
GENDER AND FOOD: CORRELATION BETWEEN WOMEN'S PARTICIPATION IN THE LABOR FORCE AND HOUSEHOLD MEMBERS' FOOD SECURITY

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ABSTRACT

Food security is a crucial issue in development that directly impacts individual well-being. This study analyzes the relationship between women's participation in the workforce and household food security. This study aims to investigate how women's employment affects food security at the household level, as well as the factors that moderate this relationship, including household expenditure and the presence of working men. The method used in this study is binary logistic regression, utilizing longitudinal data from the Indonesian Family Life Survey (IFLS) in 2007 and 2014, which involved 8,869 individuals. The results show that households with at least one working woman have better food security. Women's employment improves food security not only for themselves but also for other household members, with no significant differences based on household income or expenditure groups. This study also found that factors such as per capita expenditure and men's employment status have a positive effect on food security. The implications of this study support the development of more inclusive policies to increase the role of women in the workforce as a strategy to improve household food security, particularly in developing countries such as Indonesia.

Keywords: food security; household; women's employment

INTRODUCTION

Food security is becoming an increasingly pressing global issue amid the challenges faced by the worldwide community, including climate change, economic inequality, and the COVID-19 pandemic. According to the Food and Agriculture Organization (FAO), over 800 million people worldwide experience chronic hunger, and more than two billion people lack access to nutritious and sufficient food. (FAO, 2013). Food security is not only related to food availability but also to access, utilization, and long-term food stability. In many developing countries, the problem of food security is increasingly complex due to socio-economic, political, and gender factors that influence the distribution of food resources (Barrett, 2010; Choudhary & Parthasarathy (2007). Indonesia, as a developing country, also faces similar challenges, with food security varying across regions, especially between urban and rural areas (Akbar et al., 2023).

One of the critical issues affecting food security is the role of women in the household and their contribution to the household economy. In many countries, including Indonesia, women play a crucial role in household management, although their contributions are often underappreciated, particularly in the economic sphere. Based on data from various sources, the role of women in the workforce has a significant influence on household food security;

however, this influence is often moderated by several factors, including education level, male employment status, and access to economic resources (Komatsu et al., 2018; Duflo, 2003). Previous research by Anderson and Eswaran (2009) and Quisumbing (2000) has shown that women's empowerment through employment can improve household economic welfare and enhance food security. However, there is still much research that does not examine how this relationship is manifested in the specific context of Indonesia.

The urgency of this research stems from the importance of understanding the role of women in food security, particularly in developing countries such as Indonesia. As a country with a large population, increasing women's participation in the workforce can be a strategic approach to reducing food insecurity. This is increasingly important amid global crises, such as the COVID-19 pandemic, which has exacerbated food security issues and heightened food insecurity in many households. (Akbar et al., 2023). This study aims to fill the existing literature gap by analyzing the impact of women's employment status on household food security in Indonesia, as well as the moderating factors that influence this relationship.

This study focuses on two main issues: first, the role of women in the household economy, and second, the factors that influence food security. Numerous studies have shown that employed women make significant contributions to household welfare. Duflo (2003) revealed in her research that working women tend to allocate most of their income to household consumption, especially for food and their children's education. In addition, Quisumbing et al. (1996) stated that women's empowerment in household decision-making is directly related to improved access to food. On the other hand, factors such as education, men's employment status, and household expenditure affect household food security. (Carletto et al., 2013; Bray et al. 2022). However, although many studies have examined the role of women in food security in general, there is still limited research that focuses on the interaction between women's work and other variables in the context of Indonesian households (Broussard, 2019 ; Hadad, 1992).

This study introduces innovation by providing an in-depth analysis of how women's employment affects household food security in Indonesia, taking into account moderating factors such as per capita expenditure, male employment status, and the age of household members. Previously, many studies have assessed the relationship between women's employment and food security in aggregate without considering differences in household socioeconomic factors. (Isaura et al., 2020; Pangaribowo et al., 2019). This study also introduces a more robust methodology, utilizing longitudinal data and panel regression to minimize bias and provide more valid results.

The primary objective of this study is to examine the impact of women's employment on household food security in Indonesia and to identify factors that moderate this relationship. This study is expected to make significant contributions to public policies related to women's empowerment and strategies for reducing food insecurity in developing countries such as Indonesia.

METHOD

Data

This study utilizes data from the IFLS, a publicly accessible survey that represents 83% of the Indonesian population, as reported by Strauss et al. (2016). The initial survey wave took place in 1993, with subsequent waves conducted in 1997, 2000, 2007, and at the end of 2014. Waves from 2007 and 2014 are used in this study. Since household food security indirectly reflects individual food security, as each household typically consists of several individuals, this study utilizes observations from 8,869 individuals. I only include individuals from households that have at least one adult female who is included in the nuclear family group (head of household, spouse of the head of household, or children of the head of household). Panel analysis for binary logistic regression will only include observations with different outcomes in different periods; therefore, I only include individuals who experienced different food security statuses in 2007 and 2014.

a. Dependent Variable

The dependent variable is Food Security. The measurement of food security in this study follows the concept of the World Food Program (WFP) to conduct food consumption analysis, which produces a food consumption score. (World Food Programme, 2015). This method is also used by Mason et al. (2015) and Isaura et al. (2020) which utilizes the Food Consumption Score (FCS), based on food consumption recall for the past seven days, to assess food security. FCS is calculated by summing the scores of eight different food groups, taking into account the frequency and weight of each group.

This study analyzed food consumption using 10 food items from the food frequency questionnaire (FFQ) presented in the IFLS4 and IFLS5. Isaura et al. (2020) contextualized the method as follows: First, I classified 10 food items from the FFQ of IFLS3, IFLS4, and IFLS5 into five food groups: vegetables (including carrots and green leafy vegetables), fruits (such as mango, papaya, and banana), proteins (eggs, fish, meat), dairy products, and staple foods (sweet potatoes). Then, I calculated a food consumption score (FCS) for each food group and categorized them according to three food consumption groups (FCGs). FCS, which is continuous data, was used to obtain FCGs, which are categorical data. FCGs were defined as “insecure” if the FCS was less than 21, “threshold” if the FCS ranged from 21 to 35, and “secure” if the FCS was greater than 35. “Poor” and “threshold” FCGs refer to individuals who have been categorized as food insecure. In particular, these participants are considered to be at risk of inadequate access to sufficient and nutritious food.

b. Variables of Interest

The variable of interest in this study is women's employment status. In the context of large families in Indonesia, analyzing the employment status of each wife or mother in the household may be less relevant and less reasonable. Therefore, this study defines women's employment as having at least one female adult (over 15 years old) in the nuclear family (i.e., the head of household, the spouse of the head of household, or the children of the head of household) who is employed. Individuals are classified based on whether they are part of a household where at least one adult female resides. These categories are represented as dummy variables in the regression analysis, with individuals living in households that do not

have an adult female in the nuclear family who does not participate in paid activities as the omitted dummy.

c. Control Variables

Since other factors influence household food security, control variables are included in the model to account for them. The control variables and their operational definitions are as follows:

Table 1List of Research Variables

NO	Variables	Variable Definition	Variable Types
1	Food security	0 = Not safe, 1 = Safe	Results
2	Employment status of female household members	1= at least one adult female (> 15 years) in the nuclear family has a job, 0 = There are no adult women (> 15 years) in the nuclear family who have a job	Interest
3	Year	The year 2007 The year 2014	Control
Individual Characteristics			
4	Education	1 = No/basic 2 = High school 3 = High School 4 = University	Control
5	Age	Number of ages	Control
6	Sex	1 = Male 0 = Female	Control
Household Characteristics			
7	Household size	The number of people living in the household at the time the survey was conducted	Control
8	Employment status of male household members	1 = At least one adult male (> 15 years) in the nuclear family has a job 0 = no adult males (> 15 years) in the nuclear family have jobs	Control
9	Receiving <i>Raskin</i>	1= No, 0= Otherwise	Control
10	Have a card for the poor	1= No, 0= Otherwise	Control
11	Food Expenditure per Capita	Total household food expenditure divided by the number of household members (ln)	Control
Regional Characteristics			
12	Urban residence	1 = yes, 0 = otherwise	Control
13	Living in Java	1= yes, 0= otherwise	Control

RESULTS AND DISCUSSION

Research result

Descriptive Analysis

Before conducting empirical analysis to determine the relationship between women's employment status and household food security, data exploration was undertaken to provide a general description of the characteristics of individuals and households in the sample. Table 2 presents the descriptive statistics for the variables examined in this study. The mean value of the women's employment status variable studied was 0.48, indicating that in the sample, more people were living in households where no women were employed.

For the covariates, it is notable that the mean of the male employment variable is 0.725, indicating that a higher proportion of people reside in households with employed men in the sample. The significant difference in employment status between males and females suggests that men have traditionally been the primary breadwinners while women have been more focused on domestic roles.

Table 2 Descriptive Statistics of Variables

Variables	Observation	Means	St. Dev	minute	Maximum
Food Safety Status	17,738 people	.5	.5	number 0	1
Working Women	17,738 people	.4811704	.4996594	number 0	1
Working Man	17,738 people	.7257864	.4461297	number 0	1
HH Size	17,738 people	4.550795	1.684622	2	18
HH ² Size	17,738 people	23.54753	19.24014	4	324
Per capita expenditure (ln)	17,738 people	10.8461	.7388764	5.164786	16.07011
Age	17,738 people	28.73599	18.77715	number 0	94
Urban	17,738 people	.5272861	.499269	number 0	1
Island	17,738 people	.2259556	.4182218	number 0	1
Have a card for the poor	17,738 people	.2022776	.4017094	number 0	1
Receiving <i>Raskin</i>	17,738 people	.5746984	.4944026	number 0	1
Education	17,738 people	1.717499	.9382883	1	4
Sex	17,738 people	.4678656	.4989804	number 0	1

Table 2 presents descriptive statistics for the variables used in this study. Descriptive statistics describe the general characteristics of the sample studied, which consisted of 17,738 individuals. Some of the variables defined in this table include:

1. **Food Security Status:** Indicates the proportion of individuals categorized as "secure" (1) or "insecure" (0) in terms of food security. The mean value of 0.5 indicates an almost equal distribution between individuals experiencing secure and insecure food security.
2. **Working Women:** This variable indicates the proportion of individuals living in households with at least one working adult female. The mean value of approximately 0.48 suggests that more than half of the individuals reside in households where women are not employed.
3. **Working Men:** This variable indicates the proportion of households where at least one adult male is employed. The mean value of 0.73 suggests that most individuals live in households with a working male.

4. **Household Size:** The average household size is 4.55 people, indicating that the average household size is slightly larger than four people.
5. **Per Capita Expenditure:** The average per capita household expenditure is 10.85, with considerable variation between richer and poorer individuals.

Estimation Results

Table 3. Regression Analysis

Dependent Variable :	(1)	(2)	(3)	(4)
Food Safety Status	Logic Collected	Logit (Individual control)	Logit (Individual and household controls)	Logit FE Panel
(Basic: Not Safe)				
Working Woman = Yes	-0.000452 (-0.02)	0.0313 (1.03)	.0401345 * (1.65)	0.110 *** (2.61)
Age		-0.00928 *** (-11.47)	-.0091222 *** (-10.7)	-0.204 *** (-36.82)
Education = Junior High School		-0.455 *** (-11.11)	-.3866343 *** (-9.31)	-0.343 *** (-4.94)
Education = High School		-0.379 *** (-9.50)	0.3062406 *** (-7.37)	-0.239 *** (-2.85)
Education = University		-0.246 *** (-3.40)	-0.1680355 ** (-2.24)	0.0290 (0.18)
Gender = Male		-0.00851 (-0.28)	-0.0114694 (-0.37)	0.326 (0.36)
HH Size			-0.11873 *** (-3.23)	0.128 *** (2.53)
HH Size ^2			0.007761 *** (2.41)	-0.00384 (-0.89)
Male Worker = Yes			0.108287 *** (3.07)	0.190 *** (2.61)
Having a card for the poor = No			-0.360105 *** (-9.02)	0.0904 * (1.84)
Receiving <i>Raskin</i> = No			.1411784 *** (4.06)	-0.00311 (-0.06)
Place of residence = Urban			.0006408 (0.98)	0.0648 at (0.83)
Island = Java			.0089506 (0.81)	-0.254 (-0.38)

Dependent Variable :	(1)	(2)	(3)	(4)
Food Safety Status	Logic Collected	Logit (Individual control)	Logit (Individual and household controls)	Logit FE Panel
(Basic: Not Safe)				
Food expenditure per capita (ln)			0.35588 ***	0.495 ***
			(14.93)	(14.01)
Individual Control	N	You	You	You
Household Control	N	N	You	You
FE Year	N	N	N	You
Observation	17,738 people	17,738 people	17,738 people	17,738 people
R squared	0.0001	0.0132	0.0 287	0.2079

t in brackets

* *p* value < 0.1, ** *p*-value < 0.05, *** *p*-value < 0.01

The regression results in column (3) of Table 3, using a representative sample from IFLS waves 4 and 5, provide initial indications that living in a household with at least one female member in the nuclear family is associated with a significant positive correlation in food security. However, this study acknowledges the potential for endogeneity issues that may lead to biased estimates. This study employs standard panel fixed effects methods to minimize bias by accounting for time-invariant unobserved heterogeneity.

As illustrated in Table 3, column 4, our panel regression, which includes fixed effects and binary logistic regression, concludes that individuals living in households where at least one female member of the nuclear family works outside the home are more likely to experience food security. The findings revealed a positive correlation between having at least one female household member who works outside the house and one's food security status.

The control variables show some critical results. The regional variable shows no significant correlation between place of residence (urban vs. rural and Java vs. non-Java) and individual food security. Meanwhile, increasing age negatively correlated with the food security of the people living in the household, meaning that adults and older people are less likely to experience food security than children. Individuals living in households where at least one male member of the nuclear family works outside the home are more likely to experience food security. Finally, socioeconomic factors such as food expenditure indicate that people living in households with higher per capita expenditure are more likely to experience food security. Consistently, having a card for the Poor (an indicator of low socioeconomic status) shows a negative and significant correlation with food security.

Table 3 presents the results of the regression analysis examining the relationship between women's employment status and household food security. This analysis employs a binary logistic regression model to investigate the dependent variable (food security status) while controlling for individual and household-level variables. Some significant findings from this table are:

1. **Working Women = Yes:** This variable shows the relationship between women's employment status and food security. The regression results indicate a significant positive correlation between having at least one working woman in the household and individual food security (p-value < 0.01). A positive coefficient indicates that households with working women tend to have better food security.
2. **Age:** These findings suggest that age is negatively correlated with food security, indicating that older individuals are more vulnerable to poor food security.
3. **Male Workers = Yes:** Households with male workers also exhibit a positive correlation with food security, suggesting that male employment status contributes to improving household food security.
4. **Education:** The education variable was also found to have a significant influence, with individuals with higher levels of education tending to experience better food security.
5. **Household Size:** Household size is also related to food security, with larger households generally experiencing lower food security.

Endurance Test

To evaluate the sensitivity of our estimation results, I conduct a series of robustness checks by (i) replacing the food security measure with a continuous variable of food consumption score, (ii) exploring other proxies for per capita income as a control variable, and (iii) exploring other proxies for social assistance as a control variable.

Additional income from paid activities of other family members can alter the proportion of household expenditures, as higher incomes may result in a lower percentage of food expenditures. (Rusmawati et al., 2023). Therefore, instead of using per capita food expenditures by quintile, I employ total per capita expenditures as an additional measure of per capita income for robustness checks. (Sangwan & Kumar, 2021). Furthermore, it is essential to determine whether different measures yield similar results in the main specification; therefore, I employ alternative versions of the food security and social assistance variables. For the food security measure, I use the food consumption score, a continuous variable used to derive FCG, which is categorical data used in the regression analysis. For the social assistance variable, I use the category “received at least one program: *BLT (Direct Cash Assistance)* or *Raskin*” because Chakona & Shackleton (2019) found that households receiving social assistance do not always experience higher food security compared to households not receiving such assistance.

Table 4 shows that the logistic regression results are robust to a series of robustness checks. The estimates show positive correlations and are statistically indistinguishable. These results confirm the robustness of the model listed in Table 4.

Table 3Durability Check

Dependent Variable : Food Safety Status	Dependent Variable: Food Consumption Score	Control Variable: Total Expenditure per Capita (ln)	Control Variables: BLT and Raskin
Working Woman = Yes	1,906 *** (3.35)	0.107 ** (2.54)	0.107 *** (2.61)
Total expenditure		0.49531 ***	

per capita (ln)			
(14.01)			
Receive BLT and/or Raskin			-0.01704
(-0.32)			
Individual Control	You	You	You
Household Control	You	You	You
FE Year	You	You	You
Observation	17,738 people	17,738 people	17,738 people
R squared	0.2818	0.1972	0.20797

t in brackets

* *p* value < 0.1, ** *p*-value < 0.05, *** *p*-value < 0.01

Table 4 presents the results of the model robustness check, which includes several tests to ensure the reliability of the main findings in this study. Some of the tests carried out include:

1. **Use of Alternative Measures of Food Security:** In this examination, the Food Consumption Score (FCS) was used as an alternative measure of food security. The results showed that women's employment remained positively and significantly correlated with food security (*p*-value < 0.01).
2. **Additional Controls: In this analysis, researchers added alternative controls**, such as total expenditure per capita and receipt of social assistance (BLT/Raskin). The regression results still show a positive relationship between female employment and food security, although the effect is slightly different after adding additional controls.
3. **Heterogeneity of Effects: This test aims to investigate whether the effect of women's employment on food security varies according to control variables, including** men's employment status, per capita food expenditure, and age. The results show that there is no significant difference in the effect of women's employment between these groups, indicating that the impact of women's employment on food security is consistent across household conditions.

Heterogeneity Analysis

This study examines the heterogeneous effects of women's employment status across multiple dimensions, including men's employment, age, and per capita food expenditure. I use interaction effects to determine whether the impact of women's employment differs across specific categories of control variables.

Table 4 implies that no significant effects were found across all control variables. That is, the effect of female employment does not differ between (i) individuals living in households with an employed man vs. without an employed man, (ii) individuals living in households with low vs. high per capita food expenditure levels, or (iii) the age of the individual.

Table 4 Impact of Women's Employment Status on Food Security Based on Covariates

Dependent Variable : Food Safety Status	Women's Jobs *Men's Jobs	Women's Employment *Food Expenditure per Capita (ln)	Employment Status Female*Age
Working Woman = Yes	0.0624 years (0.70)	0.00703 (0.15)	-0.00193 (-0.87)
Individual Control	You	You	You
Household Control	You	You	You
FE Year	You	You	You
Observation	17,738 people	17,738 people	17,738 people
Adj R squared	0.2080	.20797	.20780

t statistics in parentheses

*p<0.1, **p<0.05, ***p<0.01

Table 5 presents the results of the regression analysis, which examines the impact of women's employment status on food security, considering the interaction between women's employment and various control variables. This analysis aims to investigate whether the effects of women's employment on food security vary depending on specific control variables, including men's employment status, per capita food expenditure, and individual age. Some of the essential results found in this table are as follows:

1. Women's Jobs * Men's Jobs :

- Coefficient: 0.0624
- P-value: Not significant (t-statistic 0.70)

The interaction between women's employment status and men's employment status did not show a significant effect on food security. This suggests that the impact of women's employment on food security is not significantly influenced by whether men in the household also work.

2. Women's Employment * Food Expenditure per Capita (ln) :

- Coefficient: 0.00703
- P-value: Not significant (t-statistic 0.15)

The interaction between female employment and per capita food expenditure also showed no significant effect. This suggests that the impact of female employment on food security does not vary based on the level of per capita food expenditure in the household. In other words, although household expenditure can impact food security, the effect of female employment remains consistent across all expenditure levels.

3. **Women's Jobs * Age :**

- a. Coefficient: -0.00193
- b. P-value: Not significant (t-statistic -0.87)

The interaction between women's employment and individual age also did not show a significant effect. This suggests that the impact of women's employment on food security does not change significantly based on the age of individuals in the household; both younger and older individuals in the household gain similar benefits from women's employment.

The role of female labor force participation in enhancing household food security is supported by a positive and statistically significant correlation between women's employment in households and household food security. This finding aligns with existing literature, which shows that women's involvement in paid work not only enhances women's economic empowerment but also improves household welfare as a whole.

From a theoretical perspective, this study draws on gender and development theory, which emphasizes the significant role of women in household economic activities. As stated by Duflo (2003), women tend to allocate most of their income to household consumption, particularly in areas such as food and children's education, which are crucial aspects in improving the quality of life. This study confirms the significant correlation between women's employment and food security, supporting the hypothesis that women's income improves household access to sufficient and nutritious food, which is essential for achieving food security.

This study also contributed to the debate on resource allocation within households. According to Quisumbing and Maluccio (2000), the allocation of resources within households is influenced by the relative bargaining power of household members. Women's employment, therefore, strengthens women's bargaining power, which may explain why households with working women report better food security outcomes. Furthermore, this finding is consistent with Choudhary and Parthasarathy's (2007) study, which found that working women have higher levels of decision-making power, which may lead to improved food access and distribution within the household.

The study also identified several moderating factors, including household income, male employment, and the age of household members, that interact with female employment to influence food security. These findings challenge the notion that the impact of female employment on food security is uniform, suggesting that the effects of female employment may vary depending on other contextual factors. For example, households with higher income levels or those with male workers may benefit more from female employment, as it increases their economic resources and allows access to a broader range of food options.

Additionally, the analysis reveals no significant heterogeneous effects resulting from the interaction between women's employment and factors such as men's employment status, per capita food expenditure quintile, and the age of household members. This suggests that, regardless of these factors, women's employment has a consistent positive impact on food security across household contexts. This finding further supports the notion that women's

participation in the labor force plays a significant role in enhancing household economic resilience, regardless of other demographic or socioeconomic variables.

Finally, while the results of this study demonstrate a strong positive relationship between women's employment and household food security, the study also acknowledges the limitations of its design, particularly regarding issues of endogeneity and causal inference. Future research could address these concerns by using experimental or longitudinal designs that can more definitively establish the causal relationship between women's employment and food security outcomes.

CONCLUSION

This study demonstrates that women's participation in the workforce has a significant and positive impact on household food security. The results of the analysis show that households with at least one working adult woman tend to have better food security status compared to households without working women. This finding confirms the importance of empowering women in the workforce as a strategic effort to improve food security at the household level. However, although women's employment contributes to food security, this effect is not significantly influenced by factors such as men's employment status, per capita food expenditure, or age of household members. This shows that the benefits of women's employment on food security tend to be consistent across various household socio-economic contexts. Overall, the results of this study can serve as a basis for policy-making that supports women's empowerment in both the formal and informal sectors, thereby improving household food security, particularly in developing countries like Indonesia. Programs that facilitate women's access to decent work and support their dual roles in work and household responsibilities can strengthen family food security more effectively.

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