Policy Research

WORKING PAPERS

Transition and Macro-Adjustment

Country Economics Department
The World Bank
November 1992
WPS 1038

Determinants of Expatriate Workers' Remittances in North Africa and Europe

Ibrahim A. Elbadawi
and
Robert de Rezende Rocha

The level of remittances from expatriate workers is significantly affected by economic policies in the home (labor-exporting) country. Special incentive schemes cannot substitute for a stable, credible macroeconomic policy.

Policy Research

WORKING PAPERS

Transition and Macro-Adjustment

WPS 1038

This paper — a product of the Transition and Macro-Adjustment Division, Country Economics Department, and the Trade and Finance Division, Technical Department, Europe and Central Asia and Middle East and North Africa regions — is part of a larger project funded by the two departments, "The Determinants of Expatriate Workers' Remittances." Copies of this paper are available free from the World Bank, 1818 H Street NW, Washington, DC 20433. Please contact Lanha Ly, room H9-071, extension 37352 or Anna Marañon, room N11-025, extension 31450 (November 1992, 56 pages).

Elbadawi and Rocha review the theoretical literature on the determinants of international workers' remittances and then posit an empirical model that accounts for demographic, portfolio, and macroeconomic factors that — together with special incentive policies — determine official remittances.

They estimated the model using data from five major labor-exporting countries of North Africa and Europe: Morocco, Portugal, Tunisia, Turkey, and the former Yugoslavia. The econometric results strongly corroborate the model's predictions and reveal interesting policy implications.

In planning for the future growth of remittances, labor-exporting countries should explicitly take into consideration the history of migration, since an aging labor force abroad will be less inclined to remit. Labor-exporting countries should also account for the economic prospects of the major labor-receiving countries and for the geographical distribution of their migrant labor.

Elbadawi and Rocha's results show that remittances are significantly affected by economic policies in the home (labor-exporting) countries. Special incentive schemes cannot substitute for a stable, credible macroeconomic policy.

Produced by the Policy Research Dissemination Center

Determinants of Expatriate Workers' Remittances In North Africa and Europe

Ibrahim A. Elbadawi, CECMG

and

Roberto de Rezende Rocha, EMTTF*

The World Bank

---

* This paper is a product of a larger project funded by CECMG and EMTTF: "The Determinants of Expatriate Workers' Remittances".

Table of Contents

List of Figures and Tables

Determinants of Expatriate Workers' Remittances in North Africa and Europe

1. INTRODUCTION

The increase in the volume of international migration over the recent decades has led to an unprecedented increase in financial flows to labor-exporting countries. Indeed, the flows of workers' remittances increased more than fivefold in real terms during the 1970s and 1980s--from around US$ 5.6 billion in 1969 to US$ 33.8 billion in 1990.[1] The magnitude of these flows has revived the well-known debate on external transfers in the economic development literature. (e.g. Bhagwati (1977), Bhagwati and Brecher (1982), de Macedo (1977) and Pereira (1983)). Migration and remittances have also become major policy issues in the agendas of both labor-sending and labor-receiving countries, as well as multilateral organizations.

From the perspective of labor-sending countries, there is a wide range of important issues related to external migration and remittances. These include the determinants of remittances, the channels through which these remittances flow, and the impact of remittances on the sending country. While international remittances relax foreign exchange constraints and enhance the potential for capital accumulation and growth (see Solimano (1990)), they may also undermine the competitiveness of export industries, thus hurting the labor sending countries in other directions (the Dutch disease effect). Furthermore, the impact of remittances on labor-sending countries may also include lower morale and productivity in the labor force left behind, or a conspicuous consumption behavior in the society.

---

[1] IMF figures of labor-related remittances for 38 labor-exporting countries.

In this paper we confine our attention to the major determinants of workers' remittances. The theoretical and empirical literatures suggest two broadly distinct but not necessarily irreconcilable sets of determinants. The first consists of the basic determinants of savings, the demographic characteristics of the migrant labor force and other family relations. The other set comprises relative prices and special incentive policies adopted in the labor-sending countries.[2] Except for a few examples, however, (Glytsos and Katseli (1986), Rocha (1989)), previous empirical work finds a significant influence of the first set of determinants on remittances, while consistently failing to find any significant effects of macroeconomic variables and incentive policies.

This paper provides an empirical analysis of the flows of workers' remittances in six major labor-exporting countries of North Africa and Europe: Algeria, Morocco, Portugal, Tunisia, Turkey and Yugoslavia.[3] The selection of countries was guided by the availability of data on the stocks of workers and population abroad. Labor-exporting countries usually have very incomplete information on the number of nationals abroad. However, migration from these North African and European countries is primarily directed to Western Europe, where better data is available. The paper is organized as follows: section two reviews briefly the theoretical and empirical literature on the determinants of remittances and provides a synthesis of the literature that suggest a parsimonious yet encompassing set of potential determinants. Section three

---

[2] Political and cultural factors may also influence significantly the volumes of remittances across countries and over time.

[3] This analysis covers the period before the recent break-up of Yugoslavia. Therefore, for the remainder of this paper Yugoslavia is taken to be the political entity before 1991.

examines the pattern of migration, remittances, and their potential determinants for each of the six countries. Section four presents and estimates a fixed effects econometric model using panel data from the above countries. This section also contains detailed diagnostic tests and the interpretation of the results. Finally, section five summarizes the results and presents some conclusions. The appendix provides a detailed description of data sources and construction.

2. A REVIEW OF THE LITERATURE ON INTERNATIONAL WORKERS' REMITTANCES

There are two main (not necessarily irreconcilable) approaches to modelling international workers' remittances (IWR). One approach treats IWR as an endogenous variable in the decision making process on migration and remittances within the family. The other models it as a transfer of saving from one region to another. Naturally, the determinants of IWR under the first tradition are dominated by family relations, while in the second approach portfolio considerations are emphasized. In this section we briefly review the theoretical and empirical literature on workers' remittances (see Eissa (1990) for a detailed survey of the literature). The ultimate objective of the review is to develop a synthesis of the two approaches, which can be subsequently used to justify an empirical model of IWR determination.

2.1. The Endogenous Migration Approach to IWR

In the literature that endogenizes the migration decision, the ability to remit is directly linked to the wage received in the host country and the migrant saving behavior, among other factors. This suggests a sequential (or nested) decision process, where an aggregate level of savings is determined

before (or simultaneously with) the share to be remitted to the home country. There is a class of models that centers the analysis in the determination of the migrant worker's savings function. In these models, the migrant is seen as the traditional macroeconomic agent maximizing intertemporal utility to generate a savings-consumption path, both at home and abroad (Djajic (1989), Djajic and Milbourne (1988)). The migrant's program is more complex than the standard savings program, since he needs to account for information on foreign relative prices, wages and interest rate paths, in addition to his length of stay abroad. Djajic (1989) utilizes such a framework to generate optimal savings rate abroad and commodity and leisure consumption paths in the context of guest worker migration.

The Djajic (1989) model assumes an institutionally determined length of stay, an assumption found to be inconsistent with empirical evidence (e.g. Swamy (1981), OECD (1986)). Djajic and Milbourne (1988) relax this assumption by examining the joint optimal determination of the length of stay abroad and the savings rate. Other extensions of the model emphasize the socioeconomic background of the migrant (Kumcu (1989)).

There is another class of models that maintain the endogeneity of the migration decision, but treat remittances as an intertemporal contractual agreement between the migrant and his family. The exact terms of the contract are defined by the relative bargaining powers of the parties involved. Stark (1980,82,83,84,85b,87a)) is the main contributor to this literature. He considers the family contract as a risk-sharing arrangement between the family and the migrant which compensates for the prevalent lack of insurance markets in developing countries, particularly in rural regions. He further argues that this contract is Pareto optimal and hence self-enforcing. The benefit for the migrant

is guaranteed income during cyclical down-turns. The benefit for the family is an improved risk-return frontier, such that it can take on riskier investments (e.g. farm mechanization). Lucas and Stark (1984) explore altruism and self-interest as elements in the remittance contract and Chaney (1986) models remittances as intra-family resource transfers in the context of a Becker's type family production function framework. Chaney's model highlights the role of the migrant's socio-economic status in influencing the behavior of his remittances.

One of the major implications of this second approach is that there is a minimum level of "required" remittances determined by the terms of the contract between the migrant and his family. Empirical evidence show that this fraction of remittances is not likely to be affected by incentive policies in the labor-sending country such as preferential exchange rates and interest rates, the permission to maintain foreign exchange accounts, and land purchase arrangements (e.g. Swamy (1981), Bhat (1981) and Straubhaar (1986)). Following the same line of thought, Glytsos (1988) provides an explicit formulation for this contract by specifying the minimum or "required" level of remittances to be at least equal to the difference between the family average income and the average income of the community. Furthermore, the ability of the family to extract a higher level of remittances than the income differential depends on the family's relative bargaining power.

The above literature suggests an empirical framework that includes as major determinants of remittances the composition of the family at home and abroad, the level of disposable income (wage) in the host country, the income differentials, and the anticipated length of stay. Empirical evidence in general corroborates the predictions of this framework. For example, Swamy (1981) found that the ratio of females to the total labor population of each nationality has

a negative and significant impact on remittances in some Mediterranean countries. Also, migrants with poorer or socially lower status (low caste in India) or less education tend to have significantly higher rates of remittances (Oberai and Singh (1980), Serageldin et. al. (1981)). The level of wages in the host country and the number of migrants have also been found to be among the major determinants (Swamy (1981), and Birks and Sinclair (1979)).

2.2. Portfolio Approach to IWR

The concept of "desired" remittances is the basis of the portfolio approach. Desired remittances emerge as a result of a broader process of portfolio allocation by the migrant worker. The migrant must decide whether to maintain his savings in the host country or to remit them home, in the form of financial or real assets. This approach focuses on relative rates of return, relative prices and uncertainty as primary determinants in the decision to remit (Swamy (1981)[4], Katseli and Glytsos (1986), Miranda (1988) and Straubhaar (1986)).

Swamy (1981) presents a simple model of remittances which includes the following as major potential determinants: the "incentive" interest rates on foreign currency deposits in the sending country relative to the interest rate on comparable maturity deposits in the receiving countries, the rate of real return on real estate in the home country relative to comparable rate of real return on bank deposits in the receiving countries, the difference between the black market exchange rate and the official exchange rate (the black market premium) in the home country and the difference between the preferential exchange

---

[4] However, in the empirical implementation of her model, Swamy (1981) also introduced family-related indicators.

rate for remittances (if any) and the official exchange rate in the home country. The first and last factors studied by Swamy directly reflect the effect of the special incentive schemes introduced by labor-exporting countries to enhance IWR through official channels. Swamy tests the model using data from Greece, Turkey and Yugoslavia over eighteen years and found that remittances were not significantly affected by any of the above factors. Instead, Swamy's results show that about 90 percent of the variations in remittance flows are explained by the stock of workers abroad and their earnings.

Swamy's broad conclusions are supported by Straubhaar (1986), who builds a simple model to examine the remittances of Turkish workers in Germany. The model is tested through a reduced form equation in which the flow of remittances is a function of the deviation of the official exchange rate from the one defined by a purchasing power parity equilibrium between Turkey and Germany, the difference between expected real rate of returns to investment in the home and the host country, the stock of Turkish workers in Germany, and their wages. In Straubhaar's model all variables are expressed in variations. Like Swamy, Straubhaar also found remittances to be significantly affected by the stock of workers and their income, but not by the other variables.

Katseli and Glytsos (1986) incorporate risk factors in an intertemporal model of exchange of factors, more specifically an exchange of abundant unskilled labor for scarce capital. The inflow of capital takes the form of remittances while the migrant is abroad, and human capital upon his return. Katseli and Glytsos generate a budget constraint for the migrant where the return on the portfolio is a function of his wealth, the relevant interest rates (foreign and domestic) and the exchange rate variability. The budget constraint and the risk return preference schedule jointly determine the share

of the migrant's portfolio to be placed in assets in the home country. The authors test their model using Greek migration data and find per capita remittances to be positively related to per capita income and interest rates in the host country and negatively related to inflation rates in the home country. The home interest rate is significant with a negative sign but becomes insignificant when domestic inflation is introduced, suggesting that the home interest rate and domestic inflation are positively correlated.

To summarize, while the impact of income and demographic variables seem to be corroborated by most studies, the evidence on the impact of relative rates of return is more mixed. Swamy (1981) and Straubhaar (1986) found that interest rate differentials between the host and home countries have no effect on remittance flows, while Katseli and Glytsos (1986) find per capita remittances to be related to the foreign interest rate, although the coefficient is positive, implying that the wealth effect dominates the substitution effect.

The failure to find a significant influence of differential rates of return on remittances may be caused by a correlation of home country interest rates with other variables. For instance, high interest rates on foreign exchange-denominated deposits in the home country may simply reflect the risk of appropriation of these deposits.[5] Likewise, high interest rates on domestic currency deposits in the home country may simply reflect the high level and volatility of domestic inflation. In these cases, the migrant's perception of risk and uncertainty may more than offset the interest differential. Indeed, Katseli and Glytsos (1986) interpret the negative influence of home country

---

[5] Many labor exporting countries introduce foreign exchange deposits in order to attract the remittances of workers abroad. In the cases where foreign exchange is primarily used to finance imports there is always some risk of force conversion, freeze, or appropriation, because the financial system becomes unable to meet large net withdrawals.

inflation rate on remittances as a proxy for general political and economic uncertainty, rather than a price variable in the migrant's portfolio. There is also evidence that migrant workers are very sensitive to political developments in the home country (e.g. Chandavarkar (1980)).

The fact that remittances can flow to the labor-exporting countries through official or unofficial channels introduces an additional complexity, since the decision concerning the level of remittances is clearly linked to the channel used to remit. This is a very important issue, since there is ample anecdotal evidence that the volume of unofficial remittances is substantial in many countries, accounting for a large share of total remittances to these countries. In the Sudan, only 24 percent of migrants surveyed used official banking channels (Serageldin et. al. (1981)), while in Yemen private agents provide the principal transfer mechanism (El-Erian (1988)). There is a variety of informal channels through which the migrant can remit, including triangular operations with family, friends and middlemen who actually operate outside the home country. Although the recourse to informal channels usually involves a cost, the migrant will be willing to incur such costs when there is a large premium between the exchange rates in the black and official markets.

The black market premium becomes a central variable in the models that focus on the choice of channels of remittances (Miranda (1988), Wahba (1989)). These models characterize the migrant as an investor facing arbitrage conditions, whereby he equates the expected marginal benefits and costs for using the black market. Wahba (1989) derives a model which combines the determinants of the level and the channel of transfer. The model is developed within a framework of portfolio management where the agent faces perfect arbitrage conditions. As such, there is a binary outcome where the migrant either remits

all of his savings or remits nothing. According to Wahba's model, the worker will channel his remittances through the official channel if the black market premium is smaller than the cost of using the black market. Wahba tests the model for Egypt and shows official remittances to be sensitive to the black market premium. The same conclusion is reached by Miranda (1988) for Bangladesh, and by Rocha (1989) for the Maghreb countries. The policy implications from these results is that large exchange rate misalignments can divert a substantial volume of remittances away from official channels and towards parallel markets, despite the existence of incentives, such as preferential interest rates or exchange rates.

2.3. A Synthesis of the Two Approaches

Although the two approaches focus on different aspects of the decision to remit, a synthesis can be clearly envisaged. The first approach can be seen as determining a "required" level of remittances, that tends to be substantially dominated by income and demographic variables, and much less influenced by economic policy. Under the second approach, portfolio factors and the macroeconomic environment in the home and host countries (especially in the former) influence the residual level of remittances, i.e., the excess of "desired" over "required" remittances.[6] Implicitly assuming this last component to be transitory, Glytsos (1988) argues that the socio-demographic and income factors--the fundamentals of the first approach--are the long-run determinants of the remittance function, and that economic policy has only a short-run effect, essentially by shifting remittances around the long-run trend.

---

[6] The concept of "desired" remittances is due to Katseli and Glytsos (1986), and "required" remittances to Glytsos (1988).

Macroeconomic policies in the labor-exporting country may, however, influence the choice of the channel of transfer--official versus unofficial. Furthermore, it is argued that as the stock of migrants becomes older, the "required" component of remittances experiences a secular decline and becomes relatively less important. This means that the short-run versus long-run dichotomy between the two sets of influences is not as straightforward as suggested by Glytsos (1988). Since actual remittances data reflect both "required" and "desired" components, any empirical model that strives to have meaningful policy implications must account for the determinants of both concepts.

Except for few exceptions (Katseli and Glytsos (1986), Glytsos (1988), and Swamy (1981)), no such synthesis exists in the literature. Katseli and Glytsos explicitly consider the above two concepts and, as noted above, find remittances from Greek migrants in Germany to be positively related to income per capita and interest rate in Germany, and negatively related to income and the inflation rate in Greece. However, Katseli and Glytsos fail to account for the length of stay--a major determinant of remittances. This deficiency is partially rectified in Swamy (1981) by introducing the ratio of females to males. A further important finding of Swamy is the significant and positive effect of the stock of migrant workers. However, Swamy failed to find significance for the black market premium in her cross-country regressions.

To recapitulate, a useful empirical model for the determination of official remittances must include the following:

(1) The income level in the host country or the income differential between the host and home countries; the stock of

migrant population or migrant workers; and a proxy for the length of stay, based perhaps on a discounted measure of the stock of migrant population or migrant workers; These factors constitute the minimum set of fundamentals needed to account for the "required" component of remittances.

(2) The interest rate differential between the host and home countries, the rate of domestic inflation and the premium in the black market for foreign exchange in the home country, although the interactions between the interest rate differential and the premium should preclude their simultaneous inclusion (Dornbusch at al (1983)). The existence of incentives such as preferential interest rates or exchange rates should be duly taken into account in the construction of the variables.

(3) The empirical framework should permit testing for whether each of the above factors has influence in the short-run, the long-run or both.

3. EXTERNAL MIGRATION AND REMITTANCES IN NORTH AFRICA AND EUROPE

In this section we explore the patterns of official remittances in six major labor-exporting countries in North Africa and Europe: Algeria, Morocco, Portugal, Tunisia, Turkey and Yugoslavia. The host countries that have absorbed most of the migration from these areas have been: Austria, Belgium, France, Germany, the Netherlands, Sweden and Switzerland. The period of analysis has

also been determined by the availability of data on workers and total population abroad, starting in 1977 and ending in 1989. Subscribing to the framework of the previous section, we also make a preliminary assessment of the relevance of demographic, income and other macroeconomic factors as potential determinants of official remittances.

Figure 1 shows the normalized values of three key variables--workers' remittances in current US dollars, the average income in the host countries, also in current US dollars, and the number of workers abroad. For each labor-exporting country there is a series measuring the (weighted) average income per capita in the host countries.[7] The appendix provide more information on demographic and macroeconomic indicators for each of the six labor-exporting countries, and a detailed account of data sources and construction.

Figure 1 suggests that remittances are closely correlated with the income cycles in the host countries and, to a lesser extent, with the stock of migrant workers. The three variables are closely related in the case of Morocco and Turkey. Remittances are closely related to host country income in the case of Portugal and Tunisia and, to a less extent, in the case of Algeria and Yugoslavia. The relation between remittances and the number of workers seems weaker in these four cases.[8]

Although the association between remittances and the number of nationals working abroad seems weak on an individual basis, it is substantially

---

[7] For instance, in the case of Morocco this series is the weighted average of income per capita in each of the seven major host countries, the weights being the shares of Moroccan workers in each respective host country.

[8] The very close correspondence between the dollar value of remittances and income in the host countries is partly due to the fluctuations of the dollar vis-a-vis the European currencies. The econometric estimation of remittances in section 4 avoids any possible bias by measuring the variables in real German Marks.

strong across countries. As shown in Figure 2 and Table 1, the countries with larger numbers of workers abroad also tend to have larger remittances, the only exception being Algeria. Of course, the relation is not strictly proportional. There are significant differences between per capita remittances across countries, whether remittances are divided by the number of workers abroad or total population abroad. Excluding Algeria from the comparison, average yearly remittances per worker during the 1977-89 period ranged from US$2,700 in the case of Turkey to US$4,200 in the case of Morocco. Average yearly remittances per total population ranged from US$1,100 in the case of Turkey to US$2,200 in the case of Portugal.[9] Per capita remittances to Algeria are considerably lower.

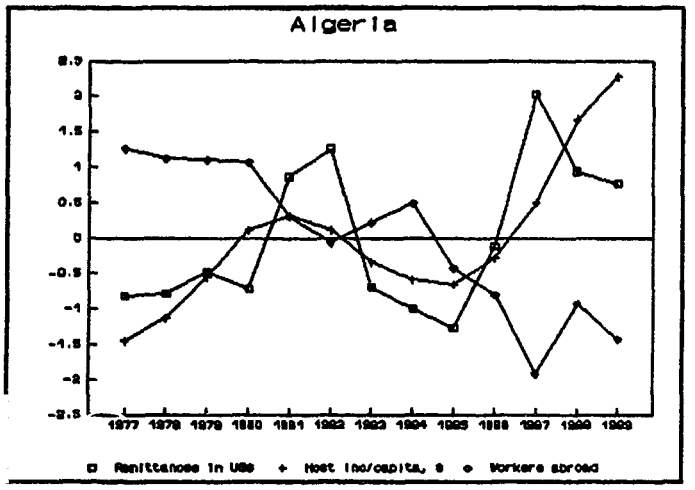
These differences in per capita remittances may be partly due to noise in the migration data. The number of unregistered migrants may vary significantly across countries and over time. However, they also reflect differences in the length of stay and many other factors. Consider first differences in the length of stay. Although most of the registered migrant workers arrived in Western Europe before 1977, there are still significant differences in the length of stay. The very low level of remittances per worker in the case of Algeria is partly explained by the relatively old history of Algerian migration to France. The same is true for Turkey: although the number of Turkish workers continued to grow after 1977, most of Turkish migrants had arrived in Europe well before that year. By contrast, the Moroccan and Tunisian migration are relatively recent. That can partly explain the high level of remittances per worker in the two countries.

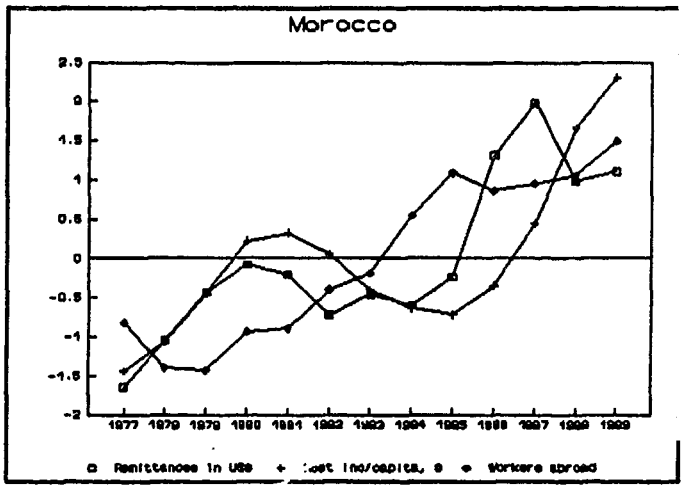
---

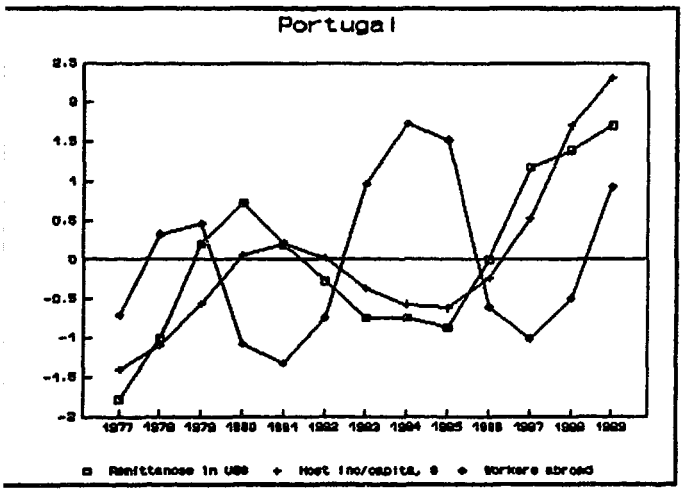
[9] These figures imply monthly per capita remittances of US$250--350 when measured by the number of workers abroad, and of US$100-200 when measured by total population abroad. These orders of magnitude seem reasonable, especially considering the income earned by wives and other family members through informal jobs.

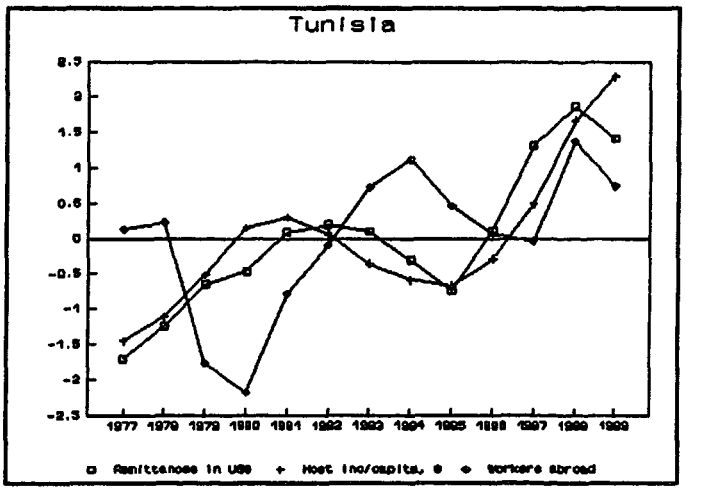
Figure 1

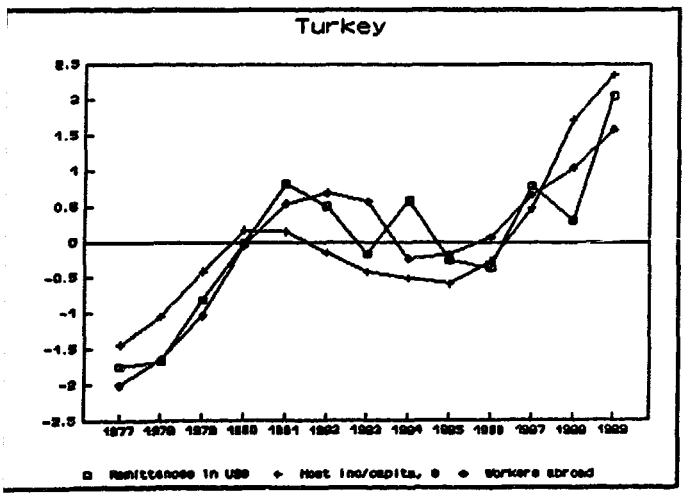
Remittances (US$), Income per Capita in Host Countries (US$), and Number of Workers Abroad (Normalized Series)











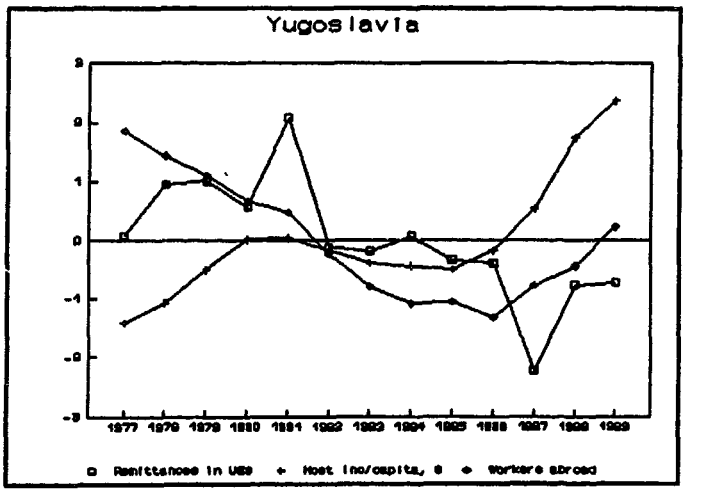


FIGURE 2

Remittances and Number of Workers Abroad

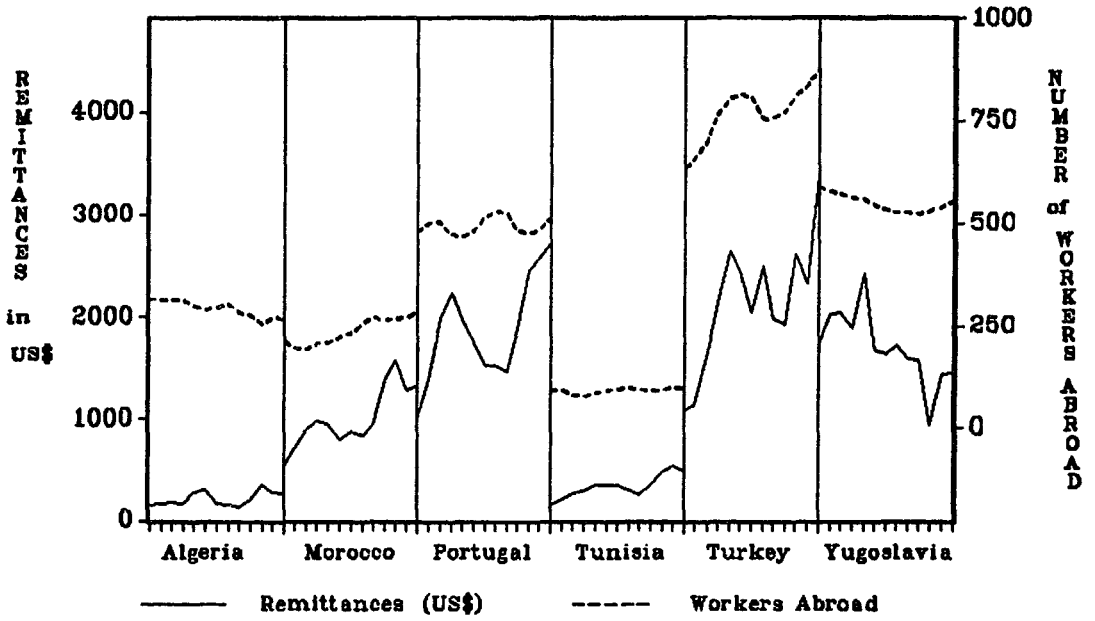


Table 1

Remittances, Workers Abroad and Total Population Abroad, 1977-89 Averages
(Remittances in US$ Millions, Migrants in Thousands,
Per Capita Remittances in US$)

	Algeria	Morocco	Portugal	Tunisia	Turkey	Yugoslavia
Remittances	216	1,007	1,886	338	2,148	1,704
Workers Abroad	293	237	496	90	769	550
Popul. Abroad	816	696	871	217	1,910	966
Remit./Workers	754	4,200	3,810	3,730	2,740	3,090
Remit./Popul.	267	1,430	2,180	1,530	1,100	1,760

Sources: Migration data: OECD.
Remittances: Individual Country Sources.

Success in mobilizing remittances also seems to be correlated with indicators of macroeconomic policy. For example, the three top performers--Morocco, Portugal and Tunisia--experienced very low average rates of inflation during this period: 8, 18 and 11 percent, respectively. The average black market premium was also very low: 5, 6 and 5 percent, respectively. The corresponding averages for the following three countries--Yugoslavia, Turkey, and Algeria--were significantly higher: 151, 43, and 10 percent for inflation; and 11, 12, and 270 percent for the premium, respectively.[10]

To summarize, this section provides preliminary evidence that the flow of remittances to labor-exporting countries in North Africa and Europe is positively correlated with the number of nationals working abroad and income in the host countries. Cross-country comparisons also suggest that remittances tend to decline with the aging of the migrant population. Finally, there is also indication that remittances tend to be higher in countries where inflation is low and the exchange rate is not misaligned.

4. ECONOMETRIC ESTIMATION OF THE REMITTANCE FUNCTION

4.1. Model Specification

In this section we specify and estimate a family of simple linear specifications relating remittance flows to some of the determinants identified in section 2 above. The econometric estimation will be based on the following four equations:

---

[10] Although Algeria's average rate of inflation looks low in comparison with the other countries, inflation was severely repressed by pervasive and strict price controls during the sample period. The accumulation of a monetary overhang during this period was actually one of the major causes of the large and increasing black market premium (see Rocha (1989a)).

$$\log Rem_t = \alpha_0 + \alpha_1 \log Work_t + \alpha_2 \log Yhost_t + \alpha_3 \log Prem_t + \alpha_4 Length_t + \alpha_5 Inf_t + \alpha' DUM \quad \text{(I)}$$

$$\log Rempcw_t = \alpha_0 + \alpha_1 \log Yhost_t + \alpha_2 prem_t + \alpha_3 Length_t + \alpha_4 Inf_t + \alpha' DUM \quad \text{(II)}$$

$$\log Rem_t = \alpha_0 + \alpha_1 \log Pop_t + \alpha_2 \log Yhost_t + \alpha_3 Prem_t + \alpha_4 Length_t + \alpha_5 Inf_t + \alpha' DUM \quad \text{(III)}$$

$$\log Rempcp_t = \alpha_1 \log Yhost_t + \alpha_2 Prem_t + \alpha_3 Length_t + \alpha_5 Inf_t + \alpha' DUM \quad \text{(IV)}$$

where Rem is the real DM value of official remittances to the labor-exporting countries; Work is the stock of migrant workers; Pop is the stock of total migrant population; Rempcw is remittances per migrant worker (Rem/Work); Rempcp is remittances per migrant person (Rem/Pop); Yhost is the real DM value of the average per capita income of the host countries; Prem is the black market

premium, defined as the percentage difference between the black market exchange rate and the official exchange rate; Length is a proxy for the length of stay; Inf is the rate of domestic inflation in the labor-exporting country; and Dum includes country-specific dummies plus a dummy for Turkey in 1979--the year preceding a major change in the political regime and a stabilization program.[11] Note that equations I and II use the stock of migrant workers, while equations III and IV use the stock of total migrant population (workers and their families).

Remittances and per capita income in the host country were both expressed in real DMs because the DM is one of the two major currencies in which remittances to the countries under examination are denominated (the other being the French Franc). In addition, the use of the DM avoids any possible bias arising from the use of the US dollar--the large fluctuations of the US dollar vis-a-vis the European currencies during the sample period could cause a spurious correlation between remittances and income. In any case, this section also reports the regression results obtained with the US dollar.

The Length of stay was proxied by two alternative variables. The first proxy is the ratio of the actual stock of migrant workers (or total migrant population) relative to a discounted stock, using a 5 percent rate of discount. Therefore, this ratio is higher the "older" the history of migration, or the longer the average length of stay. The length of stay was also proxied by a simple linear trend.

---

[11] Remittances to Turkey declined dramatically during the late 1970s and staged a recovery in mid-1979, with the first attempt to correct a large exchange rate misalignment. However, the political turmoil and the failure to effectively correct the misalignment drove remittances back to very low levels in the last months of 1979. Yearly figures seem to suggest a recovery of remittances in 1979, but such recovery actually started only after the 1980 program.

In the above models, the demographic and income factors are represented by log Work (log Pop), log Yhost and Length. The coefficient of log Work (log Pop) is expected to be positive, possibly with a unitary elasticity (e.g. Swamy (1981)). Log Yhost should also enter positively, since it is a major determinant of savings in the host country. The two proxies measuring the length of stay, on the other hand, should have a negative effect on remittances, as an aging labor force abroad will tend to have less ties with the home country and therefore remit less. A potential determinant not included in the above specifications is the real per capita income in the labor-sending country. This variable serves as a proxy for a possible contractual obligation to the rest of the family back home on the part of the migrant member. However, the inclusion of the sending country per capita income did not produced satisfactory results.

The remaining set of factors account for the portfolio and macroeconomic determinants of official remittances. The portfolio determinants are represented by the premium on the black market for foreign exchange and the differential between the depreciation-adjusted interest rates at home and abroad. A high premium or a higher devaluation-adjusted foreign interest rate compared to the domestic rate are expected to discourage official remittances. However, the interest rate differential was found to be consistently insignificant as well, leaving us with the premium and domestic inflation to reflect portfolio and macroeconomic consideration. A high inflation should lead to lower official remittances since it reflect increased risk and uncertainty. Since the premium is directly related to the market for remittances, it should have a greater impact on remittances than domestic inflation.

4.2 An Overview of the Results

Tables 2-A, 2-B, 3-A and 3-B show the OLS estimates of models I, II, III and IV, respectively. The results were obtained from the use of panel data for Morocco, Portugal, Tunisia, Turkey and Yugoslavia, over the period 1977-89. Therefore, the sample comprises 65 observations. The exclusion of Algeria improved considerably the results across all the specifications considered. Indeed, it seems that the pattern of remittances in Algeria is different from the other countries because of the much longer history of migration and its highly centralized economy.

The results shown in tables 2-A, 2-B, 3-A and 3-B are generally very good. The coefficients of all of the variables have the predicted signs and are usually statistically significant. In addition, the estimates that were obtained with the stock of migrant workers are remarkably comparable to the ones based on the stock of total migrant population. Regarding the demographic and income variables, the results are consistent with previous studies (e.g. Glytsos (1988), Katseli and Glytsos (1986), Rocha (1989) and Swamy (1981) to mention a few examples). In addition, we found strong and systematic evidence on the relevance of macroeconomic and portfolio factors to the long-run determination of official remittances.

The imposition of a unitary elasticity relative to the stock of workers (or population), does not result in any noticeable change in the estimated coefficients, as shown in tables 2-B and 3-B. Indeed, the increased robustness of the estimated coefficients lends strong support to the per capita models, despite the loss of the explanatory power compared to case of the unrestricted levels models. Such feature does not obtain in previous literature.

For example, Swamy's (1981) estimated income elasticities were consistently higher in the per capita model compared to their levels regression counterparts.

The time invariant country-specific dummies were in general not significant in the levels regressions, but their significance improved substantially in the per capita models. The same evidence is obtained in Swamy (1981). The special 1979 dummy for Turkey was significant in most of the equations and increased the coefficient and the significance of the premium. As mentioned before, in the middle of 1979 remittances to Turkey staged a recovery as the government started to devalue the Turkish Lira. However, remittances dropped again in the second half of the year, with the political turmoil and the persistent exchange rate misalignment. The yearly figures for 1979 show an increase in remittances and a large premium, which tends to reduce somewhat the size and significance of the coefficient of the black market premium in the regressions. This problem is corrected by the inclusion of the dummy.

4.3 Some Diagnostic Tests and Further Estimates

The estimation of the above fixed effects model[12] gives rise to two diagnostic tests. The first is a test for the presence of heteroskedasticity and the second is a test for the potential endogeneity of the macroeconomic and portfolio determinants of remittances.

---

[12] Estimations with a random effects model failed to produce satisfactory results. In the event that the variables are trending over time, the "differenced" random effect model will be inadequate for the underlining data generation process.

We use a version of the test proposed by White (1980) to assess the presence of heteroskedasticity.[13] The tests were conduced for the OLS- estimated models of tables 2-A and 3-A, and the results are presented in table 4. The results lend strong support to the null hypothesis of no heteroskedasticity: out of the 20 tests reported in table 4, the null hypothesis was only rejected at the 5 percent significance level in two cases. Furthermore, the differences between the White heteroskedasticity-robust standard errors and their conventional counterparts were minor. Therefore, we decided to accept the null hypothesis of no heteroskedasticity.

Based on the assumption of no heteroskedasticity, we tested for the endogeneity of the black market premium and for both the premium and the domestic rate of inflation.[14] We conducted a series of sequential tests using a Hausman (1978) type metric.[15] First we tested for the endogeneity of the premium alone (i.e. assuming exogeneity of inflation). The endogeneity of inflation was tested

---

[13] This test is an extension of White (1980) to the case of panel data, as noted in Chamberlain (1982). The test is given by $nR^2 \sim X_q^2$ *where* R^2 is based on the regression of the squared of the residuals from models (2-A) or (3-A) on the moments of the right side variables of model (1-A) (or 2-A).

[14] The tests for endogeneity are substantially simplified in the absence of heteroskedasticity.

[15] Assuming the following linear relationship (A) $y = X_1B_1 + X_2B_2 + \epsilon$, where X_1 is a single variable which is possibly correlated with ϵ (a homoskedastic disturbance term), while X_2 are not. Given the matrix of instruments Z (which should include X_2), let $\hat{X}_1 = P_Z X_1 = Z(Z'Z)^{-1}Z'X_1$, and consider the following expression:

$$(B) \quad Y = X_1B_1 + X_2B_2 + \hat{X}_1B_3 + v$$

Now a test for H_0: $B_3 = 0$ (a test for the null hypothesis of no covariation between X_1 and ϵ in (A)) is given by the t-statistic corresponding to the OLS estimator of B_3.

based on the results obtained for the premium. The justification for this procedure is a strong prior on the endogeneity of the premium. Indeed, unofficial remittances may constitute one of the main sources of supply in the black market for foreign exchange. Thus, the diversion of remittances from official to unofficial channels is likely to exert a strong impact on the premium. Inflation on the other hand, tends to be more directly influenced by other macroeconomic factors, as well as by price controls, and is only indirectly related to remittances. The first test was conducted for all of the models of tables 2-A and 3-A, while the second and more laborious test was only applied to equations 9 and 10 of the above two tables.[16] The results are presented in table 5.

The results of the first test strongly reject the null hypothesis of exogeneity of the premium for regressions 6-10 in tables 2-A and 3-A. The marginal significance levels of the tests are 1 percent for nine cases and 2 percent for the remaining regression. On the other hand, we could not reject the hypothesis of premium exogeneity in equations 1-5 of tables 2-A and 3-A. Despite this seemingly inconclusive evidence, we believe that the overall evidence suggests that the premium is endogenous. First, regressions 1-5 could be misspecified, as they exclude the rate of inflation. Second, a comparison of the OLS estimated coefficients to their TSLS counterparts reveals that these

---

[16] The test procedure depends on whether the endogeneity of the two variables is tested jointly, or whether the endogeneity of inflation is tested based on a prior assumption on the endogeneity of the premium. The basic Hausman test presented in footnote (14) above applies only to the first test. In the case of testing for the endogeneity of X_1 conditional on the endogeneity of X_2 (the second test) the conditioning regressor, $\hat{X}_1$, in equation (B) should be replaced with $\tilde{X}_1$, $\tilde{X}_2$, where $\tilde{X}_1$ and $\tilde{X}_2$ are given as a linear combination of the residuals from the auxiliary individual regressions of X_1 and X_2 on the respective instruments (see Maddala (1988), pp 439-441, for a detailed description). The test is given as in (14) above by the t-statistic corresponding to the OLS estimator of the coefficient of $\tilde{X}_1$.

coefficients are remarkably stable except for the premium. Therefore, we accepted the hypothesis of premium endogeneity and proceeded to test for the hypothesis of inflation exogeneity given the endogeneity of the premium. The results shown in the lower panel of table 5 strongly support the exogeneity of inflation.

The regressions were estimated by TSLS in order to avoid the simultaneity bias. The set of instruments comprised the nominal growth of domestic credits, the lagged premium and the current and lagged values of the exogenous variables (all explanatory variables but the premium). The TSLS estimates are presented in tables 2-C, 2-D, 3-C, and 3-D. Tables 2-C and 2-D show the results obtained with the stock of migrant workers, with remittances defined in levels and per capita terms, respectively. Tables 3-C and 3-D present the results obtained with the stock of total migrant population. A comparison of the results obtained through OLS and TSLS reveals that the most significant change lies in the coefficient of the premium--the TSLS estimates are three times higher (in absolute value) than their OLS counterparts. It should be mentioned that very similar results were obtained when inflation was considered endogenous in additional (unreported) TSLS regressions. These results are consistent with the formal endogeneity tests reported before.[17]

4.4. Interpretation of the Results

In this section we select a representative equation and use it to derive some policy implications. First, despite the reasonable results obtained

---

[17] Treating the stock of migrant workers as endogenous and enlarging further the set of instruments did not produce different results either, although a broader theoretical framework would imply treating both remittances and the stock of migrant workers as endogenous. The fact that most of the migration occurred before the start of the sample period may be the explanation for these results.

with the OLS estimates, the implications of the endogeneity tests eliminate these models from our consideration for further analysis. Therefore, we will confine ourselves to equations (9) and (10) in tables 2-C, 2-D, 3-C and 3-D. Aside from the steep decline in explanatory power (especially for the regressions of table 2-D), the per capita regressions generally perform better relative to their levels regression counterparts. The significance levels of the estimated coefficients for the demographic, income, and policy variables generally improve and most of the country dummies turned from statistically insignificant to significant effects. Furthermore, while both measures of the length of stay perform well (the ratio of the actual stock to the discounted stock in equation (9) and the time trend in equation (10)), the measure used in equation (9) is more precise and more directly related to the problem at hand. Therefore, we will select equation (9) from each of tables 2-D and 3-D to use for further analysis.

The derived elasticities for both equations are presented in table 6. The unitary elasticity estimated for the stock of workers (or population) is theoretically attractive, as it implies a proportional effect of an increase in the number of workers (or population) on the level of remittances. Swamy (1981) argues that a model failure to uphold this proportionality suggests that the equation is underspecified, in terms of the variables that alter this proportionality relationship. Another important demographic factor which has a significant and appreciable effect is the length of stay. This variable has an elasticity of -0.43 for the workers model and -0.40 for the population model. This effect implies that for any given number of migrant workers (population), the flow of remittances is expected to be smaller the longer their average stay. Of course, such decline in remittances is ultimately associated with the

weakening of the ties with the home country. This finding is consistent with the demographically-inclined theoretical models of remittances, which endogenize the migrant decision along with the decision to remit. A closely related indicator--the ratio of female to male migrants--was estimated to have similar effect on remittances (Swamy (1981)).

The elasticity of real income in the host country was estimated at 0.62 for the stock of workers-based model compared to 0.48 for the stock of population model. In both models, it is clear that economic activity in the receiving countries, has had an important effect on the level of remittances per worker (or population) sent to the country of origin. In terms of policy implications, this finding suggests that, in their planning for future growth of remittances, labor-exporting countries should explicitly take into consideration the future economic prospects in the major receiving countries. Our income elasticity estimates are somewhat lower than those reported in previous studies (e.g. Swamy (1981)), but these studies usually expressed remittances and host country per capita income in current US dollars, whereas we expressed both variables in real DMs. We reestimated the regressions expressing both variables in current US dollars, and did obtain an increase in the income elasticity to unity, across all specifications, as well as a very sharp increase in the t-statistics. However, this procedure tends to introduce some spurious correlation between the two variables, especially when the sample includes periods where the dollar fluctuated largely with respect to the original currencies of denomination.

The next set of determinants are the macroeconomic and portfolio variables. The derived elasticity for the black market premium is almost identical in the two models: -0.34 and -0.32, respectively. Thus, our estimates

show that official per capita remittances are negatively and substantially impacted by a rising premium. An increase in the premium by 10 percent leads to a decline of official per capita remittances by about 3 percent. As we know from the recent literature on the black market foreign exchange (Dornbusch, et. al. (1983), Elbadawi (1992)), high and varying premia mainly reflect expansive and inconsistent macroeconomic policy for given official exchange rate regimes. This large and highly significant effect of the premium on official remittances clearly indicates that domestic macroeconomic policy matters. It is not clear from our results, however, if a lower premium leads to increased total remittances, over and above its impact on the distribution between official and unofficial channels. Nevertheless, a low premium is likely to lead to larger inflows of remittances, since the premium is also seen as a signal of inconsistent policies and risky economic and political environment.

The other macroeconomic variable estimated to have a significant, although lower, elasticity is the rate of inflation in the home country. An identical elasticity of -0.03 was estimated for both models. While the inflation variable does not directly influence the size of official remittances relative to total remittances, it does have an indirect influence. A high and variable inflation is a discouraging signal for investment and hence it leads to a deceleration of total remittances into the labor-exporting country.

5. CONCLUSIONS

The paper reviewed the theoretical and empirical literature and developed a synthesis of the two main approaches that have been followed in the analysis of international workers' remittances. Such a review suggests that a useful empirical model for the determination of official remittances must include

as determinants: the stock of workers (or population) abroad, the level of income in the host country, a proxy for the length of stay, domestic inflation in the sending country, the exchange rate premium in the parallel market (or the interest rate differential between the host and the home country), in addition to indicators of special incentive schemes designed to attract IWR.

Subscribing to the above framework, we conducted in the third section a preliminary assessment of demographic, income and other macroeconomic factors as potential determinants of official remittances to six labor-exporting countries in North Africa and Europe: Algeria, Morocco, Portugal, Tunisia, Turkey and Yugoslavia. Our analysis shows that remittances are closely correlated with income cycles in the host countries and, to a lesser extent, with the stock of migrant workers. Although the association between remittances and the number of nationals working abroad seems weak on an individual basis, it is substantially strong across countries. The relationship between the three variables, however, is not strictly proportional. Furthermore, the significant variations in remittances per worker across the six countries suggests an important potential influence of the length of stay and of macroeconomic factors.

A more rigorous analysis was conducted in the fourth section of the paper, based on variants of the synthesis outlined in section two. We estimated a fixed-effect model using panel data from the above labor-exporting countries (excluding Algeria) over the 1977-1989 period. The analysis included formal diagnostic testing of heteroskedasticity and the possible endogeneity of the premium and inflation. Our results broadly corroborates the predictions of the model and provide interesting policy implications.

The stock of migrant labor has a positive and significant effect on real remittances, and appears with a unitary elasticity. This result is

theoretically attractive, as it implies that the effect of an increase in the number of workers on remittances is proportional, *ceteris paribus*. The length of stay is another significant demographic factor, appearing with an elasticity of about -0.40. A closely related indicator, the share of females in total migrant population, was estimated to have a similar effect on remittances (Swamy (1981)). This result confirms the perception that remittances tend to decline with the aging of the migrant population and the resulting weakening of ties with the home country.

The estimates of the elasticity of real income in the host country ranged between 0.6 and 0.8. It is clear that economic activity in the receiving countries has had an important effect on the level of remittances per worker sent to the country of origin. In terms of policy implications, those findings suggest that, in their planning for future growth of remittances, labor-exporting countries should explicitly take into consideration the future economic prospects in the major receiving countries, and the geographical distribution of their migrant labor.

The next set of determinants are the macroeconomic and portfolio variables. Save few exceptions, previous empirical studies fail to detect significant effects of the later set of variables. Our estimates show that official remittances are negatively and substantially affected by a rising black market premium. An increase in the premium by 10 percent results in a decline of official remittances by about 3 percent. The literature on the black market foreign exchange (e.g. Dornbusch, et. al. (1983), Elbadawi (1992), and Rocha (1989a)), indicates that high and varying premia mainly reflect inconsistent macroeconomic policies for given official exchange rate regimes. This large and

significant effect of the premium on official remittances clearly indicates that domestic macroeconomic policy matters.

The domestic rate of inflation was also found to have a negative and significant effect on remittances, although with a much lower elasticity: -0.03. While the inflation variable does not directly influence the size of official remittances relative to total remittances, it does have an indirect influence. A high and variable inflation is a discouraging signal for investment and hence it leads to a deceleration of total remittances into the labor-exporting country.

A major policy recommendation that emerges from the results is that policy-makers should correct macroeconomic imbalances policies before considering special incentive schemes to attract remittances. The correction of such imbalances should lead to an increase in the flow of remittances towards its long-run potential. The aging of the migrant population leads to a natural decline in remittances that is unlikely to be offset by special incentive schemes. One possible exception to this rule is the establishment of a special scheme such as the one operated by the central bank of Turkey and the Dresdner Bank in Germany. The scheme involved the payment of premium interest rates for the deposits of Turkish workers in the Dresdner Bank, and the transfer of the resources to Turkey through the capital account. Such type of scheme may succeed in mobilizing resources from workers whose ties with the home country have weakened over time. However, the introduction of such schemes may also trigger a diversion of remittances from the current to the capital account, with adverse consequences for debt repayment capacity and creditworthiness, especially when the interest rate premium is large, such as the case of Turkey in the mid-1980s.

As mentioned before, the paper did not address a number of other relevant questions related to workers' remittances, such as their impact on traditional exports, capital formation and output growth, as well as the best set of policies to be followed during the remittance cycle. These are critical issues that should be examined in future research work.

Table 2-A

OLS Estimates of the Remittance Function. Level of Remittances. Stock of Workers. DM.

OLS:					Length of Stay								
Equation	Constant	lwork	lyhost	prem	ratio	t	inf	D3	D4	D5	D6	DT	$\bar{R}2$
1.	-1.29 (-0.49)	0.85 (2.48)	0.42 (1.91)	-0.79 (-2.17)	- -	- -	- -	-0.01 (-0.04)	-0.30 (-0.86)	-0.24 (-0.58)	-0.17 (-0.56)	- -	0.91
2.	-4.09 (-1.45)	1.12 (3.17)	0.60 (2.61)	-0.82 (-2.31)	0.29 (-2.23)	- -	- -	-0.20 (-0.73)	-0.02 (-0.07)	-0.56 (-1.31)	-0.39 (-1.25)	- -	0.92
3.	-5.00 (-1.60)	1.22 (3.22)	0.60 (2.60)	-0.80 (-2.26)	- -	-0.02 (-2.06)	- -	-0.29 (-1.00)	0.06 (0.15)	-0.69 (-1.50)	-0.50 (-1.48)	- -	0.92
4.	-3.66 (-1.31)	1.05 (2.99)	0.59 (2.65)	-1.47 (-2.82)	-0.28 (2.17)	- -	- -	-0.14 (-0.51)	-0.09 (-0.27)	-0.47 (-1.11)	-0.29 (-0.91)	0.54 (1.68)	0.92
5.	-4.48 (-1.45)	1.40 (3.02)	0.60 (2.62)	-1.45 (-2.77)	- -	-0.02 (-1.98)	- -	-0.23 (-0.77)	-0.02 (-0.05)	-0.59 (-1.30)	-0.39 (-1.15)	0.54 (1.66)	0.92
6.	-3.09 (-1.30)	0.75 (2.44)	0.66 (3.22)	-0.85 (-2.62)	- -	- -	-0.07 (-4.03)	0.06 (0.26)	-0.40 (-1.30)	-0.11 (-0.30)	-0.00 (-0.01)	- -	0.93
7.	-4.73 (-1.84)	0.93 (2.86)	0.75 (3.55)	-0.86 (-2.69)	-0.19 (-1.54)	- -	-0.06 (-3.60)	-0.06 (-0.26)	-0.21 (-0.66)	-0.33 (-0.85)	-0.16 (-0.55)	- -	0.93
8.	-5.31 (-1.88)	1.00 (2.84)	0.76 (3.53)	-0.85 (-2.65)	- -	-0.01 (-1.42)	-0.06 (-3.65)	-0.12 (-0.45)	-0.16 (-0.48)	-0.41 (-0.97)	-0.23 (-0.72)	- -	0.93
9.	-4.23 (-1.71)	0.82 (2.61)	0.76 (3.75)	-1.68 (-3.63)	-0.16 (-1.41)	- -	-0.07 (-4.01)	0.02 (0.09)	-0.32 (-1.01)	-0.20 (-0.52)	-0.01 (-0.04)	0.68 (2.38)	0.94
10.	-4.70 (-1.72)	0.87 (2.57)	0.77 (3.71)	-1.68 (-3.60)	- -	-0.01 (-1.26)	-0.07 (-4.06)	-0.02 (-0.10)	-0.28 (-0.84)	-0.27 (-0.64)	-0.67 (-0.21)	0.69 (2.37)	0.94

Table 2-B

OLS Estimates of the Remittance Function. Per Capita Remittances. Stock of Workers. DM.

OLS:				Length of Stay								
Equation	Constant	lyhost	prem	ratio	t	inf	D3	D4	D5	D6	DT	$\bar{R}2$
1.	-1.91 (-0.89)	0.40 (1.88)	-0.75 (-2.15)	- -	- -	- -	-0.12 (-1.45)	-0.15 (-1.80)	-0.42 (-4.60)	-0.30 (-3.29)	- -	0.36
2.	-3.50 (-1.59)	0.60 (2.66)	-0.84 (-2.48)	-0.27 (-2.26)	- -	- -	-0.11 (-1.35)	-0.14 (-1.74)	-0.42 (-4.81)	-0.29 (-3.29)	- -	0.40
3.	-3.77 (-1.64)	0.60 (2.60)	-0.85 (-2.46)	- -	-0.02 (-2.04)	- -	-0.13 (-1.57)	0.15 (-1.89)	-0.43 (-4.86)	-0.31 (-3.53)	- -	0.39
4.	-3.42 (-1.58)	0.59 (2.68)	-1.48 (-2.98)	-0.27 (-2.29)	- -	- -	-0.10 (-1.29)	-0.14 (-1.76)	-0.42 (-4.87)	-0.25 (-2.75)	0.55 (1.73)	0.42
5.	-3.71 (-1.64)	0.60 (2.63)	-1.50 (-2.97)	- -	-0.02 (-2.07)	- -	.12 -.52)	-0.15 (-1.91)	-0.43 (-4.92)	-0.27 (-2.99)	0.55 (1.74)	0.41
6.	-4.12 (-2.05)	0.63 (3.12)	-0.78 (-2.50)	- -	- -	-0.07 (-3.98)	-0.12 (-1.65)	-0.15 (-2.04)	-0.41 (-5.11)	-0.22 (-2.66)	- -	0.49
7.	-5.06 (-2.48)	0.75 (3.58)	-0.84 (-2.73)	-0.20 (-1.76)	- -	-0.06 (-3.64)	-0.12 (-1.56)	-0.15 (-1.98)	-0.42 (-5.24)	-0.22 (-2.70)	- -	0.51
8.	-5.36 (-2.54)	0.76 (3.56)	-0.85 (-2.74)	- -	-0.01 (-1.66)	-0.06 (-3.74)	-0.13 (-1.75)	-0.16 (-2.11)	-0.42 (-5.30)	-0.24 (-2.88)	- -	0.51
9.	-5.07 (-2.58)	0.75 (3.74)	-1.61 (-3.64)	-0.19 (-1.75)	- -	-0.07 (-4.00)	-0.11 (-1.51)	-0.14 (-2.05)	-0.41 (-5.41)	-0.17 (-2.02)	0.66 (2.33)	0.54
10.	-5.37 (-2.65)	0.76 (3.73)	-1.63 (-3.66)	- -	-0.01 (-1.68)	-0.07 (-4.10)	-0.12 (-1.70)	-0.15 (-2.18)	-0.42 (-5.47)	-0.18 (-2.19)	0.67 (2.36)	0.54

Table 2-C

TSLS Estimates of the Remittance Function. Level of Remittances. Stock of Workers. DM.

TSLS:					Length of Stay								
Equation	Constant	lwork	lyhost	prem	ratio	t	inf	D3	D4	D5	D6	DT	$\bar{R}2$
1.	1.34	0.56	0.33	-1.45	-	-	-	0.22	-0.55	0.16	0.09	-	0.91
	(0.40)	(1.31)	(1.35)	(-1.44)	-	-	-	(0.66)	(-1.32)	(-0.28)	(0.23)	-	
2.	-1.08	0.86	0.46	-1.96	-0.42	-	-	0.03	-0.24	-0.16	-0.09	-	0.91
	(-0.31)	(1.98)	(1.90)	(-1.92)	(-2.89)	-	-	(0.08)	(-0.56)	(-0.29)	(-0.23)	-	
3.	-2.65	1.04	0.49	-1.98	-	-0.03	-	-0.14	-0.09	-0.39	-0.29	-	0.91
	(-0.72)	(2.26)	(1.96)	(-1.93)	-	(-2.83)	-	(-0.40)	(-0.19)	(-0.67)	(-0.66)	-	
4.	-2.41	0.99	0.52	-1.96	-0.38	-	-	-0.08	-0.11	-0.39	-0.22	0.73	0.93
	(-0.81)	(2.61)	(2.38)	(-1.39)	(-2.96)	-	-	(-0.28)	(-0.29)	(-0.83)	(-0.57)	(1.06)	
5.	-4.13	1.19	0.55	-1.73	-	-0.03	-	-0.26	0.06	-0.65	-0.44	0.63	0.93
	(-1.28)	(2.93)	(2.49)	(-1.19)	-	(-2.92)	-	(-0.83)	(0.16)	(-1.28)	(-1.09)	(0.88)	
6.	0.86	0.31	0.51	-2.21	-	-	-0.07	0.40	-0.79	0.50	0.44	-	0.91
	(0.28)	(0.78)	(2.09)	(-2.88)	-	-	(-3.53)	(1.31)	(-2.00)	(1.00)	(1.18)	-	
7.	-1.44	0.64	0.61	-2.19	-0.32	-	-0.06	0.18	-0.45	0.11	0.17	-	0.92
	(-0.46)	(1.60)	(2.55)	(-3.08)	(-2.20)	-	(-2.99)	(0.59)	(-1.15)	(0.22)	(0.46)	-	
8.	-2.52	0.76	0.62	-2.28	-	-0.02	-0.06	0.07	-0.35	-0.04	0.04	-	0.91
	(-0.74)	(1.74)	(2.54)	(-3.06)	-	(-2.13)	(-2.98)	(0.19)	(-0.82)	(-0.07)	(0.11)	-	
9.	-1.54	0.56	0.66	-3.97	-0.25	-	-0.07	0.24	-0.52	0.17	0.37	1.73	0.92
	(-0.49)	(1.37)	(2.75)	(-3.11)	(-1.71)	-	(-3.47)	(0.76)	(-1.28)	(0.34)	(0.91)	(2.68)	
10.	-2.52	0.67	0.67	-3.94	-	-0.02	-0.07	0.14	-0.43	0.03	0.25	1.72	0.92
	(-0.75)	(1.52)	(2.80)	(-3.09)	-	(-1.67)	(-3.51)	(0.41)	(-0.99)	(0.05)	(0.57)	(2.67)	

Table 2-D

TSLS Estimates of the Remittance Function. Per Capita Remittances. Stock of Workers. DN.

TSLS:				Length of Stay								
Equation	Constant	lyhost	prem	ratio	t	inf	D3	D4	D5	D6	DT	$\bar{R}2$
1.	-1.06	0.32	-0.92	-	-	-	-0.11	-0.12	-0.40	-0.31	-	0.39
	(-0.42)	(1.28)	(-0.76)	-	-	-	(-1.31)	(-1.15)	(-3.16)	(-2.35)	-	
2.	-1.32	0.42	-2.48	-0.47	-	-	-0.07	-0.09	-0.29	-0.17	-	0.23
	(-0.48)	(1.52)	(-1.82)	(-2.88)	-	-	(-0.73)	(-0.96)	(-2.07)	(-1.10)	-	
3.	-2.37	0.48	-2.11	-	-0.03	-	-0.11	0.12	-0.34	-0.24	-	0.33
	(-0.90)	(1.85)	(-1.50)	-	(-2.77)	-	(-1.25)	(-1.35)	(-2.48)	(-1.71)	-	
4.	-2.38	0.51	-2.11	-0.39	-	-	-0.08	-0.10	-0.40	-0.21	0.81	0.48
	(-1.09)	(2.34)	(-1.33)	(-3.13)	-	-	(-1.05)	(-1.28)	(-4.16)	(-1.45)	(1.03)	
5.	-3.40	0.57	-0.90	-	-0.02	-	-0.12	-0.13	-0.45	-0.34	0.22	0.47
	(-1.51)	(2.56)	(-0.47)	-	(-2.75)	-	(-1.55)	(-1.63)	(-4.48)	(-2.09)	(0.24)	
6.	-1.92	0.41	-2.19	-	-	-0.07	-0.10	-0.12	-0.30	-0.13	-	0.32
	(-0.75)	(1.63)	(-2.47)	-	-	(-3.35)	(-1.13)	(-1.29)	(-2.65)	(-1.05)	-	
7.	-2.80	0.55	-2.50	-0.39	-	-0.06	-0.08	-0.10	-0.29	-0.10	-	0.31
	(-1.10)	(2.17)	(-2.95)	(-2.62)	-	(-2.69)	(-0.86)	(-1.08)	(-2.57)	(-0.85)	-	
8.	-3.61	0.60	-2.43	-	-0.03	-0.06	-0.11	-0.12	-0.31	-0.15	-	0.34
	(-1.42)	(2.38)	(-2.83)	-	(-2.69)	(-2.85)	(-1.24)	(-1.35)	(-2.81)	(-1.26)	-	
9.	-3.45	0.62	-4.22	-0.32	-	-0.07	-0.07	-0.09	-0.34	0.03	1.88	0.33
	(-1.39)	(2.48)	(-3.06)	(-2.24)	-	(-3.20)	(-0.82)	(-1.03)	(-3.27)	(0.18)	(2.67)	
10.	-4.10	0.66	-4.20	-	-0.02	-0.07	-0.10	-0.11	-0.35	-0.01	1.86	0.34
	(-1.64)	(2.63)	(-2.84)	-	(-2.35)	(-3.39)	(-1.12)	(-1.24)	(-3.40)	(-0.05)	(2.49)	

Table 3-A

OLS Estimates of the Remittance Function. Level of Remittances. Stock of Population. DM.

OLS:					Length of Stay								
Equation	Constant	lpop	lyhost	prem	ratio	t	inf	D3	D4	D5	D6	DT1	$\bar{R}2$
1.	-0.43	0.76	0.31	-0.75	-	-	-	0.44	-0.23	-0.00	0.30	-	0.92
	(-0.19)	(3.08)	(1.37)	(-2.12)	-	-	-	(4.40)	(-0.79)	(-0.00)	(2.45)	-	
2.	-2.66	0.93	0.45	-0.77	-0.28	-	-	0.43	-0.03	-0.18	0.26	-	0.92
	(-1.11)	(3.75)	(2.02)	(-2.27)	(-2.36)	-	-	(4.46)	(-0.09)	(-0.67)	(2.15)	-	
3.	-4.05	1.08	0.48	-0.76	-	-0.02	-	0.36	0.13	-0.34	0.17	-	0.92
	(-1.53)	(4.01)	(2.11)	(-2.25)	-	(-2.47)	-	(3.52)	(0.40)	(-1.18)	(1.35)	-	
4.	-2.44	0.90	0.46	-1.46	-0.28	-	-	0.45	-0.06	-0.14	0.31	0.58	0.93
	(-1.03)	(3.69)	(2.07)	(-2.95)	(-2.43)	-	-	(4.69)	(-0.21)	(-0.55)	(2.59)	(1.88)	
5.	-3.78	1.04	0.48	-1.45	-	-0.02	-	0.38	0.09	-0.30	0.23	0.58	0.93
	(-1.46)	(3.94)	(2.16)	(-2.93)	-	(-2.45)	-	(3.74)	(0.28)	(-1.06)	(1.78)	(1.87)	
6.	-2.30	0.67	0.55	-0.81	-	-	-0.07	0.46	-0.34	0.09	0.40	-	0.94
	(-1.10)	(3.04)	(2.66)	(-2.58)	-	-	(-4.03)	(5.16)	(-1.28)	(0.40)	(3.64)	-	
7.	-3.64	0.80	0.63	-0.82	-0.19	-	-0.06	0.45	-0.19	-0.04	0.37	-	0.94
	(-1.65)	(3.49)	(3.01)	(-2.65)	(-1.73)	-	(-3.61)	(5.13)	(-0.68)	(-0.15)	(3.27)	-	
8.	-4.60	0.90	0.64	-0.81	-	-0.01	-0.06	0.40	-0.08	-0.15	0.31	-	0.94
	(-1.91)	(3.60)	(3.07)	(-2.63)	-	(-1.83)	(-3.58)	(4.30)	(-0.27)	(-0.56)	(2.52)	-	
9.	-3.44	0.75	0.64	-1.66	-0.18	-	-0.07	0.47	-0.25	0.02	0.44	0.71	0.94
	(-1.64)	(3.41)	(3.23)	(-3.77)	(-1.66)	-	(-4.06)	(5.59)	(-0.93)	(0.07)	(3.99)	(2.57)	
10.	-4.31	0.83	0.66	-1.65	-	-0.01	-0.07	0.42	-0.15	-0.09	0.39	0.70	0.94
	(-1.88)	(3.51)	(3.29)	(-3.75)	-	(-1.75)	(-4.03)	(4.74)	(-0.52)	(-0.33)	(3.22)	(2.56)	

Table 3-B

OLS Estimates of the Remittance Function, Per Capita Remittances. Stock of Population. DM.

OLS:				Length of Stay								
Equation	Constant	lyhost	prem	ratio	t	inf	D3	D4	D5	D6	DT	$\bar{R}2$
1.	-1.30	0.24	-0.66	-	-	-	0.39	0.04	-0.24	0.22	-	0.52
	(-0.61)	(1.11)	(-1.94)	-	-	-	(4.68)	(0.53)	(-2.74)	(2.45)	-	
2.	-2.96	0.44	-0.75	-0.29	-	-	0.42	0.05	-0.25	0.23	-	0.56
	(-1.39)	(2.03)	(-2.28)	(-2.57)	-	-	(5.23)	(-0.67)	(-2.93)	(2.74)	-	
3.	-3.63	0.48	-0.78	-	-0.02	-	0.38	0.04	-0.26	0.20	-	0.57
	(-1.66)	(2.19)	(-2.38)	-	(-2.68)	-	(4.81)	(0.50)	(-3.07)	(2.35)	-	
4.	-2.89	0.44	-1.42	-0.29	-	-	0.42	0.05	-0.25	0.28	0.57	0.58
	(-1.39)	(2.05)	(-2.95)	(-2.60)	-	-	(5.42)	(0.70)	(-2.96)	(3.20)	(1.87)	
5.	-3.57	0.48	-1.46	-	-0.02	-	0.38	0.04	-0.26	0.24	0.58	0.59
	(-1.66)	(2.22)	(-3.05)	-	(-2.74)	-	(5.00)	(0.53)	(-3.11)	(2.82)	(1.91)	
6.	-3.40	0.45	-0.69	-	-	-0.07	0.38	-0.04	-0.24	0.29	-	0.61
	(-1.72)	(2.26)	(-2.25)	-	-	(-3.86)	(5.18)	(-0.57)	(-3.00)	(3.55)	-	
7.	-4.47	0.58	-0.76	-0.23	-	-0.06	0.41	0.05	-0.24	0.30	-	0.64
	(-2.25)	(2.88)	(-2.52)	(-2.13)	-	(-3.52)	(5.60)	(0.68)	(-3.15)	(3.71)	-	
8.	-5.11	0.63	-0.79	-	-0.02	-0.06	0.38	0.04	-0.25	0.27	-	0.64
	(-2.51)	(3.06)	(-2.63)	-	(-2.36)	(-3.60)	(5.28)	(0.54)	(-3.30)	(3.39)	-	
9.	-4.48	0.59	-1.55	-0.22	-	-0.06	0.42	0.05	-0.02	0.35	0.68	0.67
	(-2.36)	(3.03)	(-3.59)	(-2.14)	-	(-3.90)	(5.95)	(0.72)	(-3.25)	(4.42)	(2.47)	
10.	-5.13	0.64	-1.59	-	-0.02	-0.06	0.39	0.04	-0.25	0.33	0.69	0.67
	(-2.63)	(3.24)	(-3.71)	-	(-2.43)	(-3.99)	(5.65)	(0.58)	(-3.41)	(4.12)	(2.52)	

Table 3-C

TSLS Estimates of the Remittance Function. Level of Remittances. Stock of Population. DM.

TSLS:					Length of Stay								
Equation	Constant	lpop	lyhost	prem	ratio	t	inf	D3	D4	D5	D6	DT1	$\bar{R}2$
1.	1.21	0.55	0.28	-1.16	-	-	-	0.51	-0.46	0.25	0.37	-	0.92
	(0.36)	(1.38)	(1.20)	(-0.96)	-	-	-	(4.19)	(-0.98)	(0.54)	(1.74)	-	
2.	0.17	0.63	0.38	-1.84	-0.36	-	-	0.55	-0.34	0.21	0.43	-	0.91
	(0.05)	(1.58)	(1.58)	(-1.52)	(-2.67)	-	-	(4.42)	(-0.72)	(0.46)	(2.00)	-	
3.	-1.71	0.84	0.41	-1.78	-	-0.03	-	0.45	-0.11	-0.02	0.31	-	0.92
	(-0.47)	(2.04)	(1.68)	(-1.47)	-	(-2.82)	-	(3.60)	(-0.22)	(-0.04)	(1.44)	-	
4.	-1.85	0.87	0.42	-1.25	-0.34	-	-	0.49	-0.07	-0.11	0.30	0.45	0.93
	(-0.66)	(2.71)	(1.94)	(-0.80)	(-2.79)	-	-	(4.67)	(-0.17)	(-0.31)	(1.52)	(0.60)	
5.	-3.52	1.06	0.44	-1.31	-	-0.03	-	0.40	0.14	-0.31	0.21	0.48	0.93
	(-1.18)	(3.12)	(2.04)	(-0.84)	-	(-2.97)	-	(3.71)	(0.35)	(-0.84)	(1.01)	(0.64)	
6.	1.73	0.17	0.49	-2.45	-	-	-0.07	0.60	-0.89	0.72	0.67	-	0.90
	(0.53)	(0.45)	(1.85)	(-2.58)	-	-	(-3.36)	(4.87)	(-1.98)	(1.68)	(3.41)	-	
7.	0.33	0.35	0.55	-2.51	-0.27	-	-0.06	0.60	-0.67	0.54	0.63	-	0.90
	(0.10)	(0.92)	(2.08)	(-2.74)	(-1.87)	-	(-2.87)	(4.94)	(-1.48)	(1.28)	(3.28)	-	
8.	-0.92	0.49	0.56	-2.53	-	-0.02	-0.06	0.53	-0.51	0.39	0.55	-	0.90
	(-0.26)	(1.20)	(2.11)	(-2.68)	-	(-1.91)	(-2.83)	(4.15)	(-1.06)	(0.85)	(2.70)	-	
9.	-0.44	0.38	0.60	-4.38	-0.21	-	-0.07	0.59	-0.62	0.47	0.76	1.95	0.90
	(-0.14)	(1.04)	(2.31)	(-2.87)	(-1.46)	-	(-3.35)	(4.97)	(-1.42)	(1.16)	(3.44)	(2.58)	
10.	-1.55	0.51	0.61	-4.30	-	-0.02	-0.07	0.53	-0.48	0.33	0.68	1.92	0.91
	(-0.47)	(1.30)	(2.37)	(-2.85)	-	(-1.54)	(-3.33)	(4.28)	(-1.04)	(0.75)	(2.98)	(2.57)	

Table 3-D

TSLS Estimates of the Remittance Function. Per Capita Remittances. Stock of Population. DM.

TSLS:				Length of Stay								
Equation	Constant	lyhost	prem	ratio	t	inf	D3	D4	D5	D6	DT1	$\bar{R}2$
1.	-1.27	0.23	-0.48	-	-	-	0.42	0.07	-0.25	0.19	-	0.53
	(-0.50)	(0.92)	(-0.40)	-	-	-	(4.83)	(0.84)	(-1.94)	(1.43)	-	
2.	-1.63	0.33	-1.64	-0.40	-	-	0.48	0.10	-0.17	0.31	-	0.54
	(-0.66)	(1.32)	(-1.31)	(-2.93)	-	-	(5.39)	(1.12)	(-1.30)	(2.23)	-	
3.	-2.56	0.39	-1.73	-	-0.03	-	0.42	0.08	-0.18	0.26	-	0.54
	(-1.03)	(1.58)	(-1.30)	-	(-2.97)	-	(4.89)	(0.89)	(-1.40)	(1.91)	-	
4.	-2.47	0.40	-1.18	-0.35	-	-	0.46	0.09	-0.24	0.26	0.44	0.61
	(-1.14)	(1.85)	(-0.71)	(-3.00)	-	-	(5.74)	(1.13)	(-2.52)	(1.73)	(0.53)	
5.	-3.44	0.47	-0.69	-	-0.02	-	0.41	0.07	-0.27	0.18	0.18	0.60
	(-1.54)	(2.11)	(-0.37)	-	(-2.94)	-	(5.10)	(0.86)	(-2.75)	(1.00)	(0.20)	
6.	-1.88	0.30	-1.90	-	-	-0.06	0.43	0.08	-0.14	0.38	-	0.51
	(0.75)	(1.21)	(-2.21)	-	-	(-3.32)	(4.86)	(0.92)	(-1.23)	(3.22)	-	
7.	-2.66	0.43	-2.17	-0.35	-	-0.05	0.47	0.10	-0.12	0.41	-	0.51
	(-1.08)	(1.72)	(-2.60)	(-2.58)	-	(-2.74)	(5.27)	(1.09)	(-1.13)	(3.51)	-	
8.	-3.61	0.49	-2.22	-	-0.03	-0.05	0.42	0.08	-0.14	0.37	-	0.52
	(-1.46)	(2.00)	(-2.65)	-	(-2.91)	(-2.78)	(4.85)	(0.90)	(-1.30)	(3.22)	-	
9.	-3.20	0.48	-4.02	-0.30	-	-0.07	0.48	0.10	-0.16	0.55	1.86	0.49
	(-1.30)	(1.95)	(-2.81)	(-2.19)	-	(-3.24)	(5.23)	(1.15)	(-1.56)	(3.70)	(2.55)	
10.	-4.05	0.55	-4.00	-	-0.02	-0.07	0.43	0.09	-0.18	0.51	1.82	0.52
	(-1.66)	(2.23)	(-2.76)	-	(-2.60)	(-3.31)	(4.93)	(1.00)	(-1.74)	(3.44)	(2.48)	

Table 4

Heteroscedasticity Tests

	Table 2.a Models		Table 3.a Models	
	$n\bar{R}^2$	Sig. Level	$n\bar{R}^2$	Sig. Level
1.	13.00	0.250	13.65	0.250
2.	13.65	0.375	15.60	0.250
3.	11.05	0.500	13.00	0.375
4.	19.50	0.100	25.35	0.025
5.	17.55	0.175	20.80	0.100
6.	21.45	0.050	20.80	0.075
7.	18.20	0.250	18.85	0.175
8.	17.55	0.250	16.90	0.250
9.	20.15	0.175	26.65	0.038
10.	20.15	0.175	22.75	0.100

Note: (a) The test is a panel data extension of White (1980), and is based on the regression of the squared residuals from the equations of tables (2) and (3) on the moments of the independent variables (see footnote 13).

Table 5

Endogeneity Tests

	Stock of Workers Based Models		Stock of Population Based Models	
	Test	Sig. Level	Test	Sig. Level
A. Endogeneity of Premium Only				
1.	-0.72	0.48	0.37	0.71
2.	-1.27	0.21	1.01	0.32
3.	-1.32	0.19	0.95	0.35
4.	-0.36	0.72	-0.12	0.91
5.	-0.20	0.85	-0.07	0.94
6.	-2.46	0.02	2.60	0.01
7.	-2.57	0.01	2.72	0.01
8.	-2.69	0.01	2.69	0.01
9.	-2.57	0.01	2.72	0.01
10.	-2.54	0.01	2.65	0.01
B. Endogeneity of Inflation given that of the Premium				
9.	0.64	0.53	1.01	0.32
10.	0.73	0.47	1.06	

Note: This is a Hausman type test and is based on comparing the OLS model with a TS model where inflation and the premium are endogenous, (see footnotes 15 and 16).

Table 6

Elasticity of Real Remittances Relative to Its Determinants

	Stock of Workers Based Model (Eq. 2-D-9)	Stock of Population Based Model (Eq. 3-D-9)
Independent Variable		
Demographic & Income Factors:		
1. Stock of Migrant Workers (population)	1.00	1.00
2. Length of Stay	-0.43	-0.40
3. Real Income in Host Countries	0.62	0.48
Macroeconomic Policy Factors:		
4. Black Market Exchange Rate Premium	-0.34	-0.32
5. Domestic Inflation	-0.03	-0.03
6. Shift Country Specific Effects Relative to Morocco:		
Portugal	-NS	0.48
Tunisia	-NS	+NS
Turkey	-0.34	-NS
Yugoslavia	+NS	0.55
7. Special Turkish Premium Interest Rate Policy	1.88	1.86

Source: Equation (9) of tables (2-D) and (3-D).

Notes:
a. For (2), (4) and (5) the elasticities are derived by multiplying the regression coefficients with the corresponding historical averages of the independent variable.
b. NS means statistically not significant.
c. The estimated coefficients for (6) and (7) are semi-elasticities.

Appendix

Data Sources and Construction

Remittances (Rem) were defined as the sum of labor income and workers' remittances proper. Thus, we did not make the distinction of remittances from workers living abroad for less than one year or more than one year (the criterion adopted in the system of national accounts). The raw data were obtained from country sources, mostly central bank bulletins of labor exporting countries. In the case of Portugal, only remittances from Western European countries were considered. Therefore, the large flow of remittances from North America (mostly Canada) was excluded. We followed this procedure to achieve consistency between the flow of remittances and the stock of migrant workers. It was essential to obtain a breakdown of total remittances to Portugal by origin (Western Europe and other origins), as Portugal seems to have a large stock of migrant workers outside Western Europe. For the other countries in the sample it was not possible to obtain a breakdown of remittances by origin. Therefore, some inconsistencies remain between the information on the flow of remittances and the stocks of migrant labor and population. However, the measurement errors implied by these inconsistencies seem to be minor, as migration outside Western Europe looks small in comparison with total migration.

The flows of remittances were expressed in real German Marks by multiplying the original currency of denomination--either the domestic currency or the US dollar--by the yearly average exchange rate of the German Mark *vis-a-vis* the currency of denomination, and dividing the result by the yearly average

German CPI. The exchange rates and CPIs were obtained from the International Financial Statistics (IFS) of the IMF.

Stock of workers abroad (Work) was obtained from the OECD's continuous reporting system on migration (SOPEMI).

Stock of total population abroad (Pop) was also obtained from SOPEMI, OECD. However, there were a number of gaps in the series. For instance, in the case of France, the data is reported every five years; for Belgium, the data is only reported from 1982 and onwards; and data concerning Portuguese and Tunisian nationals in the Netherlands is only available from 1982. The missing observations were estimated by calculating the ratio of workers to total population in the years where both series were available, estimating the ratio between the two data points by making a linear interpolation, and dividing the stock of workers by the estimated ratio.

Length of stay (Length) was alternatively proxied by a simple linear time trend (**t**) and by the ratio (**ratio**) of the actual stock of migrant workers (total migrant population) to a discounted stock of migrant workers (total migrant population). Thus, in the case of workers, the ratio was defined by W_t/W^a_t, where W_t and W^a_t are the actual and discounted stocks of migrant workers, respectively. W^a_t was constructed by:

$$W^a_t = W_o \cdot e^{-\delta t} + \Sigma^t_{\theta=1} (W_\theta - W_{\theta-1}) \cdot e^{-\delta(t-\theta)}$$

where W_0 is the stock of workers in the base year (1977) and δ is the discount rate. The procedure simply consists of discounting less the more recent changes

in the stock of migrant workers. In the extreme case where the stock of migrant workers is constant, the summation term is zero and the adjusted stock at t is simply the stock in the base year discounted by δt. The summation term will be larger in the cases where migration is a recent phenomenon. Therefore, the ratio W_t/W^a_t is higher (lower) the longer (shorter) the average length of stay of workers abroad.

Host country per capita income (Yhost) was calculated for each sending country as the weighted average of per capita income in the host countries. The shares of migrant workers in each of the seven host countries were used as weights. All values were converted into real German Marks (DM) by using the yearly average nominal exchange rates in the given year and the yearly average German CPI. For example, host country per capita income for Algeria at time t is defined as:

$$Yhost_{A,t} = (YAustria_t \cdot E^{DM}_{AS}/P^G_t) \cdot \alpha_{A,As_t} + (YBelgium_t \cdot E^{DM}_{BF}/P^G_t) \cdot \alpha_{A,Bl_t} + (YFrance_t \cdot E^{DM}_{FF}/P^G_t) \cdot \alpha_{A,F_t} + (YGermany_t/P^G_t) \cdot \alpha_{A,G_t} + (YNetherlands_t \cdot E^{DM}_{DG}/P^G_t) \cdot \alpha_{A,N_t} + (YSweden_t \cdot E^{DM}_{SK}/P^G_t) \cdot \alpha_{A,Sw_t} + (YSwitzerland_t \cdot E^{DM}_{SF}/P^G_t) \cdot \alpha_{A,Sz_t}$$

where $Yhost_A$ is host country per capita income for Algeria, YAustria is per capita income in Austria in Austrian Schillings, E^{DM}_{AS} is the nominal exchange rate of the German Mark *vis-a-vis* the Austrian Schilling, P^G is the average yearly CPI in Germany, $\alpha_{A,As}$ is the share of Algerian workers in Austria in the total stock of Algerian workers abroad, and the t subscript is the time period. All the other subscripts were defined similarly. Per capita income in the host countries were obtained from the World Bank data base.

Black market premium (Prem) was defined as the percentage difference between the average yearly exchange rates of the domestic currency vis-a-vis the German Mark in the official and parallel markets. The official exchange rates were obtained from the IFS, whereas the exchange rates in the parallel market were obtained from Pick's Currency Yearbook.

Inflation was defined as percentage variations the yearly average CPI obtained from the International Financial Statistics of the IMF.

Interest rate differentials for each sending country were calculated as the weighted average of bilateral, depreciation-adjusted interest differentials on the yearly averages of 3-6 month deposits. The shares of workers in each host country were again used as weights. Each bilateral interest differential was defined as:

$$\frac{(1+i_t)}{(1+\hat{E}_t)\,(1+i_t^*)}-1$$

where $\hat{E}_t$ is the depreciation of the nominal bilateral exchange rate between t-1 and t, i_t is the domestic interest rate at t, and i^*_t is the foreign interest rate at t. The interest rates on deposits in the home countries were obtained from central bank reports and the interest rates on deposits in host countries were obtained from the IFS.

Appendix Table 1
Algeria: Selected Economic and Demographic Indicators, 1977-89

	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
1. Remittances (US$ millions)	192.3	162.0	164.1	184.7	169.1	274.5	300.4	170.6	149.9	132.0	208.6	351.8	278.9	268.0
2. Per Capita Remittances (US$ thousands)														
2.1 Per National Abroad		0.19	0.20	0.23	0.20	0.33	0.37	0.21	0.18	0.16	0.26	0.47	0.35	0.34
2.2 Per Worker Abroad		0.51	0.52	0.59	0.54	0.92	1.03	0.57	0.50	0.46	0.75	1.38	1.02	1.01
3. National Abroad (thousands)		845.5	835.6	799.4	845.3	833.8	821.1	825.9	830.8	836.2	814.3	749.2	806.3	776.8
4. Workers Abroad (US$ thousands)		317.7	314.8	314.5	313.7	298.7	291.5	297.1	302.4	284.3	277.1	255.0	274.6	264.8
5. Host Country Per Capita Income (US$)		7544	8439	10022	11881	12428	11887	10618	9931	9738	10785	12951	16193	17846
6. Black Market Premium (%)	74.6	112.5	119.0	131.5	181.9	215.5	249.4	259.8	333.8	390.4	348.0	386.2	396.0	386.2
7. Domestic Inflation (%)		12.1	17.2	11.5	9.5	14.6	6.7	7.8	6.3	10.5	12.4	7.4	5.9	9.3

Appendix Table 2
Morocco: Selected Economic and Demographic Indicators, 1977-89

	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
1. Remittances (US$ millions)	503.8	540.7	710.2	885.1	985.0	948.5	802.4	878.4	838.1	940.5	1380.7	1571.7	1287.2	1322.5
2. Per Capita Remittances (US$ thousands)														
2.1 Per National Abroad		1.12	1.40	1.62	1.67	1.50	1.15	1.20	1.09	1.17	1.75	1.95	1.56	1.53
2.2 Per Worker Abroad		2.55	3.67	4.59	4.73	4.53	3.56	3.79	3.29	3.45	5.21	5.86	4.74	4.64
3. National Abroad (US$ thousands)		481.2	509.0	547.7	588.3	634.0	700.5	733.1	766.1	803.9	790.9	806.0	825.1	866.2
4. Workers Abroad (US$ thousands)		211.9	193.6	192.6	208.3	209.6	225.3	231.8	255.0	272.3	265.2	268.1	271.6	285.0
5. Host Country Per Capita Income (US$)		7610	8597	10246	12020	12281	11566	10367	9749	9537	10502	12608	15826	17511
6. Black Market Premium (%)	5.3	5.8	9.4	11.9	4.5	2.8	6.3	4.9	3.7	0.8	1.0	3.3	3.4	9.2
7. Domestic Inflation (%)		12.6	9.7	8.3	9.4	12.5	10.5	6.2	12.4	7.7	8.7	2.7	2.4	3.1

Appendix Table 3
Portugal: Selected Economic and Demographic Indicators, 1977-89

	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
1. Remittances (US$ millions)	766.8	1003.7	1387.3	1986.0	2245.4	1983.9	1751.4	1523.2	1521.6	1457.3	1887.8	2468.3	2576.2	2731.6
2. Per Capita Remittances (US$ thousands)														
2.1 Per National Abroad		1.10	1.53	2.20	2.50	2.20	1.93	1.69	1.73	1.66	2.34	3.11	3.21	3.23
2.2 Per Worker Abroad		2.08	2.76	3.93	4.73	4.22	3.64	2.95	2.87	2.77	3.90	5.19	5.30	5.31
3. National Abroad (US$thousands)		912.8	906.4	902.9	899.4	901.1	907.5	899.1	881.7	876.7	805.4	793.9	801.7	846.8
4. Workers Abroad (US$ thousands)		482.0	502.6	505.5	474.6	469.7	481.5	515.5	530.7	526.6	484.1	476.0	486.3	514.8
5. Host Country Per Capita Income (US$)		7658	8597	10250	12147	12623	12038	10838	10217	10073	11240	13603	17218	19094
6. Black Market Premium (%)	12.7	11.2	7.8	2.4	2.8	4.8	6.0	15.3	2.8	-0.2	0.5	10.3	15.0	1.6
7. Domestic Inflation (%)		27.1	6.7	27.1	14.7	20.0	22.7	25.1	28.9	19.3	11.7	9.4	9.6	12.6

Appendix Table 4
Tunisia: Selected Economic and Demographic Indicators, 1977-89

	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
1. Remittances (US$ millions)	132.9	156.6	206.2	269.4	289.1	348.7	360.1	349.9	306.1	259.6	351.8	479.3	538.5	489.8
2. Per Capita Remittances (US$ thousands)														
2.1 Per National Abroad		0.86	1.10	1.39	1.48	1.68	1.60	1.52	1.32	1.11	1.54	2.12	2.15	2.06
2.2 Per Worker Abroad		1.71	2.24	3.38	3.75	4.07	4.00	3.68	3.14	2.78	3.87	5.31	5.44	5.15
3. National Abroad (US$ thousands)		182.9	188.1	194.3	194.9	207.0	225.6	229.5	231.7	234.4	227.8	225.8	250.2	238.3
4. Workers Abroad (US$ thousands)		91.4	92.0	79.6	77.1	85.7	90.0	95.0	97.4	93.4	90.9	90.3	99.0	95.1
5. Host Country Per Capita Income (US$)		7622	8564	10250	12113	12510	11864	10656	10025	9820	10854	13043	16332	18070
6. Black Market Premium (%)	12.4	1.4	4.8	2.8	10.2	0.6	7.3	8.5	13.2	5.9	4.6	1.5	6.4	2.1
7. Domestic Inflation (%)		6.7	5.3	45.3	14.1	8.9	13.7	8.9	8.4	8.0	5.8	7.2	6.4	7.4

Appendix Table 5
Turkey: Selected Economic and Demographic Indicators, 1977-89

	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
1. Remittances (US$ millions)	982.0	1090.0	1132.0	1657.0	2137.2	2645.2	2453.6	2046.1	2502.4	1991.7	1932.0	2624.5	2333.2	3391.0
2. Per Capita Remittances (US$ thousands)														
2.1 Per National Abroad		0.76	0.75	1.02	1.15	1.33	1.19	1.00	1.30	1.04	0.99	1.26	1.08	1.48
2.2 Per Worker Abroad		1.71	1.71	2.36	2.79	3.29	3.01	2.54	3.32	2.63	2.50	3.23	2.78	3.88
3. National Abroad (US$thousands)		1434.8	1499.5	1622.0	1862.9	1990.1	2061.0	2042.3	1929.2	1918.7	1946.7	2079.3	2154.4	2291.1
4. Workers Abroad (US$ thousands)		638.2	661.9	701.6	766.5	805.1	814.8	806.8	754.1	758.2	773.8	812.9	837.8	873.1
5. Host Country Per Capita Income (US$)		8154	9381	11378	13188	13161	12204	11356	11076	10831	11835	14166	18093	20066
6. Black Market Premium (%)	9.8	16.9	21.1	56.4	6.9	9.9	11.3	12.8	0.9	-2.8	-2.7	9.4	14.7	2.1
7. Domestic Inflation (%)		27.1	45.3	58.7	20.7	36.6	30.8	31.4	48.4	45.0	34.6	38.8	75.4	69.6

Appendix Table 6
Yugoslavia: Selected Economic and Demographic Indicators, 1977-89

	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
1. Remittances (US$ millions)	1772.0	1732.0	2034.0	2055.0	1902.0	2428.0	1668.0	1639.0	1729.0	1586.0	1566.0	934.0	1438.0	1452.0
2. Per Capita Remittances (US$ thousands)														
2.1 Per National Abroad		1.70	2.09	2.10	1.90	2.41	1.70	1.72	1.85	1.71	1.69	0.98	1.54	1.47
2.2 Per Worker Abroad		2.94	3.51	3.59	3.37	4.33	3.06	3.07	3.28	3.00	2.99	1.75	2.66	2.62
3. National Abroad (US$thousands)		1018.1	971.4	976.4	999.8	1006.5	983.7	951.7	933.8	928.7	927.0	949.8	932.1	989.5
4. Workers Abroad (US$ thousands)		588.9	580.1	573.0	564.1	560.2	545.3	533.7	527.8	528.3	523.0	534.1	541.1	555.1
5. Host Country Per Capita Income (US$)		7889	9062	11018	12823	12921	12194	11431	11212	11055	12144	14641	18838	21018
6. Black Market Premium (%)	5.0	5.5	6.2	8.6	10.7	14.4	18.7	13.1	8.0	6.3	15.3	23.7	15.0	6.0
7. Domestic Inflation (%)		14.7	14.1	20.7	30.9	39.8	31.5	40.2	54.7	72.3	89.8	120.8	194.1	1239.9

References

Bhagwati, Jagdish N. (editor), Brain Drain and Taxation: Theory and Empirical Analysis. North Holland (Netherlands), 1976.

_____, and Richard A. Brecher, "Immiserizing Transfers from Abroad", Journal of International Economics, 13, 1982.

Birks, J. and C. Sinclair, "Migration and Development: The Changing Perspective of the Poor Arab Countries", Journal of International Affairs, vol. 32, no. 2, 1979.

Bohning, W. R., "International Migration and the International Economic Order", Journal of International Affairs, vol. 33, 1979.

Chamberlain, G. (1982), "Multivariance Regression Models for Panel Data", Journal of Econometrics, Vol 18, pp. 5-46.

Chandavarkar, Anand G., "Use of Migrants' Remittances in Labor-Exporting Countries", Finance & Development, June 1980.

Chaney, Rick, "Regional Emigration and Remittances in Developing Countries: The Portuguese Experience", Prager Publisher, 1986.

Chaudry, Kiren A., "The Price of Wealth: Business and State in Labor Remittance and Oil Economies", International Organization, 1989.

de Macedo, Jorge, "Emigration and Remittances in Neoclassical Steady State", Economica (Portugal), 1977.

Djajic, Slobodan, "Migrants in a Guest-Worker System", Journal of Development Economics 31, 1989.

_____, and Ross Milbourne, "A General Equilibrium Model of Guest-Worker Migration: The Source Country Perspective", Journal of International Economics 25, 1988.

Dornbusch, et. al., (1983), "The Black Market for Dollars in Brazil", Quarterly Journal of Economics, February.

Eissa, Nada (1990), "Remittances: A Survey", unpublished mimeo, The World Bank.

Elbadawi, I. E. (1992), "Macroeconomic Management and the Black Market for Foreign Exchange in Sudan", The World Bank, Policy Research Working Paper #859.

El-Erian, Mohamed, "Currency Substitution in Egypt and in Yemen Arab Republic", IMF Staff Papers, vol. 135, March 1988.

Glytsos, Nicholas P., "Remittances in Temporary Migration: A theoretic Model and Its Testing with the Greek-German Experience", Weltwirtschaftliches Archiv, 1988.

_____, and Louka Katseli, "Theoretical and Empirical Determinants of International Labor Mobility: A Greek-German Perspective", Center for Economic Policy Research, Discussion Paper Series no. 148, Oct. 1986.

Hausman, J. A. (1978), "Specification Tests in Econometrics", Econometrica, Vol. 46, pp. 1251-1271, November.

Kumcu, M. Ercan, "The Savings Behavior of Migrant Workers" Turkish Workers in West Germany", Journal of Development Economics 30, 1976.

Lucas, Robert E., and Oded Stark, "Motivations to Remit", Migration and Development Program Discussion Paper Series no. 10, 1984.

Maddala, G. S. (1988), Introduction to Econometrics, Macmillan Publishing Company, New York.

Miranda, Kenneth, "Workers' Remittances, Commodity Aid Utilization and Exchange Rate Unification", IMF, Jan., 1988.

Oberai, A. S., and H. Singh, "Migration, Remittances and Rural Development: Findings of a Case Study in the Indian Punjab", International Labor Review, vol 119, no. 2, 1980.

Pereira, Alfredo, "Neoclassical Growth with Emigration and Remittances: An Extension to Optimal control", Economica (Portugal), May, 1983.

Rocha, Roberto De Rezende, "The Black Market Premium in Algeria", EMTTF, The World Bank, 1989a.

_____, "Workers' Remittances in the Maghreb Countries: A preliminary Analysis", EMTTF, The World Bank, August, 1989b.

Serageldin, I., Socknat, S. Birks, B. Li and C. Sinclair, "Manpower and International Labor Migration in the Middle East and North Africa", Research Project on International Labor Migration and Manpower in the Middle East and North Africa, World Bank, 1981.

Solimano, Andres, "Macroeconomic Constraints for Medium Term Growth: A Model for Chile", World Bank, Feb. 1990.

Stark, Oded, "On the Role of Rural to Urban Migration in Rural Development", Journal of Development Studies 16, 1980.

_____, "Towards a Theory of Remittances", Harvard Institute of Economic Research Discussion Paper Series, 1983.

_____, and David Levarthi, "On Migration and Risk in LDCs", Economic Development and Cultural Change 31, 1982.

_____, Taylor, Edwards, Yitzhaki and Shlomo, "Remittances and Inequality", Harvard Institute of Economic Research, April, 1985a.

_____, and Eliakim Katz, "A Theory of Remittances and Migration", Migration and Development Program Discussion Paper Series no. 18, Sept. 1985b.

_____, and Robert Lucas, "Migration, Remittances and the Family", Migration and Development Program Discussion Paper Series no. 28, Feb. 1987a.

Straubhaar, Thomas, "The Determinants of Workers' Remittances: The Case of Turkey", Weltwirtschaftliches Archiv 122, Oct. 1986.

Swamy, Gurushri, "International Migrant Workers' Remittances: Issues and Prospects", World Bank Staff Working Papers, no. 481, Aug. 1981.

Wahba, Sadek, "Workers' Remittances as a Source of Foreign Earnings: A Study of Determinants of Recorded Remittances in Egypt", IMF, Oct. 1989.

White, H. (1980), "A Heteroskedasticity-Consistent Covariance Estimation", Vol. 48, pp. 817-838, May.

Policy Research Working Paper Series

	Title	Author	Date	Contact for paper
WPS1019	How Effective are Directed Credit Policies in the United States? A Literature Survey	Anita M. Schwarz	November 1992	M. Raggambi 37664
WPS1020	Another Look at Population and and Global Warming	Nancy Birdsall	November 1992	S. Rothschild 37460
WPS1021	Measuring Welfare Changes from Commodity Price Stabilization in Small Open Economies	Jonathan R. Coleman Chris Jones	November 1992	D. Gustafson 33714
WPS1022	A New Approach to Evaluating Trade Policy	James E. Anderson J. Peter Neary	November 1992	M. T. Sanchez 33731
WPS1023	Tariff Index Theory	James E. Anderson	November 1992	M. T. Sanchez 33731
WPS1024	An Exact Approach for Evaluating the Benefits from Technological Change	Will Martin Julian M. Alston	November 1992	D. Gustafson 33714
WPS1025	Openness and Economic Performance in Sub-Saharan Africa: Evidence from Time-Series Cross-Country Analysis	Kazi M. Matin	November 1992	D. Ballantyne 38004
WPS1026	Financial Liberalization and Adjustment in Chile and New Zealand	Paul D. McNelis Klaus Schmidt-Hebbel	November 1992	A. Marañon 31450
WPS1027	Lessons from Bank Privatization in Mexico	Guillermo Barnes	November 1992	W. Pitayatonakarn 37664
WPS1028	Socioeconomic and Ethnic Determinants of Grade Repetition in Bolivia and Guatemala	Harry Anthony Patrinos George Psacharopoulos	November 1992	L. Longo 39244
WPS1029	Controlling Tropical Deforestation: An Analysis of Alternative Policies	Robert T. Deacon	November 1992	P. Pender 37851
WPS1030	Measuring the Effects of Urban Transportation Policies on the Environment: A Survey of Models	Alan J. Krupnick	November 1992	P. Pender 37851
WPS1031	Measuring the Possibilities of Interfuel Substitution	Robert Bacon	November 1992	P. Pender 37851
WPS1032	East Asia and Pacific Region, South Asia Region Population Projections, 1992-93 Edition	Eduard Bos My T. Vu Ann Levin	November 1992	O. Nadora 31091

Policy Research Working Paper Series

	Title	Author	Date	Contact for paper
WPS1033	Latin America and the Caribbean Region (and Northern America) Population Projections, 1992-93 Edition	My T. Vu Eduard Bos Ann Levin	November 1992	O. Nadora 31091
WPS1034	Revising Financial Sector Policy in Transitional Socialist Economies: Will Universal Banks Prove Viable?	David H. Scott	November 1992	K. Waelti 37664
WPS1035	How Heavy Protection Affects the Philippines' Motor Vehicle Industry	Wendy E. Takacs	November 1992	D. Ballantyne 37947
WPS1036	Output Decline in Hungary and and Poland in 1990-91: Structural Change and Aggregate Shocks	Simon Commander Fabrizio Coricelli	November 1992	O. del Cid 35195
WPS1037	Vocational Secondary Schooling, Occupational Choice, and Earnings in Brazil	Ana-Maria Arriagada Adrian Ziderman	November 1992	C. Cristobal 33640
WPS1038	Determinants of Expatriate Workers' Remittances in North Africa and Europe	Ibrahim A. Elbadawi Robert de Rezende Rocha	November 1992	A. Marañon 31450
WPS1039	Education, Externalities, Fertility, and Economic Growth	Martin Weale	November 1992	PHREE 33680
WPS1040	Lessons of Trade Liberalization in Latin America for Economies in Transition	Jaime de Melo Sumana Dhar	November 1992	D. Ballantyne 37947
WPS1041	Family Planning Success Stories in Bangladesh and India	Moni Nag	November 1992	O. Nadora 31091
WPS1042	Family Planning Success in Two Cities in Zaire	Jane T. Bertrand Judith E. Brown	November 1992	O. Nadora 31091