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Television and Contraceptive Use

Panel Evidence from Rural Indonesia



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Jörg Peters, Christoph Strupat, and Colin Vance¹

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Abstract

In recent years, rural electrification and access to television have spread rapidly throughout the developing world. The values and cultural norms embodied in television programming have potentially profound implications for influencing behavior, particularly as regards reproductive decisions. Using household panel data from the Indonesian Family Life Survey (IFLS), this paper explores the effect of television ownership on the use of modern contraceptives in rural Indonesia. Although results from a pooled regression suggest a statistically significant and positive relationship between contraceptive use and television ownership, this finding is not robust to fixed effects estimates that control for time-invariant unobserved characteristics. By contrast, several other individual and community-level determinants, most notably the presence of midwives and health services, are statistically significant in the fixed effects model. We conclude that the growing corpus of cross-sectional evidence on a link between television and contraception should be interpreted cautiously.

JEL Classification: J13, O12, O33

Keywords: Contraceptive use; television; fertility; technology adoption; rural development

September 2012

¹ Jörg Peters, RWI; Christoph Strupat, RWI and Ruhr-Graduate School in Economics; Colin Vance, RWI and Jacobs University Bremen. – We thank Christoph M. Schmidt for helpful comments. – All correspondence to Christoph Strupat, RWI, Hohenzollernstr. 1-3, 45128 Essen, Germany, E-Mail: christoph.strupat@rwi-essen.de.

1. Introduction

World population grew by 1 billion in the last 13 years and reached 7 billion in 2011, with particularly strong growth in developing countries (UNITED NATIONS 2011). Because declining birth rates are widely acknowledged to promote economic welfare, many development interventions target the support of family planning. In addition to improving access to modern contraceptives, these interventions include the expansion of health-care facilities, the establishment of educational programs, and increased access to information on contraceptive options. This last measure, which may be facilitated by television and other technologies, holds particular promise as a cost effective family planning measure owing to the potentially broad reach of modern media across the country-side in areas where electricity is available. Television programming, for example, can provide a window on modern lifestyles and values. The messages conveyed in TV programs may have especially strong resonance in rural areas, where women who are otherwise interested in controlling fertility are often not aware of the options afforded by modern contraceptives or even of their existence.

As documented in a comprehensive survey by HORNİK AND MCANANY (2008), several empirical studies have emerged that establish a significant correlation between mass media and contraceptive use. Nevertheless, disentangling a causative mechanism out of such correlations is tricky, particularly given that much of the evidence gathered to date is based on cross-sectional data collected at a regional level, making it subject

to potential biases from aggregation and omitted variables. Even when individual level data is available, it is difficult to rule out the possibility of biased relationships. The basic problem arises because the incidence of television ownership is unlikely to be randomly distributed across households. To the contrary, it is plausible that many of the same variables that influence television ownership also influence contraceptive use. If these variables are unobserved, then causal effects ascribed to the impact of television on contraception will be spurious.

In this paper, we attempt to deal with this difficulty by drawing on household panel data spanning the decade beginning in 1997 to investigate the effect of television ownership on the use of modern contraceptives in rural Indonesia. The launch of nation-wide private television in 1995 coupled with the increased availability of modern contraceptives makes rural Indonesia an ideal setting for examining the television-contraceptives relationship. Although the data does not allow us to directly observe what TV shows are viewed, our research documents relatively limited educational and public service programming along with a high prevalence of soap operas, which are generally thought to strongly influence values associated with fertility (WESTOFF AND KOFFMAN 2011). Millions of women watch Indonesian soap operas (*sinetrons*) and Brazilian *telenovelas* every day, as soon as their households have access to television (AGB NIELSEN 2007, NILAN 2003, WIDODO 2002).

Exposure to these programs sensitize viewers to issues ranging from family size to gender equality and the empowerment of women, introducing values that may be

positively associated with modern contraceptives. As a large fraction of rural women in Indonesia still do not use modern contraceptives (MCDONALD 2010, MIZE AND ROBEY 2006), an important question is the extent to which television increases acceptance of contraceptives.

The ten-year panel is taken from the Indonesian Family Life Survey (IFLS), which covers 3,844 women in their reproductive age (15-49). Our empirical approach proceeds by first estimating pooled logit and linear probability models of the influence of television on contraception. The econometric specification controls for a large suite of individual- and community level socio-economic variables, including the presence of family planning services in the woman's village of residence. Confirming findings found elsewhere in the literature, the pooled analysis identifies a positive and statistically significant effect of both television ownership and the variables capturing family planning services. To explore the robustness of these effects, we subsequently exploit the panel dimension of the data by estimating a fixed effects model that controls for time-invariant unobserved characteristics. While this model does not find a statistically significant effect of television ownership, the coefficients of the family planning service variables are remarkably robust, both with respect to their magnitude and statistical precision.

The remainder of this paper is organized as follows. Section 2 summarizes television programming in Indonesia, relating this to findings in the literature on the link between information and contraception. Section 3 describes the data and gives details

on our empirical model. Section 4 presents the results before section 5 concludes with a summary of the main findings and a research outlook.

2. Background on Television in Indonesia

2.1 Television availability and programming

Over the last two decades, access to television has advanced rapidly in the developing world. Since 1980 the number of television sets in Asia increased over six-fold, from 100 million to 650 million (THOMAS 2003). A precondition for this development was the electrification of formerly non-electrified rural areas. By 2008 the rural electrification rate in Indonesia reached 32%, which enabled a growing number of rural households to use television (UNDP 2009). In 1997 around 37% of households with electricity connection reported having access to a TV, a figure that increased to 60% by 2007 (DHS Surveys 1997-2007). As KENNY (2009) documents, even some of the poorest households in rural Indonesia had acquired television sets.

On the programming side, the deregulation of the television market in the 1990s allowed private channels to broadcast throughout Indonesia over air and via satellite. As a consequence, 10 additional television channels emerged and every household with a TV-antenna was able to receive at least six of these stations over the air (OLKEN 2009). These channels include one all-news station (Metro TV) and nine commercial stations (RCTI, SCTV, Indosiar, ANTV, GLOBALTV, LATIVI, TV7,

TransTV, and TPI) offering a range of entertainment programs such as soap operas, movies, and daily national news shows.

According to the literature, public service messages addressing modern contraceptive use can be highly effective in changing the attitudes of women towards reproductive behavior. In Indonesia, such targeted TV programming has been relatively sparse. Between 2000 and 2004 there were only two short TV spots, one from the Safe Motherhood Program funded by the World Bank and the other from the SAHABT media campaign funded by USAID. On average 25% of women living in rural areas were exposed to these spots over the entire duration of their run (DHS Surveys 1997-2007).

The spot of the World Bank, which contained interviews and public service announcements about the advantages and availability of modern contraceptives, was broadcasted 3 times a day by two commercial TV stations and lasted about 20 seconds (LULE et al. 2005). The spot of the SAHABT media campaign ran for two minutes and was broadcasted two times a week by private TV stations. The spot promoted the quality interaction between clients and providers of modern contraceptives and the involvement of husbands in family planning (Annual report STARH program 2003).

Contrasting with the relatively limited reach of public services messages, Indonesian soap operas (*sinetrons*) and imported Brazilian *telenovelas* have dominated prime daytime and early evening programming. *Sinetrons* and *telenovelas* had the highest audi-

ence shares – about 76% – among all broadcasted programs between 1997 and 2007 (AGB NIELSEN, 2007), and have become especially popular among women. Episodes are broadcasted every day to millions of Indonesian women, with *sinetrons* and *telenovelas* becoming an integral part of their social life and private leisure (HOBBART 1999, NILAN 2003). In addition, women often schedule all daily household chores, community meetings and social events around the timetables of *sinetrons* and *telenovelas* (WIDODO 2002).

Over 40 percent of these *sinetrons* were produced in Jakarta, but they often copied the imported *telenovelas* from Latin America. NILAN (2003) shows that several key elements demonstrate the generic similarity of these shows both in storyline and character line-up, including a young and desperate woman living in a small family in an urban environment, a wealthy and neglectful husband, another man who threatens the marriage, and children over whom an ownership struggle rages. While *sinetrons* and *telenovelas* in Indonesia do not explicitly address the use of modern contraceptives, they provide information about controversial ideas such as divorce, abortion, and female emancipation. Altogether, *sinetrons* and *telenovelas* in Indonesian TV reinforce the image of a specific type of woman and her family: One who lives in a small, wealthy and urban family and who is able to decide and act independently of her husband and relatives.

2.2 The role of information

Given the popularity of the *sinetrons* and *telenovelas* along with the limited use of public service messages to promote contraception, the question emerges as to the overall effect of television on family planning. By all accounts, Indonesia has already seen an impressive increase in contraception use, rising from 17.2% in 1976 to 52.4% in 2003 (Hull 2007), since the launch of the Indonesian Family Planning Program in 1970. The program employed a broad variety of family planning instruments to encourage the use of contraceptives, including the distribution of local field workers, trained midwives, and mobile clinics (HULL AND HULL 1997). Cornerstones of the program were maternal health clinics in villages (*Puskemas*), community health posts (*Posyandu*) and family planning posts (*PPKBD*). Health posts, which are run by health volunteers on a monthly basis, provide baby weighing, immunization and information on family planning. Family planning posts are staffed by community members that implement the family planning program at the village level through counseling and the dissemination of information (HERARTRI 2008). Midwives are also an important part of the program. Beyond birth attendance, they serve to improve the utilization of family planning services and enhance the mix of contraceptives available to target populations (WORLD BANK 1991). Beside the increase of contraceptive prevalence and a 50% decrease in the total fertility rate between 1968 and 2003 (WHO 2003), the program has been especially successful in improving the health of young mothers, decreasing child mortality and increasing cognitive skills of children (FRANKENBERG AND THOMAS 2001; SHRESTHA 2010; NEELSEN 2012).

Notwithstanding these successes, there is some evidence that contraception uptake rates have been stagnating in recent years. According to surveys conducted by the DHS, 45.5 percent of women did not use any modern contraceptives in 1997, a figure that dropped only marginally to 43 percent by 2007 (DHS Surveys 1997-2007). As suggested by MCDONALD et al. (2010) and MIZE AND ROBEY (2006), one of the main reasons for the low rate of uptake is the lack of information on modern contraceptives, especially in rural areas. While the daily exposure to television, in particular to *sinetrons* and *telenovelas*, portray smaller families and greater female autonomy, the extent to which this type of information changes the reproductive behavior of rural women in Indonesia remains unclear.

Much of the empirical evidence gathered to date indicates that access to information is crucial for the adoption of new technologies in developing countries. External information about an available new technology like modern contraceptives can initiate a transition from traditional behavior to the use of the new technologies. Owing to uncertainty about the technology's efficacy and the fear of potential side-effects, many studies explain the transition as a gradual process involving social learning (UDRY AND CONELY 2010, MUNSHI AND MYAUX 2006, BANDIERA AND RASUL 2006) or individual learning (MUNSHI 2004, BESLEY AND CASE 1994) about the advantages and disadvantages of the technology. A second strand of the literature stresses the importance of education in the transition process. More educated individuals are more likely to adopt new technologies, as they have better access to and are more receptive of relevant information (SKINNER AND STAIGER 2005, FOSTER AND ROSENZWEIG 1996).

As a strong correlation between TV exposure and contraceptive use has been established for many developing countries (WESTOFF AND KOFFMAN 2011), access to TV may be an important source of information for encouraging the use of modern contraceptives, even when the programming content is for entertainment rather than education. In Brazil, for example, CHONG, DURYEY AND LA FERRARA (2007) find that role models of liberated women and family planning in soap operas induce behavioral adaptation in reproductive behavior in regions in which the TV channels are expanded. JENSEN AND OSTER (2009) use TV cable roll-out as a treatment to investigate its effect on fertility and women's rights in rural India. They find negative impacts on the number of births and women's acceptance of domestic violence. PETERS AND VANCE (2011) explore the role of electrification on fertility, distinguishing between direct and indirect channels through which access to electricity affects birthrates. The direct channel reduces the frequency of intercourse due to better lighting and alternatives to sex, while the indirect channel operates via the modernization of rural areas that is fostered by exposure to TV and radio programming. Their finding of a negative association between rural electrification and fertility for rural households in Côte d'Ivoire supports evidence gathered in an earlier study by IEG (2008), which also uncovers a negative correlation between electrification and fertility based on a cross-country sample.

3. Data and empirical approach

3.1. Data description

The analysis undertaken in the present study affords a unique opportunity to probe more rigorously into the television-contraception linkage because, unlike much previous work on this topic, it employs the fixed-effects panel method to control for unobserved heterogeneity. We use data from three waves of the Indonesian Family Life Survey (IFLS), which contains socio-economic variables measured at the individual, household and community levels, including information on the use of contraceptives. For the first wave, 7,224 households across 13 Indonesian provinces were interviewed in 1993 (IFLS1). In 1997, the first follow-up, IFLS2, was carried out, which re-interviewed 94.5% of the households from the 1993 survey. The third wave was conducted in 2000 and included the entire sample of IFLS1 respondents. The fourth and last round in 2007, IFLS4, includes 93% of all households that were interviewed for IFLS1.

Since the first wave does not contain information on our treatment variable, TV ownership, we use the last three waves, thereby covering the time from 1997 to 2007. We limit the data set to women of reproductive age, between 15 and 49 years, who live in rural areas. This results in a sample of 3,844 women living in 2,426 households. Among the electrified households, 56% percent own a TV set, typically obtained directly following electrification. TV usage rates in our sample increased from around 41% in 1997 to 78% in 2007.

Table 1 displays the descriptive statistics of the variables used in the econometric model, distinguished by television use. Contraceptive use is seen to be higher among women living in TV-using households. Table 1 shows two potential indicators for contraceptive use: First, an indicator for whether the woman is currently using modern contraceptives and, second, an indicator for whether the woman has ever used modern contraceptives. Among the women living in households with a TV, 47% currently use contraceptives, compared to 57% of women in TV owning households. The respective share of women who have ever used contraception distinguished by television ownership are 61% and 76%. Several other differences are notable. Sixty-eight percent of women without television and 58% of women watching television attended primary school. Moreover, per capita expenditures of the household, which serves as proxy for income (DEATON 1997), are nearly 133,000 Rupiah less among households without a television. While other variables such as marital status, age and the number of family planning posts do not differ significantly between the two groups, the substantial differences in terms of education and income stress the importance of controlling for these influences in the model specification.

Table 1: Descriptive statistics

	Total	Use TV	No TV	p-value
	mean	mean	mean	(Diff. in means)
<i>Household- level variables:</i>				
Number of children live in HH	1.84	1.76	2.11	0.00
Primary School Head (Male) (0/1)	0.63	0.61	0.64	0.10
Secondary School Head (Male) (0/1)	0.22	0.29	0.13	0.00
Expenditures per capita (in Rupiah)	293,188	352,055	219,419	0.00
<i>Individual- level variables:</i>				
Current contraceptive use (0/1)	0.52	0.57	0.47	0.00
Ever contraceptive use (0/1)	0.67	0.76	0.61	0.00
Marital status (0/1)	0.91	0.95	0.91	0.12
Age	34.41	35.01	33.66	0.15
Working Status Woman (0/1)	0.58	0.61	0.53	0.00
Primary School (0/1)	0.61	0.58	0.68	0.00
Secondary School (0/1)	0.25	0.33	0.15	0.00
<i>Village- level variables:</i>				
Midwife (0/1)	0.81	0.83	0.78	0.01
Number of Family planning posts (PKKBD)	2.29	2.38	2.19	0.38
Community health meeting (Posyandu) (0/1)	0.86	0.90	0.80	0.00
Community woman meeting (PKK) (0/1)	0.54	0.61	0.46	0.00
Number of observations:	6,961	3,872	3,089	

3.2. Econometric model

The decision of whether to use contraception is a discrete choice, denoted here by the outcome variable C_{it} , which takes the value 1 if woman i uses modern contraceptives at time t and 0 if she does not.¹ The binary nature of the dependent variable would conventionally suggest estimation of the coefficients using a probit or logit model, an approach followed here as a point of departure when we pool the data. Binary choice

¹This definition follows the standard approach in the literature, which focuses on current use of contraception. As a robustness check, we also explored models whose dependent variable is 1 if the woman ever used contraceptives and zero otherwise. This distinction was found to have no bearing on the key results from the analysis. The results are available from the authors upon request.

models, however, can be problematic when applied using fixed effects panel methods because they often suffer from a substantial loss of observations owing to the nonlinearity of the model. Specifically, observations for which the dependent variable remains the same over two consecutive time periods are excluded from the estimation. To avoid this loss of information, we instead use the fixed effects version of the linear probability model (LPM). While the LPM generates consistent and unbiased estimates, the obvious drawback of the model is that it treats the dependent variable as continuous, with the consequence that the predicted values from the model may fall outside the 0-1 range. It is thus prudent to assess the extent to which this problem afflicts the estimates, an issue taken up below.

To identify the impact of television ownership on contraceptive use, we begin with the following regression model:

$$C_{it} = \alpha + \delta T_{it} + \beta' x_{it} + \theta' z_t + e_{it}. \tag{1}$$

where T_{it} is the indicator for television ownership, x_{it} is a vector of control variables, z_t is a vector of unit-invariant year fixed effects, and e_{it} a stochastic disturbance term. The coefficients α , δ , β , and θ are a set of parameters and parameter vectors to be estimated, with robust standard errors obtained by clustering on the household. The coefficient of interest is δ , which represents the effect of television ownership on the likelihood of using contraception.

Whether we can interpret this effect as causal depends critically on our ability to control for the range of confounding factors that determine contraception and that are

correlated with television ownership. We thus subsequently exploit the panel structure of the panel by augmenting Equation 1 with a time-invariant and person-specific fixed effect:

$$C_{it} = \alpha + \delta T_{it} + \beta' x_{it} + \theta' z_t + \phi_i + e_{it} . \quad (2)$$

The term ϕ_i represents unobserved individual-specific characteristics that affect the outcome variable but do not change over time. Such factors include access to infrastructure, economic background, distance to contraceptive distribution centers like health clinics, or social norms influencing fertility regulation. Allowing for the possibility that the term ϕ_i is correlated with e_{it} , we proceed to apply a fixed-effect transformation to the data to eliminate any residual biases.

4. Results

Table 2 presents estimation results from three models. The first two columns contain the coefficient estimates and associated marginal effects from a pooled logit model, the third column contains the coefficients from a pooled linear probability model (LPM), while the last column contains the coefficients of the linear probability model including fixed effects (LPM-FE). Turning first to the two pooled models, we begin by noting that the marginal effects of the logit and the coefficients of the LPM are virtually the same, providing some assurance that the distinction between a linear and non-linear modeling approach has little bearing on the interpretation with these

data. Further assurance is provided by the fact that the differences in the predicted probabilities between the two models are negligible, with those of the LPM falling consistently within the 0-1 range.

Both the logit and LPM suggest a statistically significant and positive effect of the television dummy. Specifically, the logit model indicates that the presence of a television in the household is associated with a nearly 7 percentage point higher probability of using contraception.² The corresponding odds ratio, calculated as e^β , is 1.36, suggesting that women with a television have a 35% higher odds of using contraception than women without a television. This estimate is similar in magnitude to the 1.49 odds ratio obtained by WESTOFF, KOFFMAN, AND MOREAU (2011), who use cross-sectional household data drawn from Indonesia in 2007 among women who report watching TV daily. If we remove the controls for community meetings, midwives and the number of family planning posts, which were not considered in the work of Westoff and colleagues, we obtain an even closer odds ratio of 1.45.

Several other variables are also statistically significant, all of which have signs that are consistent with intuition. Higher numbers of children in the household, which would increase the likelihood that the target household size is reached, increases the likelihood of using contraception, as does the woman's marital status. Being married

² The marginal effect of dummy variables is calculated by subtracting the value of the logit function when the dummy is set to one from the value when it is set to zero:

$$\frac{\Delta Y}{\Delta X_k} = \frac{\exp(\beta'x)}{1+\exp(\beta'x)} \Big|_{x_k=1} - \frac{\exp(\beta'x)}{1+\exp(\beta'x)} \Big|_{x_k=0}.$$

increases the probability of using birth control by 19 percentage points, one explanation for which is that marital status serves as proxy for frequency of intercourse, because premarital sexual activities are less likely in rural Indonesia (HULL AND MOSELY 2008). Education also increases the likelihood of using modern contraceptives; women who attended a primary school have 8 percentage point higher probability to use modern contraceptives than women who never attended a school. Age has a non-linear effect, increasing the likelihood of using contraception at a decreasing rate. Specifically, the likelihood to use contraceptives rises until age 35 and falls thereafter, a finding consistent with the expectation that younger women are more likely to become pregnant due to higher sexual activity and hence more likely to use contraceptives to space or avoid births.

Finally, the community-level variables, which measure the impact of health and social-support organizations in the community of residence, all have positive impacts on contraception. For example, the presence of a midwife in the community increases the probability of contraception by 2 percentage points, while the effect of each additional family planning post is to increase the probability by 0.4 percentage points.

The final column presents estimates of the LPM with fixed effects to control for unobserved heterogeneity. While many of the explanatory variables, including the midwife dummy and the control for the number of family planning posts, retain their statistical significance, the most notable discrepancy is the drop in magnitude of the coefficient on television. Based on this estimate and its standard error, we can no

longer reject the null hypothesis that the effect of television on the probability of contraceptive use is different from zero at the conventional significance levels.

Other specifications that included interaction terms were also estimated (but not presented) to explore whether the impact of television is perhaps mediated by other variables. It is conceivable, for example, that television programming encourages women to raise reproductive issues with health care practitioners or family planning counselors in their community, which would strengthen the impact of these influences. However, none of the interaction terms created to capture such effects were found to be statistically significant. We thus conclude that notwithstanding the statistically significant correlation between television and contraception in the pooled models, the reduced magnitude and insignificance of the television dummy in the fixed effects model suggests that a causal interpretation is not warranted.

Table 2: Regression of modern contraceptive use

	Logit		LPM	LPM-FE
	Coefficient	Marg. effect	Coefficient	Coefficient
Household- level variables				
Television	0.3089 (0.000)	0.0707 (0.000)	0.0709 (0.000)	0.0112 (0.667)
Number of children live in HH	0.1085 (0.000)	0.0246 (0.000)	0.0247 (0.000)	0.0487 (0.000)
Primary School HH- Head	0.1638 (0.071)	0.0375 (0.071)	0.0347 (0.094)	-0.0653 (0.192)
Secondary School HH- Head	0.2670 (0.015)	0.0612 (0.015)	0.0593 (0.019)	0.0185 (0.802)
Log per capita expenditure (Rupiah)	-0.0043 (0.924)	-0.0008 (0.939)	-0.0008 (0.941)	-0.0205 (0.165)
Individual- level variables				
Primary School	0.3747 (0.000)	0.0854 (0.000)	0.0832 (0.000)	0.0523 (0.450)
Secondary School	0.1810 (0.000)	0.0406 (0.145)	0.0391 (0.160)	0.1341 (0.149)
Age	0.2479 (0.000)	0.0568 (0.000)	0.0573 (0.000)	0.0766 (0.000)
Age2	-0.0041 (0.000)	-0.0011 (0.000)	-0.0012 (0.000)	-0.0011 (0.000)
Married	0.8575 (0.000)	0.1940 (0.000)	0.1810 (0.000)	0.1181 (0.041)
Working status	0.0737 (0.000)	0.0169 (0.202)	0.0167 (0.208)	0.0115 (0.520)
Community- level variables				
Community health meeting	0.3561 (0.000)	0.0819 (0.000)	0.0793 (0.000)	0.0197 (0.359)
Community women meeting	0.2082 (0.000)	0.0477 (0.000)	0.0478 (0.000)	0.0135 (0.441)
Midwife	0.1194 (0.091)	0.0276 (0.088)	0.0275 (0.091)	0.0374 (0.090)
Number of family planning posts	0.0187 (0.008)	0.0042 (0.000)	0.0040 (0.006)	0.0049 (0.015)
Number of observations	6,961		6,961	6,961
adj. R-sq			0.080	0.061

p-values are in parentheses.

5. Conclusion

This paper investigates the effect of television ownership on the usage of modern contraceptives in rural Indonesia. A large fraction of women, roughly 44%, still do not use modern contraceptives, which has been argued to be due to a lack of information and/or social norms on fertility regulation that discourage acceptance of modern contraceptives. In addition to midwives and family planning posts, found here to be statistically significant in all of the estimated models, rural electrification and the subsequent spread of television in Indonesia may serve to close this information gap and help to overcome social norms on fertility regulation.

According to qualitative studies and national audience figures, soap operas (*sinetrons*) and Brazilian *telenovelas* enjoy high viewership, especially among women. While *sinetrons* and *telenovelas* in Indonesia do not explicitly address the use of contraceptives, they still provide information about controversial ideas such as divorce, abortion, and female emancipation that are positively associated with family planning. The literature on the adaption of new technologies indicates that these new information technologies can change the attitudes towards reproductive behavior, and therefore might increase the use of modern contraceptives.

Nevertheless, our findings suggest that the strong association between television and contraceptive use established by the empirical literature may, in the Indonesian context, be just that, an association. Based on the model estimations with pooled data, our results are in line with the findings of the related literature, showing a statistical-

ly significant correlation between television and modern contraceptive use: Women with a television in the household have a 0.07 higher probability of contraceptive use. Controlling for unobserved heterogeneity with a fixed effects model, however, substantially reduces the estimated coefficient and renders it statistically insignificant. The discrepancy across the pooled and panel estimates thus substantiates the concerns raised by some authors (e.g. HORNİK AND MCANANY 2008; WESTOFF AND KOFFMAN 2011) concerning the difficulties in disentangling cause and effect of media impacts.

Two possible explanations come to mind for the statistically insignificant effect of television on contraceptive use. The first is reliance on an overly blunt indicator for media exposure. The use of a television dummy precludes us from measuring either the intensity of television viewing or its content, and it may be that better measurement of these features would enable more precise estimates. A second explanation may relate to the content of Indonesian television programming, including the lack of public service messages. As *sinetrons* and *telenovelas* do not explicitly address the use of modern contraceptives, their content – and the content of other programming – may not be sufficiently persuasive to overcome prevailing norms related to reproductive behavior. A promising avenue for future research would therefore elicit more detailed data on which type of broadcasts is watched and by whom. Future research using cross-national data could also probe more deeply into the role of cultural background and how this mediates the impact of information.

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