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# The Impact of the Expansion of Commercial Television Coverage on Fertility: Evidence from Indonesia

**Rika Kumala Dewi**
*The SMERU Research Institute*

**Daniel Suryadarma**
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**Editor**

Jamie Evans
*(Australian Volunteers International)*

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For further information on SMERU's publications, phone 62-21-31936336; fax 62-21-31930850; e-mail smeru@smeru.or.id; or visit www.smeru.or.id.

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# ABSTRACT

## The Impact of the Expansion of Commercial Television Coverage on Fertility: Evidence from Indonesia

Rika Kumala Dewi (*The SMERU Research Institute)*, Daniel Suryadarma (*Australian National University)*, Asep Suryahadi (*The SMERU Research Institute)*

The media is increasingly recognized as playing an important role in affecting individual behavior. In this paper, we examine the effect of the expansion of commercial television broadcasting on fertility in Indonesia. The results of our district (*kabupaten*)-level fixed-effects estimation show that increasing the share of the population with access to commercial television by one standard deviation—essentially moving from 78% coverage to universal coverage—reduces the country's crude birth rate by 6.2%. This is equivalent to a 0.95-point decline in crude birth rate from 15.39 to 14.44 per 1,000 population. Given Indonesia's 200 million population, the decline is equivalent to around 190,000 fewer births. We also find evidence that television causes an increase in the usage of modern contraceptives, but no change in the proportion of married women using traditional contraception. Therefore, our results show that increasing access to television leads to a behavioral change that results in lower fertility.

Keywords: television, fertility, birth rate, Indonesia
JEL Classifications: D10, J13, L82

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# I. INTRODUCTION

The media is increasingly recognized as playing an important role in affecting individual behavior. In the United States, DellaVigna and Kaplan (2007) find that the entry of Fox News, a right-wing television channel, significantly increased votes for the Republican Party. In Rwanda, Yanagizawa (2009) finds that the extent of violence is higher in villages with a complete coverage of Radio RTLM, which promotes violence against the Tutsi minority. In Indonesia, Farré, and Fasani (forthcoming) find that television plays a significant role in rural residents' decision to migrate to urban areas. Moreover, other studies examine the relationship between television and participation in community activities in Indonesia (Olken, 2009), views on women's status in India (Jensen and Oster, 2009), and test scores in mathematics, spatial reasoning, verbal ability, and reading among adolescents in the United States (Gentzkow and Shapiro, 2008).

In this paper, we examine the impact of the expansion of commercial television broadcasting on fertility in Indonesia. To our knowledge, there are only two studies in academic literature that investigate this issue. La Ferrara, Chong, and Duryea (2012) use the Brazilian census and find a correlation between the entry of Rede Globo, a television network that specializes in soap opera, and a reduction in the fertility rate in Brazil. In addition, since children born after the entry of Rede Globo were more likely to be named after characters in the soap opera, the authors argue that the content, rather than the act of watching television, is responsible for the observed reduction in fertility. Similarly, Jensen and Oster (2009) find that the entry of cable television into India reduced the probability of women in rural areas falling pregnant by four percentage points.

The access to commercial television in Indonesia is considered exogenous for the following reasons. First, differences in *kabupaten* (district)[1] topography cause a variation in television signal quality between *kabupaten*, which in turn affects access to television (Olken, 2009). Second, the rollout of commercial television channels differs between *kabupaten* (Farré and Fasani, forthcoming). A new commercial television channel usually starts broadcasting in Jakarta, before moving on to other provincial capitals, and then *kabupaten* in Java, where around 60% of the Indonesian population lives. Afterwards, the broadcast is broadened to cover *kabupaten* in the western part of Indonesia, before finally reaching the eastern region.

In addition to looking at the effect of television on fertility in a third developing country, this paper differs from the two studies above in that we construct our dependent variable such that it more closely resembles the widely used measure of fertility: crude birth rate. In contrast, La Ferrara, Chong, and Duryea (2012) use the average number of live births among women aged 15–49, while Jensen and Oster (2009) use the probability of pregnancy. In addition, the longitudinal data set that we use contains more data points for each panel observation. Therefore, we use a model with lagged independent variables, which guards against potential reverse causality and allows for the time lag between the decision to have a child and the resultant birth of the child.

Nevertheless, our study also has a number of limitations. Firstly, we do not have data on broadcast content. Therefore, we cannot explicitly investigate whether any change in fertility is due to the content of the broadcast or because watching television takes up time that is

[1] *Kabupaten* (district) is the second level administrative region in Indonesia and village is the fourth. Indonesia currently has around 550 *kabupaten* and more than 75,000 villages.

traditionally spent on reproduction. In this paper, we attempt to indirectly test for the mechanisms by looking for any changes in the use of contraceptives. Secondly, we only focus on free-to-air television and ignore cable or satellite television services due to data limitations on access to cable television in villages. However, the first satellite television provider in Indonesia only started in 1994 and, up to the present, these subscription-based services are mostly confined to urban centers and only serve a relatively small number of customers. As of 2009, the largest cable television provider in Indonesia, First Media, had only 190,000 subscribers in a country with more than 50 million households. Therefore, excluding these services from the analysis does not substantially weaken our findings.

We organize the rest of the paper as follows. The next section provides context on Indonesia with regards to fertility and television. Section III discusses the data used in this study. We then present the empirical strategy in Section IV and discuss the estimation results in Section V. Section VI provides the conclusion.

# II. COUNTRY CONTEXT

## 2.1 Fertility in Indonesia

During the last 40 years, Indonesia has exhibited a decreasing fertility rate. The World Development Indicators show that the country's birth rate has dramatically decreased from 45 live births per 1,000 population in 1960 to just 18 in 2010. Similarly, the expected number of children a woman has during her productive age—the Total Fertility Rate (TFR)—has decreased from 5.5 to 2.1 children over the same period. As shown in Figure 1, the decline in Indonesia's fertility rate is similar to other lower middle income countries and faster than OECD countries, whose birth rate has relatively plateaued since early 1990s. As of 2010, Indonesia's birth rate was only slightly above that in OECD countries in 1980.

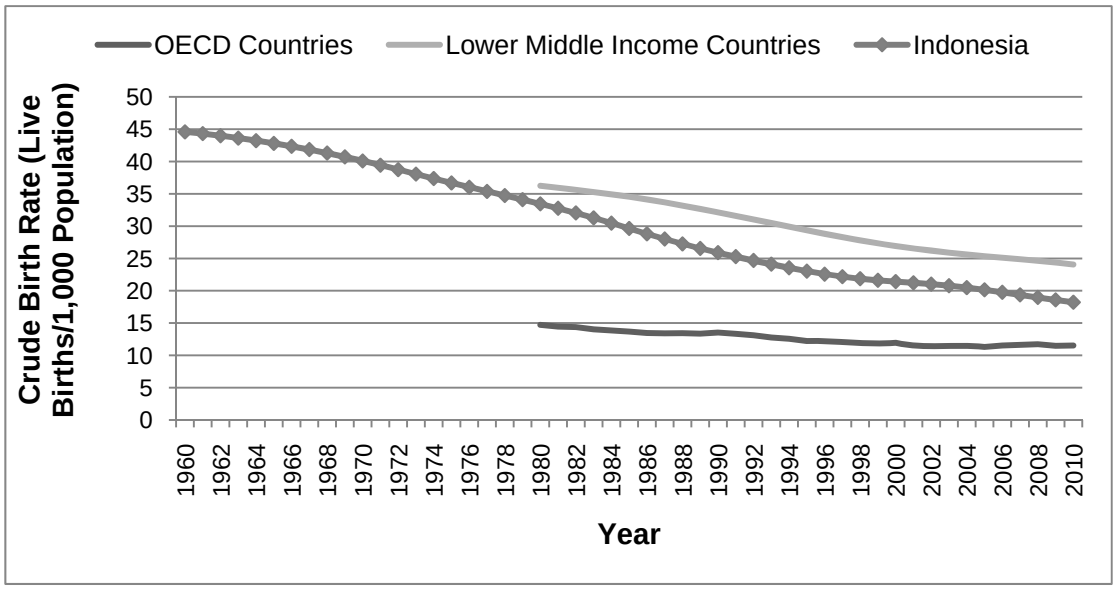


**Figure 1. Fertility in Indonesia, 1960–2010**
*Source*: World Development Indicators.

The fastest reduction in the fertility rate took place prior to 1997. The National Development Planning Agency (Bappenas, 2005) attributes the growth in the use of contraceptives as one of the major factors responsible for the decline. While the prevalence rate of contraceptives in 1971 was less than 5% of married women, it reached 26% in 1980 and 57% in 1997. While Bappenas (2005) claims the increase in contraceptive prevalence as a success of the government's family planning program, Jones (2003) finds difficulties in quantifying the impact of the family planning program on the fertility rate during the period. Instead, they state that the fertility decline in Indonesia was due to declining infant and child mortality, resulting in mothers having to give birth fewer times in order to have the same number of children. In addition, the support of religious leaders, women's empowerment (due to the increase in women's literacy and labor force participation rates), and the shift of family size preference also played a significant role.

The decline in the fertility rate appears to have slowed down after 1998. Nevertheless, Statistics Indonesia (BPS, 2005) estimates that Indonesia will achieve its replacement rate—where the population size is constant in absence of migration—by 2020, leaving Indonesian population relatively stable at around 261 million. However, according to World Development Indicators, the replacement rate had been achieved in 2010.

## 2.2 Television in Indonesia

The first television channel to broadcast in Indonesia was TVRI, the state television service, which was founded in 1962. The channel was established in connection with Indonesia's hosting of the Fourth Asian Games. For this reason, TVRI was initially placed under the Asian Games organizing committee (Rismawan, 2009). Although the committee was chaired by the president, TVRI was not officially owned by the state until 1965, when it was incorporated into the Ministry of Information.

During its infancy, the content broadcast by media was stringently controlled by the government. Sanyoto (2002) reveals that the media "had to be hostile to dissidents and critics, and portray them as detrimental to state security." TVRI was expected to contribute to the unity of Indonesia and to Indonesia's growth as a nation (Farré and Fasani, forthcoming). The Indonesian Press Council and journalists were also under tight control through, among other ways, the licensing system. Hence, the content and topics that were covered in the media were under government's close supervision. Until 1989, TVRI was the only television channel available in Indonesia.

Due to the desire of the state to expand services to the population and to provide a venue for businesses to advertise on television, the first commercial station, Rajawali Citra Televisi Indonesia (RCTI), was established in 1987 and delivered its initial broadcast in August 1989. Then, in 1990, 1991, 1993, and 1995, four other national commercial television channels were established: SCTV, TPI, ANTV, and Indosiar respectively. Taking advantage of the liberalization of the media sector that took place in 1992, five additional privately owned television stations were established between 2000 and 2002. By 2010, Indonesia had 11 free-to-air television stations with nearly national coverage (TVRI and the ten privately-owned stations).

In addition, there are now around 100 local television channels, each catering to local regions. Moreover, nine subscriber-only providers mostly cater to demand in Indonesia's major cities.

Therefore, within a space of only two decades, the number of television stations in Indonesia has increased from two (TVRI and RCTI) to more than 100 stations.

In addition to the 1992 liberalization, which caused a dramatic increase in the number of television stations, Law No. 40/1999 on Freedom of the Press virtually removed all state controls over the content broadcast by these stations. Therefore, besides the increase in access to television channels, the amount and variety of content available to the Indonesian population has also increased.

# III. DATA

The first data set that we use is from the village census (Podes), which is a census of all villages in Indonesia. Podes collects a large amount of village-level information, ranging from population, topology, infrastructure, health, and education facilities to communication and transportation. Podes is undertaken by Statistics Indonesia (BPS), the state statistics agency, roughly once every three years. In this paper, we use the six Podes from between 1994 and 2009, almost fully covering the two decades during which access to television rapidly increased.

Podes records whether a village has access to three types of television channels: state-owned channel TVRI, commercial (domestic) channels, and foreign channels. Together with data on the population in each village, we can construct a *kabupaten*-level measure of the share of the population with access to each type of television channel applied triennially between 1994 and 2009.[2]

Among the three types of television channel, we focus on access to commercial television due to the following reasons. First, TVRI has been broadcasting since 1962. Being the state television service provider, its reach has remained relatively constant over time. Second, only about 2% of the population has access to foreign television channels. Third, commercial television stations are the main source of variation in access to television in Indonesia, due to differential rollout between *kabupaten* over time (Farré and Fasani, forthcoming).

The second dataset is from the National Socioeconomic Survey (Susenas), which is a nationally representative household survey, also administered by BPS. Susenas has two components: core and module. The core component collects annual information on basic demographics, education and health outcomes, labor market activities, household expenditure, and access to public services. The module component, on the other hand, is comprised of health, education, and housing modules. Each module is carried out triennially.

We use Susenas surveys in the years corresponding to the Podes to calculate our measure of fertility: crude birth rate. We define this variable as the number of live births per 1,000 population. Since Susenas is a repeated cross-sectional survey, we calculate the share of infants younger than one year old per 1,000 individuals. The calculation is done at the *kabupaten* level, since the *kabupaten* is Susenas' lowest region of representativeness. We then merge the data from Susenas and Podes, also at the *kabupaten* level.

[2]District is the second level administrative region, while village is the fourth level. Indonesia currently has around 550 districts and more than 75 thousand villages.

Figure 2 shows data on access to television, calculated from Podes. The access to commercial television increased from 61% of the population in 1994 to 87% in 2009, or about 43% proportionally. The rate of increase in access was most rapid between 1997 and 2003, which coincided with the period when the entry of national commercial television broadcaster was the most intense. The rate then slowed afterwards, although it remains positive. In the following section, we describe the identification strategy to examine the causal relationship between access to television and fertility.

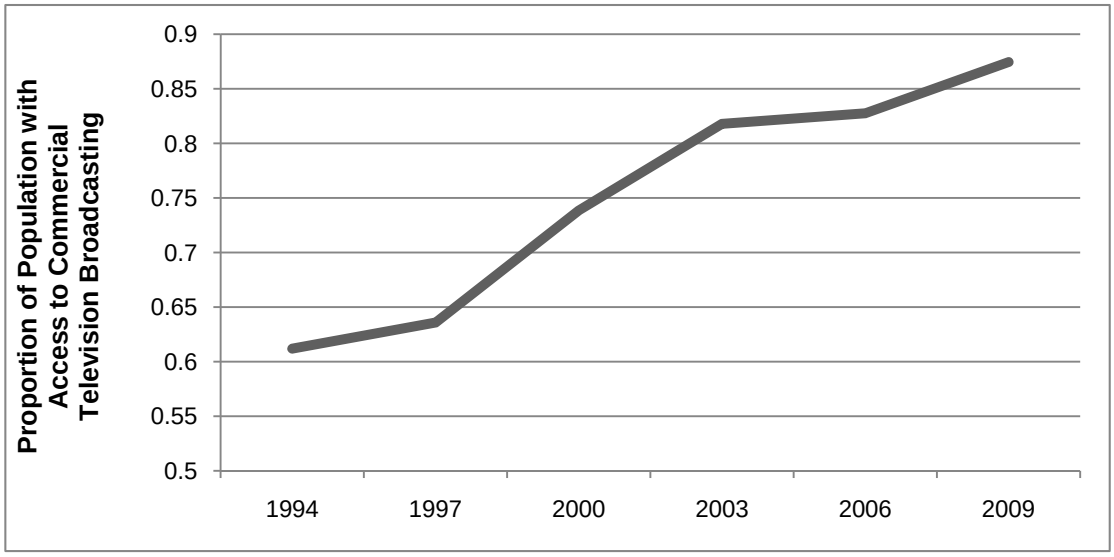


**Figure 2. Access to commercial television broadcasting, 1994–2009**
*Source*: Podes.

# IV. ESTIMATION STRATEGY

There are two previous studies that estimate the causal impact of television in the context of Indonesia. Olken (2009) examines the way television impacts social capital, while Farré and Fasani (forthcoming) investigate the impact of television on migration patterns. According to these two studies, the nature of access to commercial television in Indonesia is likely to be exogenous for the following reasons. First, differences in topography result in variations in television signal quality between *kabupaten*, which in turn cause a plausibly exogenous *kabupaten* variation in access to television. Second, the rollout of commercial television channels is different between *kabupaten*. A new commercial television channel usually starts broadcasting in Jakarta, before moving on to other provincial capitals, and then *kabupaten* in Java, where around 60% of Indonesia's population lives. Afterwards, the broadcast area is broadened to cover *kabupaten* in the western part of Indonesia, before finally reaching the eastern region. This process generally takes place over a number of years, causing variation in access to commercial television between *kabupaten*.

The reasons put forward by Olken (2009) and Farré and Fasani (forthcoming) imply that access to commercial television in Indonesia is plausibly exogenous. In order to remove the

remaining sources of bias in our estimates, we implement several identification strategies[3]. First, we avoid individual-level and household-level unobserved heterogeneity by constructing a *kabupaten* level measure of access to television and birth rate. Second, our longitudinal data set allows a fixed effects estimation that removes time-invariant unobserved *kabupaten* heterogeneity. Third, we control for a number of time-varying *kabupaten* factors that plausibly affect both access to television and fertility. These include the education attainment of adults, gross domestic product (GDP) per capita, availability of healthcare facilities, and the prevalence of religious facilities. We construct these control variables from Podes and Susenas.

We include two specific variables that measure access to healthcare: proportion of villages with a health center and healthcare staff per 1,000 population. These variables are especially important in the context of Indonesia, given that midwives are the government's main instrument for promoting its family planning program (Hull and Hull, 1997); the major expansion in midwifery services took place between 1993 and 2007 (Weaver and Frankenberg, 2012). Finally, we lag the independent variable by one survey period (around three years) to avoid issues with reverse causality.

Equation 1 shows our reduced form econometric model:

$$\ln(birth)_{vt} = \alpha + \beta TV_{vt-1} + \gamma X_{vt-1} + \delta_v + \eta_{pt} + \varepsilon_{vt} \qquad (1)$$

where *birth* is the crude birth rate (births per 1,000 population) in *kabupaten v* at period *t*. Our main explanatory variable is $TV_{vt-1}$, which is the proportion of population that can access commercial channel(s) in *kabupaten v* in the previous period. We also include $X_{vt-1}$, the vector of time varying *kabupaten* characteristics. Finally, the model includes $\delta_v$, representing *kabupaten* fixed effects, and $\eta_{pt}$, period fixed effects that are allowed to vary by island.

## 4.1 Summary Statistics

A summary of the statistics is shown in Table 1. Looking at the time-varying variables, the table shows that around 40% of Indonesian adults have at least nine years of schooling. The healthcare variables show limited access, with only 2.8 healthcare staff per 1,000 population and around 17% of villages on average having a public health center.

Looking at access to other types of media, the statistics show that only slightly more than one-third of the population listens to radio, and only 18% reads newspapers. These figures are very low in contrast to the proportion of population that watches commercial television, which is around 78%.

Finally, we also measure the extent of contraceptive use. Contraceptive use leads to a decline in fertility among the population. Moreover, fertility can also be affected by increased access to television. In the mid-1990s, the government used television to provide public service announcements on the importance of family planning. Therefore, contraceptive use could be a significant channel through which television affects fertility. We formally test the merit of

[3]One strategy employed by Olken (2009) and Farré and Fasani (forthcoming) that we choose not to implement is one that exploits differences in television reception across *kabupaten* due to topography. Farré and Fasani (forthcoming) find that the estimation results with and without this particular strategy are qualitatively very similar.

this particular channel in the next section. The statistics show that the majority of married women do not use contraception.[4] Among the 44% who do, virtually all use modern contraceptives.

**Table 1. Summary Statistics (*kabupaten* averages)**

| | Mean | Standard Deviation |
|---|---|---|
| ln (births per 1000 population) | 2.734 | 0.406 |
| Proportion of population with access to commercial television channels | 0.782 | 0.195 |
| Proportion of adults with nine years of schooling | 0.404 | 0.196 |
| Healthcare staff per 1000 population | 2.858 | 5.258 |
| Proportion of villages with a public health center | 0.167 | 0.148 |
| GDP per capita (1994 Rupiah, million) | 6.962 | 10.162 |
| Mosque per 1000 population | 2.785 | 1.892 |
| Proportion of population who accessed the following media in the past week | | |
| Radio | 0.369 | 0.171 |
| Newspaper | 0.178 | 0.124 |
| Proportion of married women who use | | |
| No contraception | 0.557 | 0.112 |
| Traditional contraceptives[a] | 0.008 | 0.029 |
| Modern contraceptives[b] | 0.434 | 0.117 |

[a]Periodic abstinence (rhythm); withdrawal; herbal mixtures of different forms taken orally as a means to avoid pregnancies, such as *jamu* (traditional medicine) and eating certain fruits; applying a hot object to the abdomen externally; and massage.
[b]Male and female sterilization, intrauterine devices (IUDs), pills, injections, implants, and condoms.

# V. THE IMPACT OF TELEVISION ON FERTILITY

Table 2 shows the estimated impact of access to television on crude birth rates. When time varying *kabupaten* characteristics are not controlled, our fixed effects estimation shows that in *kabupaten* where 100% of the population has access to commercial television channels, the birth rate is around 30.8% lower than *kabupaten* with no access to commercial television channels. Adding all the control variables magnifies the estimated impact to 32.3%.

To put economic significance into our results, the estimates in Column 2 show that increasing the share of population with access to commercial television by one standard deviation—basically providing universal access to commercial television—will reduce crude birth rate in the next period by 6.2%. This would imply a 0.95-point decline in crude birth rate from 15.39 to 14.44 per 1000 population from the mean. Given Indonesia's population of around 200 million in this period, the drop translates to 190,000 fewer births.

[4]In Susenas, the question on contraceptive use is not asked to unmarried women or to male respondents.

**Table 2. The Impact of (Lagged) Television Access on Fertility**

| | | (1) | (2) |
|---|---|---|---|
| *Lagged independent variables* | | | |
| Proportion of population with access to commercial television channels | | -0.308** | -0.323** |
| | | (0.134) | (0.142) |
| Proportion of adults with nine years of schooling | | | 0.337 |
| | | | (0.211) |
| Proportion of villages with a public health center | | | 0.068 |
| | | | (0.223) |
| Healthcare staff per 1000 population | | | -0.004 |
| | | | (0.004) |
| GDP per capita (Rp million, real) | | | 0.000 |
| | | | (0.001) |
| Mosque per 1000 population | | | 0.019 |
| | | | (0.028) |
| Proportion of population who accessed | | | |
| | Radio | | 0.079 |
| | | | (0.115) |
| | Newspaper | | 0.077 |
| | | | (0.204) |
| Constant | | 2.870*** | 2.736*** |
| | | (0.100) | (0.150) |
| *Kabupaten* fixed effects | | Yes | Yes |
| Year-island fixed effects | | Yes | Yes |
| Number of observations | | 1,352 | 1,352 |
| Number of *kabupaten* | | 284 | 284 |
| R-squared (within) | | 0.154 | 0.158 |

Note: *** 1% significance, ** 5% significance, * 10% significance; dependent variable is ln (births per 1,000 population); standard deviations are in parentheses.

In summary, our findings corroborate the results from Brazil and India regarding the effect of television on fertility. Although our results are not directly comparable to those studies due to our different measure of fertility, we find evidence that the effect in Indonesia is relatively large. In Brazil, the entry of a highly popular television channel reduces the average number of children among childbearing women by only about 0.03 children (La Ferrara, Chong, and Duryea, 2012). Similarly, the entry of cable television service in India reduces the probability of pregnancy by 4 percentage points (Jensen and Oster, 2009).

## 5.1 Mechanisms

There are two potential channels through which television may affect fertility. The first is the substitution channel, where individuals increase the time spent watching television and, holding everything else constant, reduce the time spent on reproduction. Johnson (2001)

observes that women in rural India immediately substitute other activities with watching television as their villages gain access to television broadcasting. The second is the behavioral channel, where the content changes individual behavior and preferences with regards to fertility. Empirically, Pritchett (1994) finds that nearly all of the differences in fertility between countries can be accounted for by differences in desired fertility.

We do not have data on the content of each television channel or time-use data. These limitations imply that we cannot explicitly investigate whether the mechanism through which television reduces fertility works mainly through the activity of watching television itself or through the content of the broadcast. However, since Susenas collects questions on contraceptive use, we can indirectly test which of these mechanisms is more likely to be responsible.[5]

Specifically, we estimate the impact of access to television on the use of different contraceptive methods. If the content of the broadcast is the main mechanism through which television reduces fertility, we should observe a positive effect of television on contraceptive usage. This is due to the fact that in Indonesia, similar to other developing countries, television soap operas depict families living a "modern" lifestyle, typified by having a maximum of two children and a working mother. In addition, the government continues to use television to promote family planning. Given that the government's family planning program recommends the use of modern contraceptives, we should observe a negative effect of television on the proportion of married women using traditional contraception. Finally, if we find that television has no effect on contraceptive use or the type used, then the more likely mechanism would be the substitution channel.

To formally test for the proposition above, we estimate a *kabupaten* fixed effects Seemingly Unrelated Regression (SUR) model, with three dependent variables: no contraception, traditional contraception, and modern contraception.[6] We include the same time-varying control variables, as well as island-specific time fixed effects, as from Equation 1. Unlike Equation 1, however, we do not lag the independent variables as we assume that the impact of television on contraception occurs instantaneously.

Table 3 shows the estimation results. We find that television has no impact on traditional contraception usage. In contrast, we find a positive and statistically significant impact on modern contraception usage. A one-standard deviation increase in the proportion of population with access to commercial television will increase modern contraception usage by 2.7 percentage points, with all of the increase coming from a reduction in the proportion of married women with no contraception. Therefore, the more likely mechanism is the content of the broadcast.

[5]In Brazil, La Ferrara, Chong, and Duryea (2012) argue that the content, rather than the activity of watching television, is the main mechanism. They come to this conclusion after finding that children born after the entry of Rede Globo have a higher probability to be named after a soap opera character. In addition, they find that the entry of another television channel, one with less soap opera content, has no effect on fertility.
[6]See Blackwell (2005) on estimating multiple-equation panel fixed effects models.

## Table 3. The Impact of Television on the Choice of Contraception

| | No Contraception | | Traditional Contraception | | Modern Contraception | |
|---|---|---|---|---|---|---|
| Proportion of population with access to commercial television channels | -0.1389 | *** | -0.0006 | | 0.1394 | *** |
| | (0.030) | | (0.003) | | (0.028) | |
| Proportion of adults with nine years of schooling | -0.0490 | *** | -0.0040 | | 0.0530 | *** |
| | (0.018) | | (0.006) | | (0.014) | |
| Proportion of villages with a public health center | 0.0521 | ** | -0.0066 | ** | -0.0455 | * |
| | (0.025) | | (0.003) | | (0.026) | |
| Healthcare staff per 1000 population | 0.0001 | | 0.0002 | *** | -0.0003 | |
| | (0.000) | | (0.000) | | (0.000) | |
| GDP per capita (Rp million, real) | -0.0002 | | 0.0000 | | 0.0002 | |
| | (0.000) | | (0.000) | | (0.000) | |
| Mosque per 1000 population | 0.0001 | | -0.0003 | * | 0.0002 | |
| | (0.002) | | (0.000) | | (0.002) | |
| Proportion of population who accessed | | | | | | |
| Radio | 0.0349 | *** | -0.0017 | | -0.0333 | *** |
| | (0.007) | | (0.004) | | (0.007) | |
| Newspaper | -0.0059 | | 0.0015 | | 0.0044 | |
| | (0.023) | | (0.010) | | (0.017) | |
| *Kabupaten* fixed effects | Yes | | | | | |
| Year-island fixed effects | Yes | | | | | |
| Number of observations | 1,662 | | | | | |
| Number of *kabupaten* | 284 | | | | | |

*Note*: *** 1% significance, ** 5% significance, * 10% significance; figures are average marginal effects; standard deviations are in parentheses; estimated using panel fixed effects seemingly unrelated regression (SUR) method.

# VI. CONCLUSION

Several studies have documented the impact of television on individual behavior, including voting behavior, participation in community activities, engagement in violence, views on women's status, and adolescent test scores. In this paper, we estimate the impact of access to television on fertility in the context of Indonesia. Specifically with regards to its impact on fertility, studies in Brazil and India find television to have a negative effect on fertility. Different from those studies, our dependent variable more closely resembles a widely used measure of fertility: the crude birth rate.

Our *kabupaten* fixed-effects estimation shows that increasing the share of population with access to commercial television by one standard deviation—basically shifting from 78% coverage to universal coverage—will reduce crude birth rate in the next period by 6.2%. This is equivalent to a 0.95-point decline in crude birth rate from 15.39 to 14.44 per 1,000 population from the mean. Given Indonesia's population of around 200 million in this period, the drop translates to 190,000 fewer births.

With regards to the main mechanism that explains the relationship between television and fertility, we find evidence that television causes an increase in the use of modern contraceptives, but no change in the proportion of married women using traditional contraception. These results show that increasing access to television results in a behavioral change that leads to increased use of modern contraception and lower fertility.

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The SMERU Research Institute

Telephone : +62 21 3193 6336
Fax : +62 21 3193 0850
E-mail : smeru@smeru.or.id
Website : www.smeru.or.id

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