

## The effect of remittances on financial literacy in Mexico

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### Abstract

This article studies the impact of remittances on financial literacy and its components using data for ENIF 2021 in Mexico. Using instrumental variables, random matching estimators and non-parametric estimations that control for the endogeneity of remittances and other econometric challenges, the study is the first to find that remittances increase the average level of financial literacy, and its components of financial knowledge, behavior, and attitudes. The effect is not monotonic, since the study finds that remittances reduce the probability of showing high levels of literacy, as well as that of its components of financial knowledge, behavior, and attitudes. Non-parametric estimations show that remittances move the distribution of financial literacy outcomes towards the center of the distribution, which explains why average values of financial literacy outcomes are above the average. These results may indicate that households acquire financial literacy through a process of learning by doing, which shows decreasing returns. They highlight the need for specific policies to increase the level of financial literacy among households that receive remittances. The limitation of the study is the lack of panel data.

*JEL Classification: G41, G53, O15, O16.*

*Keywords: Financial literacy, Financial Behavior, Financial Attitudes, Financial Knowledge, Remittances.*

## El efecto de las remesas sobre el alfabetismo financiero en México

### Resumen

Este artículo estudia el impacto de las remesas sobre el alfabetismo financieros y sus componentes de conocimiento, comportamiento y actitud usando datos para México provenientes de ENIF 2021. Se utilizan variables instrumento, estimadores emparejados aleatorizados y estimaciones no paramétricas para controlar endogeneidad y otros problemas econométricos. Es el primer estudio en encontrar que las remesas aumentan el nivel promedio de alfabetismo financiero y sus componentes. El efecto no es monótono pues el estudio encuentra que las remesas reducen la probabilidad de que los individuos muestren altos niveles de alfabetismo, así como de sus componentes. Estimaciones no paramétricas muestran que las remesas mueven la distribución de alfabetismo financiero hacia el centro de la distribución, lo que explica por qué los valores promedios de alfabetismo financiero son mayores que el promedio. Estos resultados pueden implicar que los hogares que reciben remesas aumentan su alfabetismo financiero con la experiencia, la cual es un proceso con retornos decrecientes. Los resultados demuestran la importancia de promover la educación financiera entre la población que recibe remesas. Una limitante es que no se cuenta con datos panel.

*Clasificación JEL: G41, G53, O15, O16.*

*Palabras clave: Alfabetismo financiero, Comportamiento financiero, Conocimiento financiero, Actitudes financieras, Remesas, México*

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## 1. Introduction

Financial literacy is defined as the combination of knowledge, behavior and attitudes needed to take better financial decisions to improve welfare (Organization for Economic Cooperation and Development [OECD], 2005). Financial literacy is considered a key component to increase financial inclusion in a sustainable way (Roa, 2015).

The latest measure of financial literacy shows that on average, the global population has a financial knowledge of 61% in 2020 (OECD, 2020). Previous measures, put that figure at 33% in 2015 (Klapper et al., 2015). In the case of Mexico, financial literacy is estimated to be 32% (Klapper et al., 2015). Studies about financial literacy have been done in Mexico in recent years, to study its level among high school students in Mexico City (Villagómez, 2016; Arceo-Gómez & Villagómez, 2017), its determinants at national level (Antonio-Anderson et al., 2020; García-Mata et al., 2021), regional level (García-Mata, 2021), as well as to study its relationship with the demand for retirement funds (Hastings & Tejeda-Ashton, 2008), retirement decisions (Villagómez & González, 2014), and mathematical knowledge among the youth (Villagómez & Hidalgo, 2017).

Remittances are defined as the current transfers in cash or in kind between resident and non-resident individuals, independent of the source of income of the individual and relationship between the households (World Bank, 2023). According to estimations by the World Bank (2022), the total amount of remittances reached an amount of 621 billion US dollars in 2022. For Mexico, Banxico (2023) estimates a total of 58,497 US million dollars received in remittances in 2022. Many studies have been carried out to determine the implications of remittances for economic development, for a review see Fajnzylber and Lopez (2008). A topic that has been under studied is the relationship between the financial literacy and migration. Some authors argue that financial literacy may be needed before the migration, during the migration, during the period of reception of remittances, and later during the period of return migration (OECD, 2019). For other authors, financial literacy is needed to know the financial products available at the destination country, while for others financial literacy is needed to know the financial products available at the origin country (OECD, 2019). Some studies for the Philippines have suggested that a higher financial literacy may be related to the reception of remittances and a higher observation of investors, savers, and entrepreneurs (Opiniano, 2021). Other authors argue that Mongolian households in Japan with higher financial attitudes remit less (Murakami, 2023). In the case of Mexico, few studies have look at the relationship between remittances and financial literacy (Rios-Obregón and Vázquez-Delgado, 2022), and no studies have researched the causal effect of remittances on financial literacy.

The objective of this article is to contribute by showing the causal effect of remittances on financial literacy, using data from Mexico's National Survey of Financial Inclusion (ENIF, for its acronym in Spanish) 2021 carried out by the National Institute for Geography and Statistics (INEGI, for its acronym in Spanish) (2021). The importance of such effect stems from the fact that remittances are mostly received by electronic means (Banxico, 2023a), which implies that households need to use the financial system as they receive remittances. As explained before, if households use the financial system with little financial literacy, they can incur in risky behaviors (Roa, 2015). On the other hand, the experience acquired by households that receive remittances may generate a process

of learning by doing (Arrow, 1962), which may imply that households receiving remittances when compared with households that do not receive remittances may have more financial literacy.

Finding the causal effect of remittances on financial literacy is not a trivial matter, since it is unlikely that the reception of remittances may be considered an exogenous variable. In fact, the following econometric challenges may be found: a) endogeneity bias, since households choose whether or not to participate in migration cum remittances strategies, the unobservable components in the remittance decision may be correlated with the unobservable components of the financial literacy equation ; b) reverse causality, since by having more financial literacy individuals could learn cheaper ways to receive remittances; c) omitted variable bias, since financial literacy outcomes may depend on unobservable characteristics of individuals that may be correlated with remittance reception; d) measurement error, if individuals answered ENIF 2021 questions about financial literacy or remittance reception with error, and such error is not random, and e) specification bias if the parametric model selected specifies with error the true decision model.

This article presents four different techniques: first, it presents linear and non-linear models that will estimate the correlation between remittances and financial literacy indexes, such estimations, however, may be subject to bias because of the several reasons discussed earlier; a second technique, uses as instruments information from CONAPO (2020) about the share of households that have emigrants and circular migrants at the level of region and size of locality; a third technique uses Random Matching Estimators (Rosembaum and Rubin, 1983; Cattaneo, 2010) that offer a semiparametric estimation of the average treatment effect of receiving remittances on the treated; and a fourth technique that presents a non-parametric estimation for the distribution of financial literacy that allows to estimate the effect of remittances on the entire distribution of financial literacy.

The rest of this article is divided in the following way: the first part presents theoretical considerations about financial literacy and remittances, as well as shows the literature that has explored the relationship between the two for Mexico; the second part presents the empirical model to estimate; the third part presents the data and the results for the different econometric analysis; the fourth part concludes the paper.

## **2. Theoretical considerations**

### **2.1 Definitions**

According to OECD (2005) financial literacy is the combination of knowledge, behavior and attitudes needed to take better financial decisions to improve welfare. Financial literacy is measured using questions that search about the knowledge, behavior and attitudes that are needed to take financial decisions (Demirguc-Kunt et al., 2017).

In this paper, an index of financial literacy is constructed, which is comprised of three components that are combined linearly: financial knowledge, financial behavior, and financial attitudes.

In ENIF 2021 financial knowledge is measured by seven questions that are recommended by Lusardi & Mitchell (2007) and Klapper et al. (2015), which explore whether the individual

understands concepts of: a) inflation, b) risk and return, c) risk diversification, d) simple interest, e) the calculation of simple interest, f) the meaning of loss of purchasing power.<sup>2</sup>With these questions, the study constructs an index of financial knowledge that adds linearly the answers to the seven questions.<sup>3</sup>

Financial behavior in ENIF 2021 is measured by three questions that are recommended by Cucinelli et al. (2019) that explore whether the individual: a) considers if it can pay for something or not, b) pays its accounts on time, and c) if establishes long run goals.<sup>4</sup> By adding the answers to these questions, the paper builds an index of financial behavior.

Financial attitudes in ENIF 2021 are measured only by one question recommended by Atkinson & Messy (2012) which is whether the individuals prefer spending the money today rather than save it for tomorrow.<sup>5</sup> This question constitutes our only measure for financial attitudes.

## 2.2 Financial literacy and studies about its components

According to Huston (2010) and Das (2016), before 2016, studies about financial literacy were scarce, since more studies would specialize in the study of financial knowledge, while very few would study financial behavior or attitudes.

Klapper et al. (2015) developed a study with one hundred and forty countries to measure financial literacy. They conclude that the global level of knowledge is 33%, while for Mexico is 32%, which is below G7 countries like Germany or the US, but at the same level than other emerging countries like China and India.

Antonio-Anderson et al. (2020) use OLS methods to study the determinants of financial literacy using the ENIF 2018 for the case of Mexico. The authors conclude that age, civil status, schooling, the number of economic dependents and the income level are correlated positively with the level of financial literacy, while being a male and having a job relate negatively with financial literacy.

García-Mata et. al. (2021) study the data from ENIF 2018 to study the determinants of financial literacy and its components. The authors find that there exists a gender gap and that schooling is the more important variable explaining financial literacy. García-Mata (2021) uses ENIF 2018 with a regional focus. The author finds that only the income keeps a positive correlation with financial literacy in all the regions studied. In the case of gender, age, income, civil status, and size of locality the sign changes with the region studied.

Villagómez & González (2014) report a positive correlation between measures of wealth and financial literacy for the case of Mexico. Villagómez (2016) studies the level of financial literacy in the

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<sup>2</sup> Lusardi & Mitchell (2007) and Klapper et al. (2015) recommend 9 measures of financial knowledge, but ENIF 2021 only includes seven.

<sup>3</sup> If a question is answered correctly it is graded with a 1. If a wrong answer is obtained is graded with a zero. Then all questions are aggregated.

<sup>4</sup> Cucinelli et al. (2019) recommends four measures of financial behavior, but ENIF 2021 only includes three. A similar procedure to the one explained for financial knowledge is followed for financial behavior.

<sup>5</sup> Atkinson & Messy (2012) recommend three measures of financial attitudes but ENIF 2021 only measures one. If the question is answered correctly it is graded with a one, otherwise it receives a zero. Consequently, it forms a binary variable as the index of financial attitudes.

Valley of Mexico. It finds that the levels are low, and that there is a disadvantage for women and students from public high schools.

Arceo-Gómez & Villagómez (2017) study the level of financial literacy among high school students in Mexico City. They find that only 20% of the students understand basic financial concepts, 57% have a level of financial knowledge that is desirable and 70% have a positive financial attitude.

Villagómez & Hidalgo (2017) study the relationship between mathematical knowledge and financial literacy among young individuals in the Valley of Mexico. The authors find that mathematical knowledge have a positive correlation with the index of financial knowledge, behavior, and attitudes.

In the case of financial knowledge, studies done for Latin America concluded that there is a low level of financial knowledge in the region (García et. al., 2013). In the case of Mexico, García et al. (2013) conclude that the country shows levels of financial knowledge like those found in the rest of Latin America, except for the knowledge about the effects of inflation where Mexico shows a higher knowledge than the rest of Latin America. More recent studies based on ENIF 2018, show that Mexico has a level of financial knowledge above the global average (Oficina de Información Científica y Tecnológica para el Congreso de la Unión [Incytu], 2018).

Shim et al. (2010) show that financial knowledge is linked to gender, age, marital status, occupation, the number of economic dependents, schooling, the schooling level of parents and income. Shim et al. (2010) conclude that individuals with more job experience have higher levels of financial knowledge, while individuals with low levels of productivity or unemployed show lower levels of financial knowledge. Laibson et al. (2009) show that adults of middle age have higher levels of financial knowledge compared to younger or third age individuals. Different authors show that women have lower levels of financial knowledge (Lusardi & Mitchell, 2007; Atkinson & Messy, 2012; Incytu, 2018). Lusardi & Mitchell (2007) show that individuals with more education and access to financial information have higher levels of financial knowledge. Mandell (2008) shows that individuals whose parents have higher education also have more financial knowledge. Finally, individuals with lower levels of income also have lower levels of financial knowledge (Atkinson & Messy, 2012).

### **2.3 Determinants of remittances**

For some authors, remittances are explained by altruistic reasons under an intertemporal optimization problem (Djajic, 1989; Djajic and Milbourne, 1988). Other authors argue that remittances are part of an exchange mechanism, where household members send remittances in exchange of land or property bequests and as part of a strategy of risk diversification at the level of the household (Lucas and Stark, 1985; Stark and Lucas, 1988). A third approach looks at remittances as part of a portfolio optimization decision, where migrants send money to increase the returns on their savings (Elbadawi and Rocha, 1992). Any of these approaches implies that at the level of a household survey, remittances are an endogenous variable.

## 2.4 Empirical models to study the relationship between financial literacy, and remittances

Few studies have explored the relationship between remittances and financial education. Opiniano (2021) studies differences in the observation of investors, savers and entrepreneurs in the Philippines and finds that communities that receive remittances are more likely to show those types of individuals. Rios-Obregón and Vázquez-Delgado (2022) study the relationship between remittances and financial inclusion in Mexico, including certain variables measuring financial education as control variables, specifically whether the individual knows about the insurance that protects bank deposits. They find that their financial education variable relates negatively with their measure of financial inclusion specially for households that receive remittances. They do not use instruments for the remittance reception variable in their study. Murakami (2023) studies Mongolian migrants in Japan. They find that households with higher financial attitudes remit less.

## 3. Empirical Models

In this section, the paper applies four methodologies to identify the relationship between remittances and measures of financial literacy. The first methodology identifies the partial correlation of the  $j$ th financial literacy measure with remittances. This partial correlation suffers from bias due to the endogeneity of the remittance variable. A second methodology applies instrumental variables, by using the aggregate share of households that receive remittances at the level of the size of the locality. A third methodology applies random matching estimators that based on the estimation of the probability of remittance reception compares the levels of financial literacy of similar households. A fourth methodology uses a non-parametric methodology that compares the distribution of financial literacy outcomes for households that receive remittances, with the counterfactual distribution of financial literacy outcomes, should those households receive no remittances.

### 3.1 Linear and non-linear models

In this section, the empirical approach followed is explained. The objective is to estimate the impact of remittances  $rem$  on financial literacy indicator  $y$ . As such, the following equation is estimated:

$$y_i = \beta_0 + \beta_1 rem_i + \delta' X_i + e_i \quad (1)$$

Where  $X$  is a vector control variables age, education, an indicator variable for whether the individual has income above the mean, an indicator for whether the individual is married, an indicator for whether the individual is employed, an indicator for whether the individual dedicates to household activities, the number of household members that depend on the individual, an indicator for whether the individual is a women, the share of females in the household, the share of persons of third age in the household, the share of minors in the household, and regional dummies. The regions used are those defined in ENIF 2021 as Northwest, Mexico City, South, West, South

Central and East, and the comparison category is Northeast.<sup>6</sup> All control variables are intended to control for heterogeneity among households, trying to capture differences in the need for attaining an specific level of financial literacy, considering that these characteristics may represent different possibilities to learn and develop capabilities to use financial services.

Equation 1 is applied to the index of financial literacy, the index of financial knowledge, and the index of financial behavior. In the case of financial attitudes, we have only an indicator variable. Then, we apply the following non-linear model:

$$P(Z = 1) = \Omega(\gamma_0 + \gamma_1 rem_i + \theta'X_i + u_i) \quad (2)$$

Where  $\Omega$  is the normal cumulative distribution, and all other variables as explained before.

### 3.2 Instrumental variables estimation

Because remittances are not an exogenous variable the estimation of equations 1) and 2) are biased because of any of the following reasons: 1) there may be endogeneity bias if remittances are linked to unobserved characteristics that are correlated with unobserved components in the financial literacy equation; 2) there may be inverse causality if it is the case that individuals have accumulated financial literacy because they have experience with the reception of remittances; 3) there may be omitted variable bias if the true model to achieve a given level of financial literacy includes more variables than those included in the model and such variables are correlated with the reception of remittances; 4) there may be measurement error if the individuals answered the questions in ENIF 2021 with errors and such mistakes are not random; and 5) there may be specification bias if the true random process that explains the level of financial literacy is different from the implicit distribution assumed in the empirical model.

To obtain the exogenous effects of remittances this paper implements a strategy of using instrumental variables for remittances, an approach that has been used in the context of studying the correlation between remittances and financial inclusion outcomes by other authors (Agarwal et al., 2011; Demirguc-Kunt et al., 2011; Brown and Carmignani, 2015; Ben Naceur et al., 2020; Carrillo and Cotler, 2021). This paper uses as instruments, the average share of households with emigrants and the share of households with circular migrants by region and at the level of size of locality, which are obtained from CONAPO (2020). The regions used are those explained before, and the size of localities are also defined in ENIF 2021: localities with more than 100,000 individuals, localities between 15,000 and 100,000 individuals, localities with more than 2500 individuals and less than 15,000 individuals, and localities with less than 2500 individuals. To obtain variation at the level of the household, the paper interacts the instruments with the squared age of individuals.

The identification assumption is that the share of households with circular migrants and emigrants are correlated with remittances, but they are not related with the unobserved components

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<sup>6</sup> These regions were defined in ENIF 2021. Northwest includes the states of Baja California, Baja California Sur, Chihuahua, Durango, Sinaloa, and Sonora. Northeast includes Coahuila, Nuevo León, San Luis Potosí, and Tamaulipas. West includes Aguascalientes, Colima, Guanajuato, Jalisco, Michoacán, Nayarit, Queretaro, and Zacatecas. South Central includes Estado de México, Hidalgo, Morelos, Puebla, Tlaxcala, and Veracruz. South includes Campeche, Chiapas, Guerrero, Oaxaca, Quintana Roo, Tabasco, and Yucatán.

in the financial literacy equation. The validity of these assumptions is tested using the test of Cragg and Donald (1993) and the tables of Stock and Yogo (2005), which are shown in the section of results.<sup>7</sup>

### 3.3 Random Matching Estimators

In this section, the paper presents a semi-parametric estimation that will identify the causal effect of remittances on different financial literacy outcomes using Random Matching Estimators based on the propensity score (Rosenbaum and Rubin, 1983). The propensity score is estimated based on the probability of having remittances, which is estimated with the following equation:

$$P(\text{rem}_i = 1 | X, Z) = \varphi(Z'\pi + X'\phi + u_i) \quad (3)$$

Where  $X$  are the control variables presented before and  $Z$  is the set of instruments presented before.

The potential outcome model for the  $i$ th financial literacy outcome  $Y$  is:

$$Y = Y_1 \text{rem} + (1 - \text{rem})Y_0 \quad (4)$$

$$Y_0 = X'\beta_0 + e_0 \quad (5)$$

$$Y_1 = X'\beta_1 + e_1 \quad (6)$$

Where  $Y_0$  is the financial literacy outcome for households with no remittances,  $\beta_0$  is a vector of coefficients for households with no remittances,  $Y_1$  is the financial literacy outcome for households with remittances,  $\beta_1$  is a vector of coefficients for households with remittances,  $X$  is the vector of determinants of financial literacy outcomes,  $\text{rem}$  as defined before. It is assumed that the assignment of households into the set of households with remittances follows the next rule:

$$\text{rem} = \begin{cases} 1 & \text{if } W'\gamma + \mu > 0 \\ 0 & \text{in any other case} \end{cases} \quad (7)$$

Where  $W$  is the vector of variables that determines the participation of households into the remittance reception, i.e. vectors  $X$  and  $Z$  in equation 3. To carry out the estimation, three assumptions are needed. First, the assumption of conditional independence, which implies that after conditioning on the control variables, the potential outcomes are uncorrelated with the reception of remittances. The second assumption is called the common support assumption, which implies that all observations considered in the estimation have both probability of receiving remittances and probability of not receiving remittances. These two assumptions are known as the strong ignorability assumption (Rosenbaum and Rubin, 1983). Finally, it is assumed that there is a random

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<sup>7</sup> The estimation is carried out using the command *ivreg* from STATA 16 and the command *ivreg28* available at <http://fmwww.bc.edu/RePEc/bocode/i>



sample of households that receive remittances and that do not receive remittances (Imbens and Wooldridge, 2009).

To implement the Random Matching Estimator, the technique called the propensity score (Rosembaum and Rubin, 1983) is applied.

Define:

$$p(W, t): \text{as the propensity to participate in remittance reception} \quad (8)$$

$$\Omega_m^p = \{j_1, j_2, \dots, j_m | t_{jk} = 1 - t_i, |p_i(t) - p_{jk}(t)| < |p_i(t) - p_l(t)|, t_l = 1 - t_i, l \neq j_k\}: \text{is the set of close neighbors to propensity } p_i \quad (9)$$

m: is the number of matches used in estimation

$$\delta_1 = E(Y_1 - Y_0 | t = 1): \text{is the average effect on the treated} \quad (10)$$

The average effect on the treated is estimated by:

$$\delta_1 = \frac{\sum_{i=1}^n t_i w_i (Y_{1i} - Y_{0i})}{\sum_{i=1}^n t_i w_i} = \frac{\sum_{i=1}^n (t_i - (1 - t_i) K_m(i)) Y_i}{\sum_{i=1}^n t_i w_i} \quad (11)$$

Where:

$$K_m(i) = \sum_{j=1}^n i \in \Omega_m^p \frac{w_j}{\sum_{k \in \Omega_m^p} w_k} \quad (12)$$

$w_i$ : is the frequency for the  $i$ th observation

To obtain the variance of the average effect on the treated, Abadie and Imbens (2016) are followed.<sup>8</sup>

### 3.4 Non-parametric distributions

The empirical models implemented so far, obtain the average treatment effect of remittances. However, remittances may have an effect over the entire distribution of financial literacy. To obtain an estimation of this effect, this paper applies a methodology proposed by DiNardo et al. (1996). The estimation is carried out by using kernel density estimations, using the next equation:

$$\hat{f}_k = \frac{1}{qh} \sum_{i=1}^n w_i K\left(\frac{x - X_i}{h}\right) \quad (13)$$

<sup>8</sup> The estimation is carried out using the command *teffects* in STATA 16.

Where  $x$  are the values for the distribution of financial literacy,  $q = \sum_i w_i$  and  $w_i$  are the frequencies for observation  $i$ ,  $h$  is the bandwidth, which is estimated using the method of Parzen (1962) and the kernel function  $K(\cdot)$  is given by the formula of Epanechnikov:

$$K(z) = \begin{cases} \frac{3(1-\frac{1}{5}z^2)}{\sqrt{5}} & \text{if } |z| < \sqrt{5} \\ 0 & \text{in any other case} \end{cases} \quad (14)$$

Where  $z$  are the values for the ratio  $\frac{x-X_i}{h}$ . The identification of the effect of remittances follows the methodology of DiNardo et al. (1996), which consists in obtaining the counterfactual probability distribution for households that receive no remittances, which is obtained by multiplying each observation by the probability of having migrants,  $f_i(1)$  and divide each observation by the probability of not receiving remittances,  $f_i(0)$ , defining the following weight:

$$g_i = \frac{f_i(1)}{f_i(0)} \quad (15)$$

With the above weight, we estimate the following counterfactual distribution:

$$\widehat{f}_{k,c} = \frac{1}{qh} \sum_{i=1}^n w_i * g_i * K\left(\frac{x-X_i}{h}\right) \quad (16)$$

Where  $\widehat{f}_{k,c}$  is the counterfactual distribution,  $x$ ,  $q$ ,  $w_i$ ,  $g_i$ ,  $K(\cdot)$ , and  $h$ , as defined previously. By comparing probability masses for households with no remittances and the counterfactual distribution, we can identify the impact of remittances on the entire probability distribution of financial literacy.<sup>9</sup>

## 4. Data and Results

### 4.1 Data

The data presented in this research comes from the ENIF 2021 (INEGI, 2021). This is a nationally representative survey of 13,531 individuals. Table 1 presents average values on the different financial literacy outcomes and control variables that will be used in this research. Table 1 shows that households receiving remittances have a lower financial index when compared with the rest of the population, the difference is significant. Similarly, households receiving remittances have a lower index of financial knowledge. There are no significant differences in the index of financial behavior. They have a lower financial attitude index. When only the best scores are considered, households

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<sup>9</sup> The estimation is carried out using a routine implemented in STATA 16, based on the command *kdensity*. It is available from the author upon request.

that receive remittances have a lower share obtaining such high scores. They also have a lower share obtaining high scores in financial knowledge, behavior, and attitudes.

In the case of control variables, households with remittances have a lower fraction with high income, they have lower years of schooling, they have no differences with the rest of the population in age, civil or employment status. They have a higher share carrying out household activities and have a similar number of dependent household members. There are more women among households receiving remittances and the share of females is higher in those households. The share of third age individuals is similar, while the share of minors is higher. There are more households receiving remittances in regions 1, and 3, while there are less remittance receiving households in regions 2, 4 and 5.

**Table 1.** Average values for different variables

	All households	Households with no remittances	Households with remittances	Difference
Financial literacy index	17.45	17.46	17.36	_*
	[2.30]	[2.33]	[2.15]	
Financial knowledge index	9.92	9.94	9.82	_***
	[1.59]	[1.60]	[1.49]	
Financial behavior index	9.71	9.71	9.71	+
	[1.54]	[1.55]	[1.54]	
Financial attitude indicator	2.18	2.18	2.17	_***
	[0.72]	[0.72]	[0.71]	
Share with high financial literacy	0.18	0.18	0.16	_***
	[0.38]	[0.39]	[0.36]	
Share with high financial knowledge	0.07	0.07	0.04	_***
	[0.25]	[0.26]	[0.19]	
Share with high financial behavior	0.28	0.28	0.27	_***
	[0.45]	[0.45]	[0.44]	
Share with high financial attitude	0.36	0.362	0.357	_***
	[0.48]	[0.48]	[0.48]	
Share with remittances	0.14	Na	Na	
	[0.34]			
Share with high income	0.10	0.10	0.09	_***
	[0.30]	[0.30]	[0.28]	
School years <sup>a</sup>	9.31	9.43	8.64	_***
	[4.90]	[4.91]	[4.74]	
Age	43.96	43.92	44.26	+
	[17.33]	[17.38]	[17.04]	
Married	0.59	0.59	0.59	+
	[0.49]	[0.49]	[0.49]	
Employed	0.69	0.69	0.69	-
	[0.46]	[0.46]	[0.46]	
Household activities	0.15	0.15	0.18	+**
	[0.36]	[0.36]	[0.38]	

Number of dependent household members	1.94	1.94	1.95	+
	[0.24]	[0.24]	[0.23]	
Women	0.55	0.53	0.61	+***
	[0.50]	[0.50]	[0.49]	
Female share in household	0.52	0.51	0.54	+***
	[0.25]	[0.25]	[0.26]	
Third age share in household	0.13	0.13	0.14	+
	[0.28]	[0.28]	[0.29]	
Minor share in household	0.23	0.22	0.25	+***
	[0.23]	[0.23]	[0.25]	
Region 1	0.13	0.13	0.16	+***
	[0.34]	[0.34]	[0.37]	
Region 2	0.13	0.13	0.11	-*
	[0.33]	[0.34]	[0.32]	
Region 3	0.20	0.19	0.33	+***
	[0.40]	[0.39]	[0.47]	
Region 4	0.08	0.09	0.02	-***
	[0.27]	[0.28]	[0.15]	
Region 5	0.30	0.31	0.23	-***
	[0.46]	[0.46]	[0.42]	
Region 6	0.16	0.16	0.15	-
	[0.36]	[0.37]	[0.36]	
N	13513	11586	1927	

Source: Own calculation with data from ENIF 2021. \*\*\*Significant at 1%. \*Significant at 10%.

<sup>a</sup>The data for schooling years is only available for 6874 observations.

## 4.2 Results for linear and non-linear models

Table 2 presents results for linear and non-linear models for different financial literacy outcomes. Column 1 presents the results for the financial literacy index, which was carried out performing an OLS regression. The effect of remittances is negative but insignificant. Households with high income have .89 more points of financial literacy. Married individuals have .28 more points. Employed individuals have .38 more points. Households with more dependent members also have 1.32 points of additional financial literacy. Women have .10 more points of financial literacy. One more year of age reduces in .02 points the financial literacy index. Individuals that dedicate to household activities have .14 less points. Households with more third age individuals have .52 less points and households with more minors have .44 less points. Regional differences are statistically significant.

Column 2 presents results for financial knowledge, which is also a linear model. Results are qualitatively like those found for financial literacy. Only exceptions are that the coefficient for individuals dedicated to household activities and women are not significant.

Column 3 presents the results for financial behavior, which is also a linear model. Results are also qualitatively like those found for financial literacy. The only exception is that the coefficient for individuals dedicated to household activities is not significant.

Column 4 presents results for financial attitude, which uses a non-linear ordered probit model. As explained before, the variable takes three values. The column presents the marginal effects for the highest value, which is three. The results show that remittances reduce in .01% the probability of showing the highest value of financial attitude. The rest of results is qualitatively like what was found for financial literacy. Four exceptions are found: first, age is now positively related to achieving the highest value of financial attitude; second, household activities are positively related with achieving the highest value; third, the number of dependent members is negatively related with achieving the highest value; and fourth, the marginal effect for the female share is significant and negative.

**Table 2.** Results for linear and non-linear models of financial literacy

	<b>Coefficientes for Financial Literacy</b>	<b>Coefficients for Financial Knowledge</b>	<b>Coefficients for Financial Behavior</b>	<b>Marginal effect for Financial Attitude level 3</b>
Households with remittances	-0.04	-0.05	0.01	-0.001***
	[0.06]	[0.04]	[0.04]	[0.0002]
Share with high income	0.89***	0.44***	0.48***	0.014***
	[0.06]	[0.05]	[0.05]	[0.0002]
Age	-0.02***	-0.01***	-0.01***	0.001***
	[0.001]	[0.001]	[0.001]	[5.2x10-6]
Married	0.28***	0.17***	0.15***	0.022***
	[0.04]	[0.03]	[0.03]	[0.0002]
Employed	0.38***	0.19***	0.22***	0.011***
	[0.06]	[0.04]	[0.04]	[0.0002]
Household activities	-0.14**	-0.06	-0.05	0.018***
	[0.07]	[0.05]	[0.05]	[0.0003]
Num. of dep. HH members	1.32***	0.91***	0.39***	-0.008***
	[0.08]	[0.06]	[0.06]	[0.0003]
Women	0.10**	-0.04	0.20***	0.032***
	[0.05]	[0.03]	[0.03]	[0.0002]
Female share in household	0.03	0.09	-0.07	-0.005***
	[0.08]	[0.06]	[0.06]	[0.0003]
Third age share in household	-0.52***	-0.45***	-0.12*	-0.027***
	[0.09]	[0.06]	[0.06]	[0.0003]
Minor share in household	-0.44***	-0.34***	-0.12*	-0.015***
	[0.09]	[0.06]	[0.06]	[0.0003]
Region 2	0.15**	0.07	0.11**	0.023***
	[0.07]	[0.05]	[0.05]	[0.0003]
Region 3	0.30***	0.19***	0.14***	0.021***
	[0.07]	[0.05]	[0.05]	[0.0002]
Region 4	0.60***	0.47***	0.17***	0.024***
	[0.08]	[0.06]	[0.06]	[0.0003]
Region 5	0.50***	0.52***	0.10**	0.062***
	[0.06]	[0.04]	[0.04]	[0.0002]
Region 6	0.07	-0.02	0.18***	0.053***

	[0.07]	[0.05]	[0.05]	[0.0003]
Constant	15.23***	8.28***	8.95***	Na
	[0.20]	[0.14]	[0.14]	
R2	11.40%	9.60%	4%	Pseudo R2 0.34%
Model	OLS	OLS	OLS	Ordered Probit
N	13513	13513	13513	13513

Source: Own calculation with data from ENIF 2021. \*\*\*Significant at 1%. \*Significant at 10%.

### 4.3 Results for Instrumental Variables Estimations

Table 3 shows the results for the estimations carried out using instrumental variables. In all the linear models, two instruments were valid: the share of emigrants and the share of circular migrants; while in the non-linear model, only the share of circular migrants was a valid instrument. In all the linear models, the Sargan test shows the validity of the instruments used. In the case of the non-linear model, the Sargan test does not apply. In all the cases, the Cragg and Donald (1993) test shows that the instruments are not weak since the F is above the critical value of Stock and Yogo (2005) for a maximal IV size bias of 10%.

Column 1 presents the results for the financial literacy index. Remittances reduce in 13 points the financial literacy index. Individuals with high income have .69 more points of financial literacy. Employed individuals have .83 more points. One additional dependent household member increases in 1.43 points the financial literacy. Women have .5 more points. Households with a larger minor share have .44 more points. One more year of age reduces in .02 points the financial literacy.

Column 2 presents results for financial knowledge. Remittances reduce in 9.8 points financial knowledge. Other coefficients for control variables are qualitatively like those reported for financial literacy, except for the share of women which is positive and significant for financial knowledge.

Column 3 shows results for financial behavior. Remittances reduce 4.3 points the financial behavior index. Other coefficients are qualitatively like those presented for financial literacy, except for two results: first, married individuals have now a positive and significant coefficient; and second, the share of minors is now insignificant.

Column four presents results for the non-linear instrumental variable estimation of an ordered probit. Remittances have a negative sign but are not significant in the marginal probability of reaching the highest level of financial attitude. Other coefficients are qualitatively similar like those presented for financial literacy, except for seven coefficients: first, age is positively related to achieve the highest value of financial attitude; second, married individuals have a positive probability of achieving the highest value; third, individuals with household activities have a positive probability of reaching the highest value; fourth, households with more dependent members have lower probability of achieving a high value; fifth, households with higher share of females have lower probability; sixth, households with higher share of third age individuals have lower probability; and seventh, households with more minors have lower probability.

**Table 3.** Results for Instrumental Variables estimations for financial literacy outcomes

	<b>Coefficientes for Financial Literacy</b>	<b>Coefficients for Financial Knowledge</b>	<b>Coefficients for Financial Behavior</b>	<b>Marginal effect for Financial attitude level 3</b>
Households with remittances	-13.54***	-9.88***	-4.35***	-0.001
	[1.93]	[1.40]	[0.81]	[0.002]
Share with high income	0.69***	0.30***	0.41***	0.013***
	[0.15]	[0.11]	[0.06]	[0.0002]
Age	-0.02***	-0.01***	-0.01***	0.001***
	[0.003]	[0.002]	[0.001]	[5.3x10-6]
Married	0.15	0.07	0.10***	0.023***
	[0.10]	[0.07]	[0.04]	[0.0002]
Employed	0.83***	0.51***	0.36***	0.011***
	[0.15]	[0.11]	[0.06]	[0.0002]
Household activities	0.28	0.24*	0.09	0.019***
	[0.18]	[0.13]	[0.07]	[0.0003]
Num. of dep. HH members	1.43***	0.99***	0.43***	-0.010***
	[0.19]	[0.14]	[0.08]	[0.0003]
Women	0.50***	0.25***	0.33***	0.032***
	[0.12]	[0.09]	[0.05]	[0.0002]
Female share in household	0.34	0.31**	0.03	-0.005***
	[0.20]	[0.14]	[0.08]	[0.0003]
Third age share in household	-0.12	-0.16	0.01	-0.025***
	[0.21]	[0.15]	[0.09]	[0.0003]
Minor share in household	0.44*	0.30*	0.16	-0.015***
	[0.25]	[0.18]	[0.10]	[0.0003]
Region 2	-0.40**	-0.32***	-0.07	0.022***
	[0.19]	[0.14]	[0.08]	[0.0003]
Region 3	1.03***	0.72***	0.38***	0.022***
	[0.19]	[0.13]	[0.08]	[0.0002]
Region 4	-1.04***	-0.72***	-0.36***	0.022***
	[0.31]	[0.22]	[0.13]	[0.0003]
Region 5	-0.32*	-0.08	-0.17**	0.062***
	[0.19]	[0.13]	[0.08]	[0.0002]
Region 6	-0.42**	-0.37***	0.02	0.054***
	[0.18]	[0.13]	[0.08]	[0.0003]
Constant	16.07***	8.89***	9.22***	
	[0.47]	[0.34]	[0.20]	
Cragg Donald F	30.09	30.01	30.09	56.2
Sargan Test	0.01	0.01	0.51	NA
Model	2SLS	2SLS	2SLS	Ordered Probit

Source: Own calculation with data from ENIF 2021. \*\*\*Significant at 1%. \*Significant at 10%.

#### 4.4 Results for Random Matching Estimators

Table 4 presents results for the Random Matching Estimators. The paper estimates average treatment effects on the value of the indexes, and in the probability of achieving high values in the different indexes. Table 4 shows that remittances have a positive impact once we match observations by their probability of receiving remittances. Remittances increase in .15 points the index of financial literacy, increase in .11 points the index of financial knowledge, increase in .06 points the index of financial behavior and increase in .02 points the index of financial attitude. These results contrasts with those obtained with instrumental variables. They indicate that selectivity biases down the results of the instrumental variables.

Table 4 shows that when the probability of achieving high scores in financial literacy outcomes is studied, remittances reduce such probability in 1% for the case of financial literacy, knowledge, and behavior. In the case of attitude, the reduction is .1%. These results indicate that the effect of remittances is different over the entire distribution of financial literacy outcomes, since on average they increase those indicators, but there is a negative effect on the probability of observing high values of financial literacy outcomes.

**Table 4.** Random Matching Estimators for Financial Literacy Outcomes

	Average treatment on the treated
Index of financial literacy	0.15*** [0.001]
Index of financial knowledge	0.11*** [0.001]
Index of financial behavior	0.06*** [0.001]
Index of financial attitude	0.02*** [0.0005]
High financial literacy	-0.01*** [0.0002]
High financial knowledge	-0.01*** [0.0001]
High financial behavior	-0.01*** [0.0003]
High financial attitude	-0.001*** [0.0003]

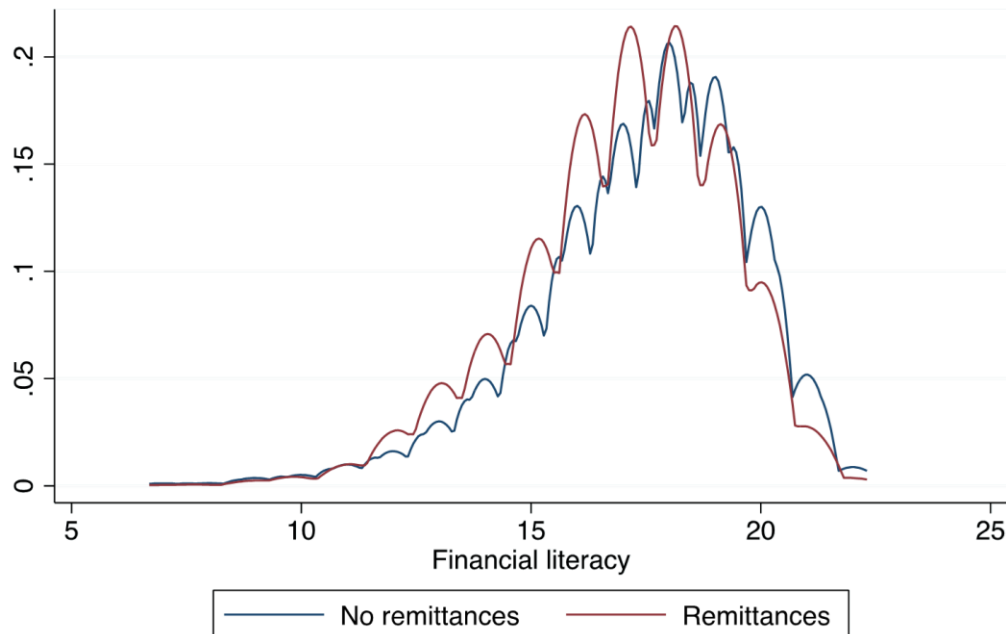
Source: Own calculations with data from ENIF 2021.

\*\*\*Significant at 1%.



## 4.5 Results for Non-Parametric Distributions

In this section, the paper present results for non-parametric distributions of the different financial literacy outcomes. Figure 1 shows the non-parametric distribution for financial literacy index for households that receive remittances and households without remittances. The distribution for households with remittances shows more probability mass at the center of the distribution and less mass in the low values and the high values of the distribution. This would explain why they have, on average, a higher financial literacy index, but have a lower probability of showing high values.

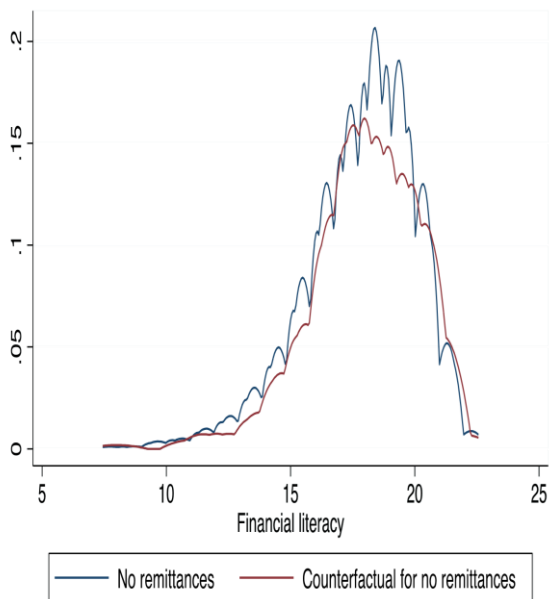


**Figure 1.** Differences in financial literacy  
Source: Own calculations with data from ENIF 2021

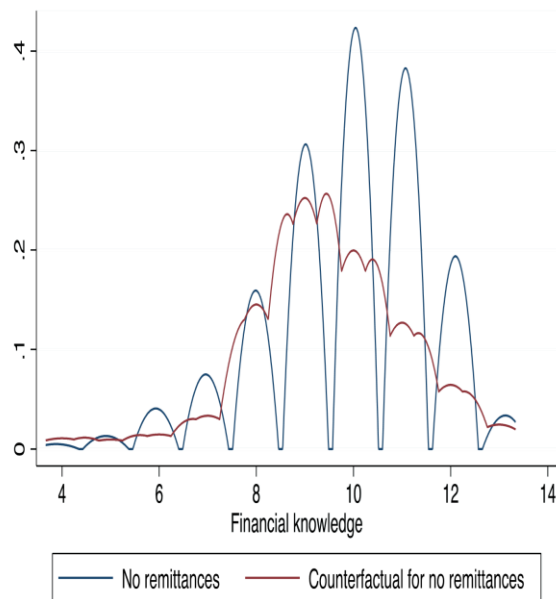
Figure 2a shows the counterfactual distribution of the financial literacy index for households that do not receive remittances, which shows that if those households would have the distribution of the receiving remittances households, the distribution would tilt toward the right, while showing less mass at the center. These results would imply that remittances increase financial literacy.

Figure 2b shows the counterfactual distribution for financial knowledge for households that do not receive remittances. The distribution concentrates more at the center compared to the observed distribution of financial knowledge for households that do not receive remittances. Figures 2c and 2d show similar patterns when the counterfactual distribution for financial behavior and for financial attitudes is considered. These results imply that the unobserved characteristics of the remittance receiving households seem to move the distribution of the non-remittances receiving households towards the center of the distribution.

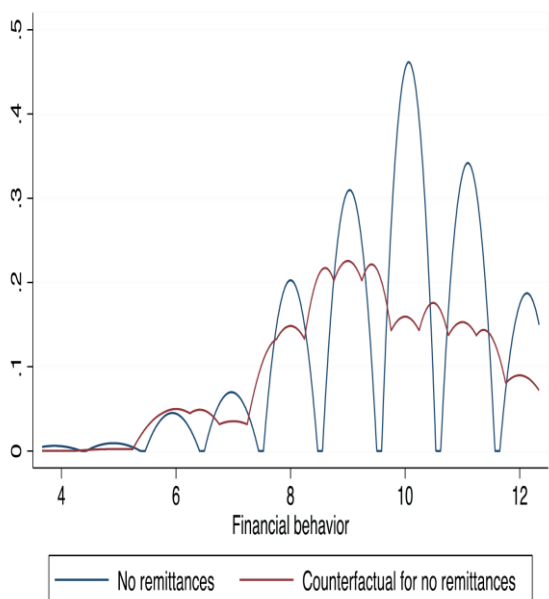
A potential explanation for these results is that the reception of remittances may increase the experience of households in using financial services above the average use of the households that do not receive remittances, but it does so at a decreasing rate to the extent that their level of financial literacy is lower when compared with households that do not receive remittances and have a high financial literacy.



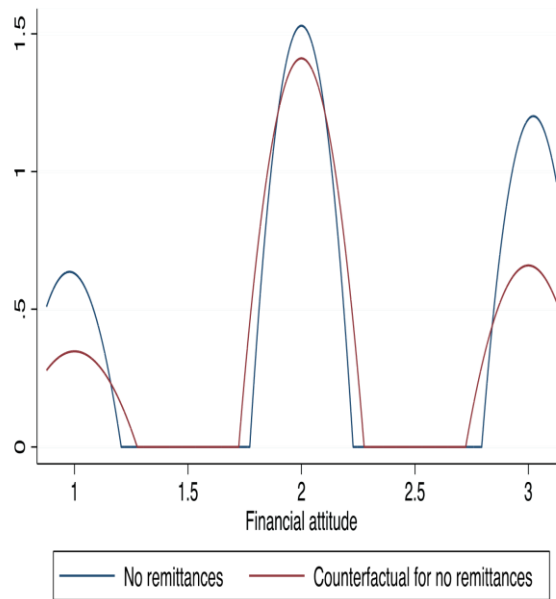
**Figure 2a.** Differences in financial literacy



**Figure 2b.** Differences in financial knowledge



**Figure 2c.** Differences in financial behavior



**Figure 2d.** Differences in financial attitude

Source: Own calculations with data from ENIF 2021

## 5. Conclusions

Using data for the 2021 National Survey of Financial Inclusion (ENIF for its abbreviation in Spanish), this article studies the relationship between financial literacy and its components with the reception of remittances.

Using instrumental variables and random matching estimators that control for the different econometric challenges that this study faces, including endogeneity, measurement error, omitted variable bias, among other econometric problems, this study finds that remittances increase the average level of financial literacy, knowledge, behavior, and attitudes. However, the positive effect of remittances is not monotonic, since remittances are linked negatively with the probability of observing high values of financial literacy, knowledge, behavior, and attitudes.

These results are consistent with the idea that the reception of remittances induces learning by doing with decreasing returns. This is because there is evidence that households receiving remittances increase their financial knowledge, behavior, and attitudes, but not enough to achieve the high levels of financial literacy observed among certain households with no remittances.

The policy implications of these results highlight the importance of increasing the levels of financial literacy among households that receive remittances to improve the beneficial effects of remittances on their welfare. These efforts to increase financial literacy may be done by public policies aimed to increase financial literacy among households that receive remittances as well as by providers of financial services that already service such type of households.

The limitations of this study are due to the cross-section nature of the data, which does not allow to follow households over time, and consequently does not allow to study how the acquisition of financial knowledge can cause beneficial effects over time. Studies of such nature are required to better understand the relationship between financial literacy and remittances.

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