

Received: 01/22/2021

Accepted: 07/28/2021

## IMPACTS OF FINANCIAL EDUCATION ON THE REDUCTION OF ECONOMIC VULNERABILITY OF LOW INCOME ELDERLY

## IMPACTOS DA EDUCAÇÃO FINANCEIRA NA REDUÇÃO DA VULNERABILIDADE ECONÔMICA DE IDOSOS DE BAIXA RENDA

Rafaela Aires Tavares Santos<sup>1</sup>

Waldecy Rodrigues<sup>2</sup>

Joel Isaac Hernandez Lanza<sup>3</sup>

### Abstract

This paper reports the implementation and evaluation of the financial education program for adults "I and my retirement - organizing the financial life" and its effects on the reduction of the economic vulnerability of low income elderly in Palmas - TO. The evaluation method used was the Propensity Score Matching with Differences in Differences econometric model considering the effects of the program on the financial health of the elderly. The results pointed to the positive effect of the program in all dimensions surveyed: monthly income spent on food, health, housing, water and electricity; savings (72%); ability to make financial decisions (14%); debt knowledge (30%) and reduction of overdue accounts after intervention (50%).

**Keywords:** Impact assessment; financial education; vulnerability; Propensity Score Matching; Differences in Differences

### Resumo

Este artigo relata a experiência da implantação e avaliação do programa de educação financeira para adultos "eu e minha aposentadoria – organizando a vida financeira" e seus efeitos sobre a redução da vulnerabilidade econômica de idosos de baixa renda no município de Palmas – TO. O método de avaliação utilizado foi o modelo econométrico *Propensity Score Matching* com Diferenças em Diferenças considerando os efeitos do programa sobre a saúde financeira dos idosos. Os resultados apontaram para efeito positivo do programa em todas as dimensões pesquisadas: renda

<sup>1</sup> PhD Student in Business Management - Faculty of Economics, University of Coimbra, Coimbra, Portugal. E-mail: rafaela.aires@gmail.com

<sup>2</sup> PhD in Sociology (UNB). Professor at the Federal University of Tocantins, Palmas – TO. E-mail: waldecy@terra.com.br

<sup>3</sup> Master in Government and Culture of Organizations. University of Navarre (UNAV). Master in Economics with emphasis on Health System. University of Budapest. Online Modality Professor at the Technological University of Honduras: San Pedro Sula, Cortes, Honduras. Email: isaac\_lanz@hotmail.com

mensal gasta com alimentação, saúde, moradia, água e luz; poupança (72%); capacidade para tomar decisão financeira (14%); conhecimento sobre dívidas (30%) e redução das contas em atraso após a intervenção (50%).

**Palavras-chave:** Avaliação de impacto; educação financeira; vulnerabilidade; Propensity Score Matching; Diferenças em Diferenças.

## Introduction

From the 1970s onwards, Brazil began to increase the elderly population, which has been accompanied by numerous social changes, one of which was in the family organization itself, with regard to the role and / or participation of the elderly. Till the 90s, the elderly was seen as dependent on the resources and care of the family, in many cases without any income, was regarded as a poor plot and no autonomy in society. This scenario changes with the advent of retirements and pensions, which gave the elderly a new expression for the family and society. Thus, he who was previously dependent, now, in many Brazilian homes, becomes the provider and member of the country's active consumer portion, with access to goods and services designed for his age group and still with access to credit in the financial market. (BUAS, 2015 e MIRANDA et al, 2016).

This new scenario places the elderly as a target of the financial goods and services market. However, this new configuration brings to old s new challenges to their financial lives, it s now have m of dealing with major uncertainties in the process of decision making financial, and that, not most of the time, does not have a support strong social network that helps you to prevent situations that will have negative impacts on your quality of life. These inroads suffered by the elderly start from the ease of making installment purchases in installments with credit cards, credit cards and store cards to bank actions for the sale of payroll loans that constantly target the retired elderly (DOLL, 2015).

A reflection of this vulnerability can be seen by the growing number of indebtedness of the elderly in Brazil, mainly debts related to payroll loans. In this sense, data from the Central Bank of Brazil and the Credit Protection Service point to a 45% increase in the number of indebted elderly people in Brazil, from April 2018 to April 2019, with the main debt (52 %) relates to payroll loans. The INSS reports that the salary range of up to one minimum wage is the most outstanding in contracting loans, which means that the monthly income will be lower for a long time, which also affects the basic and essential expenses of the elderly. In 2019, SPC - Brazil reported that of every 10 defaulters in the country 3 are elderly.

The fact is that this situation leads to the reflection that the insertion of the low-income elderly in a consumer scenario was not accompanied by a support network that prepared them to deal with all these changes. Thus, the importance of educational interventions for this portion of the population is highlighted, which is potentially more vulnerable, considering their age, low education, and their social class (BUAS, 2015).

A strategy to contribute to reducing the indebtedness and defaults of families that are in a vulnerable situation is financial education, programs and actions of bodies such as the Organization for Economic Cooperation and Development - OECD in partnership with the World Bank, Monetary Fund International and Central Banks started an expansion of the theme by several countries in the world. The first to join were the United States and the United Kingdom, and currently more than 50 countries, including Brazil, have implemented actions and strategies for the development of programs at national level taking the theme for schools, universities and community.

In Brazil, since 2010 financial education actions and programs have been coordinated by the National Strategy for Financial Education in Brazil - ENEF, together with the Association of Financial Education in Brazil - AEF-BRASIL.

The proposal of ENEF and AEF Brasil is that this project will become a public policy of wide reach, to improve the reality of economically vulnerable adults in the country. To achieve this purpose, AEF-BRASIL establishes partnerships with institutions throughout the national territory in order to form multipliers of the program, and the main partners are educational institutions,

schools, universities, governments, municipalities and specialized care centers in public of low income.

In this direction, the Federal University of Tocantins - UFT, in 2017, became a partner of AEF-BRAZIL, through the Program of Post - Graduation in Regional Development - ADRP, and proposed to implement the Financial Education Program " Me and my retirement, organizing financial life ", which targets low-income elderly people. The program was carried out, as part of this research, with the elderly students of the University of Maturity - UMA / UFT - and also with elderly people registered at two Social Assistance Reference Centers - CRAS in the municipality of Palmas, from February to April of 2018.

In addition to the offer of the qualification program, this research mainly proposed to evaluate the effects of the program on 5 (five) indicators: a) income spent on basic expenses (food, health, housing, water and electricity); b) default; c) savings habit; c) financial behavior and d) knowledge of debts. These indicators made it possible to assess in what aspects the program proved to be effective, whether in gaining knowledge or in financial behavior.

The investigation of these indicators becomes important since from the impact APPRAISAL, it is possible to assess whether there was a change in the financial position of the individuals involved after running a program or policy, if the funds invested were effective, in the same way it is possible to observe gaps in the design of the program proposal and also to propose incremental actions for greater effectiveness of the same.

## Material and methods

This research was divided into 2 stages: the first involves the application of the program for low-income elderly people in the city of Palmas and the second stage is configured in the execution of the impact assessment.

### Implementation of the “Me and my retirement – organizing financial life” Program

The first stage of the research was carried out from February to April 2018. In this stage, the strategy of offering the financial education program in the municipality of Palmas was initially built, which went through the formalization of partnerships with the institutions that would come to be the recipients of the program; then the first data collection to compose the base data of research; d) the establishment of the group of elderly people who would receive the financial education course and subsequently the offer of the program.

The financial education program - “me and my retirement, organizing financial life”, object of study of this work, was developed by AEF-BRASIL as part of the actions that seek to popularize financial education in Brazil. The program was designed to contribute to the reduction of the indebtedness of the elderly in Brazil, and even help them make decisions more aware with regard to the management of its resources. To this end, it proposes to bring basic knowledge of organization and planning of financial life in a manner appropriate to the lifestyle of the most needy adult populations (AEF-BRASIL, 2017).

For the implementation of the program, AEF - Brasil developed a curriculum of syllabus formatted according to the results presented in the financial literacy research carried out during the ENEF structuring period. The contents were structured in the form of practical workshops, in which, in a participatory way, the elderly learn about financial planning and organization, debts, financial control, loans, future planning, among other recommended topics.

The places that the workshops, through this research, took place in the city of Palmas - TO were: the Reference and Social Assistance Centers (CRAS) - 407 Norte, the CRAS - Taquaruçu and the University of Maturity Campus Palmas. After delimiting the places where the research was applied, the managers of the partner institutions invited the elderly who were registered in the database for an initial meeting to present the project. After the presentation, the elderly interested in participating in the program were enrolled. Therefore, for each interested elderly person, an enrollment form was filled out through which personal data and socioeconomic characteristics were collected.

The next step was to select the group of elderly people who would participate in the program (treatment group). For that, the elderly were gathered, one week after the first meeting, so that they

answered a questionnaire of behavior and financial knowledge, so that baseline data were collected. This step was fundamental for the delimitation of the treatment group, for this, two criteria were used: 1) The treatment group would be composed of the elderly who were present on the second visit and answered the baseline questionnaire; 2) once 100% of the enrolled elderly came to answer the basic questionnaire, the selection of the treatment group would be by lottery. Altogether, 100 elderly people signed up and answered the baseline questionnaires, of these, 64 comprised the control group and 36 the treatment group.

After registration, the application of the basic questionnaire and the determination of the treatment and control groups, the stage of offering workshops on financial education for the elderly that make up the first group was passed. The workshops lasted an average of 4 hours and were held in 4 local meetings and another general closing meeting, totaling 5 meetings. Each workshop taught had a mediating instructor responsible for the development of activities and volunteers who performed the monitoring.

### Impact assessment of the “me and my retirement - organizing financial life” program

In the evaluation process, this research used primary data that were collected through the application of questionnaires as a collection instrument. For the case of an impact assessment, it was necessary to collect data at two different times, the first at a time  $t = 0$  (before program implementation, which are the baseline data (baseline) and other period  $t = 1$  (after the application of the program). It should be noted here that in both periods the elderly who made up the treatment group and the control group answered the questionnaires.

The questionnaires sought to contemplate questions about the behavior and financial knowledge of the elderly, so that they were related to the content covered in the program. Table 1 shows the number of elderly people who answered the questionnaires in both periods.

**Table 1:** Elderly who answered the questionnaire are in the period pre and post intervention - Palmas - TO - 2018.

Subscribers : 100 elderly		
	Treatment grupo	Grupo de controle
Pre- intervention	64	36
Post-intervention	62	28

Source: Prepared by the authors based on data from the field research

The impact of the financial education program on the economic vulnerability of the elderly was analyzed based on indicators that include behavioral changes such as: relationships with indebtedness, consumption, savings, planning, financial and financial knowledge and behavior. These indicators will show in which aspects the program is most effective, they are:

- 1) Effect of the program on the percentage of monthly income spent on basic expenses
- 2) Effect of the program on the habit of saving
- 3) Effect of the program on financial behavior
- 4) Effect of the program on debt knowledge
- 5) Effect of the program on bad debt among the elderly.

The variables that respond to the indicators were raised from the data collected in the behavioral and financial knowledge questionnaires, with the responses of individuals from the treatment and control groups in the pre and post - intervention period. Table 1 presents the variables used.

**Table 2:** Description of the variables used to respond to the impact indicators.

Variable	Description	Values
Treatment*	Binary variable that indicates the participation of the elderly in the workshops of the financial education program	Treatment = 1 - Participated in the workshops Treatment = 0 - Did not participate in the workshops
Renda_pos	Variable that indicates the income of the elderly, post-program , spent on basic expenses.	Percentage values
income_pre	Variable that indicates the income of the elderly pre-program , spent on basic expenses	Percentage values
defaulter_pos	Elderly participants, who declare to be in default in the post-program .	YES, is in default = 1 NOT in default = 0
defaulter_pre	Seniors who declare to be in default in the pre-program .	YES , in default = 1 NOT in default = 0
poupa_pos	Seniors who claim to have saved some money in the post-program period .	YES , have some savings = 1 NO savings = 0
save_pre	Seniors who claim to have saved some money in the pre-program period	YES , have some savings = 1 NO savings = 0
comp_pos	Seniors who claim to make a purchase and then think about how they will pay in the post-program period .	YES, spend and then think about how you will pay = 1 NO , think before you spend = 0
comp_pre	Seniors who claim to make a purchase and then think about how they will pay in the pre-program period	YES, spend and then think about how you will pay = 1 NO , think before you spend = 0
hecdiv_pos	Elderly people who correctly answered questions about knowledge about debts in the pre- intervention period .	YES - understand are debts = 1 NO - understand what debts are = 0
known_pre	Elderly people who correctly answered questions about knowledge about debt in the pre- intervention period	YES - understand are debts = 1 NO - understand what debts are = 0

Source: Prepared by the authors

According to the Theory of Counterfactual, when evaluating the impact of a program, the ideal scenario would be to observe the same individual, at the same time, in two similar contexts, differing in just one circumstance, the receipt of an intervention. Given the impossibility of observing an individual with and without the program simultaneously, the impact of a program can be identified by comparing two similar groups, one being under the intervention of the program and the other not (DANTAS, et al., 2013).

However, in non-random experiments, direct comparisons between the control and treatment groups are not recommended, as they may present important biases for an impact assessment, since, in these groups, systematic differences can be found between the units observed.

Stuart (2014) reinforces that, in non-experimental studies, one of the biggest challenges is to eliminate these selection biases, which are related to the possible differences between the units of the control and treatment groups. In studies of this nature, researchers are looking for methods capable of identifying a control group in which the average characteristics are the same as those found in the treatment groups. As random selection is not always possible in this situation, matching methods are commonly used.

The purpose of the pairing methods is to build a control group similar to the treatment group based on observable characteristics, in which each member of the treatment group would have a pair in the control group, which represents the result that he would have obtained had he not been treated. Thus, the only factor that differentiates the results of these individuals is the participation or not in the program (PINTO, et al., 2012).

A method commonly used is the one developed by Rosenbaum and Rubin, 1983, the Propensity Score Matching - PSM - (method of matching propensity score) that gained notoriety with the publication of the article The central role of the propensity score

in observational studies for causal effects, becoming common in the literature and significantly increasing the work in the area (STUART et al., 2014; ROSENBAUM, 2002).

The PSM is an econometric method, not experimental, that seeks to simulate the random choice for the formation of control groups with characteristics similar to the treatment group based on observable characteristics (PINTO, et al., 2012). In this hypothesis, from the selection based on observable characteristics, a vector  $X_i$ , contain all the information that determines the result ( $Y_{i0}$ ,  $Y_{i1}$ ). Therefore, the potential results are independent of the treatment variable ( $T_i$ ) (RODRIGUES e NEVES, 2016; DANTAS et al., 2013)

$$\{Y_{i0}, Y_{i1}\} \perp T_i | X_i$$

Another hypothesis is that of overlap. According to this hypothesis, each individual in the treatment group would have a pair in the control group that would represent their result if they had not received the intervention.

$$0 < \Pr(T_i = 1 | X_i) < 1$$

However, Dantas et al. (2013) emphasize that, in both hypotheses, it is possible to present the difficulty of finding a pair in the treatment group. In the first, pairing can become impracticable when there are many variables that must be matched between the treatment group and the control group. In the second, the overlap, it can happen only in the area where there is common support, excluding many units from the analysis.

As a solution to the biases, Rosenbaum e Rubin (1983) developed the Propensity Score Theorem, in which the observable variables of the vector  $X_i$  are summarized to a single scalar, which would be the probability of an individual receiving the treatment, considering the observable characteristics  $P_r(T_i=1|X_i)$ . Thus, individuals become paired according to the similarity between the propensity scores (ROSENBAUM; RUBIN, 1983).

In the operationalization of the PSM for impact, Jalan e Ravallion (2003) emphasize that some steps must be followed: 1) estimate the probability that each individual will enroll in the program based on the individual characteristics observed in the research. This process generates the propensity score; 2) Based on the propensity scores, each participant is paired with non-participants; 3) The impact of the policy is estimated based on the new sample

The estimation of the propensity score can be done using parametric probability estimation methods. A method often used for binary responses, such as participating in a program or not, is the logit regression model, which receives this name because it is based on a logistic function of accumulated probability as follows:

$$\text{Prob}(y_i = 1) = \frac{e^{\beta' X_i}}{1 + e^{\beta' X_i}} = \frac{1}{1 + e^{-\beta' X_i}} = F(\beta' X_i)$$

$$\text{Prob}(y_i = 0) = \frac{e^{\beta' X_i}}{1 + e^{\beta' X_i}} = 1 - F(\beta' X_i)$$

In general,  $Y_i=0$  and  $Y_i=1$  correspond, respectively, to “failure” and “success” scenarios, where  $Y_i=0$  is when the individual did not participate in the program and  $Y_i=1$  when he participated,  $X_i$  represents the vector of explanatory variables of  $y_i$  e  $\beta$  is the vector of parameters. In the case of the logit model, we look for the probability of “success”  $P(y_i=1)$ , which is the conditional probability of  $y_i$ . Thus, the conditioned hope of  $y_i$  is given by:

$$E(y_i | X_i) = F(\beta' X_i) = \frac{e^{\beta' X_i}}{1 + e^{\beta' X_i}}$$

Once the propensity score has been determined, the pairing of the groups can be obtained using different techniques, among which we can mention the matching, weighting and subclassification techniques (STUART, 2010). For this research, the matching form (by pairing) will be used due to its preference among researchers.

To perform the pairing, the literature discusses several models, among which we highlight here the methods stratification, nearest-neighbor, radius and kernel, and the choice of the most appropriate depends on the data structure that is at hand. Becker e Ichino (2002) present an overview of the methods.

In layering method (stratification), PSM is divided into blocks that encompass individuals  $i$  and  $j$  so that the blocks have the same propensity score matching medium. The ATT is estimated as an average of the ATTS of each block weighted by the weights given by the distribution of treaties in each one. If there are blocks that contain observations from only one of the groups, that block is discarded, that is:

$$\tau_q = \frac{\sum y_{i1}^q}{N_T^q} - \frac{\sum y_{i0}^q}{N_C^q}$$

The nearest-neighbor method compares each treatment unit with the control unit with the closest propensity score. As soon as each treatment unit is paired with a control unit, the ATT is obtained by averaging the differences in the variables of interest between treated and untreated.

$$C_j = \min_j |Pr(T_j = 1 | X_j) - Pr(T_i = 1 | X_i)|$$

The radius matching method determines a propensity score matching radius for each treatment unit. Pairing is carried out between the control units belonging to this radius. However, there are important implications, the smaller the radius of the neighborhood, the better the matching will be. However, this increases the chances that some units will not be paired, as follows:

$$C_j = \{Pr(T_j = 1 | X_j) | \|Pr(T_i = 1 | X_i) - Pr(T_j = 1 | X_j)\| < r\}$$

In the kernel method, all treatment units are paired with a weighted average of all control units, in which the weights used are inversely proportional to the distance between the treated and untreated propensity score values. The equation below defines the kernel matching, where  $K$  represents the kernel function.

$$\omega(i, j)_{kernel} = \frac{K\left(\frac{P_j - P_i}{\alpha_n}\right)}{\sum_{k \in C} K\left(\frac{P_j - P_i}{\alpha_n}\right)}$$

Thus, based on the hypotheses of selection of observables and overlap, the result that we seek to find is called the average effect or impact of the program on treaties (Average Treatment Effects on the Treated), which, in practice, is the difference between the average number of individuals who received treatment and those who did not, but who were similarly likely to participate.

$$ATT = E[Y_{i1} | T_i = 1, P_r(T_i = 1 | X_i)] - E[Y_{i0} | T_i = 0, P_r(T_i = 1 | X_i)]$$

A limitation of the PSM is not to account for unobserved characteristics that may explain and affect the results over a period of time. Due to this fact, Gertler et al. (2011) points out that the application of pairing methods combined with other methods of impact estimation can generate greater robustness in the results.

A method commonly used with Propensity Score Matching is the Differences-in-Differences method, which compares the variation observed in the indicator of interest in two periods of time, a period prior to the program ( $t = 0$ ) and the effect in a later period ( $t = 1$ ), both for the treated group and for the control group, aiming to minimize the effect of unobserved factors (PEIXOTO, et al., 2012).

Therefore, for application of the DD model, it is necessary to have baseline results and post-intervention results, both for the control group and for the treatment group. Thus, it is necessary to build four groups, not just two, as for the application of the PSM (GERTLER, et al., 2011; STUART, 2014), so that, in the DD, the counterfactual can be estimated by calculating the change in the results in the comparison group, subtracted from the change in results in the treatment group:

The average impact of the program on the DD method is obtained by calculating a double difference of means of the result variable, denoting by  $T = \{1,0\}$  the participation or not in the program and by  $t = \{1,0\}$  the periods after and before the intervention, respectively, the DD estimator will be given by:

$$\beta_{DD} = \{E[Y|T=1, t=1] - E[Y|T=1, t=0]\} - \{E[Y|T=0, t=1] - E[Y|T=0, T=0]\}$$

That is, by the temporal difference of what occurred with the treatment group subtracted from the same difference calculated for the control group. (FOGUEL, 2012).

Thus, to apply this combination of methods, we need to observe the individuals in the control group and the treatment group in at least two periods at time  $t=0$  e  $t = 1$ , one prior to receiving treatment and one period after treatment respectively. Thus, matching is performed using propensity score matching, based on the observed baseline characteristics, then the difference-in-differences method is applied to estimate the counterfactual of the change in results in each subgroup of paired units. , finally, these double differences are averaged in the paired subgroups.

$$ATT_{t_0,t_1} = E[Y_{it1}^1 - Y_{it0}^0 | T_i=1, Pr(T_i = 1 | X_i)] - E[Y_{it1}^1 - Y_{it0}^0 | T_i = 0, Pr(T_i = 1 | X_i)]$$

Posto Therefore, this article has adopted the application of PSM coupled in DD in order to obtain a more consistent result with the largest number and eliminating bias in the characteristics  $n \hat{a}$  the observable.

Regarding the operationalization of the PSM for impact assessment, Jalan e Ravallion (2003) emphasize that some steps must be followed: 1) the two samples must be gathered and the likelihood that each individual should enroll in the program based on individual characteristics observed in the research; this process generates the propensity score; 2) Based on the propensity scores, each participant is paired with non - participants; 3) The impact of the policy is estimated based on the new sample.

Thus, following what was suggested by Jalan e Ravallion (2003), the execution of step 1 started with the data collection that gave rise to the sample groups already presented. From the data of the enrolled elderly people who answered both questionnaires, Logit regression was performed in order to estimate the probability of each individual participating in the financial education program. The data used in the logit were the explanatory variables collected in the registration forms before the program, which proved to be significant and are shown in table 6 below.

**Table 3: Significant ucused in the model logit**

Variable	description	Values
Treatment*	Binary variable that indicates the participation of the elderly in the workshops of the financial education program	Treatment = 1 - Participated in the workshops Treatment = 0 - Did not participate in the workshops
AGE	Age of participating elderly	Age is described in years
Income	Monthly income of each elderly participant	Income is real value 2018
Indebted	Variable indicating self-declaration of over-indebtedness	over-indebted = 1 not over-indebted = 0

Source: Elaborated by the author based on data from the field research.

\* Dependent variable

Therefore, for the regression and for the calculation of the propensity score, we have respectively:

$$L_i = \text{Ln} \left( \frac{P_i}{1-P_i} \right) = \beta_1 + \beta_2 \text{idade} + \beta_4 \text{renda} + \beta_5 \text{endivid} \quad e$$

$$P_r (T_i = 1|X_i) = \frac{e^{\beta'x_i}}{1+e^{\beta'x_i}}$$

The next step, after estimating the propensity scores, is to pair the individuals in order to find a valid control group. This step is important, as it will balance the data sample in order to ensure that the individuals in the treatment group can be compared with the individuals in the control group, as both groups have very similar probabilities of participating in the program.

Once the groups were balanced, the Average Treatment Effects on the Treated - ATT was estimated, which, in practice, is the difference between the average of individuals who received treatment and those who did not, but who had similar probabilities of participating. The ATT estimation was performed using



the `attnd` package in the STATA 15.1 software. After the ATT estimation, the effect of the program was estimated through the application of Differences in Differences. In this step, the variables used are those collected through the responses to the questionnaires by the treatment and control groups in the pre- and post-program period.

## Results and discussions

The individuals selected for the research have an average income in the treatment (R \$ 1061.41) and control (R \$ 1453.75) group and similar demographic characteristics. Also, it is highlighted that the percentage of indebted individuals is 68% in the treatment group and 95% in the control group (table 2).

**Table 4:** Characteristics of individuals in the treatment and control group of the financial education program - Palmas - TO - 2018.

Treatment group				
Variable	Variable	Variable	Variable	Variable
Income	R\$ 1060.41	551.2609	R\$ 85,00	R\$ 3200,00
Age	65 years	7.143355	53 years	85 years
-	No	Yes	-	-
Indebted	68%	32%	-	-
Retirees	45%	55%-	-	-
Control group				
Income	R\$ 1453.75	842.6271	R\$ 300,00	R\$ 3200,00
Age	70 years	7.046301	61 years	85 years
-	No	Yes	-	-
Indebted	95%	5%	-	-
Retired	30%	70%	-	-

Source: Elaborated by the author based on data from the field research.

It is important to note that these individuals will later be paired from their respective control and treatment groups. In order to carry out the matching, in this work, the closest-neighbor matching technique was used, considering that among the others (stratification, nearest-neighbor, radius, and kernel), it was the one that showed the greatest significance after the tests. Below are the results of the t-test for each of the algorithms.

**Table 5:** T-Test of the matching algorithms for the financial education program - Palmas - TO - 2018.

Method	Income	Savings	Default	Thin comp .	Know_debt
Nearest-neighbor	1,797**	2,2002*	2,520*	1,431**	2,937*
Kernel	0,933ns	1,403 ns	4,831	0,310 ns	1,975
Stratification	0,821 ns	1,589	3,266	0,498 ns	0,723 ns
Radius	0,834 ns	0,593 ns	1,998	0,132 ns	1,313 ns

Source: Prepared by the authors, based on field research.  
\* significant at 1% \*\* significant at 10% ns : Not significant

As the function of matching is to form a valid control group, it may happen that some individuals are eliminated from the sample at the time of pairing, a fact that happened in this research. For this reason, the initial sample dropped from 92 individuals to 82, with 58 remaining in the treatment group and 24 in the control group. One way to evaluate the result of the pairing is through graphical observation.

Table 4 presents the results of the logit model. In this step, the treatment dependent variable received the values (0) when the individual was not selected to participate in the program and (1) when he participated in the program. The independent variables were analyzed in the model to see which ones would be most significant in order to bring more efficiency and precision to the results. Therefore, variables with a significance level (p-value) less than or equal to 10% were considered. After the analysis, the variables that extrapolated this value were discarded from the analysis.

**Table 6:** Logit model - Contribution of individual characteristics to participation in the financial education program - Palmas - TO - 2018.

	Coef.	Std. Err.	Z	P-Value	Odds Ratios	Marginal Effect
age	-0,105824	0,0394005	-2.69	0.007*	0,8995821	-0,0177
income	-0,000803	0,0004185	-1.92	0.055**	0,999197	-0,00013
S. indebted	2.227688	1.120995	1.99	0.047**	9.278393	0,265729
retiree	0,5913572	0,687860	-0.86	0.390NS	1.816834	0,101457
gender	-0,300738	0,618578	-0.49	0.627NS	0,7331622	-0515382
CONS	8.789963	2.847997	3.09	0.002	6567.986	-
LR chi2(3)	Log likelihood	Prob > chi2	Pseudo R2	Count R2 =		
20.43	39.358815	0.0001	0.2060	80,49%		

Source: Prepared by the authors . Field research database.  
\* Significant at 1% \*\* Significant at 5% NS - not significant.

From the analysis of table 4, it is possible to observe that the variables age, income, indebted were significant at the level of 1 and 5%, respectively, to determine the probability of the individuals in the sample to participate or not in the financial education program. retired and sex variables were not significant. The analysis of the LR chi2 shows that at least one of the explanatory variables, or the set of them, is different from zero, that is, they are jointly significant to explain the likelihood of the elderly participating or not in the program. The pseudo R2 shows that approximately 20% of the dependent variable variation may be explained by the explanatory variables. The count R2 shows that the model is able to predict 80.49% of the results correctly.

According to the results demonstrated on the chances of participating in the financial education program, it is noted that the increase in the age of the elderly reduces the chance of participating by 1.11 (1/8995821). The same happens with the income variable, which explains that, as the elderly person's income increases, he / she has 1,0008 (1 / 0.9999197) times less chance of participating in a financial education program. On the other hand, the over-indebted elderly are 9.27 times more likely to participate in a financial education program than those who do not claim to be in debt.

Still on the results obtained through the application of Logit , we have the marginal effect of the variables, which presents the probability of changing the result variable in the face of the modification of the independent variables. From the values obtained and presented in table 4, it was observed that the declaration that they are over-indebted increases the likelihood of the elderly participating in the financial education program by 26%, in relation to age, as it increases in 1 year, the probability of participation in the financial education program is reduced by 1.77%. For the income variable, the probability of participation is 0.013% lower for those who earn a salary increase. However, it is possible to observe that both in the chances and in the probability of participation, income is the least determinant variable, this can be explained due to the homogeneity of the group in relation to income.

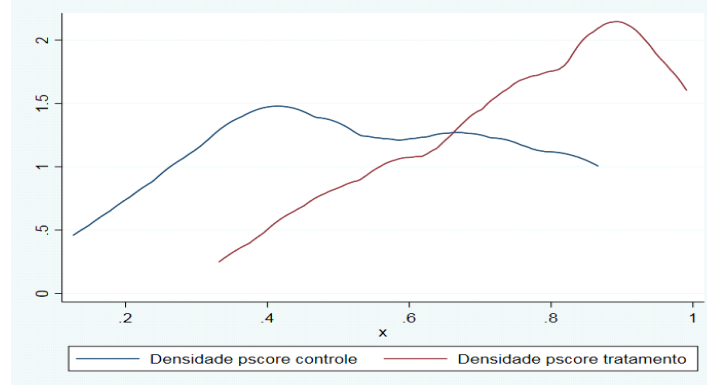
As for the propensity scores, these are located in the range between [0.1] and represent the probability that an individual will compose the treatment group. Table 5 shows the estimated propensity score for the participation of the elderly in the Financial Education Program.

**Table 7:** E propensity score of the elderly in the financial education program - Palmas - TO - 2018.

Variable	No. of observations	Average	Standard deviation	Min.	Max
Mypscore	82	.7073171	.2217137	.1263114	.9908976

Source: Prepared by the authors from the field research database.

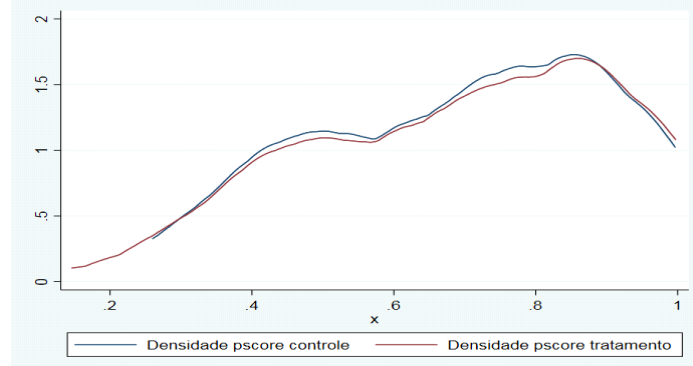
As noted in Table 5, the average probability of participating in the program for the individuals in the sample is 70.7%. The least likely individual has 12% and the highest probability is 99% to participate in the financial education program. The propensity scores are fundamental in carrying out the impact assessment of the program, however, only the estimation of this probability is not enough for the comparison of individuals in the pre and post-intervention period, since the estimation of the scores does not guarantees statistical equivalence between the individuals in the sample. Graph 1 illustrates the variability of propensity scores before pairing for the sample selected in this research.

**Graph 1:** Density of the propensity scores of the individuals in the sample before matching

Fonte: Elaborado pelos autores a partir da base de dados da pesquisa de campo.

Looking at graph 1, it can be seen that this distribution does not overlap perfectly, that is, there is a very marked asymmetry in the propensity scores of the control and treatment group. Therefore, in this scenario, a direct comparison between the groups would generate an important bias, impairing the reliability of the analysis. To resolve this issue, individuals in the treatment group need to be satisfactorily paired with at least one individual in the control group, and it may happen that there is no similar individual in the control group for any individual in the treatment group, and then discarded from the analysis.

Thus, after obtaining the scores and analyzing their distribution, the individuals in the treatment group were paired with the individuals in the control group based on the propensity score and considering the observable characteristics (income, age, over-indebted). In Graph 2, we can see the distribution of the density of the treatment group and the control group after pairing. It is noteworthy that the visual (graphical) analysis is also a way to validate the quality of the pairing

**Graph 2:** Density of the propensity scores of the individuals in the sample after matching

Source: Prepared by the authors from the field research database.

Through the analysis of graph 2, it is noted that the variables were controlled in order to establish a common support between treatment group and control group, which ensures that the mean of the propensity score will not be different for the treatment groups and control. Thus, the comparison between both groups can be performed without the risk of bias.

Once the propensity scores were established and balanced, the effect of the treatment on the treaties was estimated - ATT Average Treatment Effect of Treated and the impact of the program on the economic vulnerability of the participating individuals was assessed with the joint application of the Differences in Differences method.

To obtain the effect of the program on the economic vulnerability of the elderly, five impact indicators were analyzed: 1) percentage of the elderly's monthly income spent on basic expenses (food, health, housing); 2) savings habits; 3) financial behavior; 4) knowledge about debts and 5) Default. Each indicator was analyzed according to the responses of the elderly to the questionnaires applied in the pre and post-program for the control and treatment groups. Table 6 shows the results.

**Table 6:** Effect of treatment on the treated (ATT) of finance education program will - Palmas - TO - 2018.

Indicator	ATT - post	ATT - pre	DifinDif
1-Effect on income spent on basic expenses	40,59	22,96	17,63
2-Effect on the habit of saving	32,8	19,0	13,8
3-Effect on financial behavior	0,138	0,121	1,7
4-Effect on debt knowledge	23	18	5
5-Effect on default	0,103	0,017	0,86

Source: Prepared by the authors.

What were the effective results of the financial education program on reducing the financial vulnerability of the elderly? The results of the treatment effect in the treaties (ATT) showed that the elderly who participated in the financial education program increased : monthly income spent on food , health, money , water and electricity (76%); savings (72%) ; reflection process before taking a financial spin - off (14%); knowledge about debts (30%) and reduction of overdue accounts after the intervention (50%) .

The evolution of this s indicator es reflects more directly improvements in indicators of default and also the savings indicator, in the sense that, once stopping to reflect before taking a debt or buy a product , the elderly can reduce anxiety by purchase, considering waiting until the budget allows this extra step in financial life. In addition, it is an important exercise for the elderly in the sense that they often have to deal with requests from grandchildren, children and family members, which can lead them to be in a constant debt cycle .

Debt issues are directly related to the financial knowledge of the elderly. From this angle, a common behavior among them is the statement that debts are only commitments that were signed and are overdue, which presents itself as a delicate situation in view of the financial situation of the elderly, because, as they do not understand the fact that taking on a financial commitment is also taking on a debt, this can directly imply the level of indebtedness and, consequently, the quality of life.

Another aspect of the financial life of the elderly analyzed by this study was the situation of default. The elderly were asked about having their accounts overdue for more than two months, specifically, if they had any basic expenses (water, electricity or rent) overdue for this period or more. About this scenario, some data from Brazil are important to highlight here. In 2018, SPC-Brasil showed that, when it comes to defaults on basic expenses, the numbers for the elderly are the fastest growing in the country, reaching 34.3% of the financial pending of those over 61 years, and factors as expenses with family members and payroll loans are the main responsible for this scenario, since they take an important part of the income.

The effect on this indicator is also a response that relates to the other results of the program, as it is understood that, as the elderly start to worry about how their financial situation is, what they earn and what they spend; think before making a decision that involves your budget; seek to reduce costs through price research and cash purchase, negotiating discounts; identify the triggers that have taken the money that could be saved and save this resource; identifying new sources of income and saying no to requests from family members the tendency is for them to be able to better organize their budget and reduce debts and, consequently, the situation of default.

Given the above, it can be noted that the interactions of the results through the analysis of the impact indicators point to a positive effect of the program in relation to the financial scenario of the elderly who participated in the workshops, and this scenario encompasses not only the economic situation , but also their behaviors, attitudes and perceptions about financial life. Similar results were obtained in the impact assessment carried out by AEF-Brasil in the pilot project applied in 5 Brazilian municipalities in 2017, which shows that educational actions for the elderly can be effective and contribute to a change in perspective and reality, especially considering the who are in a vulnerable situation.

## Conclusion

The objective of this article was to assess the impact of the financial education program “Me and my retirement - organizing financial life” on the economic vulnerability of low-income elderly people, which was approached here not only from an income perspective, but also considering

knowledge financial, the development of more conscious and correct decision-making behavior about financial life, financial behavior in relation to habits such as savings and default.

Through the application of the impact assessment methods, it was possible to observe the effect of the program in a positive way on the analyzed indicators. It is observed that the elderly who participated in the financial education program increased the percentage of monthly income spent on food, health and housing, water and electricity by 76%, which is indicated as positive, as it indicates a relationship with the default situation which mainly affects basic expenses, and which, after the intervention, reduced by 50% in the elderly who declared they had some basic expenditure in arrears for 2 months or more.

The effect was also positive in relation to savings habits, since, after the intervention, there was a 72% increase in the number of elderly people who answered "yes" about having saved money. Regarding knowledge about debts, it was analyzed whether the elderly answered correctly the questions related to types of debt, and the effect was positive in 30% in this indicator. With regard to the habit of stopping and thinking before making a financial decision, which is related to the financial behavior of the elderly, regarding this indicator, the effect obtained was 14%.

In a practical way, it was observed that the elderly who participated in the workshops, in addition to appropriating new knowledge, developed planning practices, such as: saving money to buy a cash item, instead of buying in installments; share basic expenses with those who live in the same house, not assuming all responsibility alone; use home economics tools, such as having a vegetable garden, producing homemade soap, to save on the budget; analyze fixed expenses before making another commitment or even before buying someone a gift; make a shopping list when going to the supermarket; use a piggy bank as a savings resource and do a price or interest survey before making a financial decision.

The research on the effect of financial education for the elderly is not very extensive in the literature, however the results pointed out in this research corroborate those perceived in the works of BUAS (2015) and in the impact assessment report of AEF-BRASIL (2017) for the pilot project of the program applied in some cities in Brazil. These results, including those obtained in this work, point out that financial education practices can contribute to the creation of autonomy and empowerment of the elderly consumer, because, in addition to providing access to information about financial products, this type of intervention leads to individual to a more critical reading about their financial behavior in the face of the most diverse investees in the market and also of third parties, providing a more confident attitude in situations like this.

Thus, it is highlighted that the results of this research can contribute significantly to the construction of a new perspective on financial life for the participating individuals. In addition, it is important to note that both the program methodology and the impact assessment are perfectly replicable, which can contribute to an amplification of results like these and a wider scope of this type of action

## References

BECKER, Sascha; ICHINO, Andrea. Estimation of average treatment effects based on propensity scores. [Stata Journal](#), 2002, vol. 2, issue 4, 358-377

BRASIL. **Decreto 7397 de 22 de Dezembro de 2010**. Institui a Estratégia Nacional de Educação Financeira - ENEF, dispõe sobre a sua gestão e dá outras providências.

BUAS, Caroline Stumpf. **Educação Financeira com Idosos em um Contexto Popular**. Educação & Realidade, Porto Alegre, v. 40, n. 1, p. 105-127, jan./mar. 2015.

COLET, Christiane de Fátima; BORGES, Paulo Eduardo Mayorga; AMADOR, Tânia Alves. **Perfil de gastos com medicamentos entre idosos em diferentes grupos socioeconômicos**. Rev. bras. geriatr. gerontol, Rio de Janeiro, v. 19, n. 4, p. 591-601, agosto, 2016.

DANTAS, Rafael Santos. **Avaliação de impacto de reconhecimento de direito de propriedade de facto: o programa de regularização fundiária do Distrito Federal**. 2013. 88 f. Dissertação (Mestrado em Economia) -Universidade de Brasília, Brasília, 2013.

DOLL, Johannes; BUAES, Caroline Stumpf. **A inserção mercadológica de novos consumidores: os velhos entram em cena.** In: Anais IV Encontro Nacional de Estudos do Consumo, 2008. Rio de Janeiro. IV Enec Novos Rumos da Sociedade de Consumo? Rio de Janeiro: UFRRJ, 2008. p. 1-18.

DOLL, Johannes; RAMOS, Anne; BUAS, Caroline Stumpf. **Apresentação Educação e Envelhecimento.** - Educação & Realidade, Porto Alegre, v. 40, n. 1, p. 9-15, jan./mar. 2015.

FOGUEL, Miguel Nathan. **Avaliação Econômica de projetos sociais.** 1ª ed. São Paulo 2012.

GERTLER, P. J. et al. **Avaliação de impacto na prática.** The World Bank, 2015.

JALAN, Jyotsna; MARTIN, Ravallion. **Estimating the Benefit Incidence of na Antipoverty Program by Propensity-Score Matching.** Journal of Business & Economic Statistics, Vol. 21, No. 1 (Jan., 2003), pp. 19-30. American Statistical Association, 2003.

MIRANDA, Gabriella Morais Duarte; MENDES, Antonio da Cruz Gouveia; SILVA, Ana Lucia Andrade da. **O envelhecimento populacional brasileiro: desafios e consequências sociais atuais e futuras.** Revista Brasileira de Geriatria e Gerontologia. Rio de Janeiro, 2016; 19(3):507-519.

OCDE (Organização de Cooperação e de Desenvolvimento Econômico). **OECD's Financial Education Project.** Assessoria de Comunicação Social, 2004.

PEIXOTO, Betânia et al. **Avaliação Econômica de Projetos Sociais.** 1. ed. , 2012. v. 1. 186p.

PINTOS, Ana Elenara da Silva. **Análise da experiência em Monitoramento e Avaliação de Políticas Públicas do Programa Esporte e Lazer da Cidade - PELC.** (Dissertação de Mestrado) Faculdade de Educação Física da Universidade de Brasília. Brasília – 2017.

REMUND, David – **Financial Literacy Explicated: The Case for a Clearer Definition in an Increasingly Complex Economy.** The Journal of Consumer Affairs. 2010. 276-295.

RODRIGUES, Waldecy Rodrigues; NEVES, Renan Pereira. **Efeitos da Qualificação Profissional Sobre a Empregabilidade e Renda Dos Jovens: O Caso Do Pronatec em Porto Nacional - TO.** Informe Gepec, Toledo, v. 20, n.1, p. 148-163, jan./jun. 2016.

ROSENBAUM, Paul; RUBIN, Donald. **The central role of the propensity score in observational studies for causal effects.** Biometrika, 70(1), 41–55, 1983.

STUART Elizabeth. **Matching methods for causal inference: A review and a look forward.** Statistical Science, 25(1):1–21, 2010.

VAN ROOIJ, Maarten; LUSARDI, ANNA, Maria; ALESSIE, Rob, 2011. **Financial literacy and stock market participation** [HYPERLINK "http://ideas.repec.org/a/eee/jfinec/v101y2011i2p449-472.html"](http://ideas.repec.org/a/eee/jfinec/v101y2011i2p449-472.html). Journal of Financial Economics, Elsevier, vol. 101(2), pages 449-472.



*Esta obra está licenciada com uma Licença Creative Commons Atribuição 4.0 Internacional.*