem in equation (1) is

$$L = \sum_{j=t}^{\infty} \beta^{j-t}[\alpha_j Ln(H_j) + Ln(C_j^*) + \gamma_j Ln(C_j) + \mu_{1j}(W_j^* + i_j^* B_{j-1}^* - P_j^* C_j^* - M_j^* - B_j^*$$
$$+ B_{j-1}^*) + \mu_{2j}(-A_j + A_{j-1}(1+i_j) + e_j M_j^* - P_j(H_j - H_{j-1}) - e_j T_j^*)]$$

The first order conditions are then:

$$\frac{\partial L}{\partial H_j} = \frac{\alpha_j}{H_j} - \mu_{2j}\frac{P_j}{e_j} + \beta\mu_{2j+1}\frac{P_{j+1}}{e_{j+1}} = 0 \qquad (15)$$

$$\frac{\partial L}{\partial C_j^*} = \frac{\alpha_j}{C_j^*} - \mu_{1j} P_j^* = 0 \tag{16}$$

$$\frac{\partial L}{\partial C_j} = \frac{\gamma_j}{C_j} - \mu_{2j} \frac{P_j}{e_j} = 0 \tag{17}$$

$$\frac{\partial L}{\partial B_j^*} = -\mu_{1j} + \beta \mu_{1j+1}(1 + i_j^*) = 0 \tag{18}$$

$$\frac{\partial L}{\partial A_j} = -\mu_{2j} + \beta \mu_{2j+1}(1 + i_j^*) = 0 \tag{19}$$

$$\frac{\partial L}{\partial M_j^*} = -\mu_{1j} + \mu_{2j} = 0 \tag{20}$$

Using equation (20), equations (16) and (17) imply that we have:

$$P_j^* C_j^* = \frac{P_j C_j}{\gamma_j e_j},$$

 which is equation (6).

In the steady-state, we have

$$\bar{e}_{j+1} = \bar{e}_j = e, \quad \bar{\gamma}_j = \gamma, \quad \bar{\alpha}_j = \alpha, \quad \bar{P}_j = (1+\pi)\bar{P}_{j-1}, \quad \bar{P}_j^* = (1+\pi^*)\bar{P}_{j-1}^*$$

$$\tag{21}$$

$$\bar{i}_j^* = i^*, \quad \bar{i}_j = i$$

Using equations (18) and (19) , equations (16) and (17) imply that we have

$$\bar{C}_j^* = \beta \frac{1+i^*}{1+\pi^*} \bar{C}_{j-1}^*, \quad \bar{C}_j = \beta \frac{1+i}{1+\pi} \bar{C}_{j-1} \tag{22}$$

Using equation (19), equation (15) implies equation (7), with

$$a_{hj} = \frac{1}{1 - (1+\pi)/(1+i^*)}$$

Assuming that the variables remain in the "neighborhood" of their steady state values, especially that equation (7) holds even out of a steady state provided a stationary random term φ_j is added, that is,

$$\frac{P_j H_j}{e_j} == \alpha_j a_h P_j^* C_j^* + \varphi_j \tag{23}$$

we can log-linearize equations (2), (3), (5), (6) and (7) around the steady state, and then use the log-linearized version of equation (23) to rewrite the equations so as to eliminate domestic prices using the log-linearized version of equation (2).[22] The resulting equations imply equations (9) and (12), where we have

$$ECM_j = \frac{1}{\sigma_m} (\sigma_m \mathrm{Log\,M}_j^* - (\ \sigma_w^* \mathrm{Log W}_j^* + (\sigma_A + \sigma_A^{(-1)}) LogA_j$$

$$+ (\sigma_B + \sigma_B^{(-1)}) LogB_j^* + \sigma_h LogCstr_j + \sigma_w \mathrm{Log\,w}_j$$

$$+ (\sigma_e - \frac{1}{1-\lambda_1}(\sigma_i + \sigma_i^*)\lambda_2)\mathrm{Log}e_j + \frac{1}{1-\lambda_1}(\sigma_i + \lambda_1\sigma_i^*)(i_j - i_j^*)))$$

$$\tag{24}$$

$$= \frac{1}{\sigma_m} (\sigma_m \mathrm{Log\,M}_j^* - (\ (\sigma_w^* + \phi(\sigma_B + \sigma_B^{(-1)})) \mathrm{Log W}_j^* + (\sigma_A + \sigma_A^{(-1)}) LogA_j$$

$$+ \sigma_h LogCstr_j + \sigma_w \mathrm{Log\,w}_j + (\sigma_e - \frac{1}{1-\lambda_1}(\sigma_i + \sigma_i^*)\lambda_2)\mathrm{Log}e_j$$

$$+ \frac{1}{1-\lambda_1}(\sigma_i + \lambda_1\sigma_i^*)(i_j - i_j^*)))$$

after assuming that equations (13) and (14) hold and that the growth rate of assets held by workers residing abroad in the home country and abroad are stationary.

Note that equation (24) is equivalent to equation (9), which is the long-run relation between remittances and their determinants as predicted by the model.

Assuming the growth rate of financial assets is stationary implies that the term ECM_j is stationary and will represent the co-integration or long-run relations between the non-stationary variables included in the model. The empirical investigation will confirm the

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[22] The only purpose of this operation is to reduce the number variables that will be used in the VAR and to increase the degrees of freedom in order to have more reliable estimates of the long-run relation. This is not necessary when the sample size is large enough. Prices are chosen because they are the most likely to meet the assumption of small stationary deviations from the long-run values.

stationarity of the growth rate of deposits in the home country. However, since there is no data on workers' financial assets in their country of residence, there is no way to verify the validity the assumption on the stationarity of the growth rate of those assets.

B. A Summary of the Econometric Details

The dataset considered on remittances shows a sign of seasonality, especially during the third quarter (Figure 1). Nonetheless, seasonality should not necessarily be interpreted as inflows related to tourism from Moroccans living abroad. Seasonality can also come from altruism if one allows for the possibility that transfers could be made in order to help the family spend an enjoyable vacation time. Notwithstanding those remarks, the estimation procedure has included seasonality dummies.

All the potential explanatory factors discussed in section II, including interest rates cannot be ruled out a priori in the long-run relation determining workers' remittances. As Table 2 shows, the logarithm of remittances is integrated of order one, or difference-stationary. Therefore, for an explanatory factor to be considered as a potential determinant in the long-run relation, it must have the same time-series properties as the level of remittances, that is, be integrated of order one. The augmented Dickey-Fuller (ADF) tests for such properties could not reject the hypothesis of an order of integration of one for all the potential determinants considered as the table clearly shows. Note however that GDP shows a trend.

The long-run relation presented in equation (9) is first estimated using the Johansen (1991) method. Because of the sample size constraint, a fourth-order VAR is used. It could not be checked whether such a model minimized the various information criteria. Therefore, additional procedures will be used to confirm the choice of the long-run relation. The determination of the co-integration vector was based on the interpretability of the vector in line of the model and the evidence, the co-integration graphs, as well as the result of formal testing, including testing using the error correction model given in equation (12). Whether the co-integration vector's stationarity can be confirmed with ADF tests was also checked. The Johansen statistics (λ_{trace} and λ_{max}) suggest that there is one co-integration vectors that can be derived from the unrestricted VAR (Table 4). To identify the vectors from the seven presented, an approach similar to Johansen and Juselius (1992) was used. We examined the direct interpretability of the co-integration vectors[23] using the theory's predictions and the evidence. Only vector 4 seems to match both the theory and the evidence.[24]

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[23] Generic identification techniques could also be used when identifying restrictions are available and intuitive. See for example Dickey and Rossana (1994), Johansen and Juselius (1994), Hendry and Mizon (1993), Nachega (2001a, 2001b).
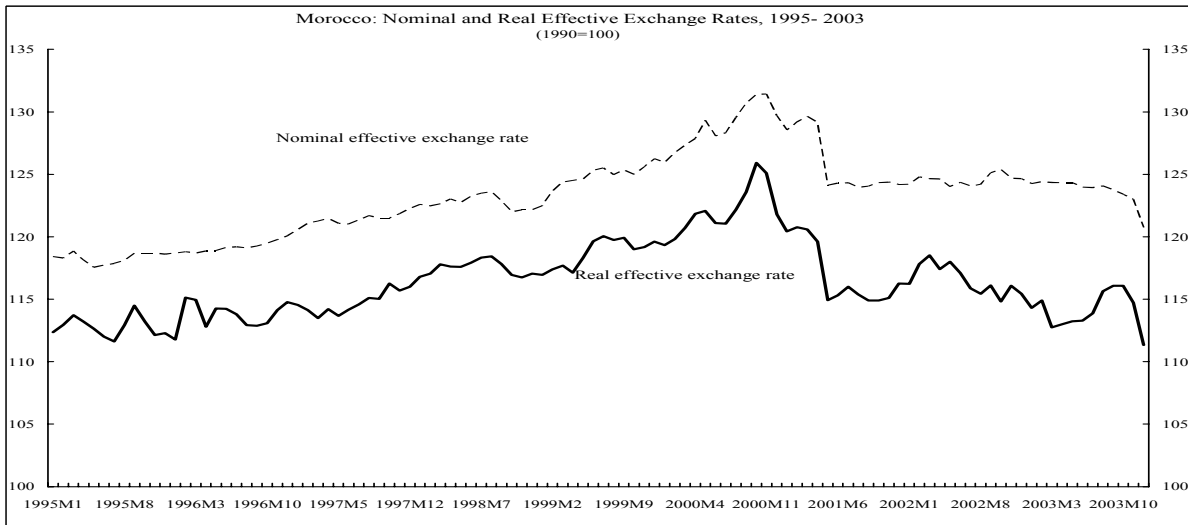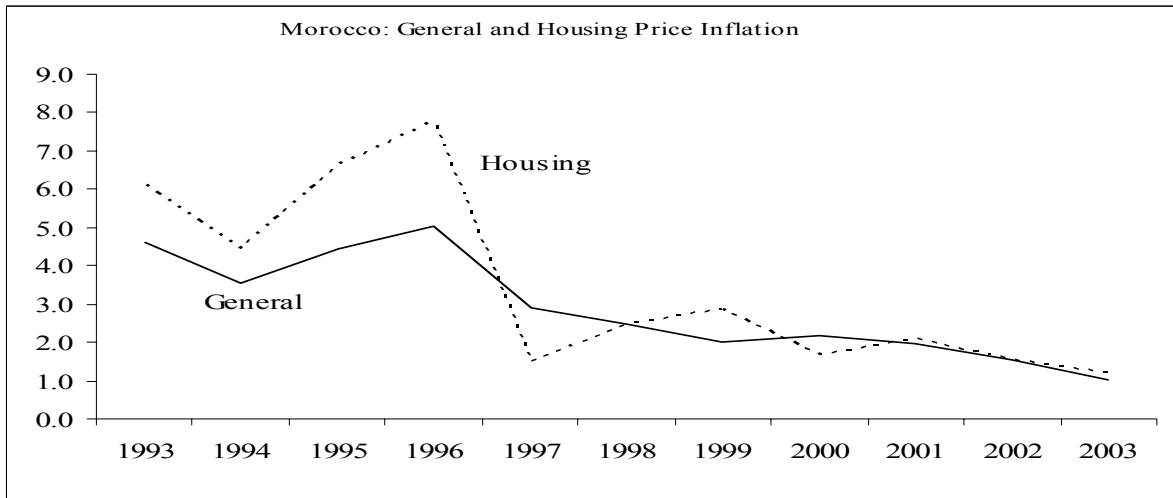
[24] Vector 1, 2 and 3 in Table 4 would suggest that the long-run elasticity of remittances with construction GDP, which is a proxy for WRAs spending on construction is negative. This would contradict both the theory and the evidence (Figure 4). Vector 5, which is normalized on the interest rate differential has an adjustment coefficient that is positive and therefore does not lead to an equilibrium correcting path for the interest rate differential. The same argument on construction GDP can be used for vector 6. Vector 7 would contradict the theoretical

(continued…)

The co-integration graph (Figure 6), the ADF tests (Table 2) and the error correction form of the model (Table 6) could not reject the vector as describing that long-run relation. Note that in the model in an error correction form given in equation (12), the misspecification tests in Table 6 do not reveal any problem, neither for residual autocorrelation (AR), skewness and excess kurtosis (normality), autoregressive conditional heteroskedasticity (ARCH), nor heteroskedasticity (RESET test). The coefficient on the term ECM is negative and significant, even using the conservative Dickey-Fuller five percent critical value of -1.95. These findings support the choice of the vector as describing the long-run relation determining the level of remittances. The model also satisfactorily describes the short-run as illustrated in Figure 7. The co-integration vector has been normalized on the remittances and is presented in equation (8).

predictions on GDP in Morocco, and the evidence showing a positive correlation between wages abroad and transfers (Figure 4).

Figure 2. Potential Long-Run Determinants of Workers' Remittances

Morocco: General and Housing Price Inflation

Morocco: Nominal and Real Effective Exchange Rates, 1995- 2003
(1990=100)

Sources: Moroccan authorities; and IMF staff estimates

Figure 2. Potential Long-Run Determinants of Workers' Remittances (continued...)

(In logarithm, unless otherwise indicated)
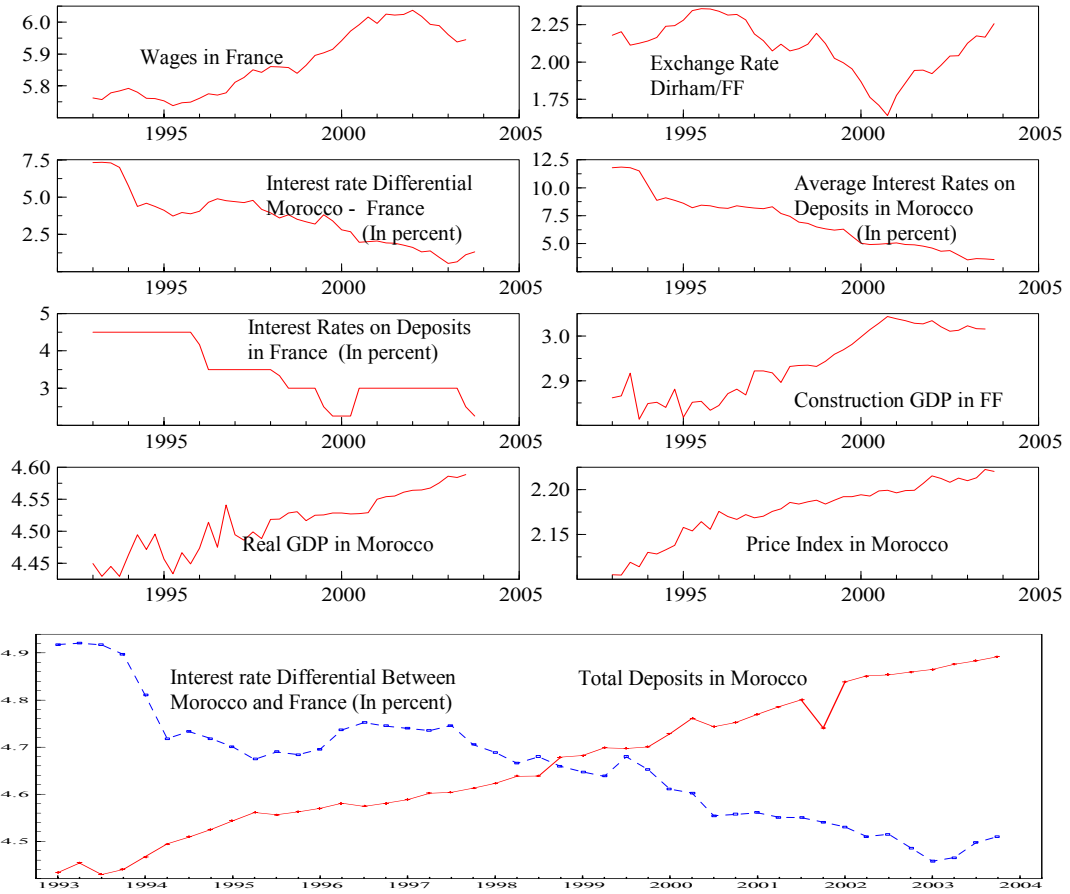
Sources: Moroccan authorities; International Financial Statistics; and IMF staff estimates

Figure 3. Deviation of Remittances from the Long-Run Value as Defined in Equation (8)
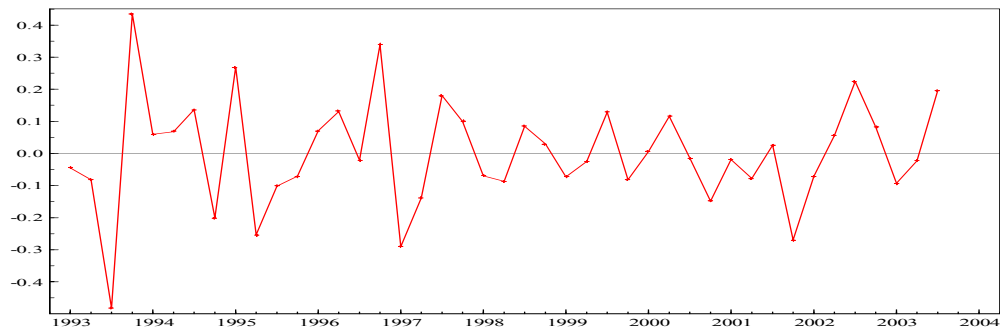
Sources: Moroccan authorities; and IMF staff estimates.

Figure 4. Evolution of Transfers and Some Of Their Potential Long-Run Determinants
(In logarithm of variables in French francs, unless otherwise indicated)
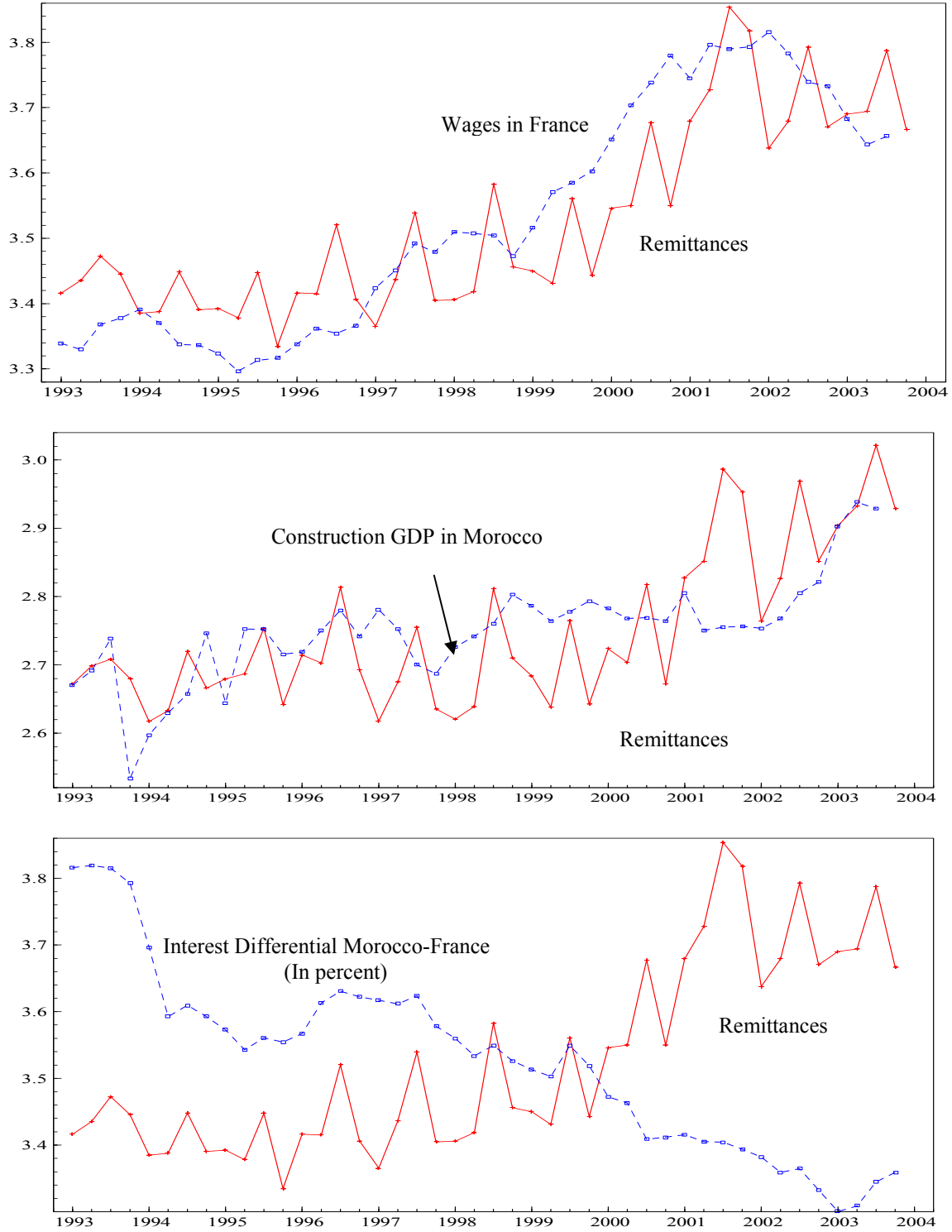
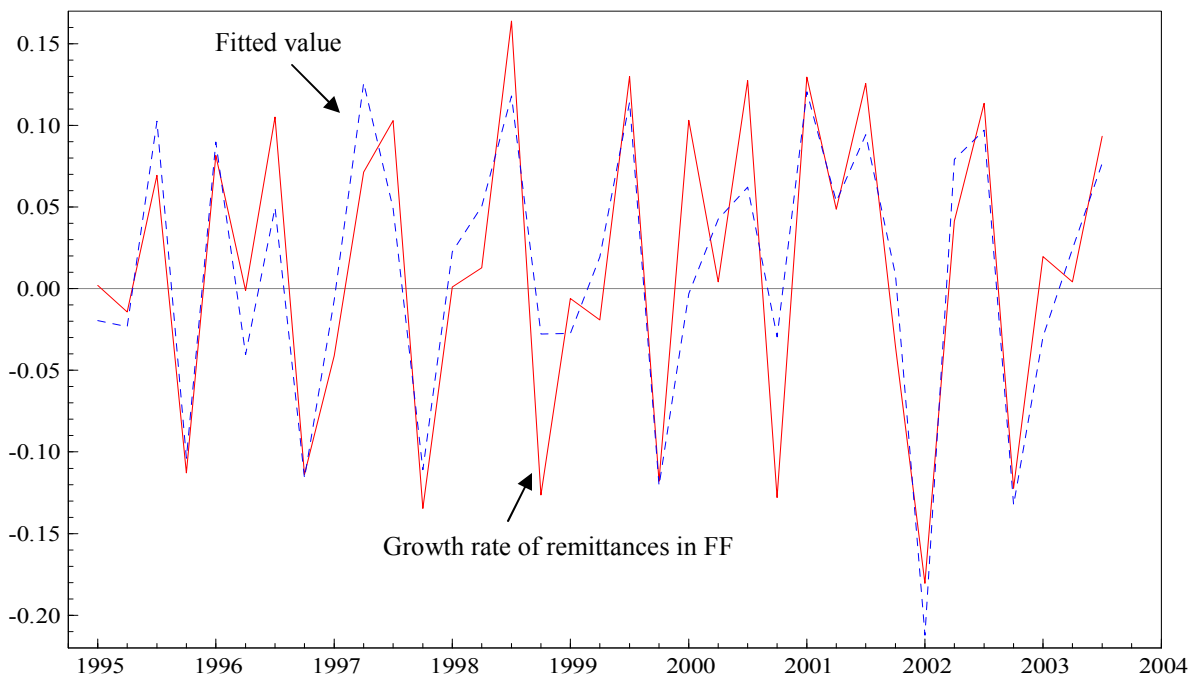Figure 5. Transfers and Total Deposits and Their Fitted Values (VAR)
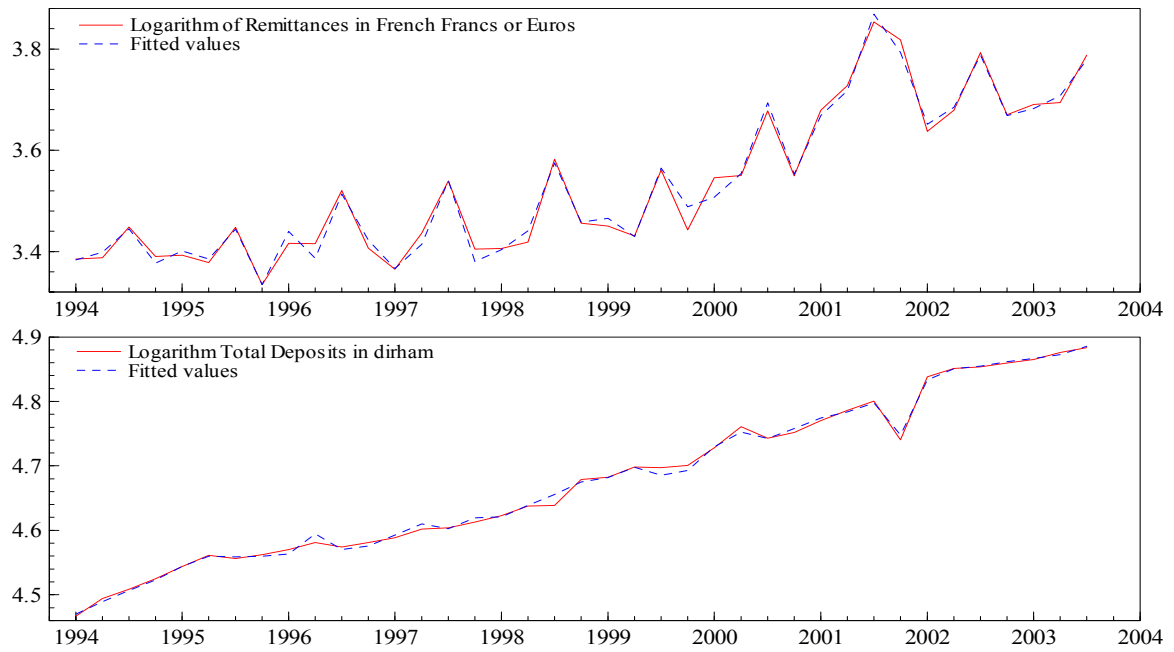
Sources: Moroccan authorities; and IMF staff estimates

Figure 6. Remittances Growth Rates and Their Fitted Values (Error-correction model)

Sources: Moroccan authorities; and IMF staff estimates

Table 2. ADF (4) Statistics for Unit Root Tests

Variables	t-ADF	Lag (AIC)	Lag (alt. model)
In (Log) levels			
Remit	-2.688	0	
Wages_Fce (FF or Euro)	-2.320	3	
ERdh/FF_EUR	-0.9331	1	
IR_Mor - IR_Fce	-1.804	0	
Dep	-2.418	1	
Cstr	-2.791	0	
GDP	-7.276**	3	
IR_Mor	-1.784	0	
IR_Fce	-2.172	1	
Price	-2.954	1	
ECM	-6.769**	0	
In first differnces			
Remit	-7.832**	0	
Wages_Fce (FF or Euro)	-4.340**		0
ERdh/FF_EUR	-3.663*	0	
IR_Mor - IR_Fce	-4.716**	0	
Dep	-9.564**	1	
Cstr	-7.557**	0	
GDP	-6.825**	4	
IR_Mor	-5.981**	0	
IR_Fce	-4.371**	0	
Price	-9.318**	0	

Notes: The estimation period is 1993:Q1-2003:Q4. The dataset is taken from the Moroccan authorities and the International Financial Staistics. The variables are defined in section III.B. Foor each variable, values in the second column denotes the t-values of the augmented Dickey-Fuller (ADF) statistics. The third column denotes the lag order that minimizes the Akaike information criteria (AIC) and the fourth, the lag order of an alternative model. The ADF statistics is testing a null hypothesis of a unit root in that variable expressed in (Log) levels and first (Log) difference against an alternative of a stationary root. Each regression contains a constant, a trend and seasonal dummies. * and ** denote rejection at the 5 and 1 percent significance levels. The ADF tests were augmented with 4 lags, except for the ECM equation where it was augmented with 6 lags. The null hypothesis was rejected for Dep_dh in levels at 5 percent level of significance when there was no lag added.

Table 3. Residual Misspecification Test Statistics: First Order (Unrestricted) VAR

	Serial correlation (AR1-5)	Normality
	F(5,2)	Chi ^2 (2)
Remit	1.9895 [0.3675]	4.7665 [0.0923]
Wages_Fce	4.8750 [0.1789]	2.4347 [0.2960]
ERdh/FF_EUR	94.263 [0.0105]*	0.47203 [0.7898]
Dep	0.63581 [0.7048]	5.1025 [0.0780]
IR_Mor - IR_Fce	3.3969 [0.2429]	1.1497 [0.5628]
Cstr	2.6360 [0.2976]	1.4349 [0.4880]
GDP	1.6517 [0.4185]	3.2080 [0.2011]

Notes: The estimation period is 1993:Q1-2003:Q4. The dataset is taken from the Moroccan authorities and the International Financial Staistics. The variables are defined in section III.B. The vector auto regression is estimated with 4 lags and contains an unrestricted constant and seasonal dummies. The null hypothesis are that of no serial correlation, and of normality. * and ** denote rejection of the null hypothesis at the 5 and 1 percent significance levels.

Table 4. Test Statistics for Cointegrating Rank

Null	Alt.	Trace statistic	Null	Alt.	λmax statistic
r = 0	r ≥ 1	258.62 [0.000]**	r = 0	r = 1	178.61 [0.000]**
r ≤ 1	r ≥ 2	80.01 [0.366]	r = 1	r = 2	32.66 [0.278]
r ≤ 2	r ≥ 3	47.35 [0.747]	r = 2	r = 3	24.55 [0.429]
r ≤ 3	r ≥ 4	22.80 [0.960]	r = 3	r = 4	11.71 [0.933]
r ≤ 4	r ≥ 5	11.09 [0.954]	r = 4	r = 5	6.66 [0.957]
r ≤ 5	r ≥ 6	4.43 [0.861]	r = 5	r = 6	3.37 [0.910]
r ≤ 6	r ≥ 7	1.06 [0.302]	r = 6	r = 7	1.06 [0.302]

Notes: r denotes the rank of the long-run matrix. The sample period is 1994:Q1-2003:Q4. The unrestricted VAR is estimated with four lags. The small sample size did not allow for a longer lag length. Given this constraint, the system with four lags minimized the information criteria (Akaike, Schwarz, Hannan-Quinn). Probability values are square brackets. * and ** denote rejection of the null hypothesis at the 5 and 1 percent significance levels.

Table 5. Unrestricted Estimates of the Cointegrating Vectors and Adjustment Coefficients

	Estimated eigenvalues						
	1	*2*	*3*	*4*	*5*	*6*	*7*
	1.00	0.95	0.89	0.66	0.45	0.26	0.09

	Estimated eigenvectors (in columns)						
	1	*2*	*3*	*4*	*5*	*6*	*7*
Remit	**1.00**	-0.15	0.54	0.22	6.10	-0.49	-0.27
Wages_Fce	-2.24	**1.00**	-0.88	-0.41	12.69	1.70	-0.50
ERdh/FF_EUR	14.74	1.14	**1.00**	-4.25	5.45	5.82	0.22
Dep_dh	-7.68	-0.54	0.47	**1.00**	30.01	-0.78	-0.32
IR_Mor - IR_Fce	-0.32	-0.01	0.07	0.03	**1.00**	-0.01	-0.01
Cstr	7.54	-0.32	2.05	-2.22	-61.12	**1.00**	1.23
GDP	7.20	0.21	-1.89	0.92	8.23	-0.59	**1.00**

	Estimated adjustment coefficients (in columns)						
	1	*2*	*3*	*4*	*5*	*6*	*7*
Remit	**-0.20**	0.29	-0.41	-0.58	0.00	-0.88	0.11
Wages_Fce	-0.02	**-1.88**	0.09	0.33	0.00	0.03	0.08
ERdh/FF_EUR	0.00	0.55	**-0.03**	-0.04	0.00	-0.06	-0.04
Dep_dh	0.04	0.50	0.02	**-0.49**	-0.01	0.25	0.00
IR_Mor - IR_Fce	0.95	-15.44	-6.36	-8.89	**0.11**	-2.58	-0.43
Cstr	-0.04	-0.95	-0.14	0.50	0.00	**0.03**	0.10
GDP	-0.11	-0.42	-0.04	-0.85	0.01	-0.10	**-0.11**

Notes: The estimation period is 1993:Q1-2003:Q4.

Table 6. Error Correction or Short-Run Model

	Δ Remit	t-values
ECM_1	-0.40	-2.01
ΔWages_Fce (FF or Euro)	-1.72	-0.89
ΔCstr	4.03	2.74
ΔGDP	-1.84	-1.63
ΔIR_Mor	0.08	1.03
ΔIR_Fce	-0.12	-1.79
ΔDep_	-0.82	-0.88
ΔDep_1	2.65	2.92
ΔDep_2	0.75	0.78
ΔDep_3	-0.84	0.94
ΔDep_4	-0.25	-0.28
ΔER dh/FF	6.11	1.15
ΔER dh/FF_1	-3.78	-1.21
ΔER dh/FF_2	-0.18	-0.06
ΔER dh/FF_3	-3.02	-0.92
ΔER dh/FF_4	-3.28	-1.07
ΔPrice	6.45	1.92
Δprice_1	-3.90	-1.24
Δprice_2	-2.04	-0.66
Δprice_3	3.02	0.85
Δprice_4	-0.22	-0.07
Constant	-0.21	-1.96

Goodness of fit and mispecification tests

Nb. Obs. = 35

R^2 = 0.78

Std Err = 0.07

AR 1-5: $F(5,8)$ = 2.4656 [0.1232]

ARCH 1-5 test: $F(5,3)$ = 0.10448 [0.9837]

ARCH 1-2 test: $F(2,9)$ = 0.016137 [0.9840]

Normality test: $Chi^2(2)$ = 1.4282 [0.4896]

RESET test: $F(1,12)$ = 0.66294 [0.4314]

Notes: The estimation period is 1995:Q1-2003:Q3. The dataset is taken from the Moroccan authorities and the International Financial Staistics. The variables are defined in section III.B. The error correction model includes 4 lags for deposits, prices and the exchange rate to reduce the serial correlation in the error terms. Note that the 't' statistic for ECM does not follow the standard 't' distribution, but rather another distribution $t_{ecm.}$ See further discusion in the appendix. For the mispecification tests, probability values are in square brackects.

REFERENCES

Abel, A., and L. Kotlikoff, 1988, "Does the Consumption of Different Age Groups Move Together? A New Nonparametric Test of Intergenerational Altruism," NBER Working Paper, No. 2490 (Cambridge, Massachusetts: National Bureau of Economic Research)

Adams, R.H. Jr., 1991, "The Economic Uses and Impact of International Remittances in Rural Egypt," *Economic Development and Cultural Change*, Vol. 39, pp. 695–722.

———,1998, "Remittances, Investment, and Rural Asset Accumulation in Pakistan," *Economic Development and Cultural Change*, Vol. 47, pp. 155–73.

Adelman I., and J.E. Taylor, 1990, "Is Structural Adjustment with a Human Face Possible? The Case of Mexico," *Journal of Development Studies*, Vol. 26, pp. 387–407.

Agarwal, R., and A.W. Horowitz, 2002, "Are International Remittances Altruism or Insurance? Evidence from Guyana Using Multiple-Migrant Households," *World Development*, Vol. 30, pp. 2033–44.

Ahmed, M.A., 1986, "Comments on Impact of Workers' Remittances from the Middle East on Pakistan's Economy: Some Selected Issues," *Pakistan Development Review*, Vol. 25, pp. 783–85.

Alderman, H., 1996, "Saving and Economic Shocks in Rural Pakistan," *Journal of Development Economics*, Vol. 51, pp. 343–65.

Altonji, J., F. Hayashi, and L. Kotlikoff, 1992, "Is the Extended Family Altruistically Linked? Direct Tests Using Micro Data," *American Economic Review*, Vol. 82, pp. 1177–1198.

Amjad, R., 1986, "Impact of Workers' Remittances from the Middle East on Pakistan's Economy: Some Selected Issues," *Pakistan Development Review*, Vol. 25, pp. 757–82.

Banerjee, A., Hendry, D.F. and Smith, G.W., 1986, "Exploring Equilibrium Relationships in Economics Through Static Models: Some Monte Carlo Evidence," *Oxford Bulletin of Economics and Statistics*, Vol. 48, pp. 253–77.

Brown, R.P.C., 1997, "Estimating Remittance Functions for Pacific Island Migrants," *World Development*, Vol. 25, pp. 613–26.

Chami, Ralph, Connel Fullenkamp, and Samir Jahjah, 2003, "Are Immigrant Remittance Flows a Source of Capital for Development?" IMF Working Paper 03/189 (Washington: International Monetary Fund).

Chami, Ralph, and Jeffrey H. Fisher, 1996, "Altruism, Matching, and Nonmarket Insurance," *Economic Inquiry*, Vol. 34, pp. 630–47.

Dickey, D.A., and R.J. Rossana, 1994, "Cointegrated Time Series: A Guide Estimation and Hypothesis Testing," *Oxford Bulletin of Economics and Statistics*, Vol. 56, pp. 325–53.

Durand, J., E.A. Parrado, and D.S. Massey, 1996, "Migradollars and Development: A Reconsideration of the Mexican Case," *International Migration Review*, Vol. 30, pp. 423–44.

Durand, J., W. Kandel, E.A. Parrado, and D.S. Massey, 1996, 1996b, "International Migration and Development in Mexican Communities," Demography, Vol. 33, pp. 249–64.

Elbadawi, Ibrahim A., and Robert de Rezende Rocha, 1992, "Determinants of Expatriate Workers' Remittances in North Africa and Europe," World Bank Policy Research Working Paper 1038 (Washington: World Bank).

Engle, R.F., and C.W.J. Granger, 1987, "Co-integration and Error Correction Representation, Estimation, and Testing," *Econometrica*, Vol. 55, No. 2 (March), pp. 251–76.

Gilani, I., 1981, "Labour Migration from Pakistan to the Middle East and its Impact on the Domestic Economy, Part 1," Pakistan Institute of Development Economics Research Report Series 126 (Islamabad, Pakistan).

Glytsos, N.P., 1993, "Measuring the Income Effects of Migrant Remittances: A Methodological Approach Applied to Greece," *Economic Development and Cultural Change*, Vol. 42, pp. 131–68.

Gordon, J., and P. Gupta, 2004, "Nonresident Deposits in India: In Search of Return?," IMF Working Paper 04/48 (Washington: International Monetary Fund).

Granger C.W.J., and P. Newbold, 1974, "Spurious Regressions in Econometrics," *Journal of Econometrics,* Vol. 2, pp. 111–20.

Gubert, Flore, 2002, "Do Migrants Insure Those Who Stay Behind? Evidence from the Kayes Area (Western Mali)," *Oxford Development Studies*, Vol. 30, pp. 267–87.

Hendry D.F, and G.E. Mizon, 1993, "Evaluating Econometric Models by Encompassing the VAR," in *Models, Methods, and Applications of Econometrics: Essays in Honor of A.R. Bergstrom,* ed. by P.C.B. Phillips (Oxford: Blackwell Publishing).

Ilahi, N., and S. Jafarey, 1999, "Guest Worker Migration, Remittances, and the Extended Family: Evidence from Pakistan," *Journal of Development Economics*, Vol. 58, pp. 485–512.

Itzigsohn, J., 1995, "Migrant Remittances, Labor Markets, and Household Strategies: A Comparative Analysis of Low-Income Household Strategies in the Caribbean Basin," *Social Forces*, Vol. 74, pp. 633–55.

Johansen, S., 1991, "Estimation and Hypothesis Testing of Cointegration Vectors in Gaussian Vector Autoregressive Models," *Econometrica*, Vol. 59, No. 6, (November), pp. 1551–80.

Johansen, S., and K. Juselius, 1992, "Testing Structural Hypothesis in Multivariate Cointegration Analysis of the PPP and the UIP for the UK," *Journal of Econometrics,* Vol. 53, pp. 211–44.

———, 1994, "Identification of the Long-Run and the Short-Run Structure: An Application to the IS/LM Model," *Journal of Econometrics,* Vol. 63. pp 7–36.

Johnson, G.E., and W.E. Whitelaw, 1974, "Urban-Rural Income Transfers in Kenya: An Estimated-Remittances Function," *Economic Development and Cultural Change*, Vol. 22, pp. 473-79.

Kozel, V., and H. Alderman, 1990, "Factors Determining Work Participation and Labour Supply Decisions in Pakistan's Urban Areas," *Pakistan Development Review*, Vol. 29, pp. 1–18.

Kremers, J.J.M., N.R. Ericsson, and J.J. Dolado, 1992, "The Power of Integration Tests," *Oxford Bulletin of Economics and Statistics*, Vol. 54, pp. 325–48

Lopez, J.R., and M.A. Seligson, 1991, "Small Business Development in El Salvador: The Impact of Remittances," in *Migration, Remittances and Small Business Development: Mexico and Caribbean Basin Countries,* ed. by Sergio Diaz-Briquets and Sidney Weintraub, Series on Development and International Migration in Mexico, Central America, and the Caribbean Basin, Vol. 4 (Boulder, Colorado: Westview Press).

Lucas, Robert E.B., and Oded Stark, 1985, "Motivations to Remit: Evidence from Botswana," *Journal of Political Economy,* Vol. 93, pp. 901–918.

———, 1988, "Migration, Remittances and the Family," *Economic Development and Cultural Chang,* Vol. 36, pp. 465–81.

Nachega, J.C., 2001a, "A Cointegration Analysis of Broad Money Demand in Cameroon," IMF Working Paper 01/26 (Washington: International Monetary Fund).

———, 2001b, "Financial Liberalization, Money Demand and Inflation in Uganda," IMF Working Paper 01/118 (Washington: International Monetary Fund).

Nishat, M., and N. Bilgrami, 1991, "The Impact of Workers' Remittances on Pakistan Economy," *Pakistan Economic and Social Review*, Vol. 29, pp. 21–41.

Obeirai, A.S., and H.K.M. Singh, 1980, "Migration, Remittances and Rural Development: Findings of a Case Study in the Indian Punjab," *International Labour Review*, Vol. 119, pp. 229–41.

Phillips, P.C.B., 1986, "Understanding Spurious Regressions in Econometrics," *Journal of Econometrics,* Vol. 33, pp. 311–40.

Poirine, Bernard, 1997, "A Theory of Remittances as an Implicit Family Loan Arrangement," *Word Development*, Vol. 25, pp. 589–611.

Russell, S. Stanton, 1986, "Remittances from International Migration: A Review in Perspective," *World Development*, Vol. 14, pp. 677–96.

Sofranko, A.J., and K. Idris, 1999, "Use of Overseas Migrants' Remittances to the Extended Family for Business Investment: A Research Note," *Rural Sociology*, Vol. 64, pp. 464–81.

Stahl, C.W., and A. Habib, 1989, "The Impact of Overseas Workers' Remittances on Indigenous Industries: Evidence from Bangladesh," *The Developing Economies*, Vol. 27, pp. 269–85.

Stark, Oded, 1991, "Migration in LDCs: Risk, Remittances, and the Family," *Finance and Development*, December, pp. 39–41.

Straubhar, T., 1986, "The Determinants of Workers' Remittances: The Case of Turkey," *Weltwirtschaftliches Archiv*, Vol. 122, pp. 728–40.

Taylor, J.E., 1992, "Remittances and Inequality Reconsidered: Direct, Indirect, and Intertemporal Effects," World Bank Staff Working Paper 481 (Washington: World Bank).

Taylor, J. Edward, 1999, "The New Economics of Labor Migration and the Role of Remittances in the Migration Process," *International Migration*, Vol. 37, pp. 63–88.

Townsend, R.M., 1994, "Risk and Insurance in Village India," *Econometrica*, Vol. 62, pp. 539–91.

Wahba, S., 1991, "What Determines Workers' Remittances?" *Finance and Development*, December, pp. 41–44.

Yule, G.U., 1926, "Why Do We Sometimes Get Nonsense Correlations Between Time Series? A Study in Sampling and the Nature of Time Series," *Journal of the Royal Statistical Society,* Vol. 89, pp. 1–64.