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Impacts of Contraception on Women's Decision-Making Agency in Indonesia

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Abstract

Increasing access to contraception has the potential to empower women and improve the economic standing of families across the globe. Many researchers have explored the impacts of contraception on families and the determinants of women's level of empowerment, but little scholarship exists on their direct relationship. This paper explores the impacts of contraceptive use on women's empowerment, measured by a sum of women's household decision-making agency. Panel data from three rounds of the Indonesian Family Life Survey is used to run multiple regressions with household fixed effects. Results suggest that women who use contraception have input on two additional types of household decisions, compared to women who do not use contraception. Therefore, women who use contraception have greater decision-making agency. Though additional research is necessary to prove causation and further understand this relationship, these preliminary findings support that use of contraception increases women's decision-making agency in their households.

Keywords

contraception, decision-making power, women, women's empowerment, Indonesia, family planning

Cover Page Footnote

Special thanks to Dr. Steve DeLoach, my research mentor for this undergraduate thesis. Thank you for your support throughout the research process, and for encouraging me to create something I am proud to publish.

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Introduction

Women in every nation face gender inequality, which limits their ability to contribute to the world economy and create greater opportunities for themselves and their children. Levels of inequality vary across nations, tending to be lower in developed nations. The Gender Inequality Index published by the United Nations Development Programme provides estimations of inequality, where a value of 1 represents perfect inequality, and a value of 0 represents perfect equality. The most equal country in 2017 was Switzerland, with a value of 0.039. Yemen had the greatest inequality, with a value of 0.839. The average value for the 158 nations included was 0.347 (United Nations Development Programme, 2018). These statistics affirm that great strides remain to be made in women's equality and empowerment.

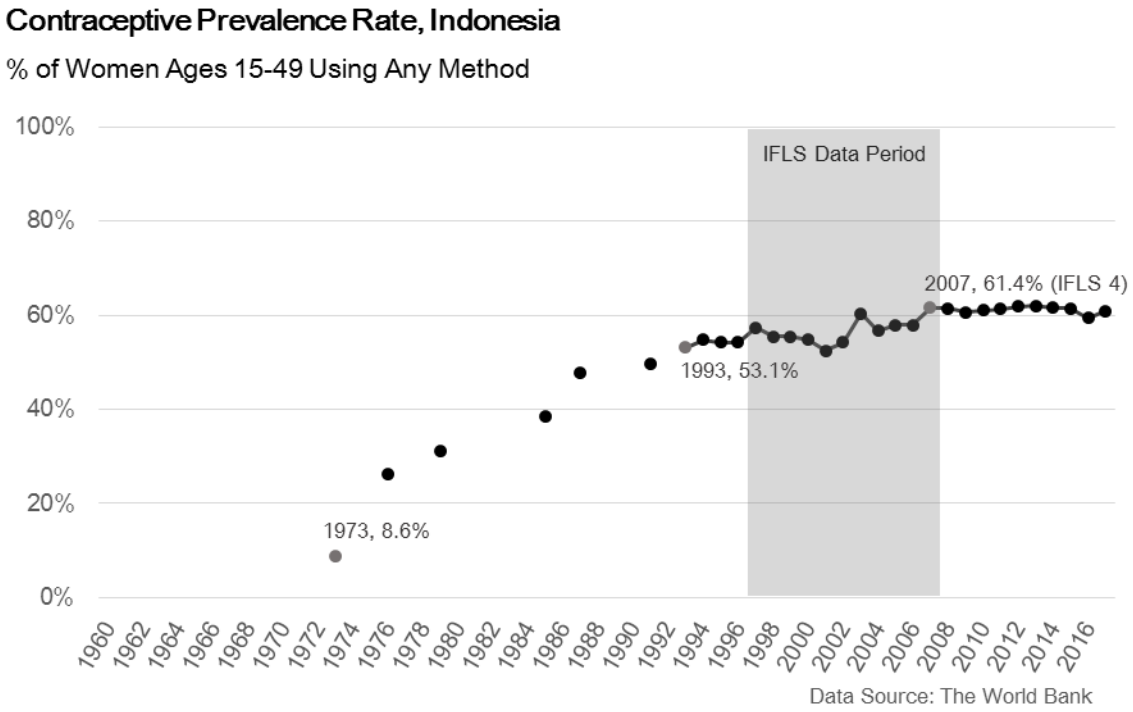
Empowering women is crucial to promoting economic development and alleviating poverty. Women's empowerment is defined by the European Institute for Gender Equality using five components: "women's sense of self-worth; their right to have and to determine choices; their right to have access to opportunities and resources; their right to have power to control their own lives, both within and outside the home; and their ability to influence the direction of social change to create a more just social and economic order, nationally and internationally" (European Institute for Gender Equality, 2002). A common measure of women's empowerment in economic research is women's decision-making agency, or the level of input women have on household decision-making processes. This is consistent with the definition of women's empowerment, as it measures choices, access to opportunities and resources, and influence. Research suggests that increases in women's decision-making agency supports long term economic growth because when women are more empowered, families spend more on nutritional foods and education-related expenditures (Pangaribowo, Tsegai, & Sukamdi, 2018), which increases the likelihood of children earning higher incomes than their parents in the future (Pohan, 2013).

This study focuses on the determinants of women's decision-making agency in Indonesia, a nation with a gender inequality index of 0.580 in the year 2017 (United Nations Development Programme, 2018). Many governments have created programs to promote female empowerment. Arguably, Indonesia has been one of the most progressive countries in terms of promoting women's equality over the past several decades. In partnership with UN Women, the Indonesian government promotes women's empowerment by allocating funds to end violence against women, maintain peace, build social cohesion, and promote women's

rights through legislation (UN Women, 2019). Other government programs promote the use of contraception, because contraception allows women to plan their families and decrease family size, delay childbirth and instead pursue further education or career advancement, and allocate time to other productive activities. Smaller family size also means more opportunities to enter the workforce and decreased spending on costs associated with child rearing.

The Indonesian government first committed to a national family planning initiative in 1969, with goals of expanding access to contraception, decreasing fertility rates, and promoting gender equality. This initiative focused on equipping local health clinics with birth control and information on family planning, and employing fieldworkers to advocate birth control door-to-door in villages (Hull, Hull, & Singarimbun, 1977). As a result of these programs, contraceptive prevalence rates increased from 8.6% in 1973 to 53.1% in 1993 (World Bank, 2019). These rates are reported for any contraceptive method among women between the ages of 15 and 49, and are available in Figure 1 below. In the same time period, average fertility rate dropped from 5.6 to 2.8 children per woman (World Bank, 2019). After the late 1990s, these rates stagnated, leaving unmet demand for contraception. In 2012 at the London Summit on Family Planning, the Indonesian government announced a new commitment to family planning initiatives, known as Family Planning 2020, with an overarching goal of "strengthening the integrated approach for rights-based family planning programming at the sub-national level" (Family Planning 2020, n.d.). This program aims to support health equity by providing information and access to contraception to all women, and achieve an average fertility rate of 2.1 children per woman by 2025 (Putjuk, 2014), compared to the 2.4 in 2016 (World Bank, 2019). As these efforts continue, barriers to the expansion of contraception include fear of side effects of modern hormonal methods and preference for traditional methods, such as herbs, massage, and long periods of abstinence (Hull, Hull, & Singarimbun, 1977), as well as access to health care facilities and costs of contraception (Putjuk, 2014).

Figure 1



The purpose of this paper is to determine whether Indonesian women's use of contraception has a causal effect on their empowerment. Empowerment is measured using women's decision-making agency in the household. Regressions are used to determine the impact of use of contraception on decision-making agency. This study uses the hypothesis that the use of contraception, especially modern methods, will increase women's decision-making agency. This research will focus on the Republic of Indonesia, the fourth most populous country in the world, and the largest Muslim nation. This nation has great potential for economic development and industrial growth, as 62% of the population lives on less than $5.50 a day (Central Intelligence Agency, 2018). The increases in contraceptive prevalence evident in Figure 1 also position Indonesia as an interesting nation for this research. Increases in contraceptive use represent a generational shift that is evident in the data. These factors make Indonesia a great candidate to explore the relationship between use of contraception and decision-making agency.

The data on use of contraception and decision-making authority come from the Indonesian Family Life Survey (IFLS). This survey has been used for research in public health, education, economics, and other disciplines. The IFLS

includes questions on household decision-making structures that can be used to estimate women's decision-making agency. Decision-making agency in the household can be used to estimate women's empowerment, based on women's involvement in decisions that affect their lives and the lives of their family members. Past research has explored this measure and its determinants. This research will add to the existing body of knowledge by using panel data to observe changes in women's decision-making agency over time and exploring the direct relationship between contraception and women's decision-making agency.

Literature Review

Decision-making agency is used across disciplines as a measure of women's empowerment. Agency is used to estimate empowerment because it measures degree of control over resources, the power to make decisions about one's life and family, and to some degree, self-confidence (Pradhan, 2003). Decision-making agency has been used as a measure of women's empowerment by researchers studying poverty reduction (Alkire, 2005), policy-making (Mosedale, 2005), and other topics.

Many researchers have explored women's decision-making agency and use of contraception using the IFLS and other sources, but not their direct relationship. Prior researchers have identified factors that influence and determine women's decision-making agency in the home. A 2015 study of women in Bangladesh found that the following characteristics had significant impacts on women's role in decision-making: education, age, rural or urban location, marriage status, participation in volunteer groups, exposure to media and television, and having at least one son (Jahan, Hossain, & Farhad, 2015). Sultana Alam (2011) reports that women's educational attainment, participation in the labor force, and income were positively associated with their decision-making agency. Another paper from Thomas, Contreras, and Frankenberg (1999) suggests that when women own more assets at the time of marriage, compared to assets owned by men, they will yield more decision-making agency, using the IFLS. A 2010 study using the Nepal Demographic Health Survey found decision-making agency to be positively associated with age, employment, education, and number of living children, and negatively associated with living in rural areas (Acharya, et. al. 2010). Women's decision-making agency has also been found to increase when women access credit through a group borrowing model. A 2005 paper found that when women are members of a borrowing group, they gain input on household decisions (Holvoet, 2005). This suggests that women's decision-making agency in the home can change during their adult life based on experiences.

Increased decision-making agency held by women is beneficial for economic development and public health, as demonstrated by research using the IFLS. Recently, Pangaribowo, Tsegai, and Sukamdi (2018) studied women's

bargaining power and household expenditure. The researchers found that when women own a larger share of assets, household spending on temptation goods (such as tobacco and alcohol) decreases, and spending on nutritious foods and other family expenditures increases. Additionally, researchers reported that when women participate in community-based organizations their families allocate less to staple foods and adult goods. Pohan (2013) presents evidence that increased spending on education will increase educational achievement for impoverished people and allow them to rise into higher income brackets in the short-term and long-term. This may be related to increases in women's decision-making agency because as Pangaribowo, Tsegai, and Sukamdi (2018) found, women are more likely to allocate funds to family expenditures. Research from Ethiopia also suggests that households where women have less decision-making agency have higher rates of child mortality (Fantahun, et. al., 2007). Research demonstrates that when women have greater decision-making agency, their families benefit.

The Center for Global Development cites access to contraception as a key factor in women's economic empowerment (Glassman, 2017). Research from the International Center for Research on Women suggests that increased contraceptive prevalence increases the educational attainment of daughters and promotes equity in marital partnerships (Stoebenau & Malhotra, 2011). This paper assumes the hypothesis that decision-making agency is positively affected by the use of contraception. Contraception allows women to plan their pregnancies and delay childbirth, providing the opportunity to complete additional years of schooling or to work outside the home (Bailey, 2006). Limiting the number of children born to a woman also decreases the amount of time that must be allocated to household work. Contraception grants women further control over their bodies and their lives, and has been cited as a cause of women's empowerment in many nations. With different responsibilities, and the opportunity to hold roles other than caretaker and mother, women may become more empowered, and gain decision-making agency.

Theory

Theoretically, the use of contraception affects women's decision-making by changing incentives and rewards within intra-household bargaining. This can be thought of as a two-player non-cooperative game. This theory assumes a traditional husband and wife who bargain to make decisions. If they both cooperate, they share decision-making equally. Alternatively, one can "cheat" by unilaterally making more decisions. Ultimately, the decision to cheat by the husband is dependent on the husband's expectation that they wife will be better-off cooperating (allowing him to cheat) rather than to cheat herself. If both choose

a non-cooperative strategy, then the household is worse off as the two struggle over decision-making power.

What role does contraception play in this bargain? The use of contraception allows women to delay childbirth, allowing them to allocate more time to pursuing further education and gaining work experience. Greater experience and education leads to increased incomes and greater independence. With greater income and experience, women may gain bargaining power in marital relationships because it is more feasible that they would be better off not cooperating. Therefore, they represent a more "credible threat". Specifically, women with decision-making power are more able to leave their husband or demand power if they are educated and have income. Women without decision-making agency are expected to cooperate with their husbands and accept decisions made by him. Past research has established this theory, known as the divorce-threat bargaining model (Lundberg & Pollack, 1994). Men may be more inclined to cooperate when women are more empowered, or have more experience in the labor force, in order to maintain a stable household. Figure 2 offers a game theory matrix explaining this concept, where utilities are reported for husbands and wives based on whether they choose to cooperate when making household decisions. The variable "U" represents utility for males and females for each possible outcome.

Figure 2
Game Theory Matrix

		Female (F)	
		Not Cooperate	**Cooperate**
Male (M)	**Not Cooperate**	U^M_3, U^F_3	U^M_2, U^F_2
	Cooperate	U^M_4, U^F_4	U^M_1, U^F_1

Based on this theory, a husband will choose to "cheat", or not cooperate if the following two assumptions are true: 1) U^M_2 is greater than U^M_1 and 2) U^F_2 is greater than U^F_3. However, if U^F_3 is a function of contraception, and increases when contraception is used, the second assumption may not hold true. This would lead men to choose to cooperate instead, therefore sharing decision-making power with their spouse. If use of contraception increases women's bargaining power in the household and incentivizes men to cooperate on household decisions, women's decision-making agency will increase.

Data & Model

The data used in this study was collected through the IFLS, a longitudinal survey comprised of over 30,000 individuals. It is representative of 83% of the Indonesian population. Topics include health, personal finance, community assets, access to healthcare, and demographics. Five waves of the survey have been conducted between 1993 and 2015. This study uses data from the second, third, and fourth rounds of the IFLS. These studies are labeled as IFLS2, IFLS3, and IFLS4, and were conducted in the years 1997, 2000, and 2007, respectively. Data was collected through interviews with members of each participating household, as well as interviews with community leaders. The interviews were conducted in the native language of respondents, and the translated results are available online. The dataset used in this study was constructed by identifying all of the women in the sample who identified as the head of their household or the spouse of the head of household. Women who moved to a different community between 1997 and 2007 are excluded to avoid confounding from changes in access to healthcare and environment.

This dataset includes 11,042 observations, representing women ranging from ages 19 to 97. Summary statistics for the dataset are available in Table A1 in the Appendix. The sample used in all regressions excludes women who were over the age of 50, to account for menopause decreasing the demand for contraception. This cutoff is consistent with internationally accepted measures, as the World Bank uses women between the ages of 15 and 49 when reporting on fertility indicators. This sample includes 6,663 observations over the three rounds, representing over 2,000 women across the three survey waves. Each woman is identified numerically by a personal ID, a household ID, and a community ID number. Summary statistics for this sample are available in Table 1.

To explore the relationship between use of contraception and decision-making agency, three regression models are estimated. The dependent variable is a sum of women's decision-making agency. The independent variables tested are contraceptive use, each woman's age in 1997, number of dependents in the household, total number of household members, and the natural log of per capita expenditure in the household. The use of panel data allows the equation to account for the effects on individual women over time, and changes after contraception is introduced. Using fixed effects controls for the impacts of factors that do not change over the course of the study, including religion, community environment, level of education (of women and their husbands), and personality traits of women. Other researchers have used additional variables, such as educational attainment and rural or urban location, in studies on women's empowerment. However, the use of fixed effects allows for the isolation of such variables and controls for unobserved factors on the individual and community levels. Therefore, the effects of factors such as a woman's desire to be

independent, her likelihood to desire greater household decision-making agency, and her general personality will be limited.

The model given in equation (1) is designed to estimate women's decision-making agency in the household based on contraceptive use, age, number of dependents, household size, and per capita expenditure. This model is used to estimate three regressions, as well as sensitivity test. The model also includes household fixed effects, $\Theta_{i,}$ and an error term to explain additional variance. In the model, "i" represents each woman, "j" represents each community, and "t" represents the year.

Equation (1):

$$\begin{aligned}\text{Decision-Making Agency}_{ijt} = {} & \beta 0 + \beta 1(\text{Use of any contraceptive})_{ijt} \\ & + \beta 2(\text{Age of respondent})_{ijt} \\ & + \beta 3(\text{Number of dependents})_{ijt} \\ & + \beta 4(\text{Household size, number of people})_{ijt} \\ & + \beta 5(\text{Household expenditure per capita})_{ijt} \\ & + \Theta_i + \varepsilon_{ijt}\end{aligned}$$

The independent variable is defined as a sum of women's household decision-making agency. The IFLS survey asks women who makes decisions about various expenditures in the household, and respondents list all individuals who have input on each of the following sixteen types of decisions. Decision-makers may include the head of household, spouses, parents, siblings, and others. These individual decisions are:

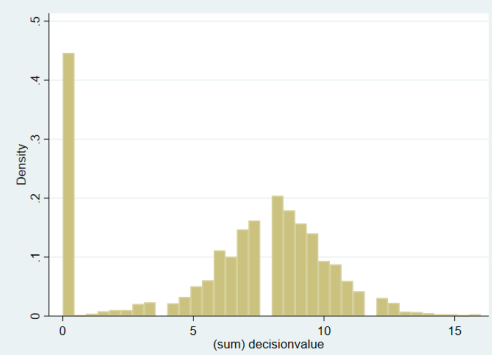
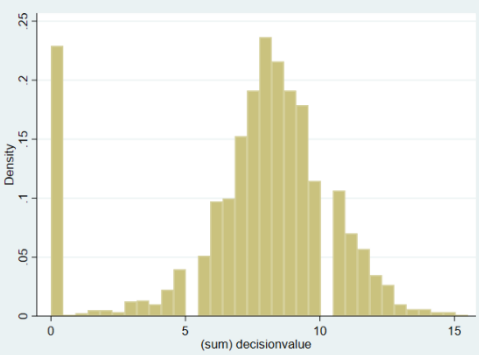
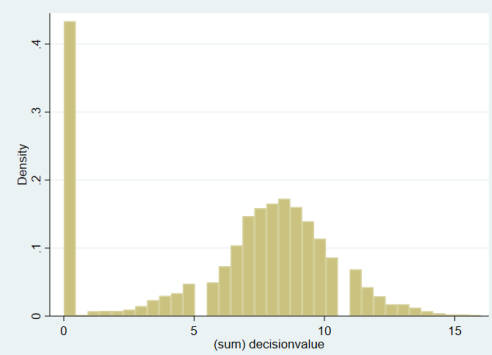
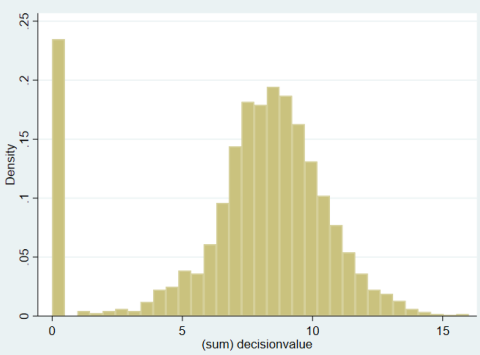
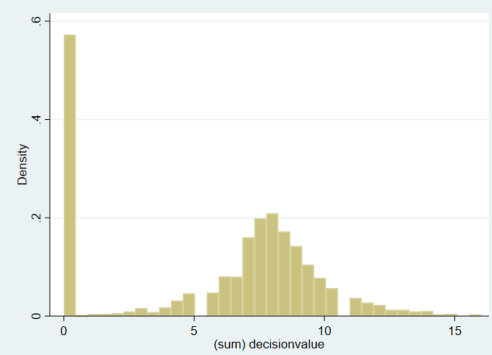
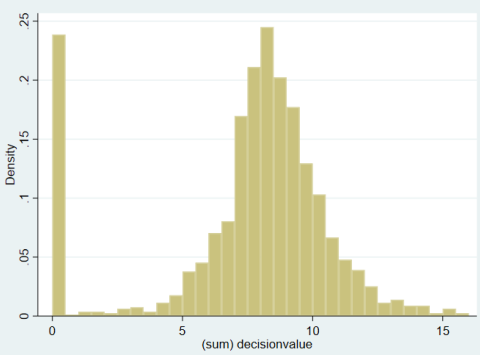
a) choice of food eaten at home;
b) routine purchases for household items such as cleaning supplies;
c) your clothes;
d) your spouse's clothes;
e) your children's clothes;
f) your children's education;
g) your children's health;
h) large expensive purchases for the household;
i) giving money to your family;
j) giving money to your spouse's family;
k) gifts for parties/weddings;
l) money for monthly arisan (savings lottery);
m) money for monthly savings;
n) time the husband spends socializing;
o) time the wife spends socializing; and

p) whether you and your spouse work.

To create a decision sum, values are assigned to each response, and a sum is calculated for each woman. When a woman is the sole person responsible for any of the above decisions, her decision sum increases by 1 point. When a woman shares any of the above decisions with her husband and no additional family members, her decision sum increases by 0.5 points. Therefore, an increase from 0 to 0.5 in this variable can be interpreted as a woman gaining shared decision-making agency on one additional household decision. When a woman has no input on a single decision, or share decision-making agency for that decision with two or more additional household members, she is assigned a value of 0 for that decision. The sum of each of these values creates the woman's decision-making agency sum, with a maximum possible score of 16. The dataset also includes a question asking who makes decisions about use of contraception. This question is excluded from the analysis to avoid reverse causality and isolate the effects of contraception on decision-making agency.

Summary statistics for decision-making agency are reported for the dataset in Table A1, for the sample in Table 1, and for each wave in Table A3. Histograms for decision-making sum are available in Figure 3. The average decision sum for women of all ages in the first wave is 6.4, with a max of 16 and over 40% of women with a score of 0. For the second wave, the average decision sum is 6.6, with a max of 16 and over 40% of women with a score of 0. In the third wave, the average decision sum is 5.9, with a max of 16 and over 50% of women with a score of 0. When only women under the age of 50 are considered, the decision sum values increase, suggesting that younger generations are more empowered. The average values in each wave for this sample are 7.5, 7.5, and 7.3, with maximum values of 15.5, 16, and 16. For women between the ages of 19 and 49, a significantly smaller proportion of women have a decision sum of 0, representing less than 25% of women in all three waves of the survey.

Figure 3
Decision-Making Agency Histograms

	Histograms: Dataset	*Histograms: Sample (Age<50)*
IFLS2 Year: 1997 All Women: μ: 6.443 σ: 3.784 Age <50: $\bar{x}$: 7.490 σ: 3.196		
IFLS3 Year: 2000 All Women: μ: 6.551 σ: 3.862 Age <50: $\bar{x}$: 7.527 σ: 3.344		
IFLS4 Year: 2007 All Women: μ: 5.927 σ: 3.985 Age <50: $\bar{x}$: 7.291 σ: 3.266		

The primary dependent variable of interest is contraceptive use. The IFLS asks women about their use of contraception in the past and present, as well as their future expectations. Survey responses about women's current method of contraception from each wave are used to create three variables representing the types of contraception used, and general use. The survey inquires on the following types of contraception:

1. Pill* (22.8%)
2. Injection (Monthly)* (6.2%)
3. Injection (Bi-Monthly)* (0.5%)
4. Injection (Quarterly)* (47.9%)
5. Intravaginal ring* (0.1%)
6. Condom (1.8%)
7. Intrauterine device (IUD)* (8.0%)
8. Implant* (3.7%)
9. Female sterilization* (4.6%)
10. Male sterilization* (0.3%)
11. Rhythm/calendar method (2.5%)
12. Coitus interruptus (1.0%)
13. Traditional herbs (0.4%)
14. Traditional massage (0.1%)
15. Female condom (0.1%)
95. Other (0.0%)

The percentage of women who reported using each method in the year 2007 is included in parentheses above. These percentages are consistent with rates reported by Indonesia's Family Planning 2020 Program (Family Planning 2020, n.d.). Women who reported current use of any of these forms were assigned a value of 1 for the use of contraception variable. An additional variable for use of a modern form of contraception was created using the types marked with an asterisk (*) above. These forms are generally more effective and longer lasting. Other types are classified as non-modern, and captured in another variable. These variables are binary, with 1 representing use and 0 representing no use. Summary statistics for the dataset and the sample are available in Tables A1 and 1, respectively. Summary statistics for each wave for use of any contraception and use of modern contraception are reported in Tables A4 and A5. For women of all ages, only 32% of respondents claimed to use any form of contraception. Table 1 below reports summary statistics for women under the age of 50. Within this sample, just over half of women reported using any form of contraception, at 52%. A total of 49% of the sample reported using a modern form of

contraception. The majority (54.6%) of women who reported using contraception use an injection as their primary form of contraception.

Other variables included in the dataset include urban or rural location, age, educational attainment, number of dependents, household size (number of people), household expenditure, and household expenditure per capita. Some of these variables are excluded from the regression because of the use of panel data and household fixed effects. These variables are summarized in Table 1 for women under the age of 50. Many variables are binary, including urban location, highest level of educational attainment, and the woman's employment status.

Table 1
Summary Statistics for Sample (Women Under the Age of 50)

Variable	Obs	Mean	Std. Dev.	Minimum	Maximum
Decision Sum	6,663	7.456	3.268	0	16
Decision Sum: Decisions About Working	6,663	0.370	0.277	0	1
Decision Sum: Decisions About Finances	6,663	2.989	1.477	0	7
Decision Sum: Decisions About Food & Kids	6,663	2.095	1.121	0	4
Any Decision-Making Agency	6,663	0.889	0.315	0	1
Z-Score: Decision Sum	6,663	0.291	0.842	-1.630	2.493
Z-Score: Decisions About Working	6,663	0.135	0.949	-1.135	2.295
Z-Score: Decisions About Finances	6,663	0.272	0.871	-1.490	2.637
Z-Score: Decisions About Food & Kids	6,663	0.290	0.901	-1.393	1.821
Urban	6,663	0.418	0.493	0	1
Age	6,663	38.766	6.574	19	49
Advanced Degree	6,663	0.019	0.136	0	1
High School Education	6,663	0.055	0.228	0	1
Junior High Education	6,663	0.069	0.254	0	1
Elementary Education	6,663	0.362	0.481	0	1
Worked in the Past Week	6,663	0.224	0.417	0	1
Use of Contraception	6,662	0.519	0.500	0	1
Use of Modern Contraception	6,663	0.495	0.500	0	1

Use of Nonmodern Contraception	6,663	0.024	0.153	0	1
Number of Dependents	6,663	1.712	1.292	0	8
Household Size (Number of People)	6,658	4.805	1.753	1	15
Household Expenditure (in thousands of rupiah)	6,622	1072.720	1637.98	28.94	61200
Household Per Capita Expenditure (in thousands of rupiah)	6,622	243.661	365.82	6.61	10400
ln(Household Per Capita Expenditure)	6,622	11.919	0.945	8.80	16.153
Community Average Per Capita Expenditure (in thousands of rupiah)	6,571	262.895	215.896	29.62	2253.854
Community Average Household Expenditure (in thousands of rupiah)	6,571	993.250	822.581	110.18	9516.032
Community Average Household Size	6,571	4.320	0.738	1.909	11.000

Across all three waves, an average of 89% of women in the sample had some decision-making agency. Approximately 42% of respondents lived in urban areas, and only 22% had worked outside the home in the past week. Work status was not found to be significant in any initial tests, and is not included in regressions. Elementary school was the highest level of education attained by 36% of respondents, and only 5% had attended high school. Education variables are not included in the regressions because the average women did not complete any additional years of education during the survey period. The average age in this sample is 38, compared to 47 in the full dataset. The average number of dependents (defined as household members under the age of 15) is 1.7, with a range of 0 to 8 total dependents. Household size, which includes all household members, has an average of 4.8 people, with a range of 1 to 15 people. Summaries of household expenditure and expenditure per capita are also reported above in thousands of rupiah. The dataset also includes averages of household size, household expenditure, and per capita expenditure for each community.

To further understand the impacts of contraception on decision-making agency, three additional variables were created to examine only certain types of decisions. These variables represent three categories of decisions: employment, finances, and food and children. The variable “Decisions About Working” includes only one question: whether you or your spouse work. The sum for “Decisions About Finances” includes seven questions: routine purchases for household items such as cleaning supplies, large expensive purchases for the household, giving money to your family, giving money to your spouse’s family, gifts for parties/weddings, money for monthly arisan (savings lottery), and money for monthly savings. The final sum variable, “Decisions About Food & Kids”, includes the following five questions: expenditure on food eaten at home, choice

of food eaten at home, your children's clothes, your children's education, your children's health. All three sums were then converted to z-scores in order to compare them to each other and to the sum of all questions.

Additional variables that were considered but not included in the final dataset include access to community health centers, availability of contraception at these centers, access to financial services in the community, women's age at their first marriage, and women's assets at the time of their first marriage. These health measures were excluded because access to contraception is virtually universal in the dataset. Financial services, marriage age, and asset variables were excluded because of low response rates.

Results

Equation (1) is estimated with both OLS and fixed effects regressions. Estimations are available in Table 2. All eight regressions referenced in this paper are available in Table A2 in the Appendix. Model (1) is an OLS regression, and Models (2) and (3) are fixed effects regressions using the decision sum and the z-score of decision sum. The z-score variable is used to facilitate comparison to Models (6), (7), and (8).

In Model (1), available in Table 2, all variables are statistically significant with p-values of 0.000. Women who use contraception have an average decision-making sum that is 0.41 points higher than women who do not use contraception. This represents approximately one additional decision on which women share decision-making agency with their spouse, compared to having no input, or sharing the decision with a larger group of household members. The coefficients for age and dependents are negative, suggesting that older women and women with more children have diminishing household decision-making agency. Household size has a positive coefficient, suggesting that women in larger household gain decision-making agency, which contradicts the result for dependents. The coefficient for the natural log of per capita expenditure is also significant, and suggests that women whose families have higher consumption expenditure have greater decision-making agency.

In Models (2) and (3), household fixed effects and panel data are used, and three dependent variables remain significant: contraception, age of respondent, and household size. The variable representing use of contraception remains significant, with a coefficient of 0.976 in Model (2). This can be interpreted as gaining shared decision-making agency on two additional household decisions, because of the use of the values 0, 0.5, and 1 in constructing the decision sum. The coefficient for use of contraception remains positive and significant in Model (3). Coefficients for age of respondent and household size remain significant, and their signs remain constant. The results suggest that older women have less

decision-making agency, and women in larger households have greater decision-making agency. The natural log of per capita expenditure is insignificant, which is consistent with the introduction of fixed effects. Number of dependents also becomes insignificant.

Table 2
Regression Results

	(1) OLS Model	(2) Fixed Effects	(3) Fixed Effects
Dependent Variable:	**Z-Score: Decision Sum**	**Decision Sum**	**Z-Score: Decision Sum**
Use of any contraceptive	0.410*** (0.026)	0.976*** (0.129)	0.251*** (0.033)
Age of respondent	-0.013*** (0.002)	-0.044*** (0.017)	-0.011*** (0.004)
Number of dependents	-0.053*** (0.014)	-0.098 (0.063)	-0.025 (0.016)
Household size (number of people)	0.091*** (0.011)	0.224*** (0.058)	0.058*** (0.015)
ln(household expenditure per capita)	0.054*** (0.014)	0.002 (0.081)	0.001 (0.021)
N	6617	6617	6617
R-sq	0.12	0.095	0.095

Notes: Standard errors are in parentheses
**p < 0.1 **p < 0.05 ***p < 0.01*
Standard error is clustered by community

These results support the hypothesis that the use of contraception increases women's decision-making agency in the home.

Robustness

Some variables studied in this paper are difficult to measure, including decision-making agency. Use of contraception also presents challenges when

ineffective methods are considered. To address these concerns, additional regressions are used to test whether the results are sensitive to measurement error.

A regression using only women who use a modern form of contraception is estimated in Model (4). This test is based on the assumption that women who use modern contraception are likely to be more educated and more empowered, which other researchers have attributed to increased decision-making agency (Acharya, et. al, 2010). Modern forms are more reliable and often longer-acting. The results of this regression, available in Table 3, are almost identical to those in Model (3). The coefficient for modern contraception remains positive and significant, and is slightly lesser that the coefficient for use of any form of contraception in Model (3). This may be attributed to a large proportion of women using modern forms of contraception instead of older, less effective forms.

Due to the sizeable proportion of women who reported having no decision-making agency, an additional regression was created using a binary variable that represents whether women have any level of decision-making agency, compared to no agency. Using a linear probability model, the coefficient for contraception (0.109) remains positive and significant. The regression results are available in Table 3, labelled as Model (5). This suggests that use of contraception impacts the probability that a woman makes any decisions at all, and increases the total number of decisions she influences. In this model, the variables representing age, dependents, and household size are significant.

Table 3
Robustness Regression Results

	(4) Fixed Effects	(5) Linear Probability
Dependent Variable:	**Z-Score: Decision Sum**	**Probability of Making Any Decisions**
Use of any contraceptive		0.109***
		(0.012)
Use of modern contraceptive	0.246***	
	(0.034)	
Age of Respondent	-0.011**	-0.004***
	(0.004)	(0.001)
Number of dependents	-0.025	-0.026***
	(0.016)	(0.005)
Household size (number of people)	0.059***	0.036***
	(0.015)	(0.005)
ln(household expenditure per capita)	0.003	-0.004
	(0.021)	(0.007)
N	6618	6617
R-sq	0.087	0.128

Notes: Standard errors are in parentheses
**p < 0.1 **p < 0.05 ***p < 0.01*
Standard error is clustered by community

Table 4 below includes three additional regressions using additional decision sums grouped by type of decisions. Model (6) uses the variable "Decisions About Working". Models (7) and (8) use "Decisions About Finances" and "Decisions About Food & Kids", respectively.

Table 4
Robustness Regression Results

	(6) Fixed Effects	(7) Fixed Effects	(8) Fixed Effects
Dependent Variable:	**Z-Score: Work Decisions**	**Z-Score: Financial Decisions**	**Z-Score: Food & Children Decisions**
Use of any contraceptive	0.104** (0.040)	0.247*** (0.033)	0.234*** (0.036)
Age of Respondent	0.012** (0.005)	-0.013*** (0.005)	-0.014*** (0.005)
Number of dependents	-0.077*** (0.021)	-0.035** (0.017)	0.033* (0.018)
Household size (number of people)	0.071*** (0.015)	0.058*** (0.015)	0.018 (0.016)
ln(household expenditure per capita)	-0.033 (0.028)	0.029 (0.023)	-0.035 (0.024)
N	6617	6617	6617
R-sq	0.011	0.088	0.083

Notes: Standard errors are in parentheses
**p < 0.1 **p < 0.05 ***p < 0.01*
Standard error is clustered by community

For all three models included in Table 4, the coefficients for use of any contraception are positive and significant, suggesting that when women use contraception, they have greater decision-making agency. In particular, women's decision-making related to finances, food and children are more responsive to the use of contraceptives. When women report using contraception, Model (6) finds that decision-making agency for decisions about work is 0.104 standard deviations higher than women who do not use contraception. Models (7) and (8) find even greater impacts, with use of contraception increasing decision-making agency for financial decisions and decisions about food and children by 0.247 and 0.234 standard deviations, respectively. This indicates that use of contraception has a significantly larger impact on decisions about finances, and food and kids.

Considering the value found for the sum of all sixteen types of decisions in Model (3) was 0.251, variation is limited.

While the benchmark results and the various robustness checks appear to strongly support the prediction that contraceptive use increases decision-making agency, this may not be a causal relationship. Specifically, increased decision making could lead to an increase in contraceptive use. To test for this, an instrumental variables regression should be used. This model was estimated using instruments that represented access to two different types of health centers, based on interviews with community leaders. These variables were selected to represent access to contraception. However, the instruments were found to be weak and ineffective, with an F-statistic of 2.44. This test provided a weak and biased estimate of use of any contraception. This may be explained by limited variation in the availability of health centers, as 99% of women in the sample live in a community that reportedly has access to both types of health centers.

Conclusion & Discussion

Empowering women through increasing women's decision-making agency is crucial to promoting global economic development. Past research suggests that increased women's decision-making agency improves health and education outcomes for children, decreases family spending on temptation goods, and increases income levels. The results of this study support the hypothesis that women who use contraception will have greater decision-making agency in the home and input on a greater number of household decisions. Findings suggest that women using contraception gain input on two additional types of household decisions. Therefore, governments and organizations that aim to empower women should consider expanding programs that improve access to contraception and increase contraceptive prevalence rates. These results suggest that such programs will not only affect fertility, but women's decision-making agency as well.

There are some limitations to this research, however. Though controls for unobserved heterogeneity were used, reverse causality cannot be completely ruled out. Future research should focus on finding instruments to explore this relationship with two-staged least squares, and should seek to include more variables related to women's empowerment, such as assets owned by women prior to marriage, and age at first marriage. Similar studies should also be conducted in other countries, and with larger samples to better understand the impacts of contraception. Nevertheless, these results have policy implications.

Though many initiatives exist to improve the global status of women, great improvements remain to be made before equality is attained. Indonesia should continue to invest in contraception, and ensure it is affordable and accessible for all people. Contraception has great potential to improve

empowerment and decision-making agency in young women. Use of contraception can allow girls to pursue further education and employment opportunities, and delay childbirth. With further education and greater experience, women may demand further input on household decisions, and gain greater respect in their communities. Increasing access to contraception has the power to improve the status of women in society and create economic and health benefits for women and families.

Appendix

Table A1
Summary Statistics for Dataset

Variable	Obs	Mean	Std. Dev.	Minimum	Maximum
Decision Sum	11,042	6.326	3.880	0	16
Decision Sum: Decisions About Working	11,042	0.331	0.292	0	1
Decision Sum: Decisions About Finances	11,042	2.528	1.696	0	7
Decision Sum: Decisions About Food & Kids	11,042	1.734	1.244	0	4
Any Decision-Making Agency	11,042	0.783	0.412	0	1
Z-Score: Decision Sum	11,042	6.6E-17	1	-1.630	2.493
Z-Score: Decisions About Working	11,042	3.1E-17	1	-1.135	2.295
Z-Score: Decisions About Finances	11,042	-1.3E-16	1	-1.490	2.637
Z-Score: Decisions About Food & Kids	11,042	-2.4E-17	1	-1.393	1.821
Urban	11,042	0.425	0.494	0	1
Age	11,042	47.313	12.716	19	97
Advanced Degree	11,042	0.016	0.125	0	1
High School Education	11,042	0.052	0.222	0	1
Junior High Education	11,042	0.069	0.253	0	1
Elementary Education	11,042	0.377	0.485	0	1
Worked in the Past Week	11,042	0.235	0.424	0	1
Use of Contraception	11,041	0.320	0.467	0	1
Use of Modern Contraception	11,042	0.305	0.461	0	1
Use of Nonmodern Contraception	11,042	0.015	0.122	0	1
Number of Dependents	11,042	1.364	1.298	0	11
Household Size (Number of People)	11,033	4.406	1.976	1	18
Household Expenditure (in thousands of rupiah)	1,075	1762.416	25.417	85700	8.57E+07
Household Per Capita Expenditure (in thousands of rupiah)	275	442.354	6.615	17100	1.71E+07
ln(Household Per Capita Expenditure)	10,918	12.018	0.971	8.797	16.656

Community Average Per Capita Expenditure (in thousands of rupiah)	10,911	289.233	233.335	29.616	2253.854
Community Average Household Expenditure (in thousands of rupiah)	10,911	1069.566	862.824	110.184	9516.032
Community Average Household Size	10,912	4.248	0.719	1.909	11

Table A2
Regression Outputs

	(1) OLS Model	(2) Fixed Effects	(3) Fixed Effects	(4) Fixed Effects	(5) Linear Probability	(6) Fixed Effects	(7) Fixed Effects	(8) Fixed Effects
Dependent Variable:	**Z-Score: Decision Sum**	**Decision Sum**	**Z-Score: Decision Sum**	**Z-Score: Decision Sum**	**Probability of Making Any Decisions**	**Z-Score: Work Decisions**	**Z-Score: Financial Decisions**	**Z-Score: Food & Children Decisions**
Use of any contraceptive	0.410*** (0.026)	0.976*** (0.129)	0.251*** (0.033)		0.109*** (0.012)	0.104** (0.040)	0.247*** (0.033)	0.234*** (0.036)
Use of modern contraceptive				0.246*** (0.034)				
Age of Respondent	-0.013*** (0.002)	-0.044*** (0.017)	-0.011*** (0.004)	-0.011** (0.004)	-0.004*** (0.001)	0.012** (0.005)	-0.013*** (0.005)	-0.014*** (0.005)
Number of dependents	-0.053*** (0.014)	-0.098 (0.063)	-0.025 (0.016)	-0.025 (0.016)	-0.026*** (0.005)	-0.077*** (0.021)	-0.035** (0.017)	0.033* (0.018)
Household size (number of people)	0.091*** (0.011)	0.224*** (0.058)	0.058*** (0.015)	0.059*** (0.015)	0.036*** (0.005)	0.071*** (0.015)	0.058*** (0.015)	0.018 (0.016)
ln(household expenditure per capita)	0.054*** (0.014)	0.002 (0.081)	0.001 (0.021)	0.003 (0.021)	-0.004 (0.007)	-0.033 (0.028)	0.029 (0.023)	-0.035 (0.024)
N	6617	6617	6617	6618	6617	6617	6617	6617
R-sq	0.12	0.095	0.095	0.087	0.128	0.011	0.088	0.083

Notes: Standard errors are in parentheses
**p < 0.1 **p < 0.05 ***p < 0.01*
Standard error is clustered by community

Table A3
Summary Statistics for Decision-Making Agency

	Obs	Mean	Std. Dev.	Minimum	Maximum
Year 1997	3985	6.443	3.784	0	16
Year 2000	3768	6.551	3.862	0	16
Year 2007	3289	5.927	3.985	0	16
Year 1997, Age <50	2663	7.490	3.196	0	15.5
Year 2000, Age <50	2408	7.527	3.344	0	16
Year 2007, Age <50	1592	7.291	3.266	0	16

Table A4
Summary Statistics for Use of Any Contraception

	Obs	Mean	Std. Dev.	Minimum	Maximum
Year 1997	3984	0.361	0.480	0	1
Year 2000	3768	0.350	0.477	0	1
Year 2007	3289	0.237	0.426	0	1
Year 1997, Age <50	2662	0.529	0.499	0	1
Year 2000, Age <50	2408	0.527	0.499	0	1
Year 2007, Age <50	1592	0.491	0.500	0	1

Table A5
Summary Statistics for Use of Modern Contraception

	Obs	Mean	Std. Dev.	Minimum	Maximum
Year 1997	3985	0.347	0.476	0	1
Year 2000	3768	0.334	0.472	0	1
Year 2007	3289	0.221	0.415	0	1
Year 1997, Age <50	2663	0.510	0.500	0	1
Year 2000, Age <50	2408	0.502	0.500	0	1
Year 2007, Age <50	1592	0.457	0.498	0	1

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