# The Effect of Credit on Female-headed Households Welfare in Indonesia

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## ABSTRACT

This study analyses credit's effect on female-headed household welfare in Indonesia. This paper employed a dataset from the National Socio-economic Survey (SUSENAS) conducted in 2018, which contains approximately 45,000 observations of female-headed households in Indonesia. Welfare here is measured by expenditure per capita per month of the households. This study employed Propensity Score Matching to analyse the average effect of credit to expenditure while controlling confounding factors such as age, education, location, housing status, marriage status, housewife status, employment status, and household size. The result shows that the credit extension significantly affects the expenditure of female-headed households.

**Keywords**: Socio-economic, female-headed household, households welfare, credit, Propensity Score Matching

## ABSTRAK

*Penelitian ini menganalisis pengaruh kredit terhadap kesejahteraan rumah tangga yang dikepalai oleh perempuan di Indonesia. Penelitian ini menggunakan dataset dari Survei Sosial Ekonomi Nasional (SUSENAS) yang dilakukan pada tahun 2018, yang berisi sekitar 45.000 observasi rumah tangga yang dipimpin oleh perempuan di Indonesia. Kesejahteraan di sini diukur dengan pengeluaran per kapita per bulan rumah tangga. Penelitian ini menggunakan Propensity Score Matching untuk menganalisis pengaruh rata-rata kredit terhadap pengeluaran sambil mengendalikan faktor-faktor pembaur seperti usia, pendidikan, lokasi, status kepemilikan rumah, status pernikahan, status ibu rumah tangga, status pekerjaan, dan ukuran rumah tangga. Hasilnya menunjukkan bahwa pemberian kredit secara signifikan mempengaruhi pengeluaran rumah tangga yang dipimpin oleh perempuan.*

*Kata kunci: Sosial ekonomi, kepala rumah tangga perempuan, kesejahteraan rumah tangga, kredit, Propensity Score Matching*

## INTRODUCTION

The effect of credit on household welfare has been shown to enhance household welfare generally. However, significant debate remains about how gender and credit intersect for welfare benefits. Although the gender issue is part of a long debate affecting household welfare, evidence has emerged about these effects. For instance, a study (Khandker 2005a) highlighted that microcredit accounted for approximately 40% of the overall reductions of moderate poverty in rural Bangladesh. It is further stated in Khandker's study that the microcredit impacts are much more substantial for female borrowers than their male counterparts. Similarly, Murni's (2014) study in

Indonesia demonstrated a positive correlation between credit and household welfare, and it significantly occurs when the borrowers are spouses who engaged in entrepreneurial activities.

Those results raised the question of whether female-headed households in Indonesia show similar results, given that they're one of the poor household categories in Indonesia based on the BPS classification(Badan Pusat Statistik Indonesia 2021). Indonesia also follows the patriarchal norm, which makes most households lead by males as the main breadwinners. The data revealed that among 11.4 million households led by women in Indonesia, nearly 16%, approximately one million households, live in poverty (Badan Pusat Statistik Indonesia 2021). This situation might often arise when a woman heads the family due to divorce, husband's death, polygamy, and the husband as the breadwinner cannot carry out activities. Consequently, they must make adjustments, one of which is to overcome economic difficulties due to the loss of financial contributions from their husbands, who are generally the primary breadwinners in the household, leading to a drastic decrease in income, which caused the vulnerability of these households (Kitson et al. 1989).

Nonetheless, it is not well studied as to whether the vulnerabilities associated with female-headed households lead to a different impact on utilizing credit due to various limitations and burdens for this household type, such as the adjustment time from shock, limited time due to multiple roles in the family(Gass-Sternas 1994a), and the ability of entrepreneurship. Therefore, further analysis is required to examine whether credit giving could improve welfare in the female-head household to alleviate vulnerability and poverty, given the limitations and burdens that might still be there.

Although the studies are limited, a study about the effect of credit on female-headed households was carried out in Ethiopia by Ayen (2016), showing that credit extension positively correlates with female-headed households' welfare. The study exhibits Propensity Score Matching in analysing the effect of credit and controlling confounding factors such as distance to the bank and the prices of staple goods. Accordingly, this research examines the credit utilization for women-led household welfare and attempts to fill the gap by investigating the effect and taking into account the demographic factor because it has proven that those factors are affecting the households' welfare as well (Gentry & Hubbard 2000; Sekhampu & Niyimbanira 2013).

This study is expected to contribute to the existing knowledge about the impact of credit on vulnerable households, especially Indonesian households led by women. Accordingly, it could contribute to academic advancement and hopefully be a policy alignment consideration. The focus

on female-headed households as a unit for analysis is not to compare bargaining power between genders but to conduct a deeper examination of whether the credit is helping female-headed households to raise their welfare, considering that millions of them still fall into poverty.

This study uses about 45,000 observations from female-headed households taken from the National Socio-Economic Survey (SUSENAS) Indonesia in 2018 to shed light on the issues. This paper uses the Propensity Score Matching (PSM) method to estimate the average treatment effects (ATE) and average treatment effect of the treated (ATT) on female-headed households in the context of credit by comparing the effects of the control and treatment groups. PSM reduces bias from confounding factors that appear from other covariates. Other covariates used in this study included independent variables such as age, education, location, marriage status, housing status, employment status, household size, and housewife status. Using logistic regression, those variables are tested to have a relationship with the probability of female-headed households participating in credit.

The result carried by this paper found that credit significantly impacts those who take credit. In addition, this study also uses the balancing score (nearest neighbor matching and caliper setting) to make the analysis more robust. From all the calculations, credit significantly affects the expenditure of female-headed households.

The results from this study are relevant to policy strategies to address vulnerable groups, the female-headed households. The policy could impact vulnerable groups by continually providing support and assistance. These findings can contribute to academic knowledge and inform policy strategies for alleviating poverty and economic hardship among this group.

Despite the findings, this study has limitations. The dataset used in this paper does not have the income of households that measures welfare and is limited to expenditure. Besides, it could be better if the credit here is in continuous variable rather than dummy variables to address the effect with different amounts of credit extensions.

The remainder of the paper is organized as follows. The introduction is in Section 1. The previous literature is in Section 2. Section 3 has information about the data and empirical analysis. The result and discussion are in Section 4. Lastly, the study's conclusion is presented in Section 5.

## LITERATURE REVIEW

### Female-Headed as Vulnerable Households

Perempuan In this context, ' Vulnerable households' pertains to those more descending into poverty. This category encompasses farmer households, disabled-headed households, and any other households. The focus of this paper is specified in female-headed households in Indonesia. Notably, despite their significance of 16% contribution in total poor households in Indonesia, this category of households is seldomly reached by some interventions.

Female-headed here refers to a family that has women take on leadership roles, have full responsibilities as main breadwinners, managing households, decision-makers, and ensuring the family's well-being, including divorced women, who are left behind by their husbands, whose husbands have died, are not married and has a family to take care, who have a husband but still for one reason the husband cannot carry out his functions as the leader of the family, and the woman who is married but the husband does not live with him continuously because of wandering or polygamy. These criteria are incorporated from previous literature on female-headed households as a unit analysis.

Again, this study uses female-headed households, not intending to compare bargaining power between genders, but as representations of the vulnerable households with a bigger chance of falling into poverty. Due to the patriarchal culture in some developing countries, including Indonesia, which is quite vigorous, men tend to be the household leaders in the economy. Consequently, this condition leads to men potentially having more responsibility to earn the household's main income source. Accordingly, when the family members lose the men-head, the households will struggle to cope with the economic situation. For this particular reason, female-headed households could be included in vulnerable groups.

Conversely, the previous study (Kabeer 1991) argues that women-headship could result from poverty rather than being a cause. Impoverished households may have a higher likelihood of experiencing the absence of male-head through migration, death, or divorce. The study mentions that it is more likely the women-headship is a consequence of being poor, so when the male-head leaves, women are obliged to become head household to cope with economic hardship. Hence, this further reinforces the justification that female-headed households are closely related to vulnerable households.

As previously indicated, vulnerable households are more prone to falling into poverty. Consequently, it can be asserted that they will experience a decline in their economic welfare. A large body of research covers the issue of the declining economic welfare of those headed by women (Appleton 1996; Kitson et al. 1989; Van de Walle 2013). Those studies scrutinize that the welfare reduction happened because female-headed households tend to experience a shock and should adjust to their economy. Research shows that the ability to cope between men and women is different. It would affect the way they overcome the hard times.

In addition to that, based on a study about targeting female-headed households for reducing poverty by Buvinic and Rao Gupta (1997), female-headed households typically exhibit lower income earnings than men-headed households, have fewer assets, and limited well-paying job opportunities and productive resources like capital, technology, and land. This economic disparity related to gender plays a significant role in the economic vulnerability experienced by female-headed families (Buvinić & Rao Gupta 1997). Moreover, women in these households previously tended to be uninvolved in income-generating activity. Hence, economic coping may need a longer time.

Based on some studies, it is inevitable that most female-headed households, especially in developing countries, will fall into poverty due to the loss of the male head. In a country where the dependency on men—first one's father and then one's husband—is embedded in the law and culture, one might expect the shock of losing a father or a husband to be linked with a decline in living standards and increased risk of experiencing poverty (Van de Walle 2013).

The main finding of van de Walle's study is that households with women as leaders might face significant welfare losses associated with widowhood. On balance, most studies find that female-headed households experience higher levels of poverty (Buvinić & Rao Gupta 1997). This investigation highlighted the diversity among female-headed households and that their degree of disadvantage is intricately linked to the reasons behind their female-head status(Kabeer 1991).

In Indonesia, household dependency on men is very high. Men significantly dominate the labor participation and the ratio of breadwinners in Indonesia. Participation in the labor force is 91.97 % in men and 62.42% in women (Badan Pusat Statistik Indonesia 2021). Furthermore, females' income contribution is only 37.26% (BPS 2020). Female-headed households are one category included in measuring households' poverty in Indonesia. Additionally, a survey conducted by a

community that monitors the welfare of communities in Indonesia (PEKKA) in 2012 shows that 71 % of households in the lowest mean of welfare are female-headed households.

Women's low education level affects the low welfare experienced by female-headed households. As a result, these women could only work in the informal sector, like agriculture, selling in small businesses, and crafter with low income (only 10,000 IDR or 1 AUD ). This low income raises the economic problem, making economic welfare hard to reach (Yulfa, Puspitawati & Muflikhati 2022). Those problems happen in many developing countries constructed with a patriarchal structure. It becomes strong evidence that households led by women have a bigger chance of falling into poverty (Anyanwu 2006).

Analysing why the chance of falling into poverty is quite tremendous could come from the numerous burden female-headed households face. A Buvinic and Gupta (1997) study analyses that females should fulfill the domestic role. As a result, they encounter more time and mobility limitations compared to their male counterparts. These constraints could lead to a preference for working fewer hours in paid employment, choosing low-paid jobs that align better with childcare responsibilities, and allocating more of their earnings to particular services like water and housing, as they cannot offset transaction costs with their time contribution. In a study by C. Chipande, he illustrates how female farmers in Malawi tended to restrict their contribution to agricultural activities due to their substantial domestic chores. In addition, any burdens that might come in these households, like the adjustments time from shock, limited times due to multiple roles in the family (Gass-Sternas 1994b), the ability of entrepreneurship, and the level of dependency on the male head will limit the ability of female-headed households coping with economic hardship.

The Access of Credit for Female-Headed Households

The vulnerability in female-headed households makes the women-head coping with the hardship of the economic situation depend on their resources; if they have many assets like land, they could sell their land to overcome the hardship (Börner et al. 2015). Studies about coping with the economy have been brought up by Yilma et al.(2014) and Borner et al. (2015). They classified economic coping into some parts like taking loans, reducing consumption, selling assets, and becoming labourers (Yilma et al. 2014). On the other hand, Börner et al. (2015) tried to classify coping economics with five dimensions: (reduced consumption), consuming their product (planting vegetables, fishing, etc.), selling their assets, looking for another job, and looking for

help. The mechanism of female-head coping activity would likely be different. In a situation where men are not there or do not have adequate earning capacity, the female head might find it harder situation to cope with economic hardship, like it might be hard looking for a job to replace the position of the male head due to the burden of the female-head such as the domestic role, childbearing, and when after all this time, they did not participate in the labour force. Hence, one of the ways they can take it based on those classifications is by taking loans and looking for help. One of the help and loans that poor female-headed households can use is with the help of extended credit.

Aligned with the explanation of microcredit, The successful case known worldwide of microcredit giving was Grameen Bank, initiated first by Muhammad Yunus, the Nobel Prize winner. Grameen Bank enables poor people in Bangladesh to lend without any collateral. The interesting point in the success of Grameen Bank was that borrowers are 94 % female. It is believed to be an increasing tool to increase economic mobility. The study from Khandker (2005b) also found that microfinance accounted for approximately 40% of the overall reductions of moderate poverty in rural Bangladesh. The microfinance impacts are much more substantial for female and male borrowers.

Furthermore, a study by Hashemi et al. (1996a) also argues that credit programs empower women by reinforcing their economic role, enhancing their capacity to contribute to their family's financial well-being, and granting them empowerment through other mechanisms. Despite the case of successful microcredit programs for women, the evidence about the success of giving credit to female-headed households is still limited. One of the studies that could be a benchmark for credit extension is the study from Ethiopia, which showed that female-headed households tend to have a positive and significant effect on their annual expenditure (Ayen 2016a).

The study from Ayen (2016) argues that financial institutions, particularly microfinance programs, are crucial in empowering poor female-headed households. He studied the effect of microcredit giving to female-headed households in Ethiopia living in poverty. This case might be valid considering that the credit given to female-headed households would empower them to use their ability to manage their loans to increase their welfare by using it to create their own businesses. However, this would need entrepreneurship ability to do this. Moreover, we need to be cautious in analysing whether giving female-headed households credit would raise their welfare properly

through entrepreneurship because they might have other challenges regarding domestic roles in the family.

On the other hand, many developing countries have embarked on providing credit extensions to women, mainly those who engage in entrepreneurial activities. Several factors contribute to the impressive rise in credit aimed at female entrepreneurs in developing countries. Firstly, there is significant growth in women's participation in entrepreneurial endeavours. To illustrate, In Canada, the count of female entrepreneurs saw a threefold increase between 1976 and 1994 (Cohen 1996), resulting in women constituting a third of all entrepreneurs within the Canadian economy (Kevane & Wydick 2001a). Consistently, the proportion of females in the informal business sector has great substantial growth in recent decades. This initiation gives women an independent ability to manage their economic households. It could prevent them from falling into poverty when forced to be the head of their households.

Moreover, much research has shown that access to credit could create a type of economic empowerment that potentially increase a woman's self-esteem and status within the family (Goetz & Gupta 1996). This phenomenon happens when they can manage the economy in the households and raise their decision-making ability. In the context of female-headed households, the evidence may not be the same because they are not in full support from their partner, making them face the hardship of managing the credit loans productively.

Some studies show that giving credit to females is more advantageous than extending it to men. Blumberg (1989) conducted an analysis suggesting that men tend to have a greater males have a higher propensity to spend their income on personal clothing and entertainment. In contrast, females tend to invest their income in the consumption of food, clothing, and human capital of their children. It intensifies why giving women credit might be useful and raise their welfare.

 Nonetheless, the expansion of credit opportunities for women should be approached with careful deliberation, taking into account the burden that might be faced by the women-head in which women must dedicate a significant portion of their time as the primary caregivers for their children(Kevane & Wydick 2001b). For instance, it is crucial to recognize that female entrepreneurs face limitations in generating employment within their enterprises compared to male entrepreneurs. The extension of credit that is believed to build entrepreneurship ability should also be undertaken with caution, considering the gradual nature of the entrepreneurship skills and

dedication required for their establishment. Nevertheless, initiating the credit extension remains a worthwhile venture despite the challenges. The potential benefit can be realized by empowering female-headed households with access to credit by navigating the limitations correctly.

Although in many developing countries, credit extended for females is already implemented by specific programs, in Indonesia, the credit extended to women has not received special attention from the Government. Through the National Strategy of Financial Inclusion (Strategi Nasional Keuangan Inklusif), the Indonesian Government made some approaches to give those vulnerable households inclusively access to formal financial services to raise their welfare. However, the persistence of this program is still questioned because the continuity of this program is in doubt due to the change of the government regime. In this way, access to credit concerned in female-headed households might still be limited.

## Expenditure of Households

Welfare can be represented by proxies such as expenditure, income, and wealth index. In this context, consumption is a proxy to represent it. Based on guidelines from UNICEF (2012), expenditure is more broadly used to examine the welfare of the households rather than income (Citro and Michael, 1995); in this way, the concept of "standard living" as the welfare measurement is represented better in the consumption term. Also, consumption could reflect the long-term welfare of the household because it is smoother and cannot fluctuate in the short term like income does Deaton and Zaidi (2002). Moreover, consumption is more stable to reflect the real living standards, and collecting consumption data is more common. Consequently, this work uses expenditure per capita from the food and non-food expenditure data set.

Several variables influence the expenditure, and demographic factors are one of the significant factors that affect expenditure. The study conducted in the United States by Ketkar & Cho (1982) shows that the household's age, education, her/his education, employment status, race, and location significantly impact household expenditures. In a developing country, South Africa, there is also a study that gained similar results; socio-economic factors such as income, total number of households number, employment status of the head, and education of the household head are associated with the household expenditure pattern (Sekhampu & Niyimbanira 2013) The age of the head of the household is also a crucial factor affecting household expenditure (Muurinen, 1982; Wagstaff, 1986; Bohlin et al, 1999). In addition, some evidence found that households with

business or in self-employment and entrepreneurial skills have better wealth, which increases substantially (Gentry & Hubbard 2000) having business in female-headed households expenditure.

Accordingly, this study intends to reveal the confounding factors affecting household expenditure and the probability of female-headed households participating in credit loans such as the age of the female head, education, location, housing status, employment status, marriage status, housewife status, and total members of the households.

Household income, household size, the number of people employed, employment status, and the household head's educational attainment were discovered that access to microcredit significantly and positively affected household expenditure. On the other hand, the marital status of the household head was linked with a negative impact on household expenditure. Interestingly, the gender and age of the household head did not appear to influence the fluctuations of household expenditure. These findings contribute valuable insight to our understanding of township residents by examining the socio-economic factors affecting household expenditure patterns. Grossman (1972a, 1972b) also emphasizes the crucial role of education and income in household decision-making (Sekhampu & Niyimbanira 2013). Other studies have found the age of the household head to be an important predictor of household expenditure.

## METHOD

This study employed a dataset from the National Socio-economic Survey (SUSENAS) conducted in 2018. The survey collected by the National Statistics Office (BPS) collates data at individual and household levels from all provinces in Indonesia. This dataset contains some variables that are used to answer the research question.

 The dataset contains approximately 45,000 observations of women-headed households in Indonesia. Additionally, it contains some important variables carried out in this paper, such as expenditure, dummy variable of credit extends, age, education of the women-head, housing status, location, housewife status, marriage status of the female-head employment status, and household size. Tables 1 and 1A provide a statistical summary for all the dataset variables, comprising 45,481 observations.

**Table 1.** Summary Statistic

| Variable | Observation | Mean |
|---|---|---|
| Location | 45,481 | .4667663 |
| Marriage Status | 45,481 | .1094083 |
| Age | 45,481 | 55.40129 |
| Education | 45,481 | 2.631099 |
| Housewife Status | 45,481 | .8155713 |
| Housing Status | 45,481 | .8437809 |
| Total Member | 45,481 | 2.802555 |
| Employment Status | 45,481 | .415866 |
| Expenditure | 45,481 | 1262118 |

**Table 1A.** Credit Participation of Female-Headed Households

| Credit | Freq. | Percent | Cum |
|---|---|---|---|
| 0 | 37,519 | 82.49 | 82.49 |
| 1 | 7,962 | 17.51 | 100 |
| **Total** | **45,481** | **100** | |

This paper employed the expenditure per capita as a dependent variable to represent the households' welfare. The expenditure per capita of households contains food and non-food expenditure in households. Non-food expenditure includes household amenities, clothing, durable goods, taxes, charges, insurance, and services. Data for expenditure per capita is gained at the household level. Thus, the expenditure per capita here is the accumulation of the expenditure in the households. In the summary Table 1, the mean expenditure on female-headed households is 1,262,118 IDR[1] , while the minimum expenditure is 8,328 IDR, and the maximum expenditure is 6,210,000 IDR per month.

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[1] IDR = Indonesian Rupiah (1 AUD = 9,891 IDR on 19 September 2023)

The variable of interest in this study is credit access to households. Table 1A shows the credit access comes in dummy variables; 0 when the households are not accessing the credit and 1 if the households get the credit. It presents that among 45,481 observations of female-headed households, 7,962 female-headed households take the credit extension. Credit in this context is the credit given by the Government and Non-Government as Business Credit at the District Level (Kredit Usaha Rakyat), Business Credit from Banks, Banks of Citizen Credit, Cooperation Credit, Pawnshop, Leasing, Joint Business Credit, etc. Mostly, the type of credit available in datasets is business credit.

On the other hand, this study uses some control variables to capture the effect of these other covariates on the outcome: the woman's education, age, housing status, location, employment status, housewife status, marriage status, and household size. In the propensity score matching method, with sufficiently large datasets, it is beneficial to include all variables potentially related to the outcome (Austin 2011).

**Empirical Analysis**

Starting from the economic theory of consumer behavior that suggest how households allocate their resource, in this context, is a credit to maximize utility which derives from the consumption of goods and services (expenditure) depending on constraints as indicated by some independent variables; the general form represents as the equation below:

$$Y = \alpha + \gamma X_1 + X'\beta + \varepsilon$$

$Y$ is expenditure per capita of women-head households that represent the female-headed households' welfare; $X_1$ is a variable of interest, which is the access of credit in the form of a dummy variable; $X'$ is other covariates that affect the outcome and might affect the probability of female-head participation in credit, which are education, age, employment status, location, marriage status, household size and the housewife status; and $\varepsilon$ represents the error term

The parameter of interest in this form is $\gamma$ which captures the effect of credit on the expenditure of female-headed households as the Average Treatment Effect (ATE) and Average Effect of the Treated (ATT) within the Propensity Score Method

**Propensity Score Matching (PSM)**

This study is more like an observational study that examines the effect of some interventions (credit) in vulnerable groups (women-headed households). The treatment referred to in this context is not random regarding the observational data characteristic, and it leads to selection where measured and unmeasured characteristics of individuals are associated with the likelihood of receiving treatment and with the outcome (Garrido et al. 2014).Based on that condition, this study uses propensity score matching to analyze the effect of the treatment (credit) in women-headed households.

The PSM method allows the analysis of the observational (non-randomized) study to imitate several characteristics of a randomized controlled trial (Austin 2011). Here, the probability of female-headed households receiving credit rather than another is not random but determined by consideration and households' choice. Hence, random treatment allocation ensures that there will be no confounding factors between treatment status with either measured or unmeasured initial characteristics.

In this context, the PSM technique's first stage estimates the probability of female-headed households taking credit. Hence, this study considered variables that affect the likelihood of getting credit. If those variables are expected to affect the outcome, it should be controlled to estimate the differences. Based on that, only those variables that affect both outcome and treatment are included in this study in the logistic model.

The potential variables to be included in the propensity score model encompass several categories: all measured baseline covariates, all baseline covariates that exhibit relationship with treatment exposure, all covariates affecting the outcome (i.e., the potential confounders), and all covariates that affect both treatment assignment and the outcome (i.e., the true confounders) (Austin 2011) but if the covariates only affect the treatment, there is no need to estimate the differences between the control and treatment groups. Hence, the variables, or all covariates expected to affect treatment and outcome, are used in this study: age, education, location, employment status, employment status, marriage status, household size and housewife status. The treated subjects here are women who took credit, and untreated subjects are women who did not.

This paper analyses the possible treatment (active and control treatment) and the outcome with the PSM method. Each subject (female-headed households) has a pair of potential outcomes: Yi (0) for the one under control treatment (not taking credit) and Yi (1) for credit exposure. Each household is only exposed to one treatment, whether control or active treatment. After assigning the control and active treatment, the treatment's effect can be measured with ATE (Average Treatment Effect) and ATT (Average Effect for the Treated). ATE is the average effect in the entire population, whereas ATT is the average effect for subjects who are ultimately exposed to the treatment (Imbens 2004). This study will measure the ATE and ATT to know the effect of the credit assignment on the entire population and whether the credit extensions will increase the welfare of female-headed households.

In this work, Propensity score matching entails forming matched sets of households that take credit and the ones that don't share a similar value of the propensity score (Rosenbaum & Rubin, 1983a, 1985). The ATT can be estimated after measuring the propensity score value (Imbens 2004). After calculating propensity scores, the values of treated and untreated households will be matched to ensure that the matched subjects have similar scores. The treatment's effect on the outcome can be estimated based on comparing matching scores between the treated and untreated subjects. The outcome that would be analysed in this work is continuous; as a result, the treatment effect is estimated as the difference between the mean outcome for subjects who take credit and those who do not in the matched sample (Rosenbaum & Rubin, 1983a). Besides, the logistic regression model was used in this study to estimate the propensity score matching for exposed and unexposed households of credit access.

PSM method has several approaches to estimate the matching score: nearest neighbor matching, caliper setting, and stratification (Austin 2011). This study runs two approach balancing scores to compare the value between those matching estimators: nearest neighbor matching and caliper setting. This is because nearest-neighbour matching is the most straightforward approach, and it will compare the matching pair for treated subjects with the closest propensity score value (Ayen 2016b). Still, a problem will arise if the closest neighbor is rather far. Therefore, this study also imposed a caliper approach with a certain threshold on the maximum propensity score distance to avoid the risk. The comparison of these two approaches is expected to raise the quality of the matching.

## RESULT AND DISCUSSION

### t-test Result

Before conducting the advanced method, this paper conducts the two-sample t-test to check the crude estimation of the mean difference effect of the treatment and control group. The treatment variable here is the credit loans. From Table 2, it can be shown that there is strong evidence to reject the null hypothesis (0 difference mean). Thus, it indicates there is a significant difference between the two groups. The results indicate that the expenditure outcome in the treated group is 122,430 IDR higher than in the control group. Although the result is statistically significant, the crude results from this t-test should be interpreted cautiously due to the non-random treatment assignment that would lead to bias by confounding factors.

**Table 2.** Two-sample t-test result

| Group | Obs | Mean | Std Error | 95 % Conf. Interval | |
|---|---|---|---|---|---|
| 0 | 37,519 | 1240685 | 6267.54 | 1228401 | 1252970 |
| 1 | 7,962 | 1363116 | 14261.5 | 1335160 | 1391072 |
| Combined | 45,481 | 1262118 | 5745.642 | 1250857 | 1273380 |
| difference | | -122430.7 | 15108.57 | -152043.7 | -92817.61 |

### Baseline Result

The results in Table 3 clearly show that the relationship between the treatment and outcome is confounded by other covariates: education, location, marriage status, age, employment status, housing status, household size, and housewife status. Employment status is the variable most closely related to the credit extension. The odds ratio of 1.426 means that a self-employed female head is associated with 1.426 times higher take credit than other categories in the employment status. Marriage status also significantly increases the likelihood of a married female-head taking credit by 1.40 higher than the ones who are widows, divorced, or unmarried. It proves that the condition of no husband will limit their decisions to take credit.

**Table 3.** Independent Variables

| Credit | Odds Ratio | Standard err. | P>|z| |
|---|---|---|---|
| Location | 1.323413 | .036394 | 0.000 |
| Marriage status | 1.405591 | .0530371 | 0.000 |
| Age | .9963711 | .0010339 | 0.000 |
| Educ | | | |
| 1 | 1.2274 | .2913916 | 0.388 |
| 2 | 1.664646 | .3984028 | 0.033 |
| 3 | 1.655358 | .395837 | 0.035 |
| 4 | 1.81535 | .4391855 | 0.014 |
| 5 | 2.422672 | .7203941 | 0.003 |
| 6 | 3.498744 | 2.141356 | 0.041 |
| 8 | .7230458 | .1740301 | 0.178 |
| | | | |
| Housing status | 1.10731 | .0338017 | 0.001 |
| Housewife status | 1.133798 | .038117 | 0.000 |
| Total member | 1.202325 | .0078726 | 0.000 |
| Employment status | 1.426364 | .0376983 | 0.000 |
| _cons | .0672751 | .0166754 | 0.000 |

Since education is categorical data, the interpretation is a little bit different. In education, 1 to 8 is compared to the baseline category (in this context is, 0 for not having formal education). For female head who has junior high school as their highest level of education, the probability of taking credit is 1.26 higher than female head who do not have formal education. The most significant difference is in female-head with master's degrees as their highest level. It indicates that the probability of female-head who have a master's degree to take credit is 3.06 higher than the baseline. This aligned with Grossman's (1972a, 1972b) study, which emphasizes that education attainment will play a crucial role in family decision-making.

Urban location seems to influence female-head households' probability of taking credit about 1.25 higher than rural areas. It contrasts with the study by Khandker (1998) that females in rural areas will tend to take more credit, although his study only focuses on rural areas. Housing status also significantly impacts the probability of someone taking credit. Based on the result, the ones who own the house have an odds ratio of 1.13 to take credit.

In addition, the household size represented by the total members of households has a probability higher by the size of 1.2. it means that the more members in the households, the probability that households participate in credit is increasing by 20%. On the other hand, in the age variables, the

odds ratio is lesser than one, which means the increasing age will decrease the probability of female-head taking credit.

In employment status, the probability of female-head taking credit is also significantly 1.42 higher in those who are self-employed or have a business. It is aligned with Murni's (2014) study, which examines that spouse-women who have their own job or business tend to have higher incomes and need to provide credit access to increase welfare. Similarly, the domestic role status variable shows that female-headed households in charge of domestic roles are more likely to access credit. Thus, the hypothesis that female-headed households tend to have less utilization of credit extension due to the burden and limitation on domestic roles is not proven.

All covariates in the dataset seem to have a relationship with the probability of the female-head participating in credit. In regards to that matter, it might lead to biased estimation if those variables are uncontrolled. To avoid the biased estimation, this study uses the Propensity Score Matching method to estimate the effect of credit on the expenditure of female-headed households by controlling all covariates.

The analysis of the effect of credit on the expenditure of female-headed households in this study is conducted by using the propensity score matching method. The Average Treatment Effect (ATE) and Average Treatment of the Treated (ATT) of credit participation on households expenditure are shown in the Table 4 below.

**Table 4.** Baseline Result

| Expenditure | Coefficient | AI robust Standard err. | Z | P > \|z\| | 95% conf. interval | |
|---|---|---|---|---|---|---|
| Average Treatment Effect (ATE) | 100102.5 | 19533.89 | 5.12 | 0.000 | 61816.83 | 138388.3 |
| Average Treatment Effect of The Treated (ATT) | 135189.6 | 18400.33 | 7.35 | 0.000 | 99125.64 | 171253.6 |

In STATA, the command of *psmatch* is undertake the nearest neighbor matching score by default and estimated within a logit form. The nearest neighbor matches each subject in the treatment group with a subject in the controlled group with the closest matching propensity score. The output shows the treatment effect after adjusting the imbalance distribution of covariates between the treated and controlled groups.

The treatment effect now is attenuated from the crude t-test earlier; in the Average Treatment Effect (ATE), the result is that the ones who take credit have higher expenditure in 100,102 IDR compared to those who did not. In the Average Treatment Effect of the Treated (ATT), the effect is also higher in the households who participate in credit, which is 135,189 IDR. The results of ATE and ATT are expected to be aligned and coincide because, due to randomization, the treated population will not, on average, differ systematically from the overall population (Austin 2011). Although the two estimations seem to be aligned, the ATT estimate is typically higher because it considers only the treated group. In contrast, the ATE considers the entire population, including both treated and untreated individuals.

Moreover, the results shown in the table could be seen as statistically significant by looking at the p-value. In practical terms, the result suggests that female-headed households who take credit significantly impact their expenditure more than those who do not. The results indicate that using Propensity Score matching (PSM) in this case, is effective in seeing the effect of credit participation to expenditure. The result aligned with the study examining the effect of microfinance on the expenditure of female-headed households in Ethiopia by Ayen (2016b), which found that the effect of microfinance positively correlated with female-headed household expenditure.

However, the performance of the balance improvement in PSM should also be considered. The purpose of using PSM is to match and improve the balance of covariates and variables of each group (Imbens 2004). This proof can be seen in the figure 1 below. Figure 1 represents the balance plot of the location variable. Initially, the raw (before matching) plot suggests that there are imbalances of this variable, which indicates that the characteristics of individuals in the treatment and control groups are not well matched. In contrast, the matched graph shows the balance plot after propensity score matching. The alignment of the two lines indicates that after applying propensity score matching, the two groups are more similar in terms of characteristics (location). Those two graphs illustrate the balance improvement achieved through propensity score matching

in location variable. A balanced distribution of covariates between treatment and control groups is a goal of propensity score matching. All of the other covariates also have similar conditions as the example.
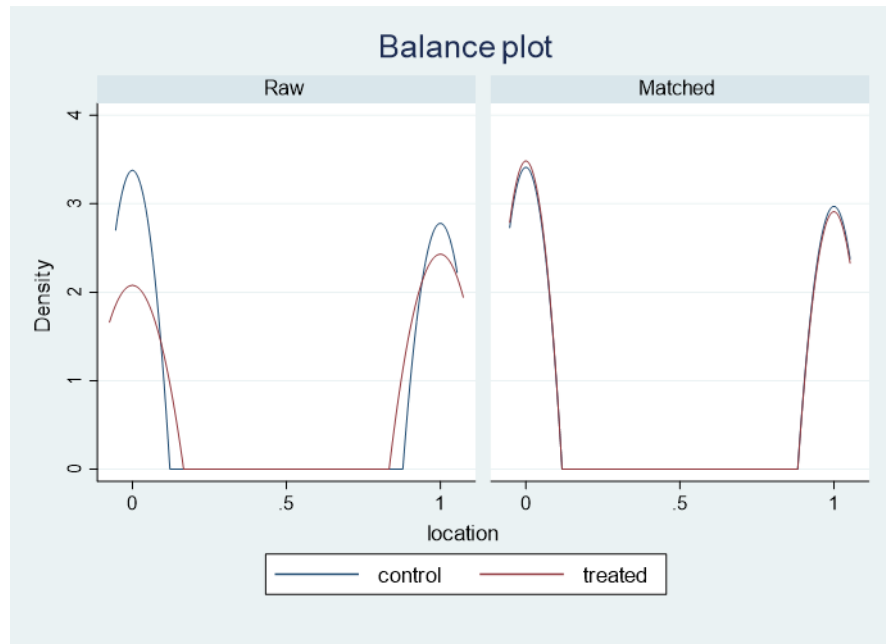


**Figure 1**

### Robustness check

In the research process, ensuring the analysis is appropriate enough to be presented and justified is crucial. Therefore, this study uses several approaches to make the analysis more robust and assess the matching quality: the nearest neighbor interval three and the nearest neighbor with a caliper setting. The comparison results of those approaches are shown in the Table 5 below.

**Table 5.** Robustness Check

| Treatment Effect | 1 | | | | | 2 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Coefficient | Std Error | P>\|z\| | 95% Conf Interval | | Coefficient | Std Error | P>\|z\| | 95 % Conf Interval | |
| ATE | 91709.82 | 17771.35 | 0.000 | 56878.61 | 126541 | 95290.19 | 17711.81 | 0.000 | 60575.68 | 130004.7 |
| ATT | 140487.1 | 16585.28 | 0.000 | 107980.6 | 172993.7 | 133229.4 | 17145.58 | 0.000 | 99624.72 | 166834.2 |

Notes: (1) is the nearest neighbor matching with 3 neighbor; (2) is nearest neighbor with 2 neighbor and 0.2 caliper setting.

From all the robustness checks, the treatment effect from all the approaches appears to be statistically significant. When using neighbor matching in interval 3, the difference mean is 91,709 IDR and 140,487 IDR higher in the ATE and ATT treatment group, respectively. In ATE, the effect decreases from the previous PSM (in default) result. On the other hand, in the ATT effect, the result slightly increases from the baseline approach. However, the standard errors from both ATT and ATE are decreasing as expected. It suggests that setting more nearest neighbors for matching, in this context, is three, resulting in improved balance. Although it results in an improved balance, the increase in bias may appear due to the reduction of variance in the estimator due to the use of more data per treated in matching on more distant (Garrido et al. 2014). Setting the caliper at a certain threshold value could decrease the biased estimation of the average treatment effect.

When using a caliper setting, the ATE increases slightly by 95,290 IDR in comparison to nearest neighbor matching, while the ATT decreases by 133,229 IDR. from nearest neighbor matching in 95,290 IDR of ATE and decreases in ATT which is 133,229 IDR. Still, the standard error in the caliper setting is lesser than the nearest neighbor matching and baseline approach, which indicates that the caliper setting has greater precision in estimating the treatment effect. Notably, the confidence interval from all the results is overlapping, implying that all the estimates are statistically consistent at the 95% confidence level. There is no strong evidence to conclude that the estimates are different. It is important to acknowledge that the choice of the number of neighbors and the caliper setting can influence the result. This is because there is no consensus on what constitutes a universally acceptable distance (A. Smith & E. Todd 2005; Austin 2011)

While the results of both ATE and ATT are consistent, it is important to align the choice between ATT and ATE. In analysing the treatment's effectiveness, the ATT is better and may be of greater interest than the ATE. On the other hand, when there is a high barrier to participation and individuals have only recently started participating in the program, the ATE appears to be a more suitable measure (Austin 2011). In the current context, as this study lack information about the duration of participation for female-headed households in the credit program, ATE becomes a more reliable choice to see the effect of credit.

Overall, after running the Propensity Score Mat ching and balancing the score with several approaches, the result of the estimation is that the credit extension positively affects the

expenditure per month of female-headed households. It indicates that giving credit to female-headed households could potentially increase their welfare.

## CONCLUSION

This study examines the effect of credit on female-headed households' welfare in Indonesia by using cross-sectional data from SUSENAS 2018. Welfare here is represented by household expenditure per capita/month. The effect of credit on expenditure is measured by Propensity Score Matching (PSM), which compares the effect of female-headed households who take credit and those who do not with controlling baseline covariates, which are age, education, location, employment status, marriage status, housing status, household size and housewife status. This study also imposed logistic regression to examine the relationship between the independent variables and the probability of female-head taking credit. The result from the logistic regression shows that those variables significantly impact the probability of the female-head taking the credit extension. Regardless, it should be highlighted the hypothesis that the limitations and burden of becoming in charge in a domestic role will affect the female-head to participate less in credit is not proven.

Based on the result of propensity score matching, the Average Treatment Effect of the female-headed households who take credit is 100,102.5 IDR higher, which means the credit positively affects the households' expenditure by that amount compared to the households who do not take credit. This work also exhibits the nearest neighbor and caliper matching with a certain threshold to make the result more precise. The results show that although the effect amount is slightly different, they are still statistically significant.

Overall, the effect of credit on female-headed households' welfare is positively significant. It indicates that credit access will help female-headed households increase their welfare and prevent them from falling into economic hardship when they do not have support from the male-head.

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