

# Are remittances a source of saving and investment in Mexico? A regional analysis of the households' behavior

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## *Resumen*

El artículo analiza las remesas en los hogares receptores que tienen ingresos adicionales por negocios y otras fuentes. Se considera que un hogar que recibe remesas y que además desarrolla alguna actividad productiva invertirá en la ampliación u operación del negocio de la familia. Con base en información de la encuesta ENIGH 2004, se utiliza un modelo Probit y de prueba de hipótesis para estimar la existencia del uso productivo de las remesas en los hogares, aproximado por las variables ahorro, erogaciones financieras y liquidación de balances negativos. Los resultados no muestran diferencias en la utilización de remesas de otros ingresos, pero hay una determinación significativa sobre el ahorro y las erogaciones financieras, no así en la liquidación de balances negativos de negocios propios.

*Palabras clave:* remesas, inversión productiva, negocios familiares, migrantes.

## *Abstract*

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This paper analyzes remittances in the receiver households that have additional incomes from businesses and other sources. It is considered that a household which receives remittances and besides carries out some other economic activity will invest on the improvement or operation of the family business. Based on information from 2004 ENIGH Survey, Probit model and proof of hypothesis are used to estimate the existence of the productive use of remittances at the households, approximating by the savings, financial expenditures and clearance of negative balances. The results do not show differences in the use of remittances from other incomes, however, there is a significant determination on saving and financial expenditures, not so in the clearance of negative balances of own businesses.

*Key words:* remittances, productive investment, familial business, migrants.

## Introduction

The present study seeks to determine to which extent remittances have become a factor of economic growth, from the viewpoint of the financing productive investment; in particular, and due to the magnitude and fast growth of remittances in Mexico, it is important to determine the characteristics and specific weight these monetary resources have on productive investment in the recipient households.

In views of identifying the productive use of remittances in Mexican households, the present work analyzes the use of remittances in the recipient households which have as an additional income source a business of their own. We start from the supposition that a household or a family that receives remittances and besides carries out some productive activity will be prone to use these resources to invest on an extension or operation of the family business compared to another family which does not have said economic contribution.

Traditionally, domestic units have been the main object of research of the destination of remittances; consequently, the use of micro-data is a tool commonly used in this sort of research and the present study is not the exception. With data from the 2004 National Survey on Incomes and Expenditures of the Households (ENIGH), and using a binary model, the probability of productively invest the resources from abroad is estimated for the households that receive remittances and incomes derived from family business.

The study is composed of four sections. In the first one the theoretical aspects of the migration-productive investment relation are presented. In the second section the economic characteristics of the recipient households and the weight of these resources in productive investment are analyzed. In the third, the theoretical aspects and the methodology to estimate the determinants of the use of remittances to finance productive activities are presented. The fourth section contains the results from the estimations of the econometric model and finally, in the fourth entry the conclusions of the research are presented.

The results suggest that the utilization of remittances cannot be distinguished from other uses given in the households to resources at hand in the case of the analyzed group. The three sources of income considered in our sample show a significant determination on the saving and financial expenditures, nevertheless in order to pay negative balances off only the incomes from the business are accountable for, which was verified applying a hypothesis test to the results of the base model.

## **Theoretical aspects**

From the theory of migration and the study of remittances at international level the causes that determine their sending by migratory workers to their relatives are still being discussed. Contrary to that assumed by many researchers, it is stated that remittances do not have the same role in economic growth as foreign direct investment and other capital flows, and prove they are guided by revenues,

but are compensatory transfers that have a negative relation to the growth of GDP, contrary to capital flows that are guided by revenues and are positively correlated to the growth of economy (Chami *et al.*, 2005).

These authors model the causes of remittances to demonstrate whether their behavior is similar to that of other capital flows. Another demonstration — carried out by means of an aggregated panel data of 113 countries along 29 years—is the countercyclical nature of remittances, which is consistent with the implication of the utilized model according to which remittances are compensatory transfers. These results imply that remittances do not act as a source of capital for economic development; besides, the countercyclical nature of remittances is verified as well in the studies by countries, for instance on India, that by Gupta (2005).

The previous lines contrast with traditional theories of migration, for which, as summarized by Venturini, remittances from migrants contribute to finance the economic growth of the countries of origin and are treated as capital growth. The author also distinguishes that remittances have important effects on the distribution of income, on the standards of life of the recipient families, on the national consumption and on prices (Venturini, 2004: 44).

A precept established by the literature on the economy of remittances—even before the appearance of the New Economy of Labor Migration—attributed the family bond, in the shape of mutual care, the probable first cause of sending remittances, as it is described by Johnson and Whitelaw (1974), and Lucas and Stark (1985). In Mexico, even if altruism is important to explain the reasons why migratory workers send funds to their families, it is possible that this is not the most important cause, because of the diversification reached by the migratory phenomenon, associated with the increment of unemployment in the labor sector corresponding to mid and high educational levels and because, increasingly Mexican migration affects urban centers.<sup>1</sup>

Other theories point out that there are reasons of self-interest or convenience to send money, where the family is seen as a business or as a contractual bond that allows the members to have arrangements that improve their wellbeing as in the sense of Pareto. Lucas and Stark (1985), for instance, suggest that migrants may have investments that they need to look for while they are away and use other members of their family as agents, in a relation where remittances

<sup>1</sup> This is also applicable to the theories of migration that state that it is the family and not the individual who decides on the migration of its members, which implies that remittances would correspond to the contractual arrangement derived from this compromise.

are sent to care for the interests of the sender, which also includes a compensation for the agent.

Another potential role of the family is that of financial intermediary, as it has been suggested, among others, by Stark (1991) and Gubert (2002), where family works as an insurance company that protects all of its members from possible *shocks*, diversifying the sources of income. Piorine (1997), and Ilahi and Jafarey (1999) model the family as a bank that finances the migration of some members, in such manner that remittances become a sort of repayment of the lending.

Two approaches have been distinguished in the literature on remittances from migrants, according to the study by Elbadawi and Rocha (1992), an approach on endogenous migration and that of the portfolio approach. The approach of endogenous migration is based on the economy of the family, which includes but is not limited to motivations on the basis altruism. On the other side, the approach of portfolio separates the decision of sending from that of emigrate, thus avoiding the topic of the familial ties; under this approach, the migrant earns money and decides how to distribute his income between actives in the residence country and actives in the country of origin. The perspective of portfolio is therefore an informal theory of remittances that supports the vision that these behave as other capital flows.

Under the endogenous approach the group of variables includes economic data that describe the conditions faced by the migrant and the family, as well as demographic data that describe the strength of the familial ties or the existence of other familial arrangements. For instance, the longer the migrants are in the host country, the less the desire to send money is assumed since they begin to think of themselves as permanent migrants who have made an own independent household. In the vision of portfolio, the rates of return of the different assets, or differential returns, may influence on the remittances. The variables used in these studies include the differentials of the interest rate on accounts of comparable deposits, which are offered in the host country and in the country of origin; in the case, some exchange prize in the black market; the return on real estate activity in their own country; inflation rates and other returns. Likewise, political risk and uncertainty might affect the decision of sending as well.

In the international sphere, the topic of sending familial remittances associated to the problem of migration of Mexican workers toward the United States has transcended in recent years from the approaches focused on the estimation of the annual amount of these remittances, to the consideration of the economic impacts of the amounts received by the relatives of the migratory workers in U.S. From the works interested in estimating the annual amounts, such as those by

Cornelius (1978), Díez-Canedo (1984), García and Griego and Giner de los Ríos (1985), Nolasco (1991), Massey and Parrado (1993), Corona (1994), Lozano Ascencio (1992, 1996), Durand and Arias (1997), etc., there was a change towards the consideration of the economic impact of the remittances, especially their contribution to the economic growth. In this respect, a number of researches have been made —sometimes with microeconomic variables and other with variables of the macroeconomic kind— using methods such as that of co-integration of remittances and that of the analysis of GDP (Castillo, 2001). Likewise, there are researches that are oriented to analyze the impact of remittances on regional economic development, among which distinguishable are the work by Mendoza and Calderón (2006), which seeks to estimate the impact of remittances in the ratio of per-capita GDP growth, by means of the estimation of the impact of financial flows in the economic growth of Mexico, remittances included. Additionally, on the side of consumption panel models applied to aggregated consumption and the consumption of families have been established (Díaz, 2004), and probabilistic methods applied to the use of remittances as current consumption, productive investment and human capital (Díaz, 2005) or of economic accountancy (Zárate, 2004) have been occupied in tracing the funds constituted by the families and their expression in the sphere of economic relations.

What most of the recent studies have verified is that it is not possible to demonstrate a parametrical association between the increment of money sent as remittances and economic growth because for the period that comprehends the available information on remittances in the Bank of Mexico, a series that displays a very accelerated dynamic tendency, the economy of the country has undergone phases of productive stagnation and low economic growth. These results, as we have seen before also coincide with recent analysis applied to the international sphere.

A relatively frequent argumentation consists in affirming that remittances have a low economic potential for they are largely destined to support familial consumption, and do not work for increasing saving or generating the productive spaces that allow the families not to use these incomes in the future. Some have tried to demonstrate this affirmation (Zárate, 2004), others challenge the validity of the argumentation that remittances must have a productive use, especially when these are substitutive of wages that workers do not receive in Mexico when they go to work to the United States (Canales, 2004), or that remittances have a compensatory character (Chami *et al.*, 2005), yet it is obviously a wrong argumentations since it supposes that said resources will be unproductive if they

are consumed but will be productive if invested, which contradicts the basic theory of the circular flow in economics.

The economic problem to be considered in the analysis of remittances lays in the fact that for the migrant and their family, the adventure of leaving the country to work in the northern country must be translated in a more accelerated social and economic promotion, and this is expected to appear as greater saving and greater capitalization of the familial income, through the substantive increment in the familial patrimony and the generation of additional or alternative sources of income, such as the formation or consolidation of an own business that allows in time the return and stay of the migratory worker.

A reasonable supposition, not considered in many of the previous researches, is that the probability of productive use of remittances tends to increase when the recipient families have developed mercantile activities or businesses before, where the resources from abroad may be destined.

So as to find these determinants of the productive use of remittances in the core of Mexican households, apart from the contribution to the economic growth these remittances may have, the present work outlines as an objective to analyze the destination of remittances of the households in Mexico which have an own business as an additional source of income.

## **Characteristics of the remittance-recipient households**

The National Survey on Incomes and Expenditures of the Households (ENIGH), edition 2004, offers a social and economic panorama precise to comprehend the most important characteristics of Mexican migrants and their families, as well as those whom they sent money periodically to. Many analyses and researches have been done on the families of the international migrant workers, that is why, in the best of cases, this diagnosis is aimed at updating many affirmations supported on this economic phenomenon and, perhaps, try to document some new tendencies that may be obtained from the adequate review of the figures from ENIGH 2004.

In order to study this problem at its national scale a distinction between the size of the localities or communities of the recipient households is established, considering the number of households at geographic scale, the amount of incomes received and the gender of the head of family. This allows making a first approach to the study of remittances, considering their geographic distribution, the gender of the head, who is assumed to be responsible for the spending of the

received remittances, which in a certain manner signalizes the potentialities of the use of resources.

Slightly above 50 percent of the households that receive remittances are located in settlements or communities under 2500 inhabitants, which seize circa 42 percent of the total of remittances sent to the country. Another important group is located in larger cities, where one finds 25 percent of the remittance-receiving households, and 36 percent of the remittances is seized. The other 25 percent belongs to communities between 100 thousand inhabitants and 2500, to them corresponds the remaining 22 percent of the money sent.

It may be concluded that the geographic distribution of the remittance-receiving households is concentrated on the rural zones of the country and the reception of money is divided into important amounts destined for the countryside and large cities. This implies that, if we consider the average sending of remittances, it is observed that in rural zones the average of the money received per household is lower than the average received in urban areas.

Following, in line with the original perspective in geographic distribution of the remittance-receiving households and the amount of said remittances, we consider the variable of gender of the family head as it is shown in table 1. We observe that in communities below 2500 inhabitants, the largest number of households has a man as a head (51.5 percent); however, the amount of resources in the spatial reference is slightly superior in the case of female heads (52.5 percent of the resources vs. 47.5 in the households with a male head). This distinction, seemingly trivial, is important actually, for it expresses the kinship between the migrant workers and the family that receives the money they sent. Hence, it might be reasonably assumed that households with a female head would correspond to the nuclear family of the worker, whereas those with a male head would correspond to a family where the migrant worker is a member, say a single son who goes to the United States and sends money to their parents. Likewise, it may be reasonably assumed that in the first case the amounts of money sent will be greater than in the second, given the degree of economic dependence of each of these families in respect to the remunerations the worker receives.

In cities with over 100 thousand inhabitants this relation between the number of households-amount of remittances is inverted from what is appreciated in the small communities, in this very case the number of households with a female head is larger (52.1 vs. 47.9 percent with a male head), nonetheless the households with a male head of family are those which receive a larger amount of resources (58.2 vs. 41.8 percent).

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TABLE I  
CHARACTERISTICS OF THE HOUSEHOLDS THAT RECEIVED QUARTERLY REMITTANCES IN 2004

	100 thousand and more inhabitants	Between 15 thousand and 99 thousand inhabitants	Between 2500 and 14 999 inhabitants	Under 2500 inhabitants	Total
<i>Households</i>	359 178.0	22 151.0	131 084.0	725 748.0	1 738 161.0
Quarterly amount of remittances (million MXN)	4 295.9	1 720.2	898.8	4 943.7	11 859.0
<i>Remittances to head of family by gender</i>					
Women	187 224.0	115 541.0	69 440.0	324 713.0	696 918.0
Remittances	1 795.7	835.1	657.9	2 931.2	6 220.0
Men	171 954.0	106 610.0	61 644.0	401 035.0	741 243.0
Remittances	2 500.2	885.0	241.0	2 012.5	5 639.0
<i>Percentages of total participation</i>					
Women	52.1	52.0	53.0	44.7	48.5
Remittances	41.8	48.5	73.2	59.3	52.5
Men	47.9	48.0	47.0	55.3	51.5
Remittances	58.2	51.5	26.8	40.7	47.5
<i>Average remittances by household</i>					
Women	9 591.1	7 227.7	9 474.2	9 027.1	8 924.8
Men	14 540.0	8 302.5	3 908.7	5 018.2	7 607.2
Total	11 960.3	7 743.5	6 857.0	6 711.9	8 245.7

Source: own elaboration with data from ENIGH 2004.

It is worth mentioning that the average of income from remittances received by the households keeps a direct relation with the size of the localities where said households are settled. The amounts are larger in the largest communities and tend to be smaller as one descends in the scale of localities.

Another relevant datum that may affect the use of remittances for ends different to consumption, this is to say for saving or investment on some business, is the demand of consumption goods in the recipient families. It may be assumed that consumption expenditures will be higher as the number of members of the family increases; comparatively, a household with many members will spend more on supporting them than a household with few members, preserving the other variables steady.

Extending this, it might be assumed that a household with many members is a household with a large or numerous family, nevertheless not every case is

TABLE2  
REMITTANCE-RECEIVINGHOUSEHOLDS  
CLASSIFIEDBYNUMBEROFMEMBERS,2004

Number of members	100 thousand inhabitants and more	Between 15 thousand and 99 inhabitants	Between 2500 and 14999 inhabitants	Under 2500 inhabitants	Total
1	14 172	19 525	9 418	16 808	59 923
2	55 236	36 529	23 259	131 961	246 985
3	59 762	41 580	26 990	137 828	266 160
4	84 572	52 812	26 107	130 806	294 297
5	52 956	37 423	23 352	103 421	217 152
6 and more	80 805	30 706	21 424	187 475	320 410
<i>Total</i>	<i>347 503</i>	<i>218 575</i>	<i>130 550</i>	<i>708 299</i>	<i>1 404 927</i>
<i>Percentage participation</i>					
1	4.1	8.9	7.2	2.4	4.3
2	15.9	16.7	17.8	18.6	17.6
3	17.2	19.0	20.7	19.5	18.9
4	24.3	24.2	20.0	18.5	20.9
5	15.2	17.1	17.9	14.6	15.5
6 and more	23.3	14.0	16.4	26.5	22.8

Source: own elaboration with data from ENIGH 2004.

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necessarily so. The available figures indicate that families that receive remittances tend to be numerous, with 6 or more members, which is particularly true for the households in rural areas that, as we have seen before, represent the largest proportion of recipient households.

By and large, most of the recipient households, independently from where they are, belongs to households with six or more members (22.8 percent of the total), nonetheless in the particular case of communities below 2500 inhabitants, which as seen represent more than 50 percent of the total of the households that receive remittances, the percentage of households with six or more members surpasses 26 percent. In localities with more than 100 thousand inhabitants the households with four members are predominant, however, the families with six or more members also represent an important group in this segment; in the other two sorts of localities, the most frequent family size is four members, and even only three, as it is the case of the communities with fewer than 15 thousand inhabitants and more than 2500 (20.7 percent). From this, it can be concluded that in most of the households which receive remittances, and that receive the most important amounts of these resources, it is difficult to avoid destining a large portion of remittances to the households' consumption and functioning, as they are used for supporting families with numerous members.

Finally, on the basis of the analyzed variables, now the total of the population benefitted from the reception of remittances in Mexican households is estimated

TABLE3  
POPULATION THAT RECEIVES REMITTANCES  
BY SIZE OF RECIPIENT HOUSEHOLD

Number of members	100 thousand and more inhabitants	Between 15 thousand and 99 thousand inhabitants	Between 2500 and 14 999 inhabitants	Under 2500 inhabitants	Total
1	14 172	19 525	9 418	16 808	59 923
2	110 472	73 058	46 518	263 922	493 970
3	179 286	124 740	80 970	413 484	798 480
4	338 288	211 248	104 428	523 224	1 177 188
5	264 780	187 115	116 760	517 105	1 085 760
6 and more	589 729	210 373	166 721	1 318 048	2 284 871
Total	1 496 727	826 059	524 815	3 052 591	5 900 192

Source: own elaboration with data from ENIGH 2004.

using the previously presented classification (table 3). It is estimated that around 5.9 million people are supported to a different extent by remittances, most of this population lives in small communities in the countryside (more than 3 million individuals) and the following numerous groups live in localities with more than 100 thousand inhabitants, there are almost 1.5 million people who to a different extent are supported from this sort of resources.

The fact that the migrants' families tend to be numerous as for the number of household members explains the large benefitted population; almost 39 percent of the population benefitted with these resources corresponds to households with six or more members, which sheds some light on the social repercussion of the sort of families that receive money from abroad and the possibilities to promote the saving or productive use of remittances.

The socioeconomic characteristics of the households that receive remittances show the need that any public policy that attempts to promote the use of incomes from remittances must start from recognizing the social conditioning in the families of migrant workers, such as it has been seen in this section.

## **Determinants of the use of remittances**

Generally speaking, the effect of remittances in the accumulation of productive passives in less developed economies is related to the migrants' characteristics, the amount of remittances sent and the impact of the effect of remittances on consumption and investments at these recipient households.

Hence, it is increasingly important to study the effect of the phenomenon of remittances in economic growth and the structure of demand in the recipient households. A determinant aspect to learn how remittances impact on the regional and national economic dynamics of economies is related to the analysis of the impact of income reception from remittances on the increment of productive investments in the recipient households, an activity that is considered key for the regional and local economic growth of the migrant communities.

The economic problem to be considered in the analysis of remittances is that in for the migrants and their families, the adventure of leaving the country to work in the United States must be translated into a more accelerated economic and social retribution, and this is expected to appear as higher savings and greater capitalization of the familial income by means of the substantive increment of the family's patrimony and the generation of additional or alternative sources of income, such as the formation or consolidation of an own business that allows the migratory worker to return and settle in the future.

The analysis of the causes of the investment of incomes in own businesses is related to the decision of consumption of the households that receive remittances. That is why it is possible to establish, in agreement with Deaton (1992), that the function of utility of a remittance-receiving household may be established as presented below:

The utility expected at the remittance-receiving household  $Ur$  in  $t$  is conditional to available information  $I$  in time  $t$ . Therefore, there are sub-utility functions  $\mu(C_t)$  that in each period must make inter-temporary and additive decisions. Since information on prices and incomes is only available changing every period of time, decisions on consumption and investment are carried out every period; likewise, uncertainty, usefulness and revenues from consumption or investment decisions are considered.

In this manner, the amount of labor incomes and incomes from productive actives from an own business is considered in each period to make the decisions of consumption or investment of said period; this may be expressed as follows:

$$A_{t+1} = \left( \sum_i (1+r)(A_t + Y_{ti} - C_{tr}) \right) \dots \dots \dots (2)$$

Where the decision of invest in investment actives  $A$  in time  $t+1$  is a function of the incomes from investment through time  $t$ ;  $At$ , the incomes plus  $Yt$  and subtracting the previous period consumption  $Ct$ , considering the effect of the performances of the variables considered including the interest rate  $r$ .

Hence, independently from the local characteristics that determine the marginal propensity to invest on an own business, the investment of the recipient households would be in function of the following conditions:

Where  $Y$  is labor income,  $R$  is the amount of income from remittances and  $M$  are the local characteristics of the migrant households.

Although the theoretical analysis requires time series, it is possible to assume they come from labor incomes, the amount of incomes from remittances and the characteristics of the households in terms of productive activity and socioeconomic

aspects can be calculated. Because of this and in views of using information at macroeconomic level, a functional form of transversal cut was established to represent these relations. In this context a binary model is used to determine the probability that a remittance-receiving household, which besides has as an auxiliary source of familial incomes an own business, invest on said business those incomes from abroad, in the shape of familial remittances; thereby, the degree of probability thus becomes the indicator of the magnitude in which productive investment is a function of the income flows from remittances.

Establishing the origin of the sources that a relative uses to invest on some business property of any of the family members represents a non-observed variable: commonly in small business, incomes and expenditures are mistaken with the cash flows at the reach of the family, sometimes the net utility obtained in a day of work is destined to household consumption in time  $t+1$ , whereas the wage perceived, if any of the members works in a subordinated relation, will be destined to buy supplies or capital goods, pay off debts, etc.

The hypothesis is that remittances are somehow introduced in this circuit of money and strengthen the accounts related to support, reinvestment or expansion of the family business. ENIGH 2004 allows tracking these accounts that are linked to the business from three variables:

1. Saving at the households.
2. Financial expenditures.
3. Payment of negative balances.

These variables, it is thought, may be related to the financing of the business; perhaps the most appropriate would be the payment of negative balances, which refers to pay debts derived from the operation of businesses, nevertheless the number of observations made are low. Maybe the payment of financial expenses turns out to be relevant, since, for instance, people who have a business might acquire financial debts to cover the supplies of the business by means of a credit card, or else to cover personal expenditures caused by a lack of cash because the funds were destined for the business, etc.; the same occurs with savings, if remittances are increasing the savings of families with an own business, it is highly probable that said savings are used at any time in period  $t+1$  to strengthen the business.

To sum up, the payment of negative balances variable refers to the liquidation of debts acquired in the business in time  $t-1$ , yet not at the time  $t$ , or in the time

$t+1$ . Financial expenditures, mainly current, may be covering debts of time  $t$ , whilst the amassing of savings may be used in acquiring capital actives for the business in  $t+1$ . In any case, the three variables indicate the potentiality of the capability of investments, and the working hypothesis supposes that said potentiation of the investment capability, with a probability that is unknown, may contribute to the functioning or improvement of the family business.

The model will determine the probability of saving, financial expenditures and payment of negative balances in function of the incomes of the business, remittances and other incomes — which is a vector that aggregates incomes different from the other two, considered independent variables. In a functional form, it is represented as:

$$\begin{aligned} P_i &= E(S = 1 | OTing, Re m, Yneg) \\ P_i &= E(E_{fin} = 1 | Oting, Re m, Yneg) \\ P_i &= E(L_{bn} = 1 | Oting, Re m, Yneg) \end{aligned}$$

This is to say, the probability to save (S), make financial expenditures ( $E_{fin}$ ) and pay negative balances ( $L_{bn}$ ), given other incomes (OTing), remittances (Rem) and incomes from business (Yneg) is determined.

If we make a function where the financing (f) of the business depends on the savings (S), financial expenditures ( $E_{fin}$ ) and payment of negative balances ( $L_{bn}$ ), then we are able to estimate:

$$f = f(S, E_{fin}, L_{bn})$$

In such manner that we are also able to estimate the probability in function of the indicated variables:

$$P_i = E(f = 1 | OTing, Re m, Yneg)$$

The expected results are that remittances (Rem) impact on any or some of the three first functions of probability and also the joint probability of having available funds to strengthen the family business in the last function.

It is necessary to distinguish the way these variables were constructed. Firstly, the group that receives remittances was identified in ENIGH, then the mean of the values of saving, financial expenditures and the payment of negative passives; later, the group that receives remittances was separated and we identified in these three variables the observations that met the criterion of registering values above the mean observed in the sample and these observations were identified as binary.

Summarizing, the households which receive remittances and have own businesses are identified with a binary relation, according to the fulfillment of any of the following conditions: that they register levels of saving, financial expenditures of the payment of negative balances above the mean observed in the sample on households that receive remittances whether they have or not an own business.

## **Results**

Table 4 presents the statistical analysis of the remittance-receiving group that has an own business as an additional source of income, they are circa 32.8 percent of the total of remittance-receiving households in the country integrated with 393 sample observations in ENIGH 2004; both the incomes from business and remittances are very volatile, particularly the former, especially if we compare it to the stability of the other incomes received by these households.

The relations between mean and median, which is taken as an indicator of dispersion, it high in the incomes from business and higher than remittances, where also exists an elevated dispersion. This deviation of the mean is also appreciated in the proportion minimum/maximum income, which is higher in the case of incomes from business, as well as in the measures of standard deviation, bias and kurtosis.

The results of the *probit* model are presented in table 5; the total sample observations equal about 40 percent of the total of the recipient households (393 households in 1001 that receive remittances have a business of their own). This group has three sources of income: the business, remittances and other incomes that may come from wages, salaries, financial perceptions, et cetera. The initial results suggest that remittances in these households are utilized to a large extent for savings and other financial expenditures in general; although not significantly consistent, remittances seem to move against the increment of negative balances of those business, which would suggest that as the business loses financial equilibrium, remittances increase.

TABLE4  
DESCRIPTIVE STATISTICS OF REMITTANCE RECIPIENTS  
THAT HAVE A FAMILY BUSNIESS

	Otros ingresos	Ingresos por negocios	Ingresos por remesas
Media	7 309.4	4 408.5	5 361.6
Mediana	3970	2 400	3 000
Máximo	62 200	39 412	62 160
Mínimo	-	30	110
Desviación estándar	9 209.5	5 680.7	6 752.3
Sesgo	2.5	12.6	20.7
Kurtosis	11.8	12.6	20.7
Estadístico Jarque-Bera	16 596.6	1 999.1	5 687.6
Probabilidad	0	0	0
Suma	2 872 592	1 732 542	2 107 090
Suma al cuadrado de desviaciones	3.32E+10	1.27E+10	1.79E+10
Observaciones	393	393	393

Source: own elaboration with data from ENIGH 2004.

The results suggest that remittances help families save or pay debts, however they do not determine the operations with passives from the business; they even have an inverse relation with the variable of payment of negative balances of the business, which indicates that the higher the payment of negative balances the lower the remittances received are. The most significant results are related to the strengthening of the mechanisms of saving from the income of remittances of cash flow at the household.

Additionally, in the study a model is established to learn which the behavior would be, if the classes or sectors of the businesses of the households were considered; in spite of having found low statistical signification in this data crossing, the estimations imply that the results from the model from the base model, previously described, increase in the case of the households with business related to services providence and care and use of animals, different from hunting and fishing, nonetheless with reduced confidence limits (table 6).

Even though the results were not significant, it is distinguishable that the probability of using these three sources of income for expenses related to the

TABLE 5  
METHOD: PROBITM-BINARY

Variable	Sample: 1 393 Observations: 393			
	Probability of saving	Probability of making financial expenditures	Probability of saving + financial expenditures + negative balances	Probability of paying negative balances
C	-1.353	-1.441	-1.011	-0.752
Z statistic	-10.469	-10.939	-7.566	-6.663
Probability of saving	0	0	0	0
Other incomes (OTING)	0.0004	0.0005	-0.000003	0.0004
Z Statistic	5.064	5.717	-0.339	2.851
Probability of saving	0	0	0.735	0.004
Remittances (REM)	0.00004	0.0004	-0.00003	0.00003
Z statistic	4.035	3.792	-1.642	2.582
Probability of saving	0.0001	0.0001	0.1004	0.0098
Income from business (YNEG)	0.00003	0.00005	0.00003	0.00003
Z Statistic	2.381	4.619	2.199	4.039
Probability of saving	0.017	0	0.027	0
McFadden squared R	0.254	0.279	0.152	0.405
Squared sum of residuals	62.323	64.895	49.645	86.631
Schwartz criterion	1.069	1.064	0.896	1.326
Hannan-Quinn criterion	1.045	1.039	0.872	1.301
LR statistic	49.351	71.903	7.521	33.196
log of the mean of likelihood	-0.504	-0.501	-0.417	-0.633
Obs. with dep = 0	293	283	333	234
Obs. with dep = 1	100	110	60	159

Source: own elaboration.

financing of the business decreases in the case of agricultural, commercial and industrial activities, where a greater growing potential would be expected for the business, nonetheless, once again, those estimations were not significant (table 7).

Another important consideration was to include *dummy* variables to describe the socio-demographic characteristics of the heads of the remittance-receiving households, who theoretically would receive these funds from abroad, which is

TABLE 6  
RESULTS BY SORT OF ACTIVITY OF THE FAMILY BUSINESS

	Sample: 1 393 Observations 393			
	Variable	Coefficient	Z-statistic	Probability
C		-0.717	0.187	-3.824 0.0001
Incomes from business	0.00004	0.00001	3.007	0.003
Other incomes	0.00003	0	4.23	0
Remittances	0.00003	0.00001	2.717	0.006
Industrial	-0.037	0.21	-0.174	0.862
Commercial	-0.073	0.179	-0.405	0.685
Agricultural	-0.181	0.166	-1.086	0.277
Services	-0.279	0.193	-1.445	0.148
Animals	0.279	0.186	1.501	0.134
Forestry	0.061	0.245	0.249	0.803
Fishing and hunting	0.313	0.537	0.582	0.56
McFadden squared R	0.079		Hannan-Quinn criterion	1.342
Squared sum of residuals	84.489		Log of the mean of likelihood	-0.621
Schwartz criterion	1.409		Obs. with dep. = 0	234
LR statistic	42.215		Obs. with dep. = 1	159

Source: own elaboration.

aimed to indicate social or demographic features of the heads who potentially are better suited to productively use remittances at the household.

The obtained results suggest that a male leadership (variable: man = 1; women = 0) at the household is more important to increase the probability that these analyzed incomes go to the circuits of money related to the family business, low schooling is more susceptible to increase the potential of productively use remittances (variable: studies above secondary = 1 and secondary or below = 0) and the rest of the incomes considered; likewise, the fact that the head has an occupation (variable: employed = 1; unemployed = 0) also increases the productive potential; and finally the fact that the head is under 50 years of age (variable: > 50 = 1.5 years, and less = 0) is favorable as well to productively use these incomes.

Finally, a model of the probability to destine these three sources of income to the sum of operations related to the business was estimated, namely the operations are: savings, payment of debts or negative balances, and it was found that remittances exert lesser determination on these expense decisions than the incomes from the business and the other incomes, yet they have a certain influence because, as we see in the first estimation, foreign incomes are the main saving-generator source compared to the other sources of income here considered. Despite it is not the expected result, it is still interesting how the aggregated sum of operations related to the business is scantily susceptible to vary in relation to incomes from remittances. The incomes from the own business are heavier and are destined to pay financial expenditures and negative balances.

TABLE7  
RESULTS OF THE MODE BY SOCIO-DEMOGRAPHIC CHARACTERISTICS  
OF THE HEAD OF FAMILY

	Sample: 1 393 Observations 393			
	Variable	Coefficient	Z-statistic	Probability
C	-1.159	0.227	-5.091	0
Incomes from business	0.00003	0.00001	2.826	0.005
Other incomes	0.00003	0	4.146	0
Remittances	0.00003	0.00001	2.882	0.004
Gender	0.111	0.153	0.727	0.468
Schooling	-0.215	0.1999	-1.078	0.281
Employed	0.397	0.184	2.159	0.038
Age	-0.011	0.148	2.159	0.031
Animals	0.279	0.186	1.501	0.134
McFadden squared R	0.405	Hannan-Quinn criterion		1.319
Squared sum of residuals	85.046	log of the mean of likelihood		-0.623
Schwartz criterion	1.368	Obs. with dep. = 0		234
LR statistic	40.628	Obs. with dep. = 1		159

Source: own elaboration.

TABLE 8  
ESTIMATION OF PROBABILITY OF SAVING, FINANCIAL EXPENDITURES AND  
PAYMENT OF NEGATIVE BALANCES<sup>1</sup>

Arithmetic mean	Other incomes	Remittances	Incomes from business addition	Sum	Probability
Saving	0.282	0.224	0.124	-0.723	76.5%
Expenditures	0.282	0.212	0.242	0.659	47.5%
Payment of passives	0.328	-0.134	0.119	-1.048	85.3%
Total	0.238	0.137	0.133	0.244	59.6%
<i>Average results</i>					
Saving	0.282	0.224	0.124	-0.723	74.9%
Expenditures	0.328	0.212	0.242	0.659	72.5%
Payment of passives	-0.022	-0.134	0.119	-1.048	84.7%
Total	0.238	0.137	0.133	0.244	59.5%

Source: own elaboration.

It may be concluded that at the households where remittances are received and at the same time have a family business there is not a clear distinction on what sort of income prevails in relation to the operation, capitalization or financial management of the business, and this might be indeed a result consistent with that occurring in practice in these environments. The truth is that all of the income sources have to do with the management of the family business, including, of course, the money sent by a relative from abroad and the results obtained in this estimation reflect said circumstance.

The results from the model indicate the derive of the probabilities that the remittance-receiving households and incomes from own business invest on concepts related to the maintenance and expansion of the business. The probability that any given household acts in this manner will depend then on the distribution of resources from the three analyzed income sources. In views of obtaining an indicator of this probability, the particular application of the parameters of the model was carried out; in the first place, to the arithmetic mean of the variables that appear in table 7, this results appear in the first part of table 8; and in the second place to each of the registrations of ENIGH that fulfill the

conditions of receiving remittances and obtaining other incomes from entrepreneurial activities, the average value of these results is presented in the second part of the reference table.

As expected, the results do not show big differences; saving and making financial expenditures are the actions where the three sources of income converge, in particular, remittances are important for savings, yet the payment of negative balances is only positively related to the incomes from the very familial businesses. If we obtain the total of the three uses of the resources, this is to say, saving, expenditures and payments of negative balances, and we relate them to the three sources of income, the probability is sharply reduced (it reaches 59.5 percent) which turned out to be the indicator that was closer to the threshold of indecision, 50 percent, where the agents are indifferent to use or not those monetary resources.

## **Hypothesis testing**

The results indicate that remittances, altogether with the rest of the incomes from the family business at these households have determination on saving decisions, financial expenditures and payment of negative balances, in the proportion stated in the aforementioned coefficients. In order to verify if remittances have any influence on dependent variables a hypothesis test was run in order to prove whether said determination is statistically significant, or whether the results are a consequence of a statistical chance, in such manner that only the incomes from the business or the other incomes are those that determine the causal reasons we found.

It is about testing the null hypothesis where  $Rem = 0$  for the determination of saving, financial expenditures and payment of negative balances. With this objective, we use the test of reason of likelihood in a two-step procedure: firstly, the original model is restricted; then the values of the likelihood functions in the restricted model and those of the unrestricted are compared.<sup>2</sup>

Also, testing the hypothesis  $(Rem + Oi) = 0$  in determining the payment of negative balances to verify whether the incomes from business work to a large extent to pay negative balances.

<sup>2</sup> Probit model is a model of maximal likelihood and in this sort of model the function of likelihood is maximized, therefore the way to compare two regressions is comparing the value of said function; for the hypothesis test that includes two or more parameters F test cannot be used, because probit model does not have the addition of squared residuals to which apply the test (Schmidt, 2005).

TABLE 9  
HYPOTHESIS TEST. LIKELIHOOD RATIO TEST

Dependent variable	Lhr	LLr	Result	Squared chi (five percent) one degree of freedom Observations
Saving	-198.2	-207	17.5	3.84 Hypothesis rejected
Expenditures	-197	-204.8	15.4	3.84 Hypothesis rejected
Passives	-164.2	-165.8	3.2	3.84 Hypothesis rejected
REM hypothesis and $O_i = 0$ in the third estimation				Squared chi (five percent) two degrees of freedom
Passives	-164.2	-165.8	3.3	5.99 Hypothesis accepted

Source: own elaboration.

Be  $LL_{nr}$  and  $LL_r$  the logarithms of the likelihood function of the unrestricted and restricted models, respectively. If restrictions are true then the statistic of test  $LR=2(LL_{nr}-LL_r)$  will take the squared chi distribution with the same degrees of freedom as the number of restrictions imposed to the model. If the statistic model of the test  $LR >$  squared chi, the null hypothesis is rejected, with the opposite result the hypothesis is accepted. The results are presented in table 9, which verify the statistical signification of the families' saving decisions, as well as the decisions to make financial expenditures, nevertheless not so for the decision of paying negative balances.

In this last variable only incomes from the familial business are used, since the null hypothesis was accepted, according to which remittances and other incomes are irrelevant in determining said dependent variable.

## **Conclusions**

In this research we analyzed the probability that remittance-receiving households with entrepreneurial activities destine this money for activities related to their business as a way to illustrate to which extent there is a productive use of the remittances, in views of confronting it to the widespread belief that these resources are largely destined for consumption at Mexican households.

In the working hypothesis the probability that using these incomes in a productive manner was higher in the entrepreneurial households was postulated given the inclination of the owners of small or micro-enterprises to mix their different sources of income in the cash flow of the working capital of the enterprise or entrepreneurial activity developed.

Productive investment carried out by the households is an unobserved variable, ENIGH records information that may be used as an approximation of this productive investment: the amassing of savings, financial expenditures and payment of negative balances.<sup>3</sup> The results validate the initial hypothesis, nonetheless they yield other observations that might be useful to understand the relations between remittances and economic growth.

<sup>3</sup> An *ad hoc* variable reported in ENIGH is the purchase of productive articles which was not integrated into the model for the analyzed sample included less than 10 observations with this variable. Moreover, the information is only referred to a trimester, thus the purchase of actives out of the surveying period is not included in the database. Because of this, and since saving may lead this sort of households to acquire actives once enough capital is amassed, it was considered that the financial and saving variables might be utilized as indicators of capitalization of business.

The results suggest that the utilization of remittances cannot be distinguished from the use given to other incomes at hand in the analyzed case. Notwithstanding, the three considered sources of income show determination on savings and financial expenditures, yet as for the payment of negative balances only the incomes from the business are accounted for, as it was obtained with the hypothesis test.

In this sense certain factors that condition the capability of the recipient households to make a productive use of these resources are noticed:

The conditionality on the use of remittances in the consumption imposed by the size of recipient families; the largest part of the households that receive remittances, independently from the place of localization, have six or more members (22.8 percent of the total), yet in the particular case of the populations under 2500 inhabitants, the percentage surpasses 26 percent, so this socioeconomic characteristic suggests a probable utilization of the incomes from remittances to satisfy the needs the consumption need of households with large families.

According to the Bank of Mexico, the annual figure of familial remittances fluctuates around 21 thousand million USD, and some studies show that the average amount sent by a migrant is around 300 USD a month. If we consider the number of members of the household, these figures acquire a different dimension, taking into account that the usual household size is 6 members, then each member receives about 50 USD a month or less than two USD a day.

On the other side, most of the households or families which receive remittances have a female head as a substitute head, which indicates they are families divided by the migratory phenomenon where the availability to start productive activities is virtually nullified by the weight of house chores and childcare which they have to fulfill as the head of the family.

These restrictions in the use of remittances with productive ends were expressed in the model as the socio-demographic indicative variables; the probability of making productive use of remittances increases when the recipient household is directed by a man, under 50 years of age and with low educational level, it is also suggested that this occurs with higher probability in urban areas than in rural zones. This conclusion points at the fact that the remittances received in the cities in households with a male head possibly respond to the portfolio model, not to the endogenous migration model, which seems to be fulfilled rather in rural areas or small cities with female heads. The determining cause of the remittances is not studied in this research, yet it remains as a future line to be researched.

These results nonetheless, reinforce the idea that the possibilities of fostering remittances to be sent to a productive activity are low, given that the prevailing sort of remittances is closer to endogenous migration. Just over 50 percent of the households that receive remittances in Mexico are located in communities under 2500 inhabitants, which seize circa 42 percent of the total of remittances sent to Mexico, this shows the importance of remittances in the semi-urban and rural sectors. In the larger cities, we find 25 percent of the recipient households, which receive around 36 percent of the annual remittances; this places the highest possibilities of using the incomes from remittances in activities located in small populations oriented to primary activities.

Notwithstanding on the other side, a favorable result for the productive use is in the characteristic of the groups of households with incomes from remittances and incomes from own business, where remittances fulfill a certain complementary role of the total income, a condition that according to the theory of the cycle of life, favors investment and saving. It is estimated that from the group that receives remittances, circa 521 thousand households, only 36.3 percent register incomes from family business, and remittances are not the main income for any of the income deciles included in the analysis.

The grouping by deciles of the analyzed population shows the least relative importance incomes from remittances have compared to other incomes which amount almost 14 thousand million MXN of the quarterly 28 thousand million MXN, before 12 thousand million MXN from remittances and 2 million MXN from the incomes from business.

Finally, it was also attempted to learn if a determination could be made on the economic sectors by means of the use of variables and indicators, however the number of observations and the diversity of economic sectors included did not allow us to reach consistent results.

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