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Impact of International Remittance on Out-Farm Labor Migration in Developing Countries: A Dynamic Panel Data Analysis

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Abstract

This study examines the impact of remittances inflows on inter-sectoral migration of farm labor toward the non-agricultural sector. Using a panel of 77 developing countries over the period 1991–2010, we find two opposing effects of remittances on out-farm migration of labor. First, remittances slow down the out-farm migration rates by supplementing farm income and consumption expenditures. Second, remittances provide a source of investment in out-farm activities that increase the rate of migration out of agriculture over time. Combining these effects, our estimates indicate that a 100 percent increase in remittances reduces the migration out of agriculture by 10 percent over time. A major policy issue facing leaders in the developing world is whether international migration, through remittances, contributes to the development process in migrant-sending communities or impedes the efficient allocation of labor and human capital at origin countries. Our results indicate that international migrant remittances help slow the rate of out-farm labor migration through its supplemental income effect; remittances help finance farm households' consumption expenditures, thereby eliminating the need to move to non-agricultural jobs.

Keywords: remittances, out-farm labor migration, dynamic panel model

JEL Codes: F22, F24

1. Introduction

This study examines the impact of remittances from immigrants on the migration out of agriculture using a panel of 77 developing countries (Table 1). The results find two opposing effects of remittances on out-farm migration. First, remittances slow the out-farm migration by supplementing consumption. Second, remittances provide a source of investment in off-farm activities that increases migration out of agriculture over time. Combining these effects, our estimates indicate that a 1 per cent increase in remittances reduces the migration out of agriculture by 0.1 per cent over time (e.g., the short-run effect is larger than the long-run effect of increased investments). Hence, remittances from international migration slow out-farm migration over time.

Adelman, Taylor and Vogel (1988) provide an excellent starting point for the framework for migration developed in this study:

> Although migration out of rural areas is almost universally regarded as an inherent part of the development process [Lewis, 1954; Ranis and Fei, 1961; and Jorgenson, 1961], most migration models are built on an atomistic view of migration: They assume that individuals or entire units located in the sector that is associated with the highest expected life time earnings and, implicitly, that migrants sever their ties with the rural economy when they migrate [Todaro 1969, Yap, 1977]. Thus, in these models, the economic impacts of outmigration on the rural economy are limited to impacts operating through the effect of migration on income from rural sources, particularly migration-induced shifts in labor supplies (Adelman, Taylor and Vogel, 1988).

Here the contention is that migration is more than an income decision. Something ties the migrant to the sending economy.

We first examine the migration models based on the "atomistic" point of view. Lewis's formulation includes two sectors – a subsistence economy (e.g., agriculture) and a capitalist sector. In this formulation, Lewis assumes an unlimited supply of labor in the subsistence economy and some degree of monopsony in the capitalist labor market. In Lewis's dual economy model, the wage rate in the subsistence market can be maintained at near zero over time while the wage rate in the capitalist sector increases as capital is accumulated. The difference between the labor markets is maintained at least in part by the inability or unwillingness of the subsistence sector to accumulate capital. This difference is important for our study. One hypothesis is that remittances provide capital that could be used to enhance income in the farm sector or provide an investment in human capital to migrate out of farm sector.

Ranis and Fei (1961) extends Lewis's formulation by deriving the point at which withdrawing labor from agriculture changes the terms of trade between the subsistence economy and the industrial sector. A similar model is developed by Jorgenson (1967). Jorgenson (1961) takes a different approach by deriving whether sufficient population exists to feed the subsistence economy and generate additional labor for use in the industrial sector.

Todaro (1969) builds on the dual economy model of Lewis (1954), Ranis and Fei (1961), and Jorgenson (1961) to develop a model which describes the migration between the farm and industrial sectors. Todaro's model explicitly uses the probability of obtaining urban employment to guarantee the equilibrium between the farm and urban labor markets. Specifically, migrating from the farm labor market to the urban labor market is based on two facets – a wage premium (excess urban wage over farm wages) and an adequate probability that the migrant will be able to obtain employment after migration. Harris and Todaro (1970) propose a similar model (to Todaro [1969]) where the urban wage is determined by a minimum wage law. Again, the equilibrium between farm and urban wages is determined by the probability of getting a job at the minimum wage rate.

Taylor (1999) set out to generalize the migration models beyond the pursuit of income to. Specifically, Taylor notes:

> For many years, researchers analysed the determinants of migration independent of migration's impacts, and vice versa. The best-known economic model of migration decisions (Todaro, 1969; Harris and Todaro 1970) has no place for income remittances from migrants to their areas of origin. Most research on the impacts of remittances on migrant sending economies does not include a model of what determines migration in the first place. This is unfortunate, because the factors influencing international migration decisions also are likely to shape the outcomes of international migration and remittances, both in the migrant host country and in the regions from which migrants come (Taylor pp. 63-64).

Taylor develops two opposing frameworks for the effect of migration on the sending areas through remittances. In the New Economics of Labor Migration (NELM) framework, the decision to migrate is a family decision that could generate income to invest in new activities or provide insurance for production activities in the sending area. In the second framework (e.g., the "Dutch disease" or "migrant syndrome" framework), migration drains valuable resources (e.g., labor and capital) from the sending area. This drain reduces the amount of tradeable goods produced in the area the migrant leaves.

The NELM provides a framework for examining remittances by migrants. In general, international remittances have been growing exponentially over the past four decades, from an estimated 1,922 million USD in 1970 to an estimated 557,083 million USD in 2013 (Figure 1). These remittances have become one of the least volatile sources of foreign currency for developing countries, thereby contributing to their financial stability[1] (Ratha 2005; Jackman, Craigwell and Moore 2009). In harsh economic times, remittances may actually be countercyclical to the extent that migrants are motivated to send more money home.[2] At the macro level, international migrant remittances play a crucial role in economic growth and development of most developing countries (e.g., Adelman and Taylor 1990; León-Ledesma and Piracha 2004; Glytsos 2005; Acosta et al. 2006; Giuliano and Ruiz-Arranz 2009; Tansel and Yasar 2010; Siddique, Selvanathan and Selvanathan 2012; Karpestam 2012).[3]

While the initial migration yields remittance to the sending economy, our focus in this study is actually about the secondary migration – the possible increase or decrease in out-farm migration

[1] See Figure 2.
[2] For a comprehensive analysis of the different motives for sending out remittances, see Rapoport and Docquier (2006).
[3] For instance, Adelman, Taylor and Vogel (1988) found that for every US dollar from international migrants into Mexico, its GNP increased by $2.69 to $3.17, depending on whether remittances were received by urban or rural households.

resulting from the remittances to households who have "sent" migrants abroad. Mendola (2012 pp.110-111) provides a discussion the economic implications of these remittances on the households that have been left behind. First, following the NELM literature, remittances may provide capital for investment or insurance against low prices or yields in agriculture in the sending economy. The investment and/or insurance provided by remittances should increase the productivity in the farm sector in the sending economy – slowing the rate of out-farm migration. However, it is also possible that the households in the sending economy may invest in non-farm activities (i.e., non-farm enterprises or human capital), which could increase the rate of out-migration. Second, the remittances may have a multiplier effect in the rural economy. Households that receive remittances will purchase goods, some of which will be sourced locally. This multiplier effect may reduce the migration out of rural areas – however, its impact on out-farm migration is less certain (e.g., individuals may leave the farm sector, but remain in the rural community). Finally, given that remittances are a source of foreign purchasing power, remittances received may put upward pressure on the real exchange rate of the sending economy. In developing economies, this upward pressure would likely result is a slowing of the rate of decline of real exchange values. The relative increase in the real exchange rate could then set up the "Dutch disease" scenario where agricultural sector becomes less profitable because it must compete with farm prices in the international markets. This scenario would imply an increase in the out-farm migration rate.

2. Pathways of Impact of International Remittances on Out-Farm Labor Migration

International migration and remittances can have profound effect on the labor supply dynamics of the nonmigrating household members in developing countries, by relaxing liquidity constraints and raising off-farm reservation wages. Receipt of remittances is preceded by migration of family members abroad. Loss of labor to international migration can have disruptive effect on the labor market of the originating communities, and the country as a whole. Migration of one or more family members abroad might require labor supply adjustments of nonmigrating household members. For farm households, this may include taking up tasks on family farms, at least in the short run. This is especially true when labor markets are not complete, a characteristic feature of most developing countries. In addition, migrant remittances, if invested in agriculture, may raise average productivity of the sector over time; as a result, this may tend to slow farm labor out-migration, counteracting the reduced-labor effect because of the migration.

Migrant remittances may increase reservation wage of nonmigrating household members for off-farm jobs, reducing the propensity to reallocate labor off the farm. This could be counteracted by increased wages in the off-farm sector, due to labor shortage occasioned by out-migration of workers abroad. For instance, Mishra (2007) finds a strong and positive impact of Mexican emigration to United States on wages in Mexico. Specifically, he finds that outflow of Mexican workers to the United States between 1970 and 2000 increased the wage of an average Mexican worker by about 8%; with the greatest increase in wages being for those with 12–15 years of schooling. Such wage differentials between sectors should stimulate out-migration of farm labor to the off-farm sector.

Moreover, participation in the off-farm sector in most developing countries is subject to constraints—such as skilled education and apprentice training—which may not readily be overcome. Education may increase the probability of being employed in the off-farm sector; it may also reduce the cost of occupational migration (Mundlak 2000). There is consistent evidence in the literature that migrant remittances helps with human capital accumulation. In Mexico, Hanson and Woodruff (2003) report that children in migrant households complete significantly more years of schooling.[4] Similarly, Borraz (2005), using migrant network as an instrument for remittances, documents of positive small effect of remittances on schooling for children living in areas with fewer than 2,500 inhabitants and with mothers with a very low level of education. In El Salvador, Edwards and Ureta (2003) find that remittances have a large and significant effect on student retention rates in schools. Acosta (2006) reports that girls and young boys (less than 14 years old) from remittance-receiving households in El Salvador are more likely to be enrolled at school than those from non-recipient households.

Similarly, Calero, Bedi and Sparrow (2009) report that remittances increases school enrollment and decreases incidence of child work, especially for girls in rural Ecuador. Adams and Cuecuecha (2010) find that households in Guatemala receiving remittances spend more on education than what they would have spent without remittances. Aside education, it has been shown that international migration and remittances can affect health status of nonmigrating household members. Health is a human capital, which relates directly to worker productivity. For instance, Hildebrandt and McKenzie (2005) find that Mexico-US migration significantly and positively affects child health among migrant-sending households.

Additionally, lack of wealth has been identified as a binding constraint on (non-farm) entrepreneurship (Evans and Jovanovic 1989). Migrant remittances could relax capital constraints and promote entrepreneurial investment. This, over time, may open further wage employment opportunities in the off-farm sector. Funkhouser (1992) finds that international migrant remittances increase the propensity of setting up microenterprises in Nicaragua. Woodruff and Zenteno (2007) show that, in Mexico, investment of capital-intensive small firms all increase with attachment to international migration networks by alleviating capital constraints in those sectors.

[4] Recently McKenzie and Rapoport (2011) report that Mexican emigration to the USA lowers the chances of boys completing junior high school and of boys and girls completing high school in the migrant-sending households.

In Philippines, Yang (2008) reports that increased remittances inflow, resulted from the 1997 Asian exchange rate crisis, was associated with the increased likelihood of setting up of capital-intensive enterprises by households. Overall, these studies suggest that international remittances if invested in the off-farm activities may increase the relative size of the off-farm sector; the larger the size of the off-farm sector, the higher the number of inter-sectoral migrants it can absorb.

Channels through which international remittances impact on farm labor out-migration is complex to be conceptualized a priori and depends on a number of factors, such as the sector in which migrant remittances are invested in, constraints on off-farm employment, and the macroeconomic environment of the individual countries[5]. A macro-level cross-country panel time-series data will be used to reveal if remittances have any impacts on farm–off-farm labor market dynamics.

3. Empirical Models of Migration and Remittance

Several papers have applied the theoretical model developed in Todaro (1969) and Harris and Todaro (1970) to aggregate data. Mundlak (1978) examines the effect of a wage differential, the relative size of the non-farm sector, and population growth on migration out of the farm sector using a panel of 77 countries. His results support the general suppositions in the theoretical models in that migration out of agriculture is an increase function of the urban wage premium. Larson and Mundlak (1997) follow the general approach and data definitions in Munklak (1978), extending the data from 77 countries to 98 countries and adding three census observations. The results are similar to those in Mundlak (1978) – migration is an increasing function of the wage differential and the relative size of the non-farm economy. Butzer, Larson, and Mundlak (2002) are interested

[5] In some instances, migrant remittances may be used to reallocate labor off the farm in the face of deep-rooted sectoral problems that cannot be readily overcome by the mere availability of migrant remittances to the farm household.

in the implications of labor migration from resource based industries to other sectors in the economy within the context of the "Dutch Disease" (e.g., the tendency for resource-abundant economies to grow more slowly than resource-rich economies). To this end, they estimate the migration from the farm to the non-farm sector as a function of the wage differential, unemployment, inflation, the cost of migration (measured by total road length and the ratio of rural to urban roads), and education using national level data for Venezuela. In general, their findings are consistent with expectations – migration is an increasing function of the wage gap, and increased investment in transportation and education. Butzer, Mundlak and Larson (2003) examine factors explaining migration from the farm sector to the non-farm sector in Thailand, the Philippines, and Indonesia using aggregate data for each country. This study focuses on the effect of correlation between the exogenous variables and applies a principal components methodology for the data from the Philippines and Indonesia. The results indicate that differences in the wage differential not statistically significant in explaining changes in migration at any conventional level of confidence for the Philippines and Indonesia. However, other factors such as the growth rate of industrial employment and education are statistically significant. Barkley and McMillan (1994) use a panel of 32 African countries for 1972 through 1987 to examine the effect of the wage differential, skilled education, and liquid capital on migration. The addition is to determine whether the ability of labor to acquire and respond to such market incentives explain some of the fixity in the migration to the non-farm sector. Barkley and McMillan also consider the effect of political rights and civil liberties. Their results indicate that the wage differential and increased levels of political rights are positively associated with increased migration out of agriculture.

Barkley (1990) used the same general approach to examine out-farm migration in the United States at the aggregate level. In addition to the wage differential and relative size of the non-farm economy, Barkley used the unemployment rate to measure the probability that farm workers would find off-farm employment and government payments to agriculture. Barkley's results indicate that farm programs do not effect migration out of the farm sector. Further, he finds that while higher levels of unemployment may reduce the migration of farm workers, it appears to increase the migration of farm operators. D'Antoni, Mishra, and Barkley (2012) reexamine the effect of government payments on the migration out of agriculture. Specifically, using aggregate data for the United States for 1939 through 1995 and 1996 through 2007, they find that increased levels of government payments are associated with increased out-farm migration. In a similar study, Önel and Goodwin (2014) extend the basic Barkley model where the migration from the farm sector to the non-farm sector is slowed due to the option of migrating at some future point in time (e.g., real options theory). Following the two previous studies, they use aggregate data for the United States for 1948 through 2007, but they use a threshold model for migration. Specifically, Önel and Goodwin estimate migration under two regimes – the first regime occurs when the logarithmic wage differential is greater than 0.72 and the second regime is when the differential is less than 0.72. Under this specification they find that migration is positively associated with the wage differential and the real land values, and negatively associated with unemployment and the size of the non-farm sector relative to the farm sector in regime 1 while none of the variables are statistically significant in regime 2. Olper, Raimondi, and Cavicchioli (2014) returns to the question of the effect of farm program payments on out-farm migration. Specifically, they use a sample of 150 regions in the European Union for 1990 through 2009 to estimate the effect of farm program payments on migration out of agriculture – paying particular attention to the endogeneity of agricultural returns and farm program payments.

A number of studies (using cross-sectional data) have explored the impact of international migration and remittances on migrant-sending farm households. Specifically, these studies have examined the impact of remittances on their labor supply decisions: (1) Do farm households with access to international remittances work more on the farm? (2) Do farm households with access to international remittances work more off the farm? And, (3) do farm households with access to international remittances optimally allocate labor among farm and off-farm income-generating activities?[6] Micro-level studies focusing on the first question typically find that migrant-sending farm households work less on the farm, and often conclude that international migration is used by rural farm households to transition out of agriculture (e.g., Miluka et al. 2010; McCarthy et al. 2009).[7] Empirical findings based on the second question are mixed. While some find negative impact of migrant remittances on off-farm labor supply by nonmigrating household members (e.g., Amuedo-Dorantes and Pozo 2006a, 2006b; Acosta 2007; Hanson 2007), others find limited or no impact on off-farm labor supply (e.g., Funkhouser 1992; Amuedo-Dorantes and Pozo 2006a; Edwards and Rodriguez-Oreggia 2009). Employing a two-sector approach, studies examining the third question have often found evidence in favor of multiple-job holding, and labor reallocation between farm and off-farm sectors by migrant-sending households (e.g., Wouterse and Taylor 2008).

The question as to whether farm households with access to international remittances out-migrate from agricultural sector is far from being settled by the micro-level studies. This can be attributed to two main factors: First factor is the lack of micro-level panel data, which allow one

[6] These questions reflect the different theoretical approaches used by these micro studies. Studies based on questions 1 and 2 often focus on only the farm and off-farm sector, respectively. However, studies based on question 3 employ a two-sector approach, focusing on both the farm–off-farm sectors.

[7] This conclusion is based on simultaneous findings of lower chemical inputs and equipment expenditures, and no significant impact on farm income and efficiency. Note that these studies consider only the labor effect of international migration (loss of family member to migration), and do not account for income effect (remittances inflows to the household). The authors assume that their international migration variable implicitly captures remittances.

to observe farm households' off-farm work over time. Second factor is the fact that micro-studies typically are based on single-sector conceptual frameworks. As a result, drawing any country-wide policy conclusions using cross-section data may be difficult. Therefore, looking at the question of whether farm households with remittances inflow reallocate labor out of agriculture from a macro-level perspective may provide additional insights. Do international migrant remittances facilitate out-farm migration of labor? Or, do migrant remittances reduce the wedge between farm/off-farm incomes, thereby slowing out-farm labor migration? The aim of this essay is to settle these questions empirically using a large, cross-country panel dataset for developing countries.

4. Conceptual Framework: Occupational Choice of Nonmigrating Household Members

Occupational change, like any investment activity, requires resources (Sjaastad 1962). Migrant remittances may act as a catalyst to facilitate occupational migration of nonmigrating household members in the originating economy. This impact is analyzed within a two-sector occupational choice model; comprising of two mutually-exclusive occupations—farm and off-farm work (Todaro 1969; Harris and Todaro 1970). Consider an individual facing given returns in the two mutually-exclusive occupations. The choice of an occupation is determined by comparing the discounted utility derived from each job over time. For an individual k who enters the labor force at age g and retires at G, the optimization problem facing the individual can be written as

$$V_{ik} = \int_{g}^{G} e^{-rt}\psi_t(P_{it}, Y_{it})dt - \int_{g}^{G} e^{-rt}\left\{\psi_t(P_{jt}, Y_{jt}) - C_{ijt}\right\}dt,\ i \neq j \tag{1}$$

where $\psi_t(.)$ is the indirect utility function, derived after the maximization of the direct utility function in year t, which is a function of consumption prices in year t (P_{it}, P_{jt})[8], and expected

[8] In circumstances where the choice of occupation requires no locational change, $P_{it} = P_{jt}$. However, because local off-farm employment opportunities are too limited to absorb all the labor that leaves agriculture, $P_{it} \neq P_{jt}$.

earnings in year t (Y_{it}); r is the subjective discount rate. $Y_{it} = \delta_{it} w_{it} L_{it}$, where δ_{it} is the probability of being employed in the farm sector (assuming farm work to be sector i) in year t, w_{it} is the wage rate (shadow value) of labor in agriculture in year t, and L_{it} is the total hours of work on the farm in year t.

Similarly $Y_{jt} = \delta_{jt} w_{jt} L_{jt}$, where δ_{jt} is the probability of being employed in the off-farm sector (assuming off-farm work to be sector j) in year t, w_{jt} is the wage rate of labor in off-farm job in year t, and L_{jt} is the total hours of work off the farm in year t. C_{ijt} is the cost of occupational change (migration) from job i to job j in year t. This includes pecuniary costs—mainly travel and housing expenses, and cost of acquiring information about distant locations—and nonpecuniary costs—mainly forgone earnings and psychic costs. These costs could be considered as barriers to occupational migration and are partially sunk as they usually incurred in the first of year of the migration. International remittances may have a nontrivial impact on the cost of migration and thus helps to remove some of the barriers to occupational migration.

Occupational migration occurs when the expected lifetime indirect utility derived from off-farm work, taking into account the cost of occupational change, exceeds the lifetime indirect utility expected in the current farm work—i.e., when $V_{ik} < 0$.

4.1. Out-farm labor migration function

We follow Larson and Mundlak (1997), and Mundlak (2000) to specify a functional form for out-farm labor migration as a basis for the empirical analysis. For an individual k, denote the lifetime expected indirect utility derived from farm and off-farm work in year t as $\phi_{kt}(i)$ and $\phi_{kt}(j)$, respectively. To specify the migration equation, we introduce an index function H, such that

$H \in \{0,1\}$. For individual k who migrates from farm to the off-farm sector in year t, the index function H is determined by

$$H_{kt}(i,j)\begin{cases}1, & iff \quad \phi_{kt}(j)-\phi_{kt}(i)>0 \\ 0, & otherwise\end{cases}. \tag{2}$$

Similarly, labor can also migrate from off-farm to the farm sector. Then, the index function is determined by

$$H_{kt}(j,i)\begin{cases}1, & iff \quad \phi_{kt}(i)-\phi_{kt}(j)>0 \\ 0, & otherwise\end{cases}. \tag{3}$$

In sum, net migration out of the farm sector in year t can be represented as

$$M_t = \sum_k^{L_i} H_{kt}(i,j) - \sum_k^{L_j} H_{kt}(j,i), \tag{4}$$

where L_i and L_j are the total labor force in farm and off-farm sectors, respectively. By definition, and consistent with Todaro (1969), and Harris and Todaro (1970), out-farm labor migration rate (M_t) at any year t should be a function of two key variables: (i) relative returns in the two sectors (RR_t) in year t, and (ii) the probability of finding off-farm employment (δ_{jt}) in year t. The larger the relative returns the more individuals in the farm sector will find that the difference in wage/income justifies occupational change. However, the fact that the probability of finding off-farm job is very low must influence the prospective migrant's choice as to whether to leave farm work or not. Therefore, it is the expected income differential, i.e., the income differential adjusted for the probability of finding an off-farm job, that matters in the prospective migrant decision rather than the prevailing real income differentials (Todaro 1969).

By construction, out-farm migration is also a function of the capacity of the off-farm labor markets, proxied by the ratio of size of the off-farm and farm labor force $(RL_t = L_{jt}/L_{it})$ in year t

. The larger the off-farm labor market, the easier it should be for migrant to find employment. From Equation 1, out-farm migration is a function of relative prices $(RP_t = P_{jt}/P_{it})$ in the farm and off-farm sectors; this reflects the terms of trade between the two sectors. Finally, I introduce international migrant remittances, RM_t, to test for its impact on out-farm labor migration patterns. Equation 4 is specified by holding the economy-wide technology constant, in Cobb–Douglas sense, hence, we specify a semi-logarithmic out-farm migration in year t, noting a possible delay in individual decisions due to sunk cost associated with occupational change, as

$$M_t = \alpha_0 + \alpha_1 \log(RR)_{t-1} + \alpha_2 \log(RL)_{t-1} + \alpha_3 \log(U)_{t-1} + \alpha_4 \log(RP)_{t-1} + \alpha_5 \log(RM)_{t\text{-}1} \tag{5}$$

where U_t is a proxy for δ_{jt} (Table 2). The objective of this essay is to isolate both the direct and indirect effect of international migrant remittances. Isolating the direct effect is equivalent to testing whether the marginal impact of remittances is statistically different from zero; because the direction of the impact of cannot be determined a priori. Additionally, we explore one specific indirect link between remittances and out-farm labor migration, specifically the one working through farm–off-farm investments. As a result, we augment Equation 5 with an interaction between remittances and the relative sectoral returns as

$$\begin{aligned} M_t = {} & \alpha_0 + \alpha_1 \log(RR)_{t-1} + \alpha_2 \log(RL)_{t-1} + \alpha_3 \log(U)_{t-1} + \alpha_4 \log(RP)_{t-1} + \alpha_5 \log(RM)_{t\text{-}1} \\ & + \alpha_6 \left[\log\left(RR\right)_{t-1} \times \log\left(RM\right)_{t-1} \right] \end{aligned}, \tag{6}$$

The hypothesis we would like test with the interaction term is whether international migrant remittances help reduce the wedge between farm–off-farm sectoral returns. $\alpha_6 > 0$ would indicate that migrant remittances boost off-farm investments, thereby raising average productivity of the sector over time; this may speed up the out-farm labor migration process. The reverse is true for the farm sector; as international migrant remittances may relax credit constraints, and thereby enabling households to make productivity-enhancing and technology-improving investments on the farm (Stark and Bloom 1985; Stark and Levhari 1982).

4.2. Measurement issues

One main issue that needs to be addressed before estimating Equation 6 is the approximation of the migration variable M_t. The reality is that out-farm labor migration is not directly measured by most countries. We follow Mundlak (1978), and Larson and Mundlak (1997), to assume that without migration labor in the farm sector would grow at the same rate as the total labor force. Deviations from this rate can, then, be attributed to off-farm migration. Therefore, the migration variable (M_t) in Equation 4 is approximated as $m_t = [L_{it}(1+\eta_t) - L_{it-1})]/L_{it-1}$, where $\eta_t = (L_t - L_{t-1})/L_{t-l}$ is the growth rate in the total labor force (L_t). It must be pointed out that using m_t to calibrate off-farm labor migration is not devoid of any shortcomings. First m_t underestimates the actual size of off-farm migration as it does not take into account part-time farming, which may be pervasive in most developing countries[9]. Secondly m_t measure implies a constant rate of population growth in the farm and off-farm sectors. However, Kuznets (1966) points out that population growth rate in the farm sector may be as high as three times that of the off-farm sector.

Another issue is related to the measurement of the relative returns variable. There seems to be no consensus on this in extant literature. While some have used average wage rates for the farm-off-farm sectors (e.g., see Barkley 1990; D'Antoni, Mishra and Barkley 2012; Önel and Goodwin 2014), others have used average sectoral income (e.g., see Mundlak 1978; Larson and Mundlak

[9] This problem is purely due to data limitation, which is beyond the researcher. Previous literature encountered this problem (see Mundlak 1978; Barkley 1990; Larson and Mundlak 1997; D'Antoni Mishra and Barkley 2012, Önel and Goodwin 2014;Olper et al. 2014).

1997; Olper et al. 2014). We follow the latter and use average value-added labor product in the two sectors. This approximates sectoral consumption well, and it is more relevant for the lifetime expected indirect utility used by persons to evaluate migration decisions, as specified in Equation 1. The use of income rather than wages also recognizes that potential migrants may factor into their decisions the income prospect of other household members especially that of their children, in making decisions regarding change of occupations. Furthermore, when a person migrates out of agriculture, the profile of future stream of income changes; such that they may be willing to trade a low wage in the sector for the prospect of skill acquisition for higher income in the future. This reflects the multi-period nature of most migration decisions (Mundlak 2000). Using wage rates, rather than income, may not properly capture such dynamics in occupational migration.

5. Data and Descriptive Statistics

With the above measurement issues in mind, this section describes the data and procedures used to estimate the out-farm migration equation. The data used is an unbalanced panel of 77 developing countries (presented in Table 1), with information on total remittances from their stock of international migrants over the period 1991–2010. Table 2 reports the data description, source and summary statistics. There is a general view in the literature that the quality of available remittances data may be low. That is, the definition of remittances in the available database is too general and likely include earnings of the home country's citizens working in foreign embassies and international organizations. This may overestimate the remittances referring to typical money transfers by households' migrants abroad.[10] In addition, the remittances used in this essay exclude

[10] To get around this problem, Giuliano and Ruiz-Arranz (2009) adopted country-specific measure of remittances as opposed to the standardized one currently used by the World Bank. This involves contacting International Monetary Fund (IMF) desk economists and country authorities regarding definitions and clarifications of remittances under the various balance of payments items. I do not pursue this approach in this essay due to time and resources it requires.

money transfers through informal channels, such as in-kind transfers, money carried by friends etc., as they are not recorded under balance of payments of a country. [11]

6. Econometric and Estimation Procedure

A dynamic panel data framework is employed to estimate the impact of remittances on inter-sectoral migration of farm labor. Labor demand and supply are inherently dynamic in nature, and panel data allows us to better understand the dynamics of their adjustment. Allowing for dynamics in the underlying process may also be crucial for recovering consistent estimates of the other parameters (Bond 2002). The dynamic panel model, using m_t as the dependent variable, is of the form

$$\begin{gathered} m_{nt} = \rho m_{nt-1} + \alpha \mathbf{x}_{nt-1} + \varepsilon_{nt}, \quad |\rho| < 1;\ n = 1,2,....,N;\ t = 2,3,...,T \\ \varepsilon_{nt} = \mu_n + v_{nt} \\ E(\mu_n) = E(v_{nt}) = E(\mu_n v_{nt}) = 0;\ E(v_{nt} v_{qs}) = 0\ \forall\, n \neq q \text{ or } t \neq s \end{gathered} \tag{7}$$

where is m_{nt} is the out-farm labor migration rate for country n in year t; m_{nt-1} is value of m_{nt} in the previous year. $\mathbf{x}$ is vector of regressors in Equations 5 and 6 (Table 1). ρ is the autoregressive parameter of the underlying dynamic process, and α is a vector of parameter estimates of the other regressors. The error term has two orthogonal components: unobserved country-specific fixed effect, μ_n, and disturbance term, v_{nt}. The fixed effects model we have chosen is generally more appropriate than a random effects model for two reasons. First, if μ_n represents omitted variables, it is likely that these country-specific characteristics are correlated with the other regressors. Second, the selection of countries used here for the analysis is not a random sample of the universe of countries; these are countries with migrant workers that report remittances receipts.

[11] However, it is estimated that recent efforts to facilitate remittances inflows by improving money transfer technologies, reducing transfer fees, and cracking down on money laundering have reduced the unrecorded portion of remittances substantially (Giuliano and Ruiz-Arranz, 2009).

Applying OLS to Equation 7 yields inconsistent estimate of ρ, due to the fact that m_{nt-1} is correlated (positively) with μ_n. Purging the fixed effects with Within-group transformation does not eliminate the bias either, as the transformed error term is still (negatively) correlated with m_{nt-1} (Nickell 1981).[12] Therefore, instruments are required to the deal with (i) the endogeneity of m_{nt-1}, and, (ii) any other potentially endogenous regressors contained in vector $\mathbf{x}$. The widely used instrumental variable estimators for Equations 2 through 7 in the literature are the Difference Generalized Method of Moments (henceforth DIF-GMM, developed by Holtz-Eakin, Newey and Rosen 1988; Arellano and Bond 1991), and the System Generalized Method of Moments (henceforth SYS-GMM, developed by Arellano and Bover 1995; Blundell and Bond 1998).[13] These panel GMM estimators start by first-differencing Equation 7 to remove the fixed effects, μ_n, as

$$\Delta m_{nt} = \rho \Delta m_{nt-1} + \alpha \Delta x_{nt-1} + \Delta v_{nt}, \; |\rho| < 1; \; n = 1,2,...,N; \; t = 3,4,...,T \tag{8}$$

where $\Delta m_{nt} = m_{nt} - m_{nt-1}$. Though first-differencing removes the country-fixed effects, μ_n, Δm_{nt-1} becomes endogenous by construction; it is now correlated with Δv_{nt}. This is due to the fact that m_{nt-1} term in $\Delta m_{nt-1} = m_{nt-1} - m_{nt-2}$ is correlated with v_{nt-1} in $\Delta v_{nt-1} = v_{nt} - v_{nt-1}$. However, the advantage that first-differencing has over Within-group transformation is that it does not introduce all realizations of the disturbances $(v_{n2}, v_{n3}, ..., v_{nT})$ into the contemporaneous disturbance term of the transformed equation. As a result, with the assumption of no serial correlation from above, values of m_{nt} lagged two periods or more remain orthogonal to the contemporaneous disturbance

[12] This is the so-called "Nickell bias" in the literature.
[13] See Bond (2000) and Roodman (2009a, 2009b) for excellent reviews of these class of GMM estimators for panel data.

term, and thus available as instruments for the first-differenced equation.[14] Arellano and Bond (1991) show that the full moment conditions can be exploited to build an instrument set for each period t to derive consistent and efficient estimate for Δm_{nt-1}, and, hence, other endogenous regressors; this is the cornerstone of DIF-GMM.[15,16]

A potential weakness of the DIF-GMM was revealed in a later work by Arellano and Bover (1995) and Blundell and Bond (1998). They show that weak instruments could cause nontrivial finite-sample biases when using DIF-GMM for highly persistent series. If m_{nt}, for instance, approaches a random walk, past levels tend to convey little information about future changes; this makes lagged values of m_{nt} weak instruments for Δm_{nt-1}. Under an additional assumption, Blundell and Bond (1998) propose the use of an extra moment conditions, suggested by Arellano and Bover (1995). This leads to lagged differences of the endogenous variable being used as instruments for the levels in Equation 7. Efficient estimation then involves augmenting the moment conditions available for the first-differenced in Equation 8 with the additional moment conditions available for levels equation in a stacked form; this leads to the SYS-GMM (Appendix A). In the next section, we explore the suitability of these two estimators in answering the main empirical

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[14] For instance, for $t = 3$, m_{nt-2} is uncorrelated with Δv_{nt} and available as instrument. This because m_{nt-2} relates to Δm_{nt-1} through $m_{nt-1} - m_{nt-2}$. At the same time v_{nt-2} is not related to $v_{nt} - v_{nt-1}$. The assumption of no serial correlation is crucial in forming the instrument set in difference GMM. By construction, $AR(1)$ in the first-differenced disturbance terms is expected. However if $AR(2)$, for example, is detected in the first-differenced disturbance terms m_{nt-2} is longer available as an instrument, as this indicates presence of AR(1) in the disturbance term of levels equation. Where $t \geq 4$ is available, that means m_{nt-3} and longer remain as valid instruments. We take these into consideration during my estimations.

[15] This differentiates DIF-GMM from the computationally simple Anderson–Hsiao estimator (Anderson and Hsiao 1981; 1982) for $AR(1)$ panel data model. However, Arellano and Bond (1991) show in a simulation study that DIF-GMM out-performs the Anderson–Hsiao estimator.

[16] Other potentially endogenous variables in vector $\mathbf{x}$ are treated in the same manner.

question of this study. We base the empirical results and analysis on the estimator that is deemed appropriate for the data at hand.[17]

7. Empirical Results and Analysis

7.1. DIF-GMM Versus SYS-GMM

As explained above, lagged m_{nt} is endogenous by construction. In addition, we consider sectoral relative returns (rr_{nt}) and remittances (rm_{nt}) to be potentially endogenous, hence, making sure that the instrument set is informative enough to identify these variables is important.[18] Table 3 reports simple $AR(1)$ specifications for the three series, using two-step (optimal) GMM. Columns 1and 2 of Table 3 report OLS levels and Within-group estimates of the $AR(1)$ parameter. These two estimators provide a reasonable bound to check for the correct specification of the first-difference estimators, as they are biased in opposite direction (Bond 2002).

The results in Table 3 indicate high persistence in all the series, except for m_{nt}. For the rr_{nt} series, the DIF-GMM estimate is found to be significantly lower, even less than that of the Within-group estimate (columns 3 and 4 of Table 3). Blundell and Bond (1998) show that weak instruments cause DIF-GMM to be biased in the direction of the Within-group estimate, and sometimes to be inferior to it, for highly persistent series.[19] The OLS levels estimate of the rr_{nt} series indicates an almost exact unit root, however, this is expected as OLS biases the $AR(1)$ parameter upwards. However for the rm_t series, DIF-GMM estimate does not appear to be

[17] We use xtabond2 (Roodman, 2006b), a user-written STATA routine, for all empirical analysis.
[18] rr_{nt} is likely to be simultaneously determined with m_{nt}; this is akin to the simultaneity bias that exists between wages and hours worked. Receipt of remittances is preceded by earlier migration of a country's labor force, and, given migration, there are varying reasons and motivations to remit to nonmigrating household members Since these unobservable factors that determine migration and remittances are not controlled for in the regressions, rm_{nt} is likely to be correlated with the disturbance term.
[19] Also, see Heid, Langer and Larch (2012).

seriously biased; it is in close proximity to the SYS-GMM estimate (columns 5 and 6 of Table 3). Given the degree of persistence in rr_{nt} and rm_{nt} series, we henceforth use the SYS-GMM estimator for the remaining analyses.[20]

7.2. SYS-GMM estimation of the impact of international remittances on out-farm labor migration

Table 4 reports results from estimating Equation 6 with the efficient two-step SYS-GMM estimator. We use a subset, rather than the total, number of available instruments in all the estimations. This estimation strategy is based on the literature, where there is some evidence that instrument proliferation can cause nontrivial finite sample biases with difference GMM estimators, especially with the SYS-GMM.[21] Two specification tests are used to test for the validity of the chosen instrument set to ensure that the results reported in Tables 3 and 4 are consistent. These are Hansen (1982) test of over-identifying restrictions, and the test of no serial correlation in the levels equation.[22] These two tests point to the validity of the instrument set used here (see Table 4 for associated p-values), and hence consistency of the estimates. We correct for the standard errors, due to the two-step estimation procedure of optimal GMM, using Windmeijer (2005) finite sample correction for linear GMM. With consistency and efficiency issues addressed, we now turn to the economic implications of the results reported in Table 4.

The results reported in column 1–3 only use instruments dated $t-2$. All the parameter estimates of lagged out-farm migration rate (m_{t-1}) across the different model specifications are

[20] Hayakawa (2007) show in a simulation study that SYS-GMM has small sample biases as compared to the DIF-GMM, in dynamic panel data models.
[21] This ranges from biased coefficient and standard errors estimate to weakened specification tests (Roodman 2009a, 2009b; Windmeijer 2005).
[22] Sargan (1958) test can be used for this purpose, however it is inconsistent in the presence of nonspherical errors. Since we use two-step SYS-GMM estimator, it readily follows that we use Hansen (1982) test due to its robustness when nonsphericity is suspected. Testing for $AR(1)$ in the levels equation is equivalent to testing for presence of no $AR(2)$ in the transformed disturbance term (Arellano and Bond 1991).

found to be within the OLS–Within-group bound; this indicates a good model specification. The coefficient of m_{t-1} is negative, as expected, and statistically significant across all model specifications. This means that given high out-farm migration rate in year $t-1$, the current out-farm migration rate is expected to be lower. The magnitude and sign of the estimate compare favorably with that of Olper et al. (2014), who use a DIF-GMM for a panel of 150 EU regions.[23] The results in Column 1 can be considered as that from the base model. Here, the capacity of off-farm labor market in period $t-1$ (rl_{t-1}) plays a crucial role in stimulating out-farm labor migration in period t. The rest of the regressors have the expected signs, however, they are not statistically significant.

In Column 2 of Table 4, we augment the base model with the remittances variable to partially answer the main empirical question of this essay. The coefficient of the remittances variable (rm_{t-1}) is negative, however, it is not statistically significant. This result coincides with micro-level findings by Funkhouser (1992), Amuedo-Dorantes and Pozo (2006a), and Edwards and Rodriguez-Oreggia (2009) that remittances has limited or no impact on off-farm labor supply. Here too, the capacity of off-farm labor markets is still a relevant driver of out-farm labor migration.

The findings above raise the question of whether there exists an indirect channel through which remittances may impact out-farm labor migration. For instance, perhaps farm households use remittances to finance investment in off-farm activities, thereby indirectly facilitating exit from farm work. To capture this effect, we include an interaction term between relative sectoral returns (rr_{nt-1}) and remittances (rm_{nt-1}). Results are in Column 3 of Table 4. The interaction term is

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[23] This is not surprising since we do not find m_{nt} series to be persistent. As a result, the additional moment restrictions implied by SYS-GMM for m_{nt} series are not more informative than the moment restrictions implied by DIF-GMM.

positive and statistically significant at the 10% level, suggesting that remittances facilitate out-farm labor migration by widening relative sectoral income gap. The unemployment rate variable (u_{t-1}) is negative and significant. This means that high unemployment rate in period $t-1$ slows down out-farm labor migration rate in period t. This variable is a proxy for the probability of getting off-farm employment; the negative and significant estimate is consistent with Harris–Todaro hypothesis that it as acts as an equilibrating force on off-farm employment rate. The absorbing capacity of non-farm sector, rl_{t-1} , is still positive and statistically significant.

7.3. Sensitivity to instrument choice

The model specification in column 3 is the eventual equation of interest, since it captures both the direct and indirect effects of remittances on out-farm labor migration. Here, we check to see if the results reported in column 3 of Table 3 are sensitive to the number of instruments used. First, we add instruments dated only $t-3$ to the instrument set (in addition to those dated $t-2$) and re-estimate the model specification in column 3; we report the results in column 4 of Table 4. The additional instruments significantly improve the statistical performance of the model; rr_{t-1} and rm_{t-1} are now statistically significant.[24] The sign of all the parameter estimates are the same as those reported in column 3. Also, the magnitudes are almost the same as those reported in Column 3. The stability of the parameter estimates of the regressors suggests that the instruments dated $t-3$ improves efficiency of the estimator. The results in column 4 now suggests significant opposing effects of international migrant remittances on out-farm labor migration rate, compared

[24] Re-estimating those in Columns 1 and 2 with this additional instrument does not change their statistical performance.

to column 3.[25] On one hand, international migrant remittances slows down out-farm labor migration rate. On the other hand, it facilitates out-farm labor migration rate when its investment channels are accounted for. The direction of the overall impact then depends on which of these two effects outweighs the other; We perform this analysis below.

Columns 5 and 6 repeat the estimation of column 3 with instruments dated only $t-4$ and $t-5$ added, respectively.[26] These results do not differ dramatically from the results in column 4, except for rr_{t-1} which turns out to be statistically insignificant. Due to the statistical performance of the instruments dated $t-2$ and $t-3$, we base my elasticity calculations, below, on the results reported in column 4.

7.4. Short and long-run elasticities

Table 5 presents short and long-run elasticity estimates for easier interpretation of results reported in column 4 of Table 4. When calculating the elasticities for relative sectoral returns and remittances variables, we take into account the interaction term in Column 4 of Table 3. Table 5 shows that the long-run effects do not deviate systematically from their short-run effects. This is in part due to the slow adjustment of out-farm labor migration towards the long-run equilibrium (see Table 4). Several interesting findings emerge from Table 5. Taken together, the total impact of international migrant remittances on out-farm labor migration rate is negative and statistically significant, both in the short and in the long run. A 1% increase in remittances inflows from a country's stock of international migrants reduces out-farm labor migration rate by 0.1% over time.

[25] In order to make sure that this finding is not being driven by collinearity among the regressors, we present results of a simple Pearson pairwise correlation test in Table A-6, and the results point to no strong correlation among the regressors.

[26] Increasing the instrument set beyond $t-5$ makes some of the parameter estimates unstable in sign and magnitude; also, there is significant loss of efficiency.

Similarly, an increase in off-farm unemployment rate by 1% slows down out-farm migration rate by roughly 0.2% over time. Further, Table 5 suggests that absorbing capacity of the off-farm labor market is a more relevant determinant of out-farm migration than the existence of sectoral income gaps. A 1% increase in the capacity of the off-farm labor market, relative to the capacity of the farm labor market, increases out-farm labor migration rate by 0.5% over time. The same increase in relative sectoral income gap raises out-farm labor migration rate only by 0.2%; however this impact is not statistically significant. Worsening terms of trade between farm and off-sectors seems to drive out-farm labor migration, however this is not statistically significant (Table 5).

7.5. Robustness: Static model

To ensure that my findings on the impact of international remittances on out-farm labor migration rate is not unduly influenced by the choice of the autoregressive functional form, as specified in Equation 7, we repeat the above estimations assuming no dynamics in the underlying out-farm labor migration variable. In other words, we estimate an endogenous static panel GMM version of Equation 7. We report the marginal coefficients and elasticity estimates in Tables 6 and 7, respectively. The magnitudes of marginal estimates are in close proximity to those obtained with the dynamic functional form. The same applies to the elasticity estimates. However, the elasticity of out-farm migration with respect to remittances is not statistically significant in the static model, with a p-value of 14%.

8. Conclusion

Do farm households use international migrant remittances to exit farm sector? Answering this question has been a focus of a number of micro-level studies, with no consensus on the direction of the impact. This may be attributed to the inherent shortcoming of working with cross-sectional data without temporal variation. This study contributes to the extant literature by addressing the issue using remittances data on panel of 77 developing countries over the period of 1991-2010 to assess the impact on out-farm labor migration within a two-sector occupational choice framework.

We accomplish this by estimating the direct impact of remittances as well as the indirect effect through its interaction with relative sectoral returns. We control for the endogeneity of remittances and relative sectoral returns variables. The estimation results indicate that there exist two opposing effects of remittances on out-farm labor migration. Specifically, we find that the direct impact of remittances inflows is to slow down out-farm labor migration. However, the indirect effect of remittances through investment in off-farm income-generating activities is positive and significant on the out-farm labor migration over time. Taking these two effects together, our elasticity estimate shows that a 1% increase in remittances inflows from a country's stock of international migrants reduces out-farm labor migration rate by only 0.1% over time. The other results are also consistent with Harris–Todaro expected income hypothesis of labor migration. At the margin, farm labor responds to higher income levels in the off-farm sector, relative to the farm sector. Furthermore, macroeconomic factors related to the probability of finding off-farm employment plays a significant role in the prospective migrant's decision to change occupations.

From a policy perspective, our main finding of the impact of international migrant remittances on out-farm labor migration should be of interest to policymakers and practitioners alike. The policy issue facing national leaders in the developing world is whether international migration, through migrant remittances, can facilitate development in migrant-sending communities and, thus, improving the economic welfare of nonmigrating residents[27] (e.g., Djajic 1986) or deprive migrant-sending communities of their labor and capital, crowding out local

[27] This is the "developmentalist" view of migration.

production of tradeable goods, and thereby worsening the economic welfare of nonmigrating residents[28] (e.g., Rivera-Batiz 1982). Our results indicate that international migrant remittances positively affects migrant-sending economies; it slows the rate of out-farm labor migration by supplementing household consumption which help maintain agricultural jobs. The consumption expenditures may trigger productive investments by other households or producers, either within or outside the migrant-sending economies or both. This effect will be larger, especially, where migrant-sending economies (mostly rural economies) are integrated with regional or urban markets provided the consumption expenditures favor goods produced domestically, with relatively labor-intensive production technologies and few imports (Taylor 1999). This finding aligns with the "developmentalist" view of international migration. Therefore, it is not surprising that temporary labor out-migration is now being pursued by most governments in the developing world as a conscious pro-poor development policy.[29]

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[28] This is the "Dutch disease" view of migration.
[29] See O'Neil (2004) for the case of the Philippines.

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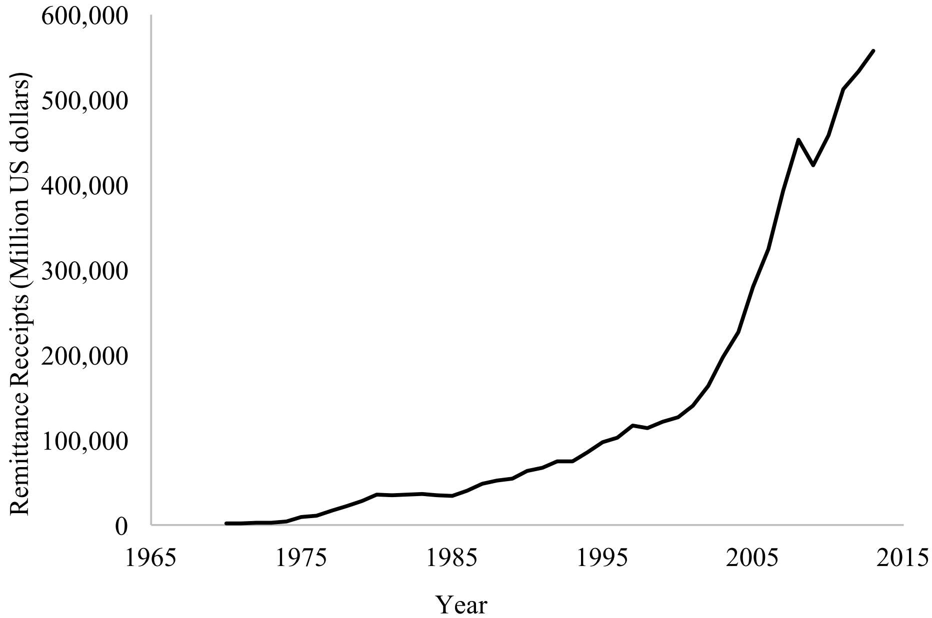

Figure 1. International Migrant Remittances, 1970-2013. Source: Authors' own based on World Development Indicators dataset, 1970-2013.

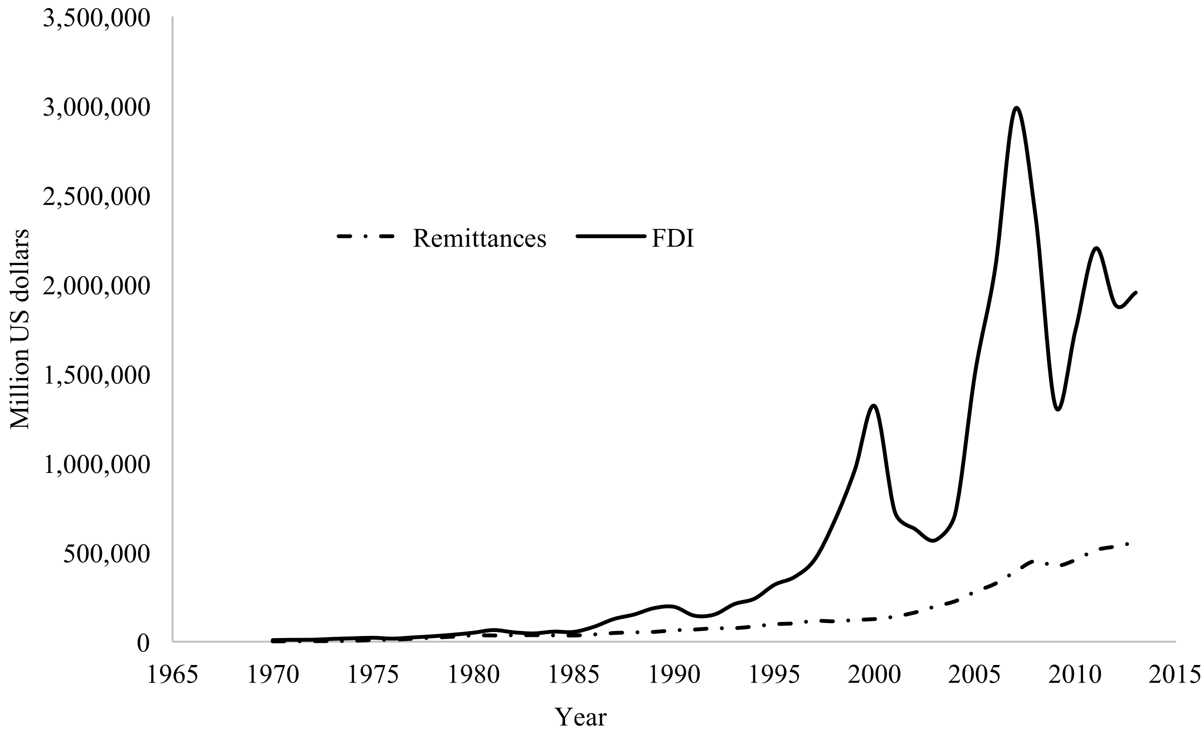

Figure 2. International Migrant Remittances and Net Foreign Direct Investment Inflows, 1970-2013. Source: Authors' own based on World Development Indicators dataset, 1970-2013.

Table 1. List of Countries used

Albania	1993-2010	Indonesia	1991-2010	Philippines	1991-2010
Algeria	1991-2010	Israel	1991-2010	Poland	1995-2010
Argentina	1993-2010	Jamaica	1991-2010	Romania	1995-2010
Armenia	1996-2010	Jordan	1991-2010	Russia	1995-2010
Bangladesh	1991-2010	Kenya	1991-2010	Senegal	1991-2010
Barbados	1991-2010	Kyrgyzstan	1994-2010	Slovakia	1994-2010
Belize	1991-2010	Lao DPR	1991-2010	Slovenia	1993-2010
Benin	1991-2010	Latvia	1997-2010	South Africa	1991-2010
Bolivia	1991-2010	Lesotho	1991-2010	Sri Lanka	1991-2010
Botswana	1991-2010	Lithuania	1995-2010	Swaziland	1991-2010
Brazil	1991-2010	Malawi	1995-2010	Syria	1991-2010
Cameroon	1991-2010	Malaysia	1991-2010	Thailand	1991-2010
China	1991-2010	Maldives	1991-2010	Togo	1991-2010
Colombia	1991-2010	Mali	1991-2010	Tunisia	1991-2010
Costa Rica	1991-2010	Malta	1991-2010	Turkey	1991-2010
Cote d'Ivoire	1991-2010	Mauritius	1995-2010	Ukraine	1997-2010
Croatia	1994-2010	Mexico	1991-2010	Yemen	1991-2010
Cyprus	1991-2010	Mongolia	1999-2010		
Czech Republic	1994-2010	Morocco	1991-2010		
Dominican Republic	1991-2010	Mozambique	1991-2010		
Ecuador	1991-2010	Myanmar	1991-2010		
Egypt	1991-2010	Namibia	1991-2010		
El Salvador	1991-2010	Nepal	1994-2010		
Estonia	1995-2010	Nicaragua	1993-2010		
Fiji	1991-2010	Niger	1991-2010		
Ghana	1991-2010	Pakistan	1991-2010		
Guatemala	1991-2010	Panama	1991-2010		
Guyana	1993-2010	Papa New Guinea	1991-2010		
Honduras	1991-2010	Paraguay	1991-2010		
India	1991-2010	Peru	1991-2010		

Table 2. Data source, description and summary statistics.

Variables	Type	Definition	Source	Mean	Std. Dev.	Min.	Max.	No. obs.
m_t	Rate	Growth rate in total labor force less growth rate in agricultural labor force	FAO	0.02	0.02	-0.07	0.36	1462
RR_t	Ratio	Value-added per worker in nonagricultural sector/Value-added per worker in agricultural sector	FAO	5.02	5.13	0.32	43.79	1462
RL_t	Ratio	Total labor force in nonagricultural sector/Total labor force in agricultural sector	FAO	5.78	12.39	0.07	147.86	1462
U_t	Rate	Total unemployment rate	WDI	9.52	6.31	0.70	39.30	1462
RP_t	Ratio	Nonagricultural real GDP deflator/Agricultural real GDP deflator	FAO	0.95	0.17	0.19	2.07	1462
RM_t	Ratio	Total remittances/GDP	WDI	0.04	0.07	0.00	0.72	1462
rr_t		$\log(RR_t)$		1.28	0.80	-1.13	3.78	1462
rl_t		$\log(RL_t)$		0.81	1.34	-2.63	5.00	1462
u_t		$\log(\mathrm{U}_t)$		2.04	0.68	-0.36	3.67	1462
rp_t		$\log(RP_t)$		-0.07	0.20	-1.67	0.73	1462
rm_t		$\log(RM_t)$		-4.18	1.57	-9.98	-0.33	1462

Note: GDP=Gross domestic product

Table 3. Diagnosing persistence in endogenous series

Variables	OLS	Within	DIF-GMM[a]	DIF-GMM[b]	SYS-GMM[a]	SYS-GMM[b]
			Dependent variable: m_t			
m_{t-1}	0.466**	-0.156***	-0.141***	-0.113***	-0.123***	-0.098***
	(0.195)	(0.033)	(0.025)	(0.031)	(0.027)	(0.031)
AR(1) test (p-value)			0.10	0.10	0.11	0.10
AR(2) test (p-value)			0.24	0.38	0.31	0.49
Hansen test (p-value)			1.00	0.22	1.00	0.22
Number of instruments			189	84	190	85
Number of countries		77	77	77	77	77
No. obs.	1385	1385	1308	1308	1385	1385
			Dependent variable: rr_t			
rr_{t-1}	1.000***	0.814***	0.563***	0.266	0.937***	0.961***
	(0.004)	(0.034)	(0.095)	(0.176)	(0.029)	(0.025)
AR(1) test (p-value)			0.00	0.05	0.00	0.00
AR(2) test (p-value)			0.29	0.33	0.29	0.29
Hansen test (p-value)			1.00	0.37	1.00	0.60
No. instrument			189	84	190	85
No. countries		77	77	77	77	77
No. obs.	1385	1385	1308	1308	1385	1385
			Dependent variable: rm_t			
rm_{t-1}	0.948***	0.813***	0.862***	0.857***	0.842***	0.842***
	(0.011)	(0.023)	(0.028)	(0.054)	(0.031)	(0.032)
AR(1) test (p-value)			0.00	0.00	0.00	0.00
AR(2) test (p-value)			0.34	0.34	0.34	0.34
Hansen test (p-value)			1.00	0.35	1.00	0.42
No. instruments			189	84	190	85
No. countries		77	77	77	77	77
No. obs.	1385	1385	1308	1308	1385	1385

Note: Year dummies included in all equations. Robust standard errors in parentheses.

[a] uses endogenous regressor dated $t-2$ and longer as instruments.

[b] uses endogenous regressor dated $t-2$ through to $t-5$ as instruments.

***, **, * denote significance at the 1%, 5%, and 10% levels, respectively.

Table 4. Marginal impact of international remittances on out-farm labor migration

Variables	1	2	3	4	5	6
m_{t-1}	-0.073*	-0.074*	-0.090**	-0.078**	-0.107***	-0.135***
	(0.037)	(0.038)	(0.040)	(0.039)	(0.038)	(0.041)
rr_{t-1}	0.001	0.007	0.015	0.012**	0.011	0.008
	(0.009)	(0.012)	(0.010)	(0.006)	(0.007)	(0.006)
rl_{t-1}	0.011**	0.013***	0.012***	0.012***	0.011***	0.011***
	(0.005)	(0.005)	(0.002)	(0.002)	(0.002)	(0.003)
u_{t-1}	-0.004	-0.004	-0.004**	-0.004**	-0.003*	-0.003*
	(0.003)	(0.003)	(0.002)	(0.002)	(0.002)	(0.002)
rp_{t-1}	-0.002	-0.001	0.001	0.001	0.002	-0.000
	(0.004)	(0.006)	(0.004)	(0.004)	(0.005)	(0.004)
rm_{t-1}		-0.003	-0.005	-0.004**	-0.003**	-0.003**
		(0.002)	(0.003)	(0.002)	(0.002)	(0.001)
$rr_{t-1} * rm_{t-1}$			0.003*	0.002*	0.002*	0.002*
			(0.002)	(0.001)	(0.001)	(0.001)
AR(1) test (p-value)	0.10	0.11	0.11	0.10	0.10	0.12
AR(2) test (p-value)	0.74	0.75	0.60	0.69	0.45	0.29
Hansen test (p-value)	0.12	0.27	0.96	1.00	1.00	1.00
Number of instruments	58	76	94	162	226	286
Number of countries	77	77	77	77	77	77
No. obs.	1385	1385	1385	1385	1385	1385

Note: Year dummies included in all equations. Robust standard errors in parentheses. Columns 1–3 use only instruments dated $t-2$. Column 4 uses only instruments dated $t-2$ and $t-3$. Column 5 uses only instruments dated $t-2$ through to $t-4$. Column 6 uses only instruments dated $t-2$ through to $t-5$.

***, **, * denote significance at the 1%, 5%, and 10% levels, respectively.

Table 5. Elasticity estimates

Variables	Short-run	Long-run
RR_{t-1}	0.190	0.176
	(0.224)	(0.210)
RL_{t-1}	0.535***	0.496***
	(0.088)	(0.089)
U_{t-1}	-0.166**	-0.154**
	(0.072)	(0.068)
RP_{t-1}	0.062	0.057
	(0.172)	(0.161)
RM_{t-1}	-0.056*	-0.052*
	(0.033)	(0.031)
No. obs.	1385	1385

Note: The elasticities are calculated at the sample means. Standard errors in parentheses are calculated by the delta method.
***, **, * denote significance at the 1%, 5%, and 10% levels, respective.

Table 6. Marginal impact of international remittances on out-farm labor migration (Static Panel GMM)

Variables	1	2	3	4	5	6
rr_{t-1}	0.005	0.007	0.013	0.013**	0.005	0.007
	(0.010)	(0.009)	(0.009)	(0.006)	(0.005)	(0.005)
rl_{t-1}	0.011**	0.012***	0.011***	0.011***	0.009***	0.010***
	(0.004)	(0.003)	(0.001)	(0.002)	(0.002)	(0.003)
u_{t-1}	-0.004	-0.004*	-0.003**	-0.004**	-0.003	-0.003
	(0.002)	(0.002)	(0.001)	(0.001)	(0.002)	(0.002)
rp_{t-1}	-0.000	0.000	0.001	0.002	0.001	0.000
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
rm_{t-1}		-0.001	-0.004	-0.004**	-0.002**	-0.003**
		(0.001)	(0.003)	(0.001)	(0.001)	(0.001)
$rr_{t-1} * rm_{t-1}$			0.002	0.002**	0.002*	0.002**
			(0.001)	(0.001)	(0.001)	(0.001)
AR(1) test (p-value)	0.10	0.10	0.10	0.10	0.10	0.10
AR(2) test (p-value)	0.59	0.59	0.58	0.58	0.57	0.57
Hansen test (p-value)	0.25	0.76	0.62	1.00	1.00	1.00
No. instruments	40.00	58.00	76.00	127.00	175.00	220.00
No. countries	77.00	77.00	77.00	77.00	77.00	77.00
No. obs.	1385	1385	1385	1385	1385	1385

Note: Year dummies included in all equations. Robust standard errors in parentheses. Column 1–3 uses instruments dated only $t-2$. Column 4 uses instruments dated $t-2$ and $t-3$. Column 5 uses instruments dated $t-2$ through to $t-4$. Column 6 uses instruments dated $t-2$ through to $t-5$. ***, **, * denote significance at 1%, 5%, and 10%, respectively.

Table 7. Elasticity estimates from static panel GMM estimation

Variables	Estimates
RR_{t-1}	0.226
	(0.210)
RL_{t-1}	0.503***
	(0.097)
U_{t-1}	-0.160**
	(0.065)
RP_{t-1}	0.105
	(0.176)
RM_{t-1}	-0.052
	(0.035)

Note: Robust standard errors in parentheses; ***, **, * denote significance at the 1%, 5%, and 10% levels, respectively