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## **Microcredit and Gender: Are There Differences in the Credit Conditions?**

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## Abstract

By means of a distinguished approach of credit granting, microcredit programs stand out as a socioeconomic alternative for social insertion and fighting against poverty. In this context, a factor that has gained prominence in literature is the female participation in these programs. Therefore, knowing that the literature indicates that there is a lower level of default among women, and considering that gender influence over the financing value has been disproportionate, the aim of this research was to evaluate the relationship between gender and the amounts which were granted in microcredit operations. In order to achieve this, a multiple linear regression technique was used on a sample of 4,454 microcredit clients of a bank with branches located in Paraíba, Brazil. Primary data collection was carried out together with the branch managers by consulting their system. Data were randomly chosen, and refer to the period from January to December 2016. Results show that women obtain a higher credit value than men, which is the opposite of what was found in literature.

**Key words:** gender; microcredit; credit conditions.

## Introduction

By means of a distinguished approach to granting credit, microcredit programs stand out as a socioeconomic alternative of social insertion and the fight against poverty (Arbolino, Carlucci, Cirà, Yigitcanlar, & Ioppolo, 2018; Bezboruah & Pillai, 2017; Dutta & Banerjee, 2018), placing the credit granted as a propellant for formal and informal microenterprises (Alves & Camargos, 2014). In general, microcredit provides financing to low income families to let them acquire essential assets and deal with certain unexpected expenses (Akotey & Adjasi, 2016).

In this context, a factor that has gained prominence in discussions is female participation in microcredit programs. Around the world, the level of microcredit is estimated to be more than 12 billion US dollars, and its beneficiaries include nearly 200 million clients, of whom  $\frac{3}{4}$  are women (Wahidi, 2017). In Brazil, in the third quarter of 2015, women represented 62.13% of the clients assisted by the National Program of Guided Productive Microcredit (Ministério do Trabalho e Previdência Social, 2015). It is noteworthy that microfinance practitioners and policymakers target women to help them earn income, gain financial independence and strengthen their decision-making power within the household and society (Zhang & Posso, 2017).

In this regard, some studies that aimed to evaluate conditioners or factors that influence the accessibility of microcredit have used gender differences among their variables, but from different perspectives and with equally differentiated results. Mazumder, Dastidar and Bhandari (2017) analyzed the factors underlying credit accessibility of rural households among rural microentrepreneurs in India. They showed that gender of the entrepreneur has a dominant and significant impact on access to credit, indicating gender discrimination in access to credit where male respondents were more favored in accessing formal credit than females.

The study by Wahidi (2017) emphasized the characteristics of beneficiaries of microcredit allocated by MFIs (microfinance institutions) in Lebanon. The results seem to show that NGO MFIs give more credit to men than to women. In addition, the results of the interviews with MFI administrative officials seem to show that male loan officers may distinguish between male and female beneficiaries and prefer to grant microcredit to a man.

Bahta, Strydom and Donkor (2017) examined the extent to which gender influences access to microcredit for farmers in Eritrea, Africa. The empirical results showed that women are less likely to be able to access microcredit, compared to men. The men have a 34.8% probability of accessing microcredit while women are only likely to access microcredit at 17.9% (the mean difference of microcredit access is 16.9%). The implication is that men have a 16.9% higher probability of accessing microcredit than women, suggesting that women have limited access to microcredit.

Other data can be found in Gosh and Vinod's (2017) study that analyze Indian data and suggest a significant disparity in both access and use of gender financing. The study reveals that, on average, female-headed families are 8% less likely to have access to formal financing. They are also 6% more likely to have access to informal financing than male-headed families.

On the other hand, studies conducted in the Brazilian context have demonstrated a positive scenario in relation to women and their participation in microcredit programs. Soares, Barreto and Azevedo (2011), for example, have investigated the importance of some factors that facilitate the way out of poverty for Crediamigo/BNB clients. They discovered that there are more women than men as active clients in this program, and women present a lower level of default. This last aspect is corroborated by Alves and Camargo (2014), who evaluated the default conditioning factors in microcredit operations granted by two microcredit institutions. They found out that men presented an increase of 7.3% in the default probability, indicating that women have a lower credit risk when compared to men.

A factor that may be affected by women's lower default is the amount contracted with microcredit providers. Therefore, it is expected that the contracted value has a positive correlation with female gender, an aspect that was not yet explored in depth in Brazilian literature. However, in the study conducted by Agier and Szafarz (2013), whose aim was to test if both women and men would benefit from the same credit conditions in Brazilian microcredit institutions, the authors discovered that there is no gender bias related to loan denials, but there is differentiated treatment regarding credit conditions.

Thus, the authors noted that there is a **glass ceiling** effect – in reference to a barrier that is so subtle that it is transparent, but strong enough to make it impossible for women to ascend (Steil, 1997) – in which the amount of granted credit is disproportionate in relation to gender, with women being negatively affected. It is worth emphasizing that analyses regarding the glass ceiling were also developed from different perspectives, and the most common is related to work (in organizations), as in Steil's (1997) study.

It is also worth noting that there are several theoretical reasons that explain a possible gender difference in the access to financial services, such as: (a) there may be taste discrimination in the sense that the financial system is dominated by man and the barriers related to financial services are consequently higher for women than men; (b) there may be statistical discrimination in the sense that a lower education level and involvement in the formal market economy is a barrier that prevent women from having access to formal financial services; (c) a lower involvement in the formal market economy may also reflect a distribution of traditional roles in society, in which women focus on domestic activities and men focus on the market economy (Al-Shami, Majid, Mohamad, & Rashid, 2017; Aterido, Beck, & Iacovone, 2013; Corsi & Angelis, 2017).

Therefore, since the literature indicates that there is a lower default among women and taking into account that the aspect of gender influence on the financing value is disproportionate, although little explored in studies, the aim of this research was to evaluate the relationship between gender and the amounts which were granted in microcredit operations. In order to do so, the article is structured as follows: first, there is a discussion about the theoretical aspects related to microcredit and, more specifically, regarding the female role in this scenario; then, there is a description of the methodology; finally, there is a brief discussion regarding the results obtained in the study and the conclusion.

## **Theoretical Background**

### **Microcredit: general discussions**

Small businesses, urban or rural, formal or informal, have suffered from a shortage of capital, resulting in low productivity and low incomes, which prevents the multiplier effect of income and the inclusive economic development in macroeconomic terms (Arbolino *et al.*, 2018; Zouain & Barone, 2007). In this sense, in most countries around the world, credit has shown to be an instrument that leverages development, placing it as a necessary condition for making resources flow in economies (Enimu, Eyo, & Ajah, 2017).

In fact, one thing that has been perceived in literature is that credit support has been strongly pointed out as one of the big challenges to boost the development of formal and informal microenterprises, contributing to income and employment generation for the development of backward regions (Alves & Camargos, 2014; Carlucci, Cirà, Immordino, Ioppolo, & Yigitcanlar, 2017; García-Pérez, Muñoz-Torres, & Fernández-Izquierdo, 2017; Rakib, Chakrabarty, & Winn, 2018). This happens because, without access to financial resources, individuals face difficulties in starting, maintaining and expanding their economic activities, sustaining poverty and income inequality (Bilau & St-Pierre, 2018; Chliova, Brinckmann, & Rosenbusch, 2015; Soares, Barreto, & Azevedo, 2011).

In Brazil, following the logic outlined above, microcredit is the most visible and developed part within a complex set of tools for generating income and combating poverty. This means low-value loans for small entrepreneurs, microenterprises and small-sized companies that have no access to the traditional financial system, mainly because they cannot offer real guaranties (Al-Shami *et al.*, 2017; Serrano-Cinca, Gutiérrez-Nieto, & Reyes, 2016).

Microcredit programs can therefore be considered one of the most popular development strategies (Enimu *et al.*, 2017; Ghosh & Neogi, 2017; Ugwuja & Nweze, 2018; Wahidi, 2017), whose objective is to serve the poor, many of whom do not have access to traditional banking services, without the need for the borrower to present some kind of guarantee (Al-Shami *et al.*, 2017; Armstrong, Ahsan, & Sundaramurthy, 2018; Milanov, Justo, & Bradley, 2015; Thanh & Duong, 2017; Wahidi, 2017).

Given these characteristics, there seems to be a consensus that microcredit is an important contemporary mechanism for reducing poverty and social inequalities, which has led several developing countries to stimulate this modality of credit, even as a development policy (Arbolino *et al.*, 2018; Bezboruah & Pillai, 2017; Bidisha, Khan, Imran, Khondker, & Suhrawardy, 2017; Dutta & Banerjee, 2018; Li, Gan, & Yu, 2011; Thanh & Duong, 2017; Ugwuja & Nweze, 2018).

In addition, studies also point out the influence that microcredit has on welfare, such as the case developed by Al-Shami, Majid, Mohamad and Rashid (2017), indicating that productive microcredit loans have a significant positive influence over family welfare.

In general, borrowers make investments to create, resume or develop an activity capable of generating income, but also to implement life projects such as the purchase of housing, job search, geographical mobility, follow-up training, etc. (Wahidi, 2017). This shows how microcredit plays a key role in the development of small entrepreneurial or family businesses, and is capable of improving the income condition of less-favored classes.

Some elements may be decisive for the success or failure of this kind of program, such as its format, regarding the volume and type of granted credit; payment deadlines for customers; borrowers' individual characteristics, such as educational level and age; or types of enterprises to be financed, such as their region of operation (Soares *et al.*, 2011).

Finally, Leismann and Carmona (2010) warn that microcredit should not be seen as the only remedy to solve poverty, which is multidimensional. However, it is one of the mechanisms found to enable an increase of income in activities whose marginal incomes are high and where access to credit can improve the life conditions of individuals and their families. Thus, this kind of program has shown its relevance in specific situations, such as the loss of a job, exclusion from the labor market, destitution of land or inequality between genders (Santos & Carrion, 2009).

### **The role of women in microcredit**

Based on the discussions found in the previous session, we can see how microcredit is used as policy, aiming at economic development and the fight against poverty. The fact is that in recent years a great emphasis has been put on microfinance, hoping that poverty might be reduced and women's empowerment might be promoted. Thus, microfinance programs have focused on millions of women living in developing countries, helping them to have access to microcredit services (Bezboruah & Pillai, 2017; Haile, Bock, & Folmer, 2012; Wahidi, 2017; Zhang & Posso, 2017).

In this way, the special attention that women receive from these programs is added to the discussion, especially when it is considered that the lack of access to finance prevents both female entrepreneurship and their participation in the modern market economy (Aterido *et al.*, 2013; Guérin, D'Espallier, & Venkatasubramanian, 2015; Mazumder, Dastidar, & Bhandari, 2017). In this sense, the concept of empowerment is highlighted in the logic of microcredit provisions for women, since this reflects women's capacity to undertake new economic activities (Al-Shami *et al.*, 2017; Bahta, Strydom, & Donkor, 2017; Bezboruah & Pillai, 2017; Tahir, Kauser, Bury, & Bhatti, 2018; Zhang & Posso, 2017).

Empowerment can be understood as a changing process through which individuals increase their ability to exercise their choice and freedom, which contributes positively to their well-being (Ganle, Afriyie, & Segbefia, 2015). In other words, empowerment means having broadened choices in life, gaining more control over it, and generally reaching the capacity to live it as one wishes to live (Mahmud, Shah, & Becker, 2012; Tahir *et al.*, 2018).

Thus, in the vast majority of cases, microcredit programs have given special attention to female clients, giving them greater control over resources, ownership and business operations, as well as skills to contribute to income for their families, which helps them to become stronger and more respected (Al-Shami *et al.*, 2017; Chliova *et al.*, 2015; Dutta & Banerjee, 2018; Garikipati, Johnson, Guérin, & Szafarz, 2017).

One of the justifications to the attention that is given to women regarding microcredit refers to the high reimbursement rate presented by them. In general, women present good credit risks and there is no lack of studies that claim that women outnumber men in terms of reimbursement - see, for example, Brana (2013), Bezboruah and Pillai (2017), Bahta *et al.* (2017), Al-Shami *et al.* (2017) and Bilau and St-Pierre (2018). Ghosh and Neogi (2017) argued that lending to women is safer due to the fact that they are less likely to default, less likely to misuse the loan, and more likely to share the benefits with other family members in their household, especially with their children.

By analyzing this particular aspect, Alves and Camargos (2014) indicate that non-repayment, which means default, can be considered as the main problem of the microfinance sector, since it can increase transaction costs and harm financial sustainability and organization growth. Therefore, the fact that women have lower credit risks when compared to men may be an attractive feature for microcredit agencies.

Also in this context, Bahta *et al.* (2017) and Das (2017) argue that, in general, women have fewer credit opportunities when compared to men, which causes them to seek to repay their loans in order to guarantee continued access to credit. Agencies see in women contracts that are easier to control and enforce, making them useful to these agencies (D'Espallier, Guérin, & Mersland, 2011). This makes it clear that the idea of having this target audience, besides being seen as **the right thing to do**, is also a strategic action, designed to facilitate easier credit recovery (Ganle *et al.*, 2015).

However, despite the prominent role that women play in microcredit scenario, in terms of the amount granted to them, the results show a reality in which there are certain differences in relation to men. For example, in the study conducted by D'Espallier, Guérin and Mersland (2011) with a set of 350 microcredit institutions in 70 countries, which aimed to analyze the common belief that women generally present better credit risks than men, it was discovered that female clients are associated with lower loan values.

In the same sense, the research developed by Ganle, Afriyie and Segbefia (2015), with rural women that are involved in a microcredit program in Ghana, revealed that most (92%) women that were served by the program believed that the amount granted was not enough. According to the authors, in this specific case, women stated that the reduced size of loans did not allowed them to make good investments that could generate high incomes, making them stop investing their loans in compensatory activities and values, and making it difficult to repay the values, making women more vulnerable and powerless.

The study by Ugwuja and Nweze (2018) was carried out to investigate micro-loan sizes accessed by male and female small-scale agro-entrepreneurs in the Niger Delta region of Nigeria on a comparative basis. Available statistics confirmed that there was a significant difference between the mean amount of loan, accessed by male and female in relation to the semiformal loans.

On the other hand, the study by Agier and Szafarz (2013), which aimed to analyze whether men and women benefit from the same credit conditions, using 34,000 loan applications from a Brazilian microcredit institution, discovered that there was no gender bias related to loan denial, whereas there was different treatment related to credit conditions.



Similarly, Corsi and Angelis (2017) followed the same methodology used by Agier and Szafarz (2013) on data from a microfinance programme in Uganda, but their results showed no sign of a significant gender gap in loan size.

What can be inferred from this discussion is that, for women, who often lack the necessity guarantees or preconditions to obtain credit through formal institutions, microcredit is very important (Nader, 2008). These programs increasingly focus on this audience for many reasons, such as: (a) the cost-effectiveness rationale, since women's reimbursement rates have been much higher than those presented by men; (b) capital ratio, considering that women have less access to productive employment in countries' development; and (c) because women invest a large part of the borrowed amounts in their children and families, generating a multiplier effect that improves the effectiveness of credit funds (Ghosh & Neogi, 2017; Nader, 2008).

Therefore, although gender is a well debated subject in the academic world regarding, for example, inequalities between men and women at work (Abendroth, Melzer, Kalev, & Tomaskovic-Devey, 2017), it seems clear that gender is a fundamental field in microcredit programs, and still allows some explorations of its characters and behavior in different realities.

## Methodological Procedures

The main objective of this study is to evaluate the relationship between the gender and the amounts which were granted in microcredit operations. In order to do so, a multiple linear regression was used as a data analysis method. The use of a multiple linear regression allows explicit control in many aspects that simultaneously affect the dependent variable. Thus, this method can be used to build better models to predict the dependent variable (Wooldridge, 2012).

The sample is made up of 4,454 microcredit clients of branches of a bank that is located in Paraíba, Brazil, which was chosen due to its representativeness in the state and due to accessibility to data. The microcredit program of this institution is the largest in South America, performing 15,500 operations per day on average and having a portfolio of 1.9 million active clients. The data collection was carried out primarily with the managers of the respective of agencies, by consulting their system. The data were randomly chosen, and refer to the period from January to December 2016. The proposed model is presented in Equation 1.

$$l\text{Contractedamount} = \beta_0 + \beta_1 * \text{Gender} + \beta_2 * \text{Age} + \beta_3 * \text{CivilStatus} + \beta_4 * \text{RiskRating} + \beta_5 * \text{Income} + \beta_6 * \text{TypeofInvestment} + \beta_7 * \text{Residence} + \beta_8 * \text{Default} + u \quad (1)$$

Where *lContractedamount* represents the log of the amount granted to the clients (in BRL); *Gender* is a binary variable of the client's gender, in which 1 is female and 0, if otherwise; *Age* represents the client's age (in years); *Civil Status* is a binary variable of the client's civil status, in which 1 is married and 0, if otherwise; *Risk Rating* refers to the risk level of the operation; *Income* represents the client's income (in BRL); *Type of Investment* is a binary variable of the type of investment that the client will perform with the loan, in which 1 is fixed and 0, if otherwise; *Residence* is a binary variable of the client's place of residence, in which 1 is rural and 0, if otherwise; *Default* is a binary variable of the client's situation, if the client is defaulting, and 0 if otherwise. The dependent variable (*lContractedAmount*) and the independent variables and descriptions, as well as the baseline references, are presented in Table 1.

Table 1

**Variables Used**

VARIABLES	AUTHORS	DESCRIPTION
Contracted Amount <sup>a</sup>	Nader (2008); Soares <i>et al.</i> (2011); Malapit (2012); Camargos, Camargos and Araujo (2012); Agier and Szafarz (2013); Corsi and Angelis (2017)	Log of the amount granted to the clients (in BRL)
Gender	Soares <i>et al.</i> (2011); D'Espallier <i>et al.</i> (2011); Li, Gan and Yu (2011); Malapit (2012); Agier and Szafarz (2013); Brana (2013); Alves and Camargos (2014); Milanov, Justo and Bradley (2015); Akotey and Adjasi (2016); Corsi and Angelis (2017); Wahidi (2017); Bahta <i>et al.</i> (2017); Rakib, Chakrabarty and Winn (2018)	Binary variable of the client's gender, in which 1 is female and 0, if otherwise
Age	Nader (2008); Soares <i>et al.</i> (2011); Li <i>et al.</i> (2011); Mahmud, Shah and Becker (2012); Malapit (2012); Agier and Szafarz (2013); Milanov <i>et al.</i> (2015); Vyas, Jansen, Heise and Mbwambo (2015); Corsi and Angelis (2017); Akotey and Adjasi (2016); Ghosh and Vinod (2017); Mazumder <i>et al.</i> (2017); Wahidi (2017); Bahta <i>et al.</i> (2017); Rakib <i>et al.</i> (2018); Ugwuja and Nweze (2018)	The client's age (in years)
Civil Status	Nader (2008); Agier and Szafarz (2013); Brana (2013); Alves and Camargos (2014); Corsi and Angelis (2017); Akotey and Adjasi (2016); Wahidi (2017); Bahta <i>et al.</i> (2017); Ugwuja and Nweze (2018)	Binary variable of the client's civil status, in which 1 is married and 0, if otherwise
Risk Rating	Brazilian Central Bank (Resolução n. 2.682, 1999)	Percentage of provision (levels of risk: AA – 0,0%; A – 0,5%; B – 1,0%; C – 3,0%; D – 10,0%; E – 30,0%; F – 50,0%; G – 70,0%; H – 100%)
Income	Nader (2008); Li <i>et al.</i> (2011); Soares <i>et al.</i> (2011); Malapit (2012); Alves and Camargos (2014); Akotey and Adjasi (2016); Corsi and Angelis (2017); Ghosh and Vinod (2017); Mazumder <i>et al.</i> (2017); Ugwuja and Nweze (2018)	The client's income (in BRL)
Type of Investment	Alves and Camargos (2014); Agier and Szafarz (2013)	Binary variable of the type of investment that the client will perform with the loan, in which 1 is fixed and 0, if otherwise
Residence	Li <i>et al.</i> (2011); Akotey and Adjasi (2016); Ghosh and Vinod (2017); Ugwuja and Nweze (2018)	Binary variable of the client's place of residence, in which 1 is rural and 0, if otherwise
Default	Camargos, Camargos, Santos, Rodrigues and Silva (2010); Soares <i>et al.</i> (2011); Camargos <i>et al.</i> (2012); Alves and Camargos (2014)	Binary variable of the client's situation, if the client is defaulting, and 0 if otherwise

**Note.** Source: Research data.

<sup>a</sup>Dependent variable.



It is worth mentioning that the source for the risk criterion is based on the bank rules from which the data were collected, which take into account the standards established by the Brazilian Central Bank. In addition, it should be noted that all variables used in the model were chosen based on studies and were used by the authors indicated in Table 1.

## Result Analysis

Table 2 is presents the descriptive statistics of the data collected in the research. For the purpose of analysis, it can be seen from the table above that the variables that are not dummies (the ones that are not 1 or 0) present the following contexts: the variable log of the contracted amount shows that the minimum contracted amount was 6,131 and the maximum was 9,388; the age variable shows that there are clients in the sample with a minimum age of 19 years and a maximum age of 88 years; the risk classification variable presents the H level (100%) and the level A (5%) as the highest level of risk according to the provision table; and that the income variable shows that that are clients with the maximum income of 7400 BRL and minimum of 0. This fact justifies, as an example, the non-use of this variable in the log form, which at first would be more advisable for monetary values, but which does not admit null value, as Wooldridge (2012) points out.

Table 2

### Descriptive Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
<b>IContractedamount</b>	4454	8.164	0.377	6.131	9.388
<b>Gender</b>	4454	0.482	0.516	0	1
<b>Age</b>	4454	46.160	15.050	19	88
<b>CivilStatus</b>	4454	0.499	0.500	0	1
<b>RiskRating</b>	4454	22.918	40.834	0.5	100
<b>Income</b>	4454	700.814	521.454	0	7400
<b>TypeofInvestment</b>	4454	0.003	0.060	0	1
<b>Residence</b>	4454	0.324	0.468	0	1
<b>Default</b>	4454	0.231	0.422	0	1

Note. Source: Research data.

Table 3 presents the results of the proposed model. From its analysis, it can be seen that the variables gender (variable of interest), risk classification, income, type of investment, residence and default were significant. However, the variables age and civil status were not significant. It is worth noting that even though they are not significant, the variables age and civil status were maintained to avoid endogeneity and bias of omitted variables (ratified by the Durbin Wu Hausman test), considering their theoretical important for the model. In addition, the constant was also significant at a significance value of 1%.

Table 3

**Results of the Proposed Model**

<b>Dependent Variable: Log(ContractedAmount)</b>	
<b>Independent Variables</b>	
Constant	8.2847** (0.0177)
Gender	0.0191* (0.0082)
Age	-0.0001 (0.0003)
CivilStatus	-0.0095 (0.0086)
RiskRating	-0.0001** (0.0003)
Income	0.00007** (8.53e-06)
TypeofInvestment	1.0329** (0.1393)
Residence	-0.3133** (0.0124)
Default	-0.3173** (0.235)
Nº Observations	4454
R <sup>2</sup>	0.4231

**Note.** Source: Research data.

\* Indicates significant at 5%; \*\* Indicates significant at 1%.

Based on the above considerations, it is possible to analyze the effect of each significant variable specifically. Thus, analyzing the control variables, we can see that these presented the expected signs, which are: the income variable has a positive effect, despite a small magnitude; the type of fixed investment showed a positive relation with the contracted amount, taking into account that it brings more security to the bank that grants the credit; risk classification presented a negative relation in which the higher the percentage of risk, the higher the risk and the lower the contracted amount; the residence variable has a negative effect for residents in rural areas; and default presented a negative relation of great magnitude, as expected, since defaulting clients represent a greater risk of payment regarding the contracted amount, which consequently reduces it.

On the variable of interest, **gender**, we can observe that women obtain a value approximately 1.91% higher than men. In addition, we can see that the proposed model presented a R<sup>2</sup> of 0.4231, which according to Hair, Anderson, Tatham and Black (2005), represents the variance percentage of the dependent variable explained by the set of independent variables. Therefore, we estimated that approximately 42.31% of variable IContracted Amount is explained by a set of dependent variables.

It is worth saying that there is normality, due to the large sample that was used, and that the presented results were obtained with the use of robust errors, since the initially estimated model has heteroscedasticity, according to the Breusch-Pagan test. This does not point to the presence of bias of inconsistency in the OLS estimators, but invalidates the standard errors and usual test statistics. This

way, standard errors and robust  $t$  statistics were calculated regarding heteroscedasticity, which is routinely done by many econometric programs (Wooldridge, 2012).

In addition, VIF and Tolerance tests were also performed to test the multicollinearity assumption, and the Durbin-Watson test to test the assumption of serial autocorrelation. As a result, it was discovered that there was absence in both tests, which means that the assumptions were not violated.

Finally, the analysis was also made regarding interactions of gender and all other variables to check if the effect is not related to other conditions. The analysis was made from the original model with addition of one interaction at a time to avoid overlap problem or multicollinearity. As a result, the interaction variable **genderXIncome** was the only one found with significance, as presented in Table 4.

Table 4

#### Results of the Proposed Model with the Interaction Variable GenderXIncome

Dependent Variable: Log(ContractedAmount)	
Independent Variables	
Constant	8.2707** (0.0187)
Gender	0.0473** (0.0165)
Age	-0.0001 (0.0003)
CivilStatus	-0.0092 (0.0086)
RiskRating	0.0001 (0.0002)
Income	0.00009** (0.00001)
TypeofInvestment	1.0334** (0.1390)
Residence	-0.3132** (0.0124)
Default	-0.3169** (0.235)
GenderXIncome	-0.00004* (0.00002)
N° Observations	4454
R <sup>2</sup>	0.4239

**Note.** Source: Research data.

\* Indicates significant at 5% ;\*\* Indicates significant at 1%.

Since the control variables continue to display the same signals as the original model, it is possible to analyze only the effect of the added interaction variable. In the first place, it can be seen that the gender variable presents a greater magnitude than in the original model (4.7%), that is, we can observe that women obtain a value approximately 4.7% higher than men.

However, as the signal from **genderXincome** was negative, as the income for women increases, the effect on the **I(ContractedAmount)** dependent variable decreases. This explains why the gender variable presented the value of 1.91% in the original model, because measuring the partial effect of gender  $\left(\frac{\Delta y}{\Delta x_1} = \beta_1 + \beta_9 x_4\right)$  with the average value of the income (700.814) of the sample, we have the same result  $[0.047 - 0.00004(700.814) \cong 0,019]$ .

Therefore, we noticed that the income has a direct impact on the gender in relation to the amounts that were granted in microcredit operations. In addition, we can see that approximately 42.39% of **I(ContractedAmount)** variable is explained by this model.

## Discussion

The studies described above, especially in relation to gender, the variable of interest, are different from those found in literature, although this type of relationship has not been yet explored. Thus, in opposition to the study by Agier and Szafarz (2013), which points out that women get a disproportional credit size when compared to men, and in opposition to the research by D'Espallier *et al.* (2011), Malapit (2012) and Ugwuja and Nweze (2018), which identified that female clients are associated with lower loans, the results of the present work suggest otherwise. The results show that women get a value that is approximately 1.91% higher than men.

An important finding worthy of consideration is the effect of income on gender, obtained by the analysis of the **genderXincome** interaction variable. It was perceived that as the income for women increases, the effect on the **I(ContractedAmount)** dependent variable decreases. This factor can be explained by the focus of microcredit programs on low-income people to combat poverty, as posed by several authors, such as: Bezboruah and Pillai (2017), Thanh and Duong (2017), Bidisha, Khan, Imran, Khondker and Suhrawardy (2017), Arbolino, Carlucci, Cirà, Yigitcanlar and Ioppolo (2018), Dutta and Banerjee (2018) and Ugwuja and Nweze (2018).

It is also necessary to consider the factors that deal with the issue of gender discrimination, still very much debated in the literature, with still controversial evidence. This is debated for the Brazilian scenario in a study recently published by Proni and Proni (2018).

Regarding the fight against discrimination in work in the Brazilian scenario, for example, Proni and Proni (2018) bring some important inferences in their recent study. The authors point out that the fight against gender discrimination brought about by the evolution of labor legislation has not been able to eliminate the differences in terms of career advancement and remuneration between men and women, particularly in large companies. However, the study also shows that there are initiatives for promoting gender equity in the corporate world, but that progress is still slow. This helps to explain why, unlike the results of the studies similar to the one proposed here, women ended up with a contracted value only slightly higher than men, despite the large focus on women in microcredit programs.

This clear preference for microcredit programs by women is addressed by the studies of Gonzalez, Righetti and Di Serio (2014), Silva, Fonseca and Santos (2016) and Mendonça and Soares (2016), focused on the Brazilian context. The study by Gonzalez *et al.* (2014) evaluated the impact of productive microcredit provided by a microfinance institution linked to a commercial bank. In their study, 64% of the total number of clients are women and the reason for this is, according to microcredit agents, that men seek more **security** in a formal job while women look for jobs that can reconcile with housework.

Silva, Fonseca and Santos (2016) verified the influence of microcredit in the development of microbusinesses and in the quality of life of the microentrepreneurs' families in Brazil. The results show the Program preference in benefitting women and encouraging their economic activity.

Mendonça and Soares (2016) pointed out that women are important for the sustainability of the microcredit program. In their study, the authors discussed client performance of a microcredit program through the estimation of growth trajectories of the operating profit of their microenterprises. The results revealed that men have a somewhat higher return than women in relation to profit development. However, women have more stable trajectories, that is, they prefer conservative evolutions in the business, which is important for the sustainability of the microcredit program itself. In this respect, the program's tendency to give preference to solidarity groups with a larger number of women is justified.

Finally, we cannot ignore other factors already discussed during the study that favor women in microcredit programs, such as default, because women borrowers are trustworthy in loan repayment compared to men (Al-Shami *et al.*, 2017; Bahta *et al.*, 2017; Bilau & St-Pierre, 2018), the fact that women are less likely to misuse the loan (Ghosh & Neogi, 2017) and to contribute to the economy (Bezboruah & Pillai, 2017) and to household welfare (Al-Shami *et al.*, 2017).

Despite this new finding, the results obtained in this study are just an initial kick-off on this topic. In this sense, based on the findings that were presented here, other works may be developed to foster this area, for example, by exploring whether the observed fact occurred due to regional social characteristics of the sample, or even which destination this women have given to the values obtained, investigating whether the microcredit granting has contributed to women's empowerment or their exit of poverty condition through employment and income generation, as studies have shown (Alves & Camargos, 2014; Chliova *et al.*, 2015; Leismann & Carmona, 2010).

In addition, it is also important to analyze whether the factors presented in literature, such as the ones pointed out by Nader (2008) on cost-efficiency, equity ratio and women's multiplier effect, were determinant for the sample and for other possibly tested samples. It is also worth noting that, although women received 1.91% higher amounts in the analyzed sample, another question to be discussed is the satisfaction of these women regarding the amounts, since according to Ganle *et al.* (2015), 92% of rural women from Ghana that were served by a microcredit program believed that the granted amount was insufficient.

## Conclusion

The aim of this research was to evaluate the relationship between gender and the amounts which were granted in microcredit operations. By using a multiple linear regression technique on a sample constituted by 4,454 microcredit clients of branches of a bank located in Paraíba, the proposed model made it possible to analyze the relationship of the gender with the grants amounted by microcredit operations.

We inferred that women obtain values approximately 1.91% higher than men, which is the opposite of other studies found in literature, in which women obtain a disproportional value credit when compared to men. It should be noted that all variables were significant and that the proposed model showed that approximately 42.31% of the variable **IContracted Amount** is explained through the set of independent variables that were used. In addition, we perceived that as the income for women increases, the effect on the **I(ContractedAmount)** dependent variable decreases.

As a practical implication of this study, we hope that the obtained results will contribute to a better understanding of the credit granting process, especially regarding gender. We also emphasize that the research fulfilled its purposes, obtaining relevant results that can be used to support future research, which may be methodologically similar to the present study, but with a most representative sample or from another locale. Besides this, it is worth mentioning that this field is very fertile for further analysis of the results, as already mentioned in the discussion session of this study.

Finally, it is important to mention this study's limitations. First, it should be noted the specificity of the sample that was investigated, so that in spite of bringing new findings, a broader analysis of other realities is necessary for the analysis of possible different results.

Secondly, it is also important to highlight the limitation in relation to the size of effect. As inferred in this study, the results pointed to an effect of only 1.91% in relation to gender, which is a small result. In addition, as Nelson (2015) demonstrated in his study on risk averseness between women and men, it is necessary to have more attention to the quantitative sizes of differences and similarities with the regression coefficients. Nelson stated that regression coefficients are not meaningful estimates of effect sizes if a researcher searches for and reports on only those combinations of variables or subsamples that yield statistically significant results, or the results that the researcher finds most plausible, and thus suggests the use of tools such as Cohen's *d* and the Index of Similarity.

## Contributions

Conception and design of study: 1st author and 2nd author

Writing and analysis of the manuscript: 1st author and 2nd author

Discussion of results: 2nd author and 1st author

Final revision: 2nd author and 1st author

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