



# Financial Vulnerability and Financial Instruments: Evidence from Mexico\*

*Vulnerabilidad Financiera e Instrumentos  
Financieros: Evidencia de México*

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## Abstract

We perform an empirical analysis to quantify the effect of holding financial instruments, such as savings and credit, on the financial vulnerability of households. Financial vulnerability refers to their capacity to withstand adverse economic shocks and fulfill regular payment obligations. Utilizing data from the 2018 National Survey of Financial Inclusion in Mexico, we construct a financial vulnerability index and perform a propensity score matching analysis to estimate the effect of holding financial instruments on financial vulnerability. Our findings indicate that holding savings instruments, both formal and informal, as well as formal credit, mitigate financial vulnerability. However, we also find that having informal credit contributes to an increase in financial vulnerability.

**Keywords:** Financial Instruments, Financial Vulnerability

## Resumen

En este estudio se realiza un análisis empírico para evaluar el efecto de la posesión de instrumentos financieros, como contratos de ahorro y crédito, en la vulnerabilidad financiera de los hogares. La vulnerabilidad financiera se refiere a la capacidad de los hogares para hacer frente a choques económicos adversos y cumplir con sus pagos regulares de manera puntual. Se utilizan datos de la Encuesta Nacional de Inclusión Financiera para México, edición 2018, para construir un índice de vulnerabilidad financiera y realizar un análisis de “propensity score matching” para estimar el efecto de tener instrumentos financieros en la vulnerabilidad financiera. Nuestros resultados indican que la posesión de instrumentos de ahorro, tanto formales como informales, y de crédito formal, reduce la vulnerabilidad financiera. Sin embargo, también encontramos que contar con crédito informal aumenta la vulnerabilidad financiera.

**Palabras clave:** Instrumentos Financieros, Vulnerabilidad Financiera

**Clasificación JEL:** G51, G52.

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## 1. Introduction

In the aftermath of an adverse economic shock, households may experience heterogeneous consequences. For households that already struggle to make ends meet, such a shock can further increase their financial vulnerability. The concept of financial vulnerability has evolved from being solely associated with the burden of debt to encompassing individuals' ability to cope with adverse shocks and meet their regular payment obligations on time (Anderloni et al., 2012). The analysis of the relationship between financial vulnerability and financial inclusion has gained prominence in recent years, as this relationship is not as straightforward as one might assume (Prina, 2015; Arellano et al., 2019; Chakrabarty and Mukherjee, 2021). In this article, we conduct an analysis focusing on Mexico, and our findings suggest that different relationships exist between financial vulnerability and formal versus informal financial instruments.

Financial inclusion is a dynamic concept that generally describes the process through which households gain access to financial markets, starting with basic instruments such as savings accounts, which eventually enables them to be more likely to use more sophisticated products like credit and insurance. Financial inclusion enhances the lives of families by facilitating planning, budgeting, borrowing, and insuring against negative shocks, thereby influencing poverty and inequality on a broader scale (Claessens, 2006; Demirgüç-Kunt et al., 2020). The World Bank recognizes financial inclusion as a driver for seven out of the 17 Sustainable Development Goals.

Moreover, financial inclusion might translate into lower financial vulnerability for households (Chipunza and Fanta, 2022), but it is not necessarily always the case. For instance, households with access to formal credit may accumulate significant debt that exceeds their earnings, resulting in high repayment obligations. This situation can jeopardize their ability to meet other regular expenses or cope with an economic emergency (Anderloni et al., 2012). Therefore, it is relevant to empirically study the relationship between financial inclusion and financial vulnerability in any country, particularly those with low levels of financial inclusion.

Reports from financial service providers indicated low levels of financial inclusion in Mexico, but there was limited information available from the demand side. In 2012, the National Commission for Banking and Securities (CNBV) collaborated with the National Institute for Statistics and Geography (INEGI) to conduct

the first assessment of financial inclusion in Mexico. Since then, the National Survey of Financial Inclusion (ENIF) has been conducted in representative samples of the adult population in Mexico in 2012, 2015, 2018, and 2021.

Since 2015, the percentage of Mexicans holding at least one financial instrument has remained stable at 68%. Data from the most recent ENIF survey in 2021 reveals significant regional disparities in financial inclusion: over 75% of Mexicans in the northwest and northeast regions of the country hold at least one financial instrument, compared to 60% in the south. This regional pattern has also remained mostly unchanged since 2015 (INEGI, 2021). Financial inclusion in Mexico also varies across gender groups, with 71% of males and 65% of females holding a financial instrument in 2021. Drastic discrepancies are also observed between urban and rural populations, with 74% and 56% of Mexicans in those areas holding financial instruments, respectively.

Analyzing financial vulnerability within the context of financial inclusion in Mexico contributes to understanding how households with different sociodemographic characteristics cope with adverse economic shocks and meet their regular payment obligations. In this article, we examine the effects of holding financial instruments on the financial vulnerability of Mexican households. Our empirical analysis consists of two main parts. First, based on Anderloni et al. (2012) definition, we construct an index of financial vulnerability using data from the 2018 edition of the ENIF survey. This index includes measures of households' response to an economic emergency, their payment behavior, and whether they have at least one member enrolled in a pension plan. Subsequently, we employ the propensity score matching method to estimate the average treatment effect of formal and informal savings and credit instruments. Our results indicate that formal financial instruments consistently reduce households' financial vulnerability, while the effects are mixed for informal financial instruments.

The remainder of the article is organized as follows: In the next section, we review the relevant literature. Section 3 presents the descriptive statistics. In Section 4, we explain our empirical strategy. Section 5 presents and discusses our econometric results. Finally, we conclude in the last section.

## 2. Literature Review

The concept of financial vulnerability has evolved from the previous concept of financial fragility, which was primarily defined as the burden of household debt (Jappelli et al., 2008; Del Río and Young, 2008). After the Great Recession of 2008, the concept of financial vulnerability expanded to include other factors besides the burden of debt, such as households' inability to respond to economic emergencies and meet regular expenses (Anderloni et al., 2012; Daud et al., 2018). More recent studies have further incorporated objective (financial assets and credit history) and subjective (opinions and perceptions) factors into the concept of financial vulnerability (O'Connor et al., 2019).

Holding formal financial instruments allows households to smooth the impact of economic shocks, maintain their standard of living, access to investment opportunities, and protect against risky outcomes (Claessens, 2006; Demirgüç-Kunt et al., 2020). Despite the global increase in the use of formal financial instruments in recent years, financial inclusion has not reached all households around the world uniformly. For instance, in high-income countries, around 90% of adults have a bank account, 71% of them save, and households tend to borrow funds from formal financial institutions while in developing countries about 63% of adults do have a bank account, 43% of them save, and family and friends tend to be the source of borrowing funds for households (Demirgüç-Kunt et al., 2020). In general, formal credit instruments tend to guarantee greater solvency to households in the face of adversity and limited access to credit can contribute to higher levels of financial vulnerability (Chen and Jin, 2017). Therefore, ensuring broader coverage of regulated and affordable banking services among the population should still be a public policy priority (Maravalle and González-Pandiella, 2022).

Access to formal financial instruments is essential for achieving financial inclusion, but barriers in the demand for these instruments hinder their use. Hence, it is not only important to expand access to formal financial instruments (Bruhn and Love, 2014; Angelucci et al., 2015), but also to incentivize their use considering, taking into account the characteristics of each financial instruments. Regarding formal savings, lack of financial education and mistrust towards banking institutions have been identified as barriers that diminish its use (Di Giannatale and Roa, 2019). So, public policy should aim to both implementing effective and just-in-time financial education programs along with workshops

to enhance numerical ability and propensity to plan (Fernandes et al., 2014; Lusardi and Mitchell, 2014). Furthermore, access to and use of formal credit should be regulated to promote its benefits and to avoid insolvency issues that are common even in microcredits (Attanasio et al., 2015; Banerjee et al., 2015; Di Giannatale et al., 2020).

Most research on financial inclusion in Mexico has primarily focused on its determinants and some of its consequences. For instance, Bruhn and Love (2014) examined the impact of the sudden introduction of banking services targeted towards low-income clients and found positive effects on employment and income for workers in municipalities where the banks opened. Angelucci et al. (2015) demonstrated that access to microfinance improves business performance, as well as measures of happiness, trust, and female empowerment. Similarly, Fareed et al. (2017) discovered that financial inclusion increases the likelihood of women becoming entrepreneurs.

The documented positive effects of financial inclusion on various economic outcomes explain why the Mexican government has prioritized it as a policy objective and has utilized existing social programs to improve access to financial products for the poorest population. Masino and Niño-Zarazúa (2020) examined the transition from in-site distribution of cash benefits to electronic payments in savings accounts under the PROSPERA program. Their study revealed that households with access to savings products reduced their reliance on informal savings mechanisms and were less likely to decrease consumption in response to negative income shocks. Bachas et al. (2018) documented that access to debit cards increased households' financial activity, leading to higher numbers of withdrawals and increased savings balances.

The availability of data from the ENIF has enabled researchers to gain a better understanding of the determinants of financial inclusion. Pena et al. (2014) used ENIF data to construct a financial inclusion indicator using multiple correspondence analysis and found that education is a key driver of financial inclusion for both the general population and informal workers. These authors confirmed the disadvantages faced by women and rural populations in terms of financial inclusion. Cassimon et al. (2022), also using ENIF data, highlighted the role of informality in hindering access to financial products and markets. Rios and Vázquez (2022) analyzed the 2015 edition of the ENIF and concluded that receiving remittances is not a primary driver of financial inclusion. Hence, evidence from Mexico supports the assertion that financial inclusion is a crucial

development objective with significant implications for economic growth and reducing inequality.

A recurring empirical observation is that households using formal financial instruments have certain sociodemographic characteristics that allow them to do so; in general, they have higher income levels and homeownership. However, due to the significant differences between households using and not using formal financial instruments, there is a selection bias issue that makes comparisons challenging. To address this problem, the propensity score matching method has been employed in this type of analysis as it controls for observable household characteristics that determine the use of formal financial instruments as a strategy to cope with economic emergencies (Urrea and Maldonado, 2011).

We propose the hypothesis that households holding formal financial instruments are characterized not only by their sociodemographic traits but also by other factors, such as their levels of numerical ability, financial education, and propensity to plan. Recent literature has demonstrated that higher levels of numerical ability and financial literacy are associated with improved credit repayment and more sophisticated use of financial instruments, including risk diversification and portfolio choice (Lusardi and Mitchell, 2014; Lusardi et al., 2017; Hasler et al., 2018).<sup>1</sup> Propensity to plan, which describes individuals who budget, plan their spending, and save regularly, has been linked to positive financial outcomes, such as living within means, better retirement planning, and greater wealth accumulation (Ameriks et al., 2003; Lee and Kim, 2016; O’Neill et al., 2016; Xiao and O’Neill, 2018). Therefore, it is expected that households with higher levels of numerical ability, financial literacy, and propensity to plan are more likely to use formal financial instruments.

In the context of the existing literature, this article makes several contributions. Firstly, it utilizes the definition of financial vulnerability proposed by Anderloni et al. (2012) to measure the impact of financial instruments on household financial vulnerability. To address the selection bias issue, the propensity score method, as suggested by Urrea and Maldonado (2011), is employed. Additionally, our measure of financial vulnerability includes whether at least one household member is enrolled in a retirement plan (Fu, 2020). Typically, the measure of financial vulnerability is obtained by constructing an index. For instance, Anderloni et al. (2012) employ a non-linear component analysis, while Fu (2020)

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<sup>1</sup> For a more detailed discussion see Di Giannatale et al. (2020), and Roa et al. (2021).

assigns a score ranging from 0 to 1 to each question included in the measurement and then transforms the total score to a scale from 0 to 100, with 100 representing the lowest level of vulnerability. Another distinction of this article compared to related studies is the construction of the financial vulnerability index, as well as indexes for numerical ability, financial education, and financial planning, using multiple correspondence analysis, which allows for the use of categorical data, as is the case with the responses to the questions in the ENIF survey.

### 3. Descriptive Statistics

We analyze data from the 2018 edition of the ENIF, a survey conducted between April and June of 2018. The survey covered a representative sample of 12,790 households in Mexico, with participants ranging from 18 to 70 years old. After excluding null answers, our sample consists of 10,555 observations. The ENIF survey collects information on various aspects, including sociodemographic characteristics, expenditure administration, and financial behavior. Specifically, it includes questions about savings and credit holdings, payment methods, insurance coverage, retirement plans, financial capabilities, and asset ownership (ENIF, 2018).

Table 1 shows the descriptive statistics regarding respondents' and households' characteristics. More than half (55.26%) of the surveyed individuals are women; the average age is 40.55 years; the average annual labor income is 4,129.8 USD per individual.<sup>2</sup> The average size of households is about 3.79 people, while the number of economic dependents of surveyed individuals is 1.59 people. The sample is comprised by individuals who have an average of 9.85 years of schooling, which is the equivalent of completed middle school.

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<sup>2</sup> USD dollars of 2023. The individual income is reported as a continuous variable in the ENIF.



**Table 1: Descriptive Statistics: Respondent and Household Characteristics**

Variable	%	Freq.	Variable	%	Freq
<b>Gender</b>			<b>Region</b>		
Female	55.26	5,833	Northwest	19.09	2,015
Civil Status			Northeast	18.21	1,922
Married	41.93	4,193	West	18.62	1,965
<b>Zone</b>			Mexico City	6.18	652
Urban	77.2	8,148	Central, South, and East	19.32	2,039
			South	18.59	1,962
<b>Variable</b>	<b>Mean</b>	<b>Median</b>	<b>Max.</b>	<b>Min.</b>	<b>S.D.</b>
Age	40.55	39.00	70.00	18.00	14.03
Years of Schooling	9.85	9.00	21.00	0.00	4.44
Income (Usd)	4,129.8	3,044.6	86,069.7	0.00	5,641.2
Household Size	3.79	4.00	20.00	1.00	1.90
Dependents (number)	1.59	1.00	12.00	0.00	1.61

Note: The West Region includes the Bajío Region.

Source: ENIF 2018.

Table 2 presents the descriptive statistics regarding financial instruments that were used by households (savings and credit). Savings instruments, formal or informal, were the most used by households at 69.92 %. We consider that an individual has an informal savings instrument if during the previous year, he/she lent money, bought animals or goods, saved money in a savings cooperative or with family or friends, or saved money at home. A considerable proportion, 65.18%, of the surveyed individuals used at least one of the mentioned informal savings mechanisms. Formal savings instruments were less used in this sample; 22.67% of the surveyed individuals saved using their credit or debit card or their retirement account, bank account to received governmental transfers, checking, or saving account, fixed-term deposit, or investment account.

On the other hand, more than half of the sample (59.54%) used at least one credit instrument. We consider that an individual has used a formal credit instrument if he /she has a credit card, payroll, automotive, retail or group credit. The proportion of people who have formal credit is 34.09%. On the other hand, informal credit instruments were used by 40.2% of the population. Informal

credit includes having used a savings cooperative or family and friends as sources of borrowing funds. So, there is a higher proportion of people who have used informal savings or credit instruments than their formal counterparts.

**Table 2: Descriptive Statistics: Financial Instruments**

Variable	%	Freq.
<b>Financial Instruments</b>		
<b>Savings</b>	69.92	7,380
Informal	65.18	6,880
Formal	22.67	2,393
<b>Credit</b>	59.54	6,284
Informal	40.20	4,243
Formal	34.09	3,590

Source: ENIF 2018.

Table 3 presents descriptive statistics regarding our outcome variable, financial vulnerability. Households that do not make ends meet every month, that show delays in their regular payments, and that do not have at least a member enrolled in a retirement plan might be in a financially vulnerable situation. First, we describe the patterns in the responses to each question we use for constructing the financial vulnerability index.

As it can be observed in table 3, when experiencing a negative shock, 67.5 % of the sample can borrow funds from family and friends and 42.9% of the sample can draw on their savings. Furthermore, 42.3% of the surveyed individuals reported that they could not pay their expenses with their monthly income. Moreover, 73.8% of the sample can pay their bills on time. Also, 45% of the sample has enrolled in a retirement plan, which can help in the case of an economic emergency (Angelucci et al., 2020). In Mexico, unemployment withdrawals from pension plans increased by 34% in 2020 (Comisión Nacional del Sistema de Ahorro para el Retiro, 2021), so it seems that this type of savings constitutes a mechanism that might help in case of an economic emergency.

**Table 3: Descriptive Statistics: Financial Vulnerability**

Questions from the ENIF 2018	%
If you had an economic emergency the size of your income in a month, you could pay it with. . .	
your savings?	42.9
a salary in advance?	28.8
sale or pledge of a good?	41.2
loans from family or friends?	67.5
your credit card or a loan from a financial institution?	17.8
a temporary job?	34.2
<b>From April 2017 to this date, was your monthly income enough to pay for your expenses?</b>	
Yes	57.7
No	42.3
<b>Do you pay your bills on time (credit card, services, etc.)? . . .</b>	
Always	73.8
Sometimes	24.5
Never	1.7
<b>Do you have a retirement account?</b>	
Yes	45
No	55

Source: ENIF 2018.

## 4. Empirical Strategy

This section is devoted to explaining our empirical strategy. In the first subsection, we detail the construction of the financial vulnerability index. In the second subsection, we explain how we apply the propensity score matching method to identify the impact of holding financial instruments on financial vulnerability.

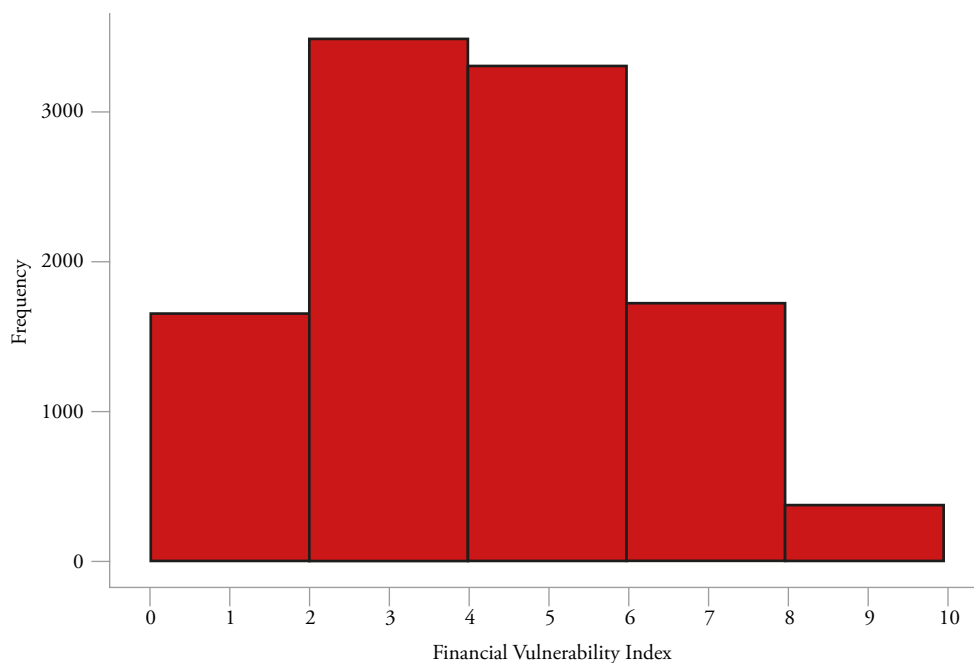
### 4.1 Index of Financial Vulnerability

The responses to the four questions in table 3 were used as measures of several dimensions of financial vulnerability (Anderloni et al., 2012). We construct an index of financial vulnerability that summarizes the information in four dimensions into a single measure. We first code each of the four questions as dummy indicators representing whether the respondent experiences financial vulnerability. Then, we obtain the financial vulnerability index using multiple correspondence

analysis (MCA), which can be thought as a generalization of the principal component analysis but that can be applied to categorical data. This method is useful for understanding how categorical variables are related to each other and across individuals in the sample. This method has been used to construct multidimensional poverty indexes (Asselin and Anh, 2008; Ezzrari and Verne, 2013), health indexes (Kohn, 2012), wealth indexes (Howe et al., 2008), among others.

Figure 1 shows the distribution of the scores of the financial vulnerability index, which we have rescaled to take values between 0 and 10. In this scale, a value of 0 corresponds to the lowest possible level of financial vulnerability.

**Figure 1: Frequency Distribution of the Financial Vulnerability (FV) Index**



Source: Own elaboration using ENIF 2018.

We used the same methodology described above to construct indexes of numerical ability, financial education, and financial planning, where 0 corresponds to the lowest level of numerical ability, financial education and financial planning respectively.<sup>3</sup> These indexes are later used for OLS regression, mean difference table and to construct the propensity score.

In Table 4 we show the correlations between our financial vulnerability measure and the observed characteristics. Not surprisingly, financial vulnerability is increasing in age, for female respondents, and with household size. On the other hand, education, being married, the number of dependents, and living in an urban locality are all associated with a lower financial vulnerability. These groups overlap, although not perfectly, with those that are less likely to be financially included. A puzzling finding is that both, the financial education index, and the numerical ability index are both positively correlated with financial vulnerability.

**Table 4: Correlation of Financial Vulnerability Index and Observed Characteristics**

	<i>Dependent Variable:</i> Financial Vulnerability Index
Education	-0.106*** (0.006)
Age	0.014*** (0.002)
Female	0.818*** (0.050)
Married	-0.133*** (0.051)
Household Size	0.062*** (0.013)
Dependents	-0.316*** (0.052)
Northeast	-0.167** (0.079)
West	0.208*** (0.078)

<sup>3</sup> Details about the construction of the indexes of financial education, numerical abilities, and financial planning can be found in Appendix A.

Northwest	-0.411*** (0.078)
Mexico City	0.706*** (0.112)
Central	0.468*** (0.077)
Urban	-0.494*** (0.060)
FE Index	0.081*** (0.011)
NA Index	0.030*** (0.011)
FP Index	-0.095*** (0.008)
Constant	4.321*** (0.157)
Observations	10,555
R2	0.154
Adjusted R2	0.153

Note: FE Index = index of Financial Education, NA Index = index of Numerical Abilities, and FP Index = index of Financial Planning. \* $p < 0.1$ ; \*\* $p < 0.05$ ; \*\*\* $p < 0.01$ . This table reports estimates from a regression of our financial vulnerability on the set of observed characteristics. Standard errors in parentheses.

Source: Own calculation using ENIF 2018.

## 4.2 Ordinary Least Squares (OLS)

As a first approximation to understanding the relevance of financial instruments on financial vulnerability, we perform an OLS estimation of the following equation:

$$FV_i = \beta_0 + \beta_1 FI_i + \sum_j B_j X_{ij} + \epsilon_i \quad (1)$$

where  $FV_i$  is the index of financial vulnerability;  $FI_i$  denotes a financial instrument (holding savings (formal and informal) or credit (formal and informal)); and  $X_i$  is a vector that includes determinants of financial vulnerability (education, age, sex, region, urban or rural area, among others).

We estimate equation 1 to corroborate the importance of observed characteristics in explaining financial vulnerability. Moreover, if holding financial

instruments is correlated with observed and unobserved characteristics that explain financial vulnerability, the estimated coefficient on  $\beta_1$  will be inconsistent for the true effect of holding financial instruments.

### 4.3 Propensity Score Matching

The first step in our application of the propensity score matching is to verify that the group of individuals that have access to financial instruments is in fact different to the group of individuals who do not. We perform a mean difference test with a null hypothesis that the mean of a given characteristic across individuals holding and not holding financial instruments are statistically the same. In table 5, each column corresponds to an instrument and each row corresponds to the variables for which we want to verify the difference in means.

The results presented in table 5 allow us to state that most of the variables that will be considered in the construction of the propensity score show statistically significant differences in means. For example, in almost all columns a significant difference is observed for the first two variables, which indicates that individuals with higher income and years of schooling are, in average, more likely to hold financial instruments. Furthermore, the probability of having access to all financial instruments is decreasing with age and with being a woman. Regarding numerical ability and financial education, high levels on those variables results in a decrease in the probability of having all the instruments.

Finally, the probabilities of holding all financial instruments increase with higher values of financial planning index, as expected. Thus, from the results shown in table 5, we conclude that there are significant differences in means in the characteristics that determine use of financial instruments across groups. Moreover, all these characteristics affect not only the probability of using financial instruments but are likely to directly affect financial vulnerability. Therefore, comparing financial vulnerability across groups of usage would produce biased estimates of the true effect of holding financial instruments. The propensity score procedure we use allows creating groups that are similar in the observed characteristic so we can attribute the differences in financial vulnerability to the use of financial instruments only.

Proposed by Rubin (1974), the propensity score is defined as the probability of receiving the treatment conditional on all relevant observed characteristics variables. Once the propensity score is estimated, individuals are matched through algorithms in such a way that an individual that belongs to the control group

is matched with one or several individuals with a similar propensity score (Caliendo and Kopeinig, 2008). One of the most used algorithms is the *nearest neighbor* that matches an individual in the control group with the one in the treatment group that has the closest propensity score. Another algorithm is *caliper* which matches individuals that are located within an established radius of propensity score. Finally, the *sub-class* algorithm classifies the values of the propensity scores in sub-classes and matches individuals that belong to the same sub-class. The purpose of all these algorithms is generating a matched sample in which individuals are similar in terms of observed characteristics.

The key assumption for using the propensity score matching method is the conditional independence (Rubin, 1974), which implies that the outcome variable, in this case financial vulnerability, is independent of the treatment assignment once after controlling for the relevant observed characteristics. In other words, the variables that are used to estimate the propensity scores determine the group assignment in such a way that this assignment is independent of the variable of interest.

In our application, a logit model is employed to obtain the propensity scores where the dependent variable is having a financial instrument:

$$Prob[Y = 1 | X] = G\left(\beta_0 + \beta_1 T_i + \beta_2 E_i + \beta_3 FE_i + \beta_4 NA_i + \beta_5 FP_i + \sum_k \delta_{6k} A_{ki} + \sum_j \delta_{7j} R_{ji}\right) \quad (2)$$

and where  $T_i$  is the household size of individual  $i$ ,  $E_i$  is years of schooling,  $FE_i$  is the financial education index,  $NA_i$  is the numerical ability index, and  $FP_i$  is the financial planning index. Also, dummy variables for each household asset are employed where  $k \in (\text{home, car, land, others})$  and for each geographical region  $j \in (\text{Northwest, Northeast, West, Mexico City, Central, South and East, South})$ . Equation 2 was estimated for each financial instrument: savings (formal and informal) and credit (formal and informal).

Several studies have demonstrated that the variables selected in the present article to estimate the propensity scores are determinants of using financial instruments. For instance, by analyzing data from 144 countries, Chu Khanh (2019) finds that being a man, more educated, having higher income, being employed, and reaching a certain age are characteristics that increase the probability of using formal financial instruments (Datta and Singh, 2019).



**Table 5: Test of Differences in Means in Observed Characteristics by Groups of Financial Instruments**

<i>Covariate:</i>	Mean differences in covariates across individuals who hold and do not hold...					
	<b>Savings</b>	<b>Informal Savings</b>	<b>Formal Savings</b>	<b>Credit</b>	<b>Informal Credit</b>	<b>Formal Credit</b>
Income	2,075.16***	1,405.73***	3,696.09***	1,606.15***	-89.42	2,740.85***
Education	2.04***	1.48***	2.96***	1.52***	0.29***	2.27***
Age	-5.88***	-6.26***	-1.23***	-2.61***	-3.49***	-0.37
Female	-0.03**	-0.03*	-0.05***	-0.06***	-0.02*	-0.05***
Married	-0.03**	-0.03**	-0.01	0.01	-0.04***	0.06***
Household size	0.06	0.17***	-0.35***	0.03	0.22***	-0.23***
Dependents	0.06***	0.05***	0.06***	0.13***	0.10***	0.11***
Northeast	0.00	0.00	0.00	0.00	-0.03***	0.05***
West	-0.02	-0.01	-0.01	-0.01	0.00	-0.02*
Northwest	0.00	-0.01	0.07***	0.03***	0.01	0.05***
Mexico City	-0.01	-0.02***	0.02**	-0.01	-0.01	-0.01**
Central	0.00	0.01	-0.06***	-0.05***	-0.01	-0.07***
South	0.03**	0.03***	-0.01	0.03***	0.04***	0.00
Urban	0.06***	0.04***	0.10***	0.07***	-0.01	0.13***
FE Index	-0.54***	-0.45***	-0.53***	-0.42***	-0.14**	-0.55***
NA Index	-0.29***	-0.19***	-0.40***	-0.23***	-0.01	-0.34***
FP Index	1.18***	0.93***	1.24***	0.43***	0.02	0.72***

Note: Each column reports the differences in means of each characteristic across those who report holding or not each financial instrument. FE Index = index of Financial Education, NA Index = index of Numerical Abilities, and FP Index = index of Financial Planning.

Source: Own calculation using ENIF 2018. Note: \*p<0.1; \*\*p<0.05; \*\*\*p<0.01.

## 5. Econometric Results

### 5.1 Ordinary Least Squares

Table 6 shows the results of estimating equation 1 using OLS. Each column corresponds to a regression where the dependent variable is the index of financial vulnerability, while we focus our attention to holding each of the financial instruments as main regressor (although all regressions control for a vector of characteristics, not reported in this table). From the results, we can conclude that holding the financial instruments considered in this analysis is correlated with the index of financial vulnerability. These results suggest that holding savings (of any type) and formal credit diminishes financial vulnerability, while having informal credit has the opposite effect on financial vulnerability. However, these estimates might be biased because the group of individuals who use these instruments is different from the group of individuals who do not, as we have previously shown in table 5.

### 5.2 Propensity Score Matching

Table 7 presents the results of estimating the propensity score defined in equation 2. The coefficients in the table show the relevance of each variable in the probability of using each instrument. The variables are the same as in Urrea and Maldonado (2011), except for the inclusion of additional demand-side variables measured through the indexes of numerical ability, financial education, and financial planning, as discussed previously.

**Table 6: OLS estimation. Dependent Variable: Financial Vulnerability.**

Predictors: holding...	Dependent Variable: Financial Vulnerability Index					
	(1)	(2)	(3)	(4)	(5)	(6)
Savings	-1.15 *** (0.05)					
Informal		-0.94 *** (0.05)				
Formal			-1.07 *** (0.06)			
Credit				0.01 (0.05)		
Informal					0.50 *** (0.05)	
Formal						-0.65 *** (0.05)
Observations	10555	10555	10555	10555	10555	10555
R <sup>2</sup> / R <sup>2</sup> adjusted	0.202 / 0.201	0.193 / 0.191	0.191 / 0.190	0.166 / 0.165	0.175 / 0.173	0.178 / 0.177

Note: All regressions use as control the vector of observed characteristics reported in table 4 except for Income and Dependents. \*p<0.1; \*\*p<0.05; \*\*\*p<0.01. Standard errors in parentheses.

Source: Own calculation using ENIF 2018.

**Table 7: Estimated coefficients in the propensity score**

	Savings (1)	Informal Savings (2)	Formal Savings (3)	Credit (4)	Informal Credit (5)	Formal Credit (6)
Education	0.06 *** (0.01)	0.07 *** (0.01)	0.15 *** (0.01)	0.06 *** (0.01)		0.11 *** (0.01)
Age	-0.02 *** (0.00)			-0.01 *** (0.00)	-0.02 *** (0.00)	0.00 * (0.00)
Female	-0.15 ** (0.05)		-0.16 ** (0.05)	-0.23 *** (0.04)	-0.10 * (0.04)	0.08 (0.06)
Northeast	-0.23 ** (0.07)	-0.24 *** (0.07)		-0.25 *** (0.07)	-0.40 *** (0.07)	
West	-0.24 *** (0.07)	-0.26 *** (0.07)		-0.25 *** (0.07)	-0.26 *** (0.07)	-0.25 *** (0.06)
Mexico City	-0.47 *** (0.10)	-0.70 *** (0.10)		-0.51 *** (0.10)	-0.29 ** (0.09)	-0.80 *** (0.09)
Northwest	-0.17 * (0.07)	-0.28 *** (0.07)	0.37 *** (0.06)	-0.11 (0.07)	-0.18 ** (0.06)	
Central	-0.18 * (0.07)	-0.14 * (0.07)	-0.25 *** (0.07)	-0.45 *** (0.07)	-0.26 *** (0.06)	-0.52 *** (0.06)
NA Index	-0.00 (0.01)	-0.00 (0.01)	-0.01 (0.01)	-0.00 (0.01)	0.01 (0.01)	-0.01 (0.01)
FP Index	0.12 *** (0.01)		0.09 *** (0.01)	0.02 *** (0.01)		0.04 *** (0.01)
FE Index	-0.06 *** (0.01)	-0.06 *** (0.01)	-0.04 ** (0.01)	-0.05 *** (0.01)	-0.03 ** (0.01)	-0.06 *** (0.01)
Married		-0.13 ** (0.04)		0.11 ** (0.04)		0.59 *** (0.07)
Household size		0.06 *** (0.01)	-0.08 *** (0.01)		0.03 ** (0.01)	-0.05 *** (0.01)
Urban				0.19 *** (0.05)		0.46 *** (0.06)
Sex* Married						-0.58 *** (0.09)
Observations	10555	10555	10555	10555	10555	10555
R <sup>2</sup> adj.	0.089	0.038	0.110	0.045	0.021	0.097

Note: FE Index = index of Financial Education, NA Index = index of Numerical Abilities, and FP Index = index of Financial Planning. \*p<0.1; \*\*p<0.05; \*\*\*p<0.01. Standard errors in parentheses.

Source: Own calculation using ENIF 2018.

Table 8 shows the main results of our paper in terms of the average treatment effect (ATE) of holding each financial instrument on our financial vulnerability index. We compare individuals who hold and who do not hold each instrument after using a matched sample based on the estimated propensity score. We construct the matched sample following three alternative matching algorithms: nearest neighbor (treated individuals are matched to the non-treated individual with the closest propensity score), nearest neighbor with caliper (a maximum of 0.05 in value of the propensity score was set), and subclass (the propensity score is broken into 6 groups according to their propensity score and individuals within each group are compared).

Of the three matching methods considered, the best balance in observed characteristics in the matched sample was achieved by the caliper algorithm, followed by the closest neighbor with replacement algorithm, and finally the subclasses algorithm. Once the individuals are matched, the differences between the variables are not statistically significant and the density of the propensity score between the treatment group and the control group overlaps.<sup>4</sup> All the estimations of the ATE are significant at 1% and all the matching methods consistently obtain similar magnitudes of the effect.

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<sup>4</sup> See Appendix A for details.

**Table 8: Estimated Average Treatment Effect (ATE)**

Dependent variable: financial vulnerability index									
Matching algorithm:									
	Nearest neighbor			Caliper			Subclass		
	Control	Treatment	ATT (%)	Control	Treatment	ATT (%)	Control	Treatment	ATT (%)
Savings	4.6376	-1.9472 ***	-36.62	5.0624	-1.2345 ***	-24.39	5.1170	-1.646 ***	-32.17
		(0.1423)			(0.0659)			(0.0536)	
Informal	4.7602	-1.2614 ***	-26.5	4.8134	-1.1371 ***	-23.62	4.8411	-1.3423 ***	-27.73
		(0.0615)			(0.0615)			(0.0523)	
Formal	3.9333	-1.2887 ***	-32.77	3.8475	-1.1814 ***	-30.7	4.3537	-1.7091 ***	-39.26
		(0.077)			(0.0707)			(0.059)	
Credit	4.0546	-0.2878 ***	-7.1	4.1617	-0.1145	-2.75	4.2594	-0.4926 ***	-11.56
		(0.0605)			(0.0587)			(0.0521)	
Informal	3.7317	0.4545 ***	12.18	3.6747	0.512 ***	13.93	3.8183	0.368 ***	9.64
		(0.0655)			(0.057)			(0.0522)	
Formal	4.0590	-0.9292 ***	-22.89	4.3432	-0.7965 ***	-27.38	4.3973	-1.2675 ***	-28.82
		(0.0665)			(0.0614)			(0.0527)	

Note: \*p<0.1; \*\*p<0.05; \*\*\*p<0.01. Standard errors in parentheses.  
Source: Own calculation using ENIF 2018.

Savings has the strongest effect with respect to other financial instruments on the reduction of financial vulnerability with magnitudes that range from 24 to 37%, depending on the matching algorithms. Informal and formal savings reduce financial vulnerability with magnitudes ranging from 24 to 28% and from 31 to 39%, respectively. The difference between the effects of formal savings versus informal savings in reducing financial vulnerability might be due to: (i) bank deposits allow fast liquidity to respond to an economic emergency (Collins, 2015); and (ii) social networks to which individuals recur in case of an emergency might also face the same situation at the same time (Ligon et al., 2002).

Credit reduces financial vulnerability in magnitudes ranging from 3 to 12 %. Formal credit reduces financial vulnerability (23 to 29%); however informal credit increases financial vulnerability (10 to 14%). An explanation to these results is the high interest rates that are usually observed with this type of credit because of monitoring costs and lack of regulation, which could ensue insolvency in the long run ( Bridges and Disney, 2004). An additional explanation is that informal credit includes loans from family and friends and the lack of risk diversification in this type of setting could result in greater financial vulnerability (Banerjee and Duflo, 2007). However, informal credit of small monetary amounts obtained from family and friends sometimes could offer advantages over credit from formal institutions, such as lower interest rates and/or flexible repayment schedules (Karaivanov and Kessler, 2018). Therefore, our result might suggest that households that use informal credit in this sample do so because they have unhealthy finances to begin with and/or they are constrained to source informal funds from providers that offer interest rates and repayment conditions that are less favorable than those from family and friends and from the formal sector.

## 6. Conclusions

This article examines the impact of holding financial instruments on a financial vulnerability index constructed based on the methodology of Anderloni et al. (2012). We employ the propensity score matching method, similar to Urrea and Maldonado (2011), to address potential endogeneity issues arising from inherent differences between households that use financial instruments and those that do not. Our findings suggest that all types of financial instruments contribute to reducing households' financial vulnerability, with the exception of informal

credit. Informal credit instruments, which are unregulated and often associated with high interest rates (Iregui et al., 2018), do not exhibit the same positive effect.

Given the significant impact of holding formal financial instruments on reducing financial vulnerability, we conclude that promoting financial inclusion should remain a top priority in Mexico. This entails minimizing barriers to accessing formal financial instruments and ensuring wider coverage of regulated and affordable banking services. Additionally, our results indicate that financial vulnerability is more prevalent among women, less educated individuals, rural populations, and unmarried individuals. These groups are likely to derive the greatest benefits from financial inclusion. Further research is needed to precisely estimate the heterogeneous benefits experienced by these groups.

Furthermore, the COVID-19 pandemic serves as a recent example of a health crisis with substantial global economic consequences. The implementation of social distancing measures during the initial months of the pandemic resulted in significant job losses worldwide. Mexico experienced a particularly severe impact, with approximately 12 million jobs lost between February and May 2020 (Banco de Mexico, 2021). The recovery of the Mexican labor market was also slower compared to other OECD countries, taking several months until total recovery was achieved by the summer of 2022 (OECD, 2022). Therefore, a potential avenue for future research would be to examine changes in financial vulnerability among Mexican households resulting from this shock, utilizing data from the already available 2021 edition of the ENIF.

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## Appendixes

### Appendix A. Details on Indexes

#### A.1 Index of Financial Education (FE)

The questions employed to construct the index of Financial Education are the following:

- It is better to save money in two or more instruments or places than just in one (a savings account, a savings cooperative, etc.). Answer: Yes or no.
- If you receive a gift of 1,000 Mexican pesos, but you must wait for one year to spend it and in that year the inflation is 5%, you could buy ... Answer: More, less or the same amount.

- Inflation means that prices go up. Answer: Yes or no.

### ***A.2 Index of Numerical Ability (NA)***

The questions employed to construct the index of Numerical Abilities are the following:

- If you lend 25 Mexican pesos to a friend and your friend pays you back 25 Mexican pesos the following week, how much did your friend pay in interest? Answer: Nothing, other quantity, he/she does not know.
- Suppose that you deposit 100 Mexican pesos in a savings account that gives you a return of 2% in one year. If you do not make another deposit or withdrawal, including the interest, at the end of one year you will have... Answer: more than 102 pesos, exactly 102 pesos, less than 102 pesos, he/she does not answer, he/she does not know.
- Suppose that you deposit 100 Mexican pesos in a savings account that gives you a return of 2% in one year. If you do not make another deposit or withdrawal, including the interest, at the end of five years you will have... Answer: more than 110 pesos, exactly 110 pesos, less than 110 pesos, he/she does not answer, he/she does not know.

### ***A.3 Index of Financial Planning (FP)***

The questions employed to construct the index of Financial Planning are the following:

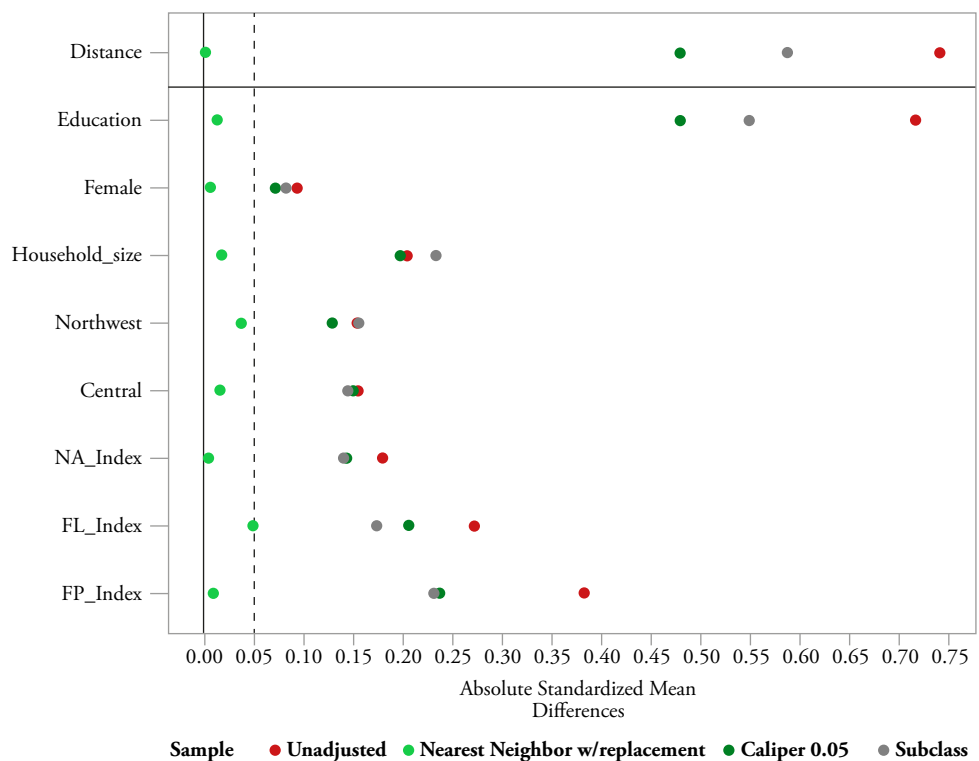
- Do you keep a budget of your incomes and expenses? Answer: Yes or no.
- Do you buy things that you did not had plan or that are out of your budget? Answer: Yes or no.
- In general, you have long term goals and make an effort to reach your goals (buy a house, retirement savings, pay vacations or parties, start a business...) Answer: yes or no.

## Appendix B. Balance Tests

### B.1 Balance Tests for Savings Treatment

#### B.1.1 Covariates Balance before and after Matching

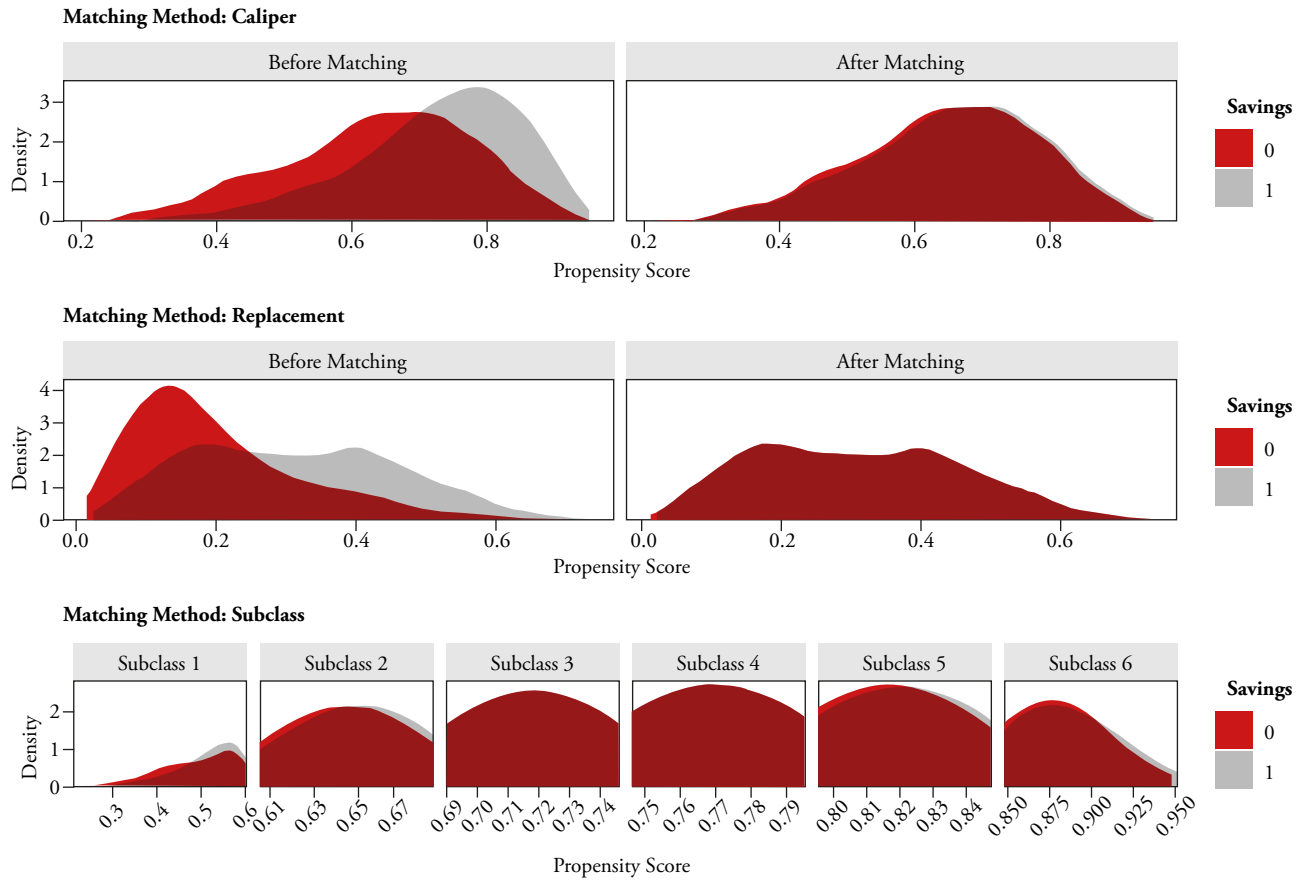
Figure B.1: Covariate Balance: Savings



Source: Own elaboration using ENIF 2018.

*B.1.2 Common Support Region*

**Figure B.2: Common Support Region Before and After Matching**

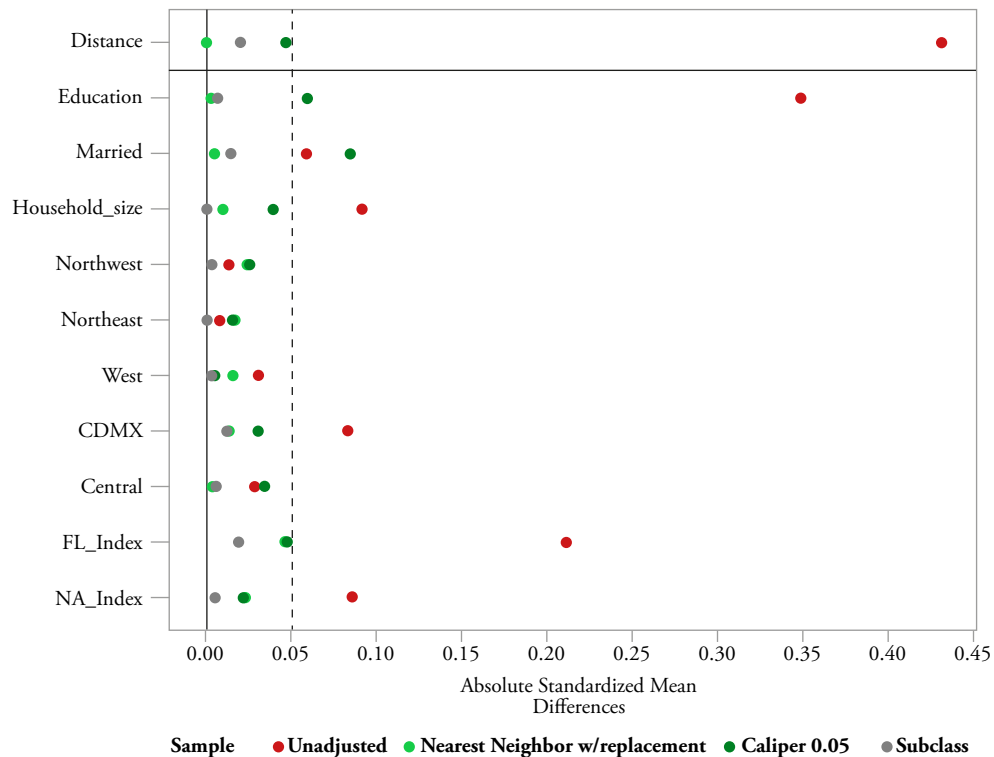


Source: Own elaboration using ENIF 2018.

## B.2 Balance Tests for Informal Savings Treatment

### B.2.1 Covariates Balance before and after Matching

Figure B.3: Covariate Balance: Informal Savings

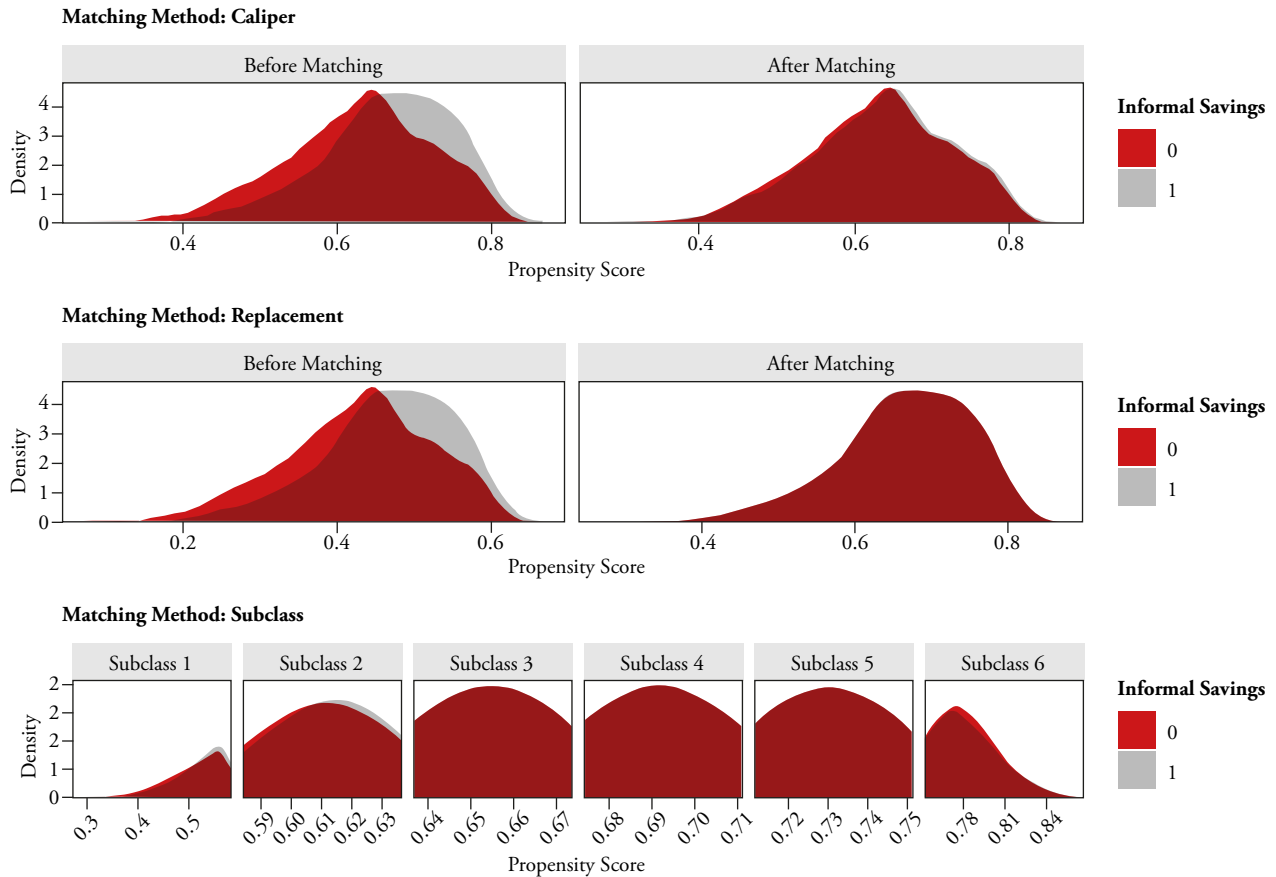


Source: Own elaboration using ENIF 2018.



B.2.2 Common Support Region

Figure B.4: Common Support Region Before and After Matching

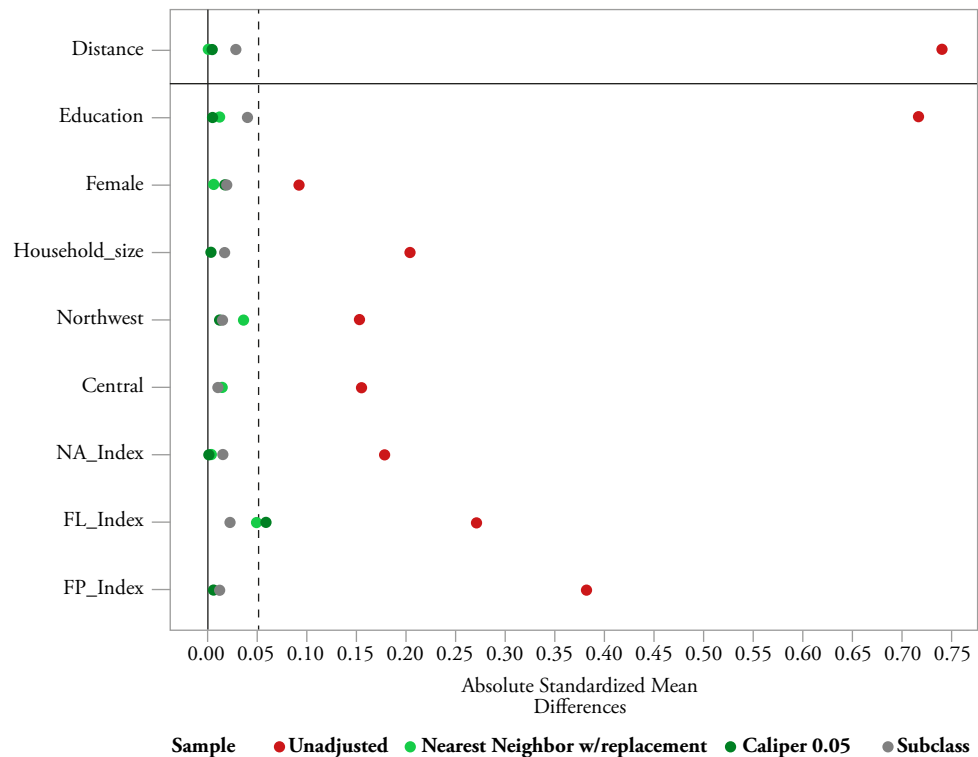


Source: Own elaboration using ENIF 2018.

### B.3 Balance Tests for Formal Savings Treatment

#### B.3.1 Covariates Balance before and after Matching

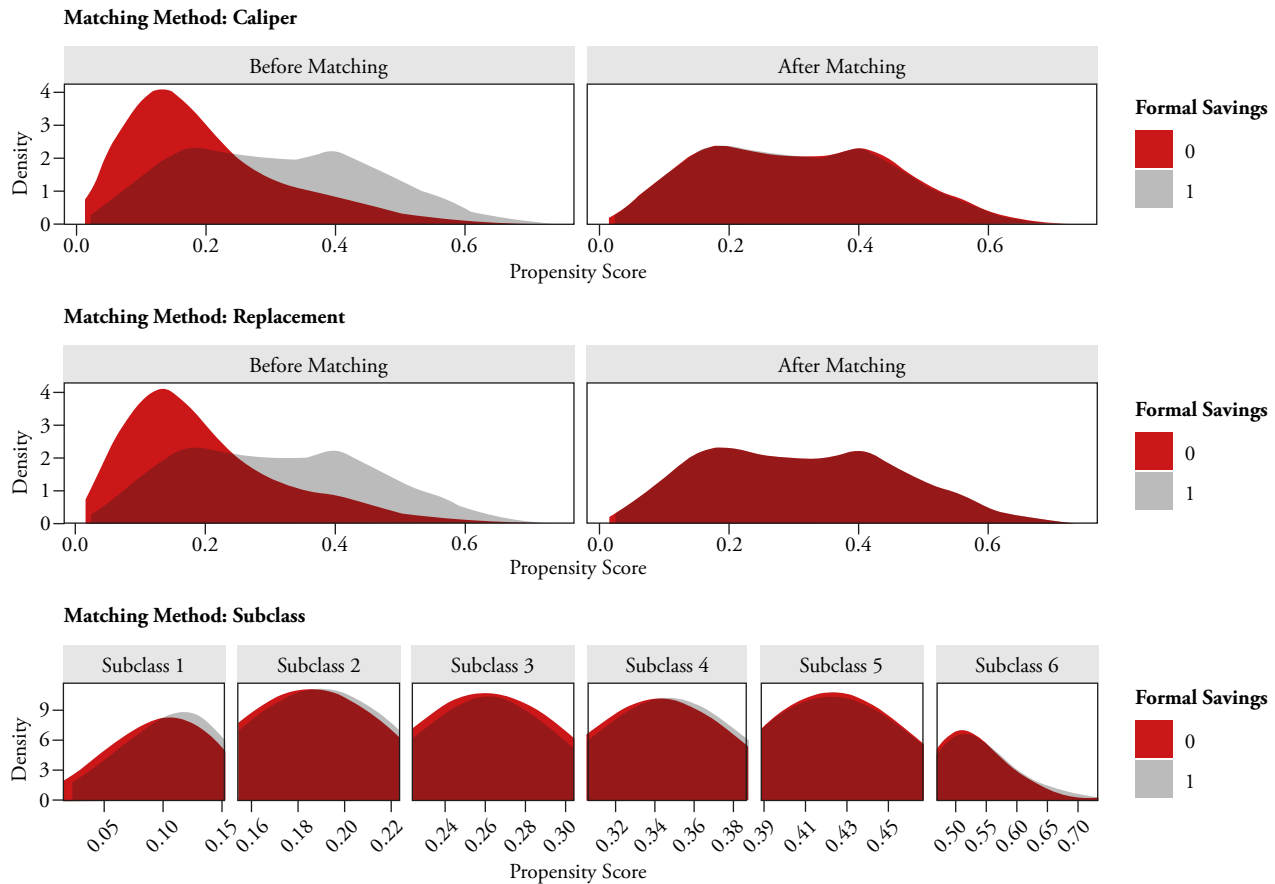
Figure B.5: Covariate Balance: Formal Savings



Source: Own elaboration using ENIF 2018.

B.3.2 Common Support Region

Figure B.6: Common Support Region Before and After Matching

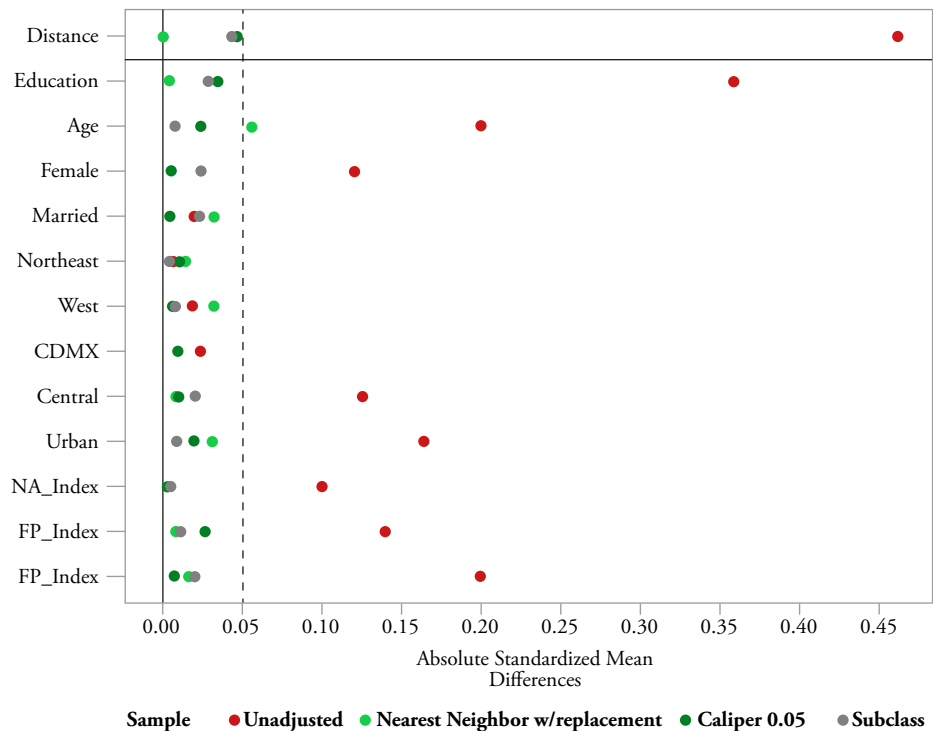


Source: Own elaboration using ENIF 2018.

## B.4 Balance Tests for Credit Treatment

### B.4.1 Covariates Balance before and after Matching

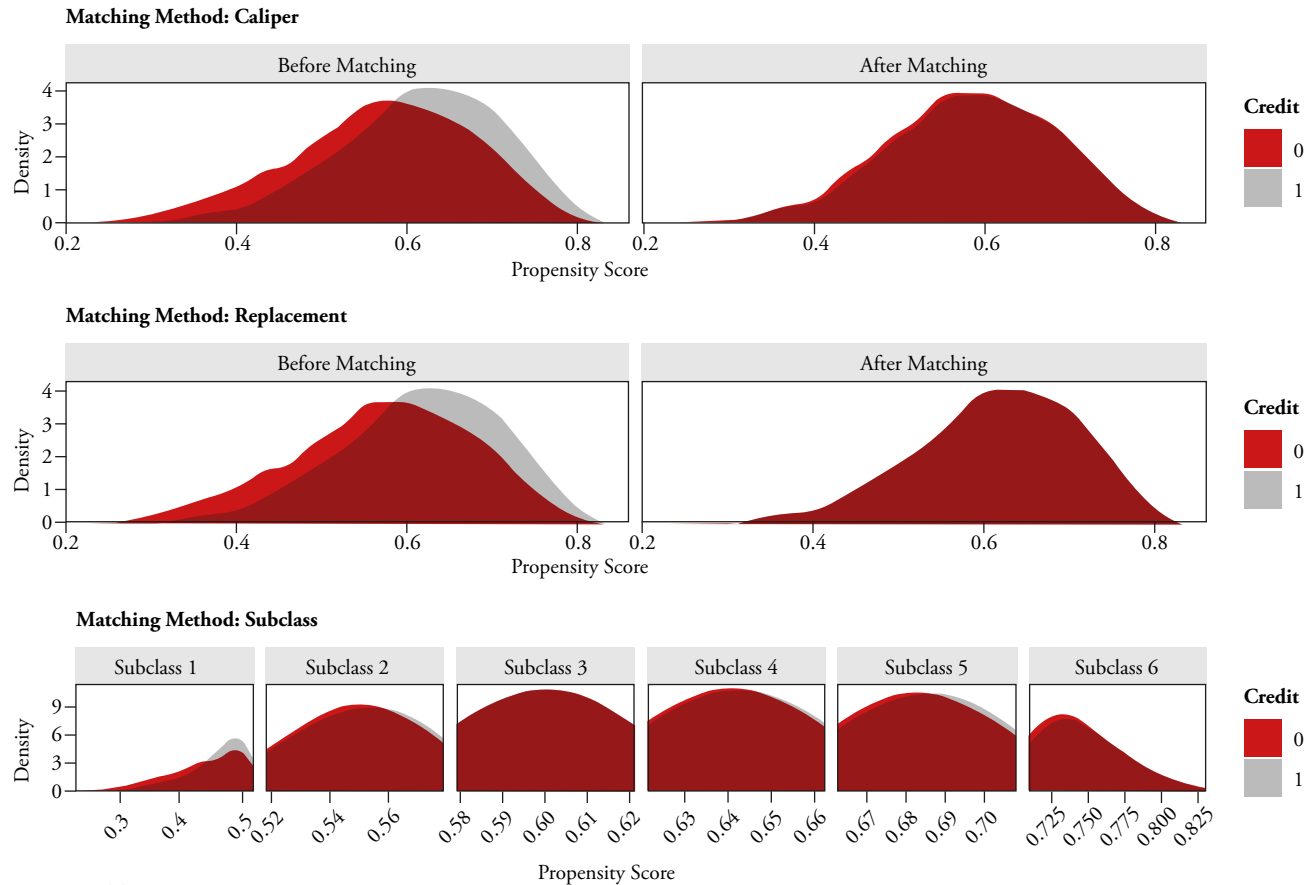
Figure B.7: Covariate Balance: Credit



Source: Own elaboration using ENIF 2018.

B.4.2 Common Support Region

Figure B.8: Common Support Region Before and After Matching

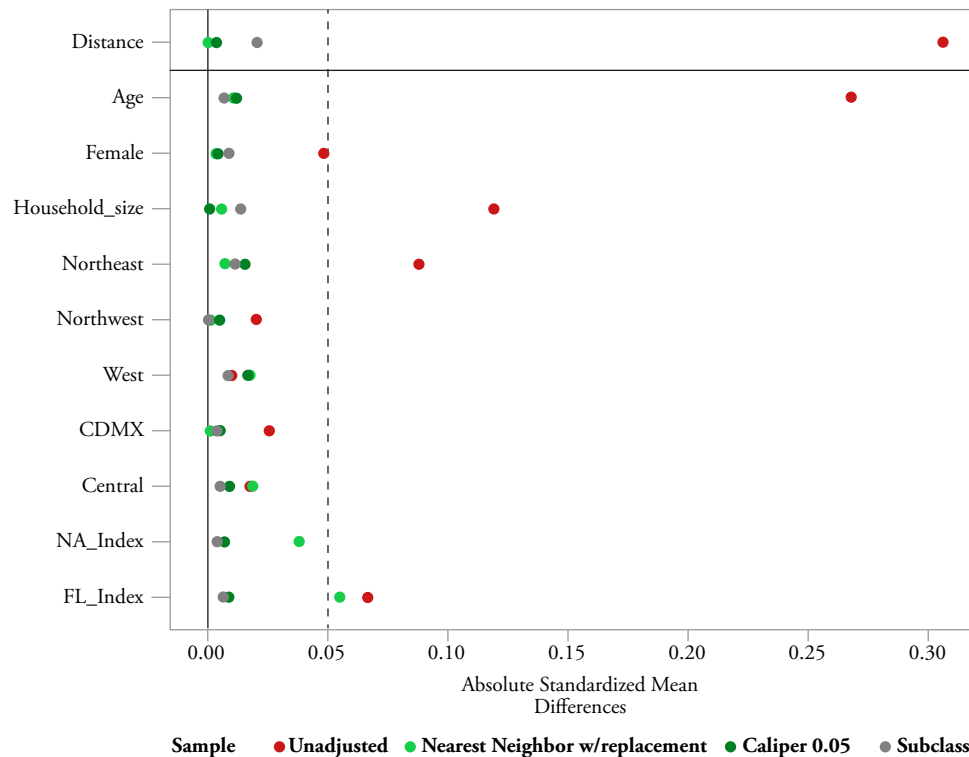


Source: Own elaboration using ENIF 2018.

## B.5 Balance Tests for Informal Credit Treatment

### B.5.1 Covariates Balance before and after Matching

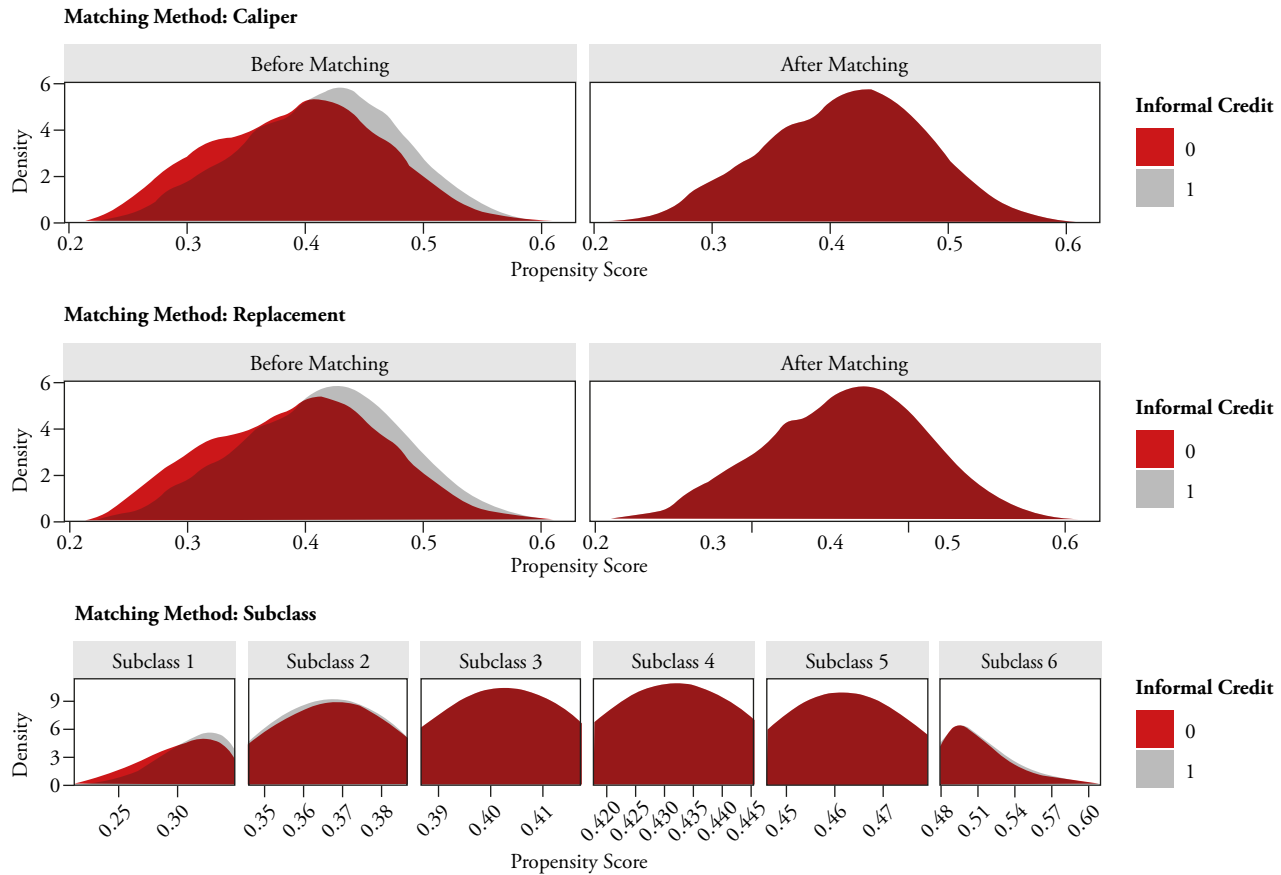
Figure B.9: Covariate Balance: Informal Credit



Source: Own elaboration using ENIF 2018.

B.5.2 Common Support Region

Figure B.10: Common Support Region Before and After Matching

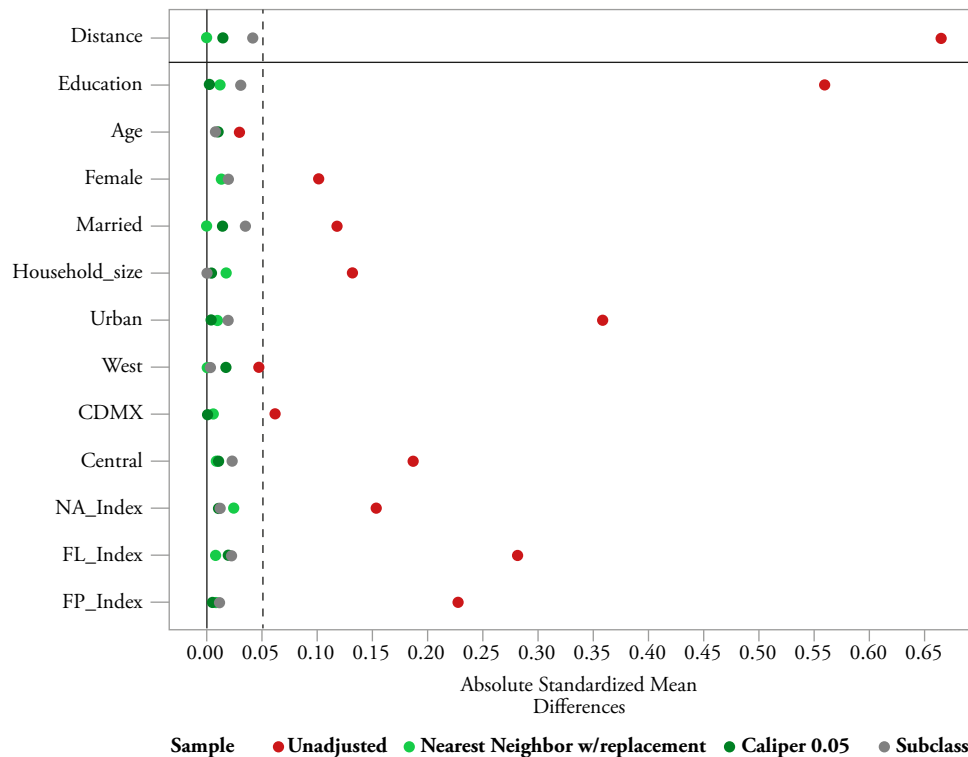


Source: Own elaboration using ENIF 2018.

## B.6 Balance Tests for Formal Credit Treatment

### B.6.1 Covariates Balance before and after Matching

Figure B.11: Covariate Balance: Formal Credit

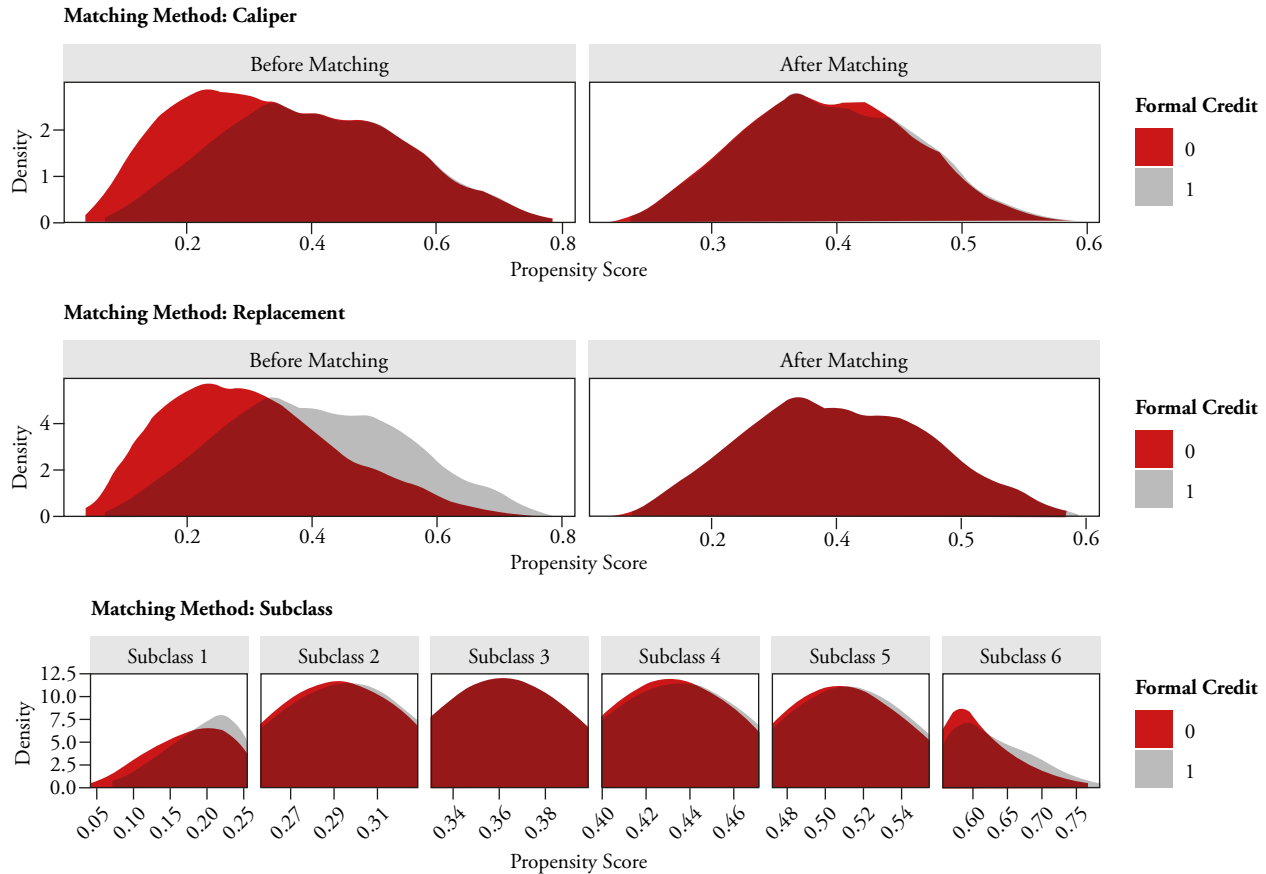


Source: Own elaboration using ENIF 2018.



B.6.2 Common Support Region

Figure B.12: Common Support Region Before and After Matching



Source: Own elaboration using ENIF 2018.